

S20

The Compact
for small precision components.



Key data

The S20 is a universal cylindrical grinding machine with electromechanical drives for the production of small workpieces. It has a distance between centres of 400/650 mm and a centre height of 100 mm. It can machine workpieces with a maximum weight of 20 kg.

A word cloud of values in various sizes and orientations, including: GLOBAL, TECHNOLOGY LEADER, EFFICIENCY, SAFETY, PERFECTION, CUSTOMER FOCUS, SOPHISTICATED PROCESSES, and PRECISION.

The Art of Grinding.

TECHNOLOGY LEADER
EFFICIENCY
PERFECTION
CUSTOMER FOCUS
SOPHISTICATED PROCESSES
PRECISION
GLOBAL
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.

S20

If you also want to grind automatically with a conventional machine, you need look no further than the S20. Pre-installed automatic grinding cycles ensure efficient grinding. The machine table with a swiveling range of up to 30 deg enables high-precision taper grinding. The S20 is also very compact and offers an advantageous price-performance ratio.

Characteristics

Dimensions

- Distance between centres 400/650 mm (15.7"/25.6")
- Height of centres 100 mm (3.94")
- Maximum workpiece weight 20 kg (44 lbs)

Features

- Cross slide with wheelhead for external grinding with grinding wheel on the right and location area for the internal grinding unit (optional)
- Wheelhead with 15 and 30 deg manual swivel
- Table with swivelling range of:
 - up to 30 deg 400 mm distance between centres
 - up to 15 deg 650 mm distance between centres
- Workhead with hydrodynamic bearing for grinding between fixed centres or with rotating spindle
- Tailstock with adjustable centre pressure and fine adjustment for rapid and easy cylindricity correction
- Control cabinet connected to the machine. Can be expanded to include in-process gauging and Sensitron



- Automatic grinding cycles for plunge and traverse grinding operations
- Automatic grinding cycle with automatic cut-out:
 - Rapid in-feed
 - Grinding feed
 - Spark-out
- Rapid retraction of feed handwheel to the preset grinding allowance
- Plunge grinding and travel grinding with or without rapid infeed
- Compact design
- Varied range of accessories



The Universal Cylindrical Grinding Machine with electromechanical drives for the production of small workpieces.

The S20 is designed for the grinding of workpieces in single-component or small series production runs. It can be used in any sector where small components are manufactured. This simple and very reasonably priced machine has a tried-and-tested SPS control unit. It is easy to operate and the machine can be reset very quickly. The proven design allows the specialist to concentrate fully on the grinding process.

The efficient automatic grinding cycles with automatic cut-off are controlled electro-mechanically, as are all the axes. Features like rapid in-feed, grinding feed, spark-out, rapid retraction of the handwheel to the preset grinding allowance, plus cycles for plunge and traverse grinding are unique and included in the basic equipment.

The systematic development, production, assembly and testing of our products are conducted in a process-oriented manner and comply with the stringent VDA6.4 and ISO 9001 directives.

Wheelhead

1

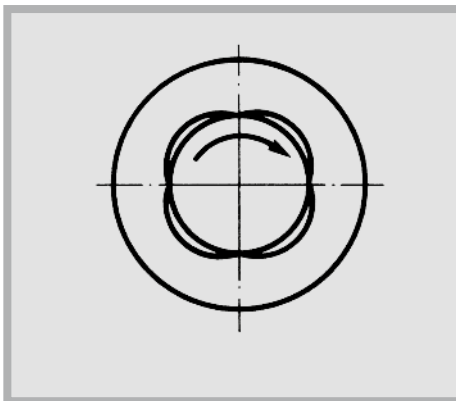


- Flexible
- Compact
- Internal grinding attachment

The external wheelhead with the grinding wheel on the right is mounted on the cross slide. The wheelhead can be adjusted to fixed settings, with swivel angles of 0, 15 and 30 deg. The hydrodynamic plain bearing on the external wheelhead guarantees high run-out with minimal maintenance over many years. It is wear-free and low maintenance. Clearance does not need to be set. The run-out of the wheelhead is outstanding.

Belt-driven spindles are used for the internal grinding attachment. Nominal speeds: 20 000, 40 000 and 60 000 rpm. The internal grinding attachment is fitted with an oil mist lubricating unit.

2



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- 1 External grinding wheel
- 2 Hydrodynamic plain bearing
- 3 Internal grinding attachment (optional)

Workhead

1



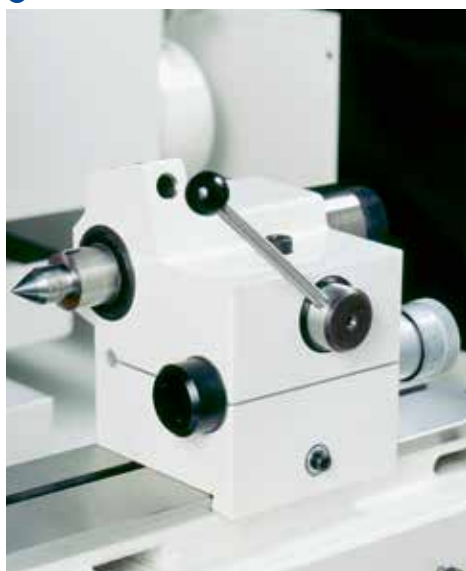
- Grinding between centres and live spindle grinding
- High roundness precision

The workhead enables grinding between fixed centres and with a rotating spindle. The powerful workhead spindle, relieved from belt tension, rotates in a hydrodynamic multi-surface plain bearing. Roundness in live spindle grinding operations is 0,0003 mm (0.000,012"), with the option of 0,0002 mm (0.000,008").

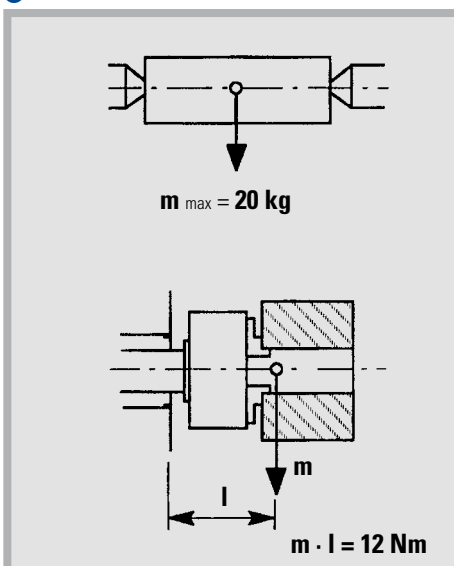
Workhead drive:
Stepped AC motor
Frequency converter for stepless drive (optional)

Tailstock

2



3



- High stability
- Adjustable centre pressure
- Cylindricity correction

The rigid tailstock has a generously dimensioned barrel that glides in effectively covered roller bearings. The centre pressure can be very finely adjusted. Hysteresis-free fine adjustment enables rapid and simple cylindricity correction in the range of $\pm 40 \mu\text{m}$, as required when machining high-precision workpieces.

Machine base

The special-cast strongly ribbed machine base has a hydraulic concrete substructure. Damping elements between the machine base and the substructure ensure optimal absorption of external vibrations.

Cross and longitudinal slide

- Vibration damping
- Swivelling range up to 30 deg

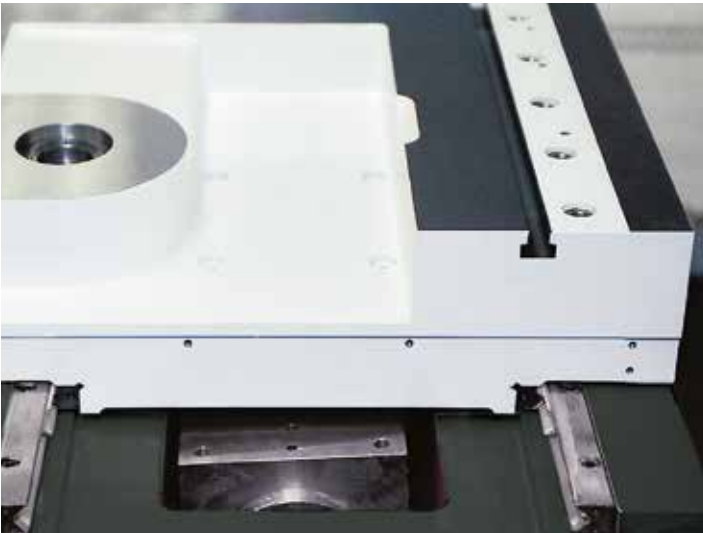
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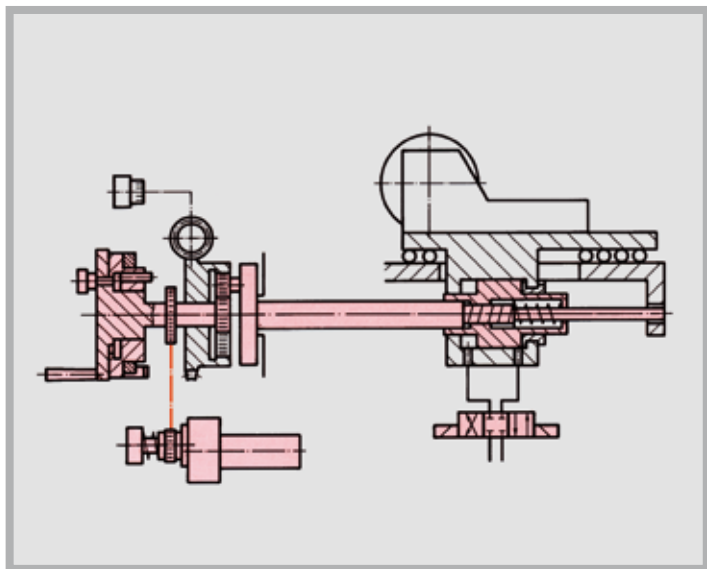
The slides rest completely on the machine base guides over the entire travel range. They benefit from the excellent straightness of the generating line, i.e. 0,0015 mm (0.000,06") over a measured length of 380 mm (14.9")!

One of the outstanding features of the cross slide with pretensioned needle guides is its exceptional repeatability. The wheelhead axis feed is infinitely adjustable.

The longitudinal slide has a high-precision, ground V and flat guideway, which is optimum for the flow of forces. A particular advantage is the wide swivelling range of the table, i.e. 30 deg for 400 mm (15.7") distance between centres and 15 deg for 650 mm (25.6") distance between centres. Fine adjustment and angle stop on the longitudinal slide for precise setting of tapers (optional).

Wheelhead axis X

1

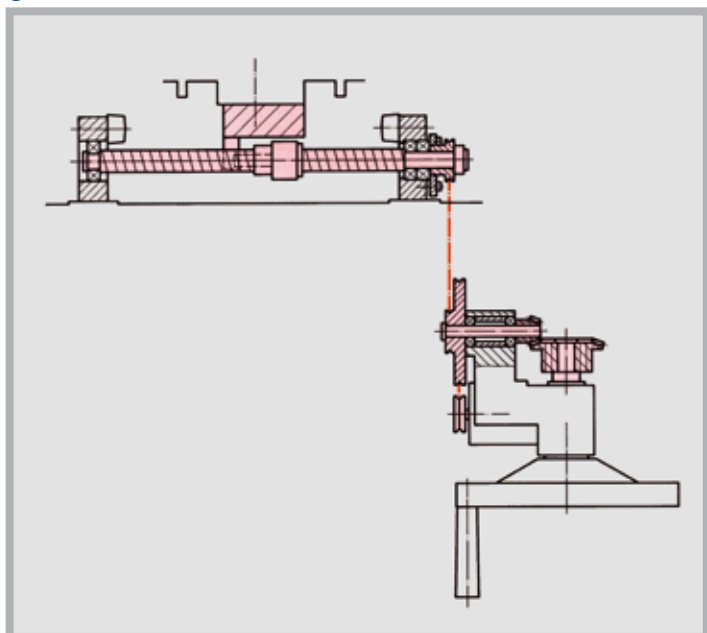


Infinitely variable feed. The cross slide is fitted with a low-maintenance hydraulic rapid approach. The pretensioned needle guides ensure stick-slip-free fine adjustment. High touching speeds and time savings are ensured by the Sensitron contact control unit (optional).

- Rapid-response hydraulics with fast reverse
- Hydraulic unit outside the machine
- Second, slow feed speed (optional)

Longitudinal axis Z

2



The drive for the longitudinal axis ensues via a handwheel, with an adjustment range of 15 mm (0.59") per rotation or automatically by means of a DC motor via a circulating ball screw. Repetition accuracy is < 0.02 mm in a variable speed range.

- The reverse stops are set mechanically
- Digital position display (optional)

Machine control and operation

1



- Control cabinet EMV-tested
- Ergonomically arranged controls

The control cabinet is fixed to the machine, making it ready for operation immediately. The control unit is reliable and maintenance-free. The electrical equipment complies with the relevant safety norms and is EMV-tested. The clear device layout guarantees optimum ease of operation.

Automatic grinding cycle with automatic cut-out

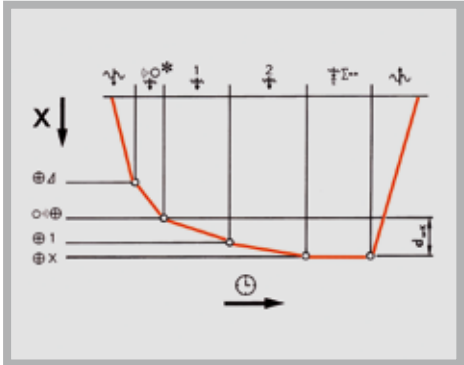
- Rapid infeed
- Grinding feed
- Spark-out
- Rapid retraction of rapid infeed and feed handwheel to the preset grinding allowance

Grinding programs

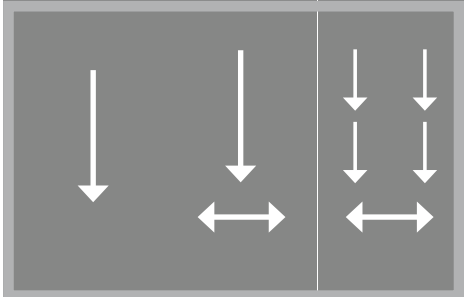
- Plunge grinding with short stroke of the longitudinal slide or travel grinding with continuous infeed
- Travel grinding with intermittent infeed on the left, right or both ends of the stroke

The Sensitron contact control unit, including vibration pick-up, enables automatic switch-over from infeed advance to grinding feed. Together with this contact detection, touching speeds of 0,06 to 30 mm/min (0.002–1.18 ipm) can be achieved with the machine. Using this option reduces grinding and setup times to a minimum.

2



3



Customer Care

STUDER cylindrical grinding machines should fulfil the customer's 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**

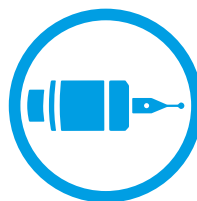
Training
Production support

**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	400/650 mm (15.7"/25.6")
Centre height	100 mm (3.94")
Max. workpiece weight between centres	20 kg (44 lbs)

Cross slide: X axis

Rapid approach	30 mm (1.18")
Max. travel	25 mm (0.98") [recess depth 1,9 mm (0.7") / 5 mm (0.2") (optional)]
Speed	0,03–1,5 mm/min (0.0012–0.06 ipm)
Feed travel with handwheel	25 mm (0.98")
Feed 1	0,03–1,5 mm/min (0.001–0.06 ipm)
Diameter plunge feed incremental	0–0,16 mm (0–0.006")
Feed 2 (optional)	0,02–0,3 mm (0.0008–0.01")
Spark-out time	0–5 s
Touching speed (optional)	0,06–30 mm/min (0.002–1.18 ipm)

Longitudinal slide: Z axis

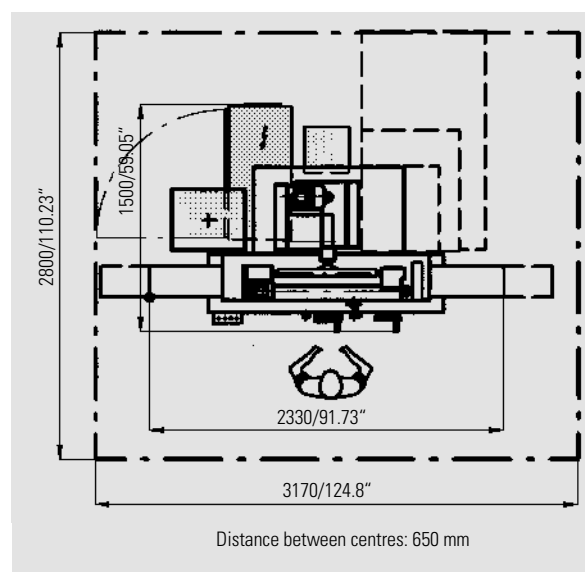
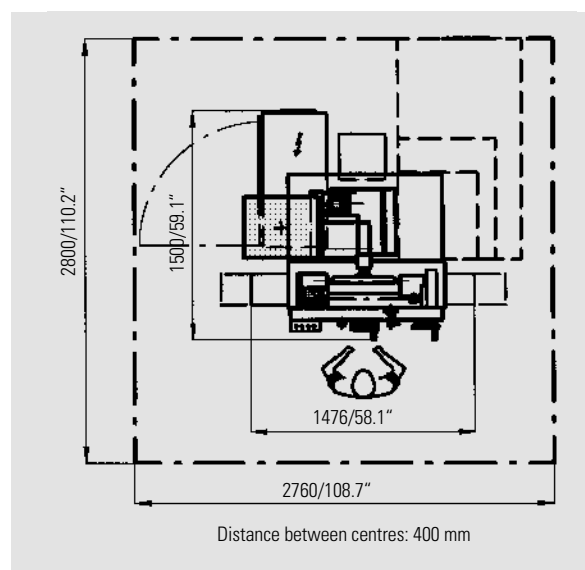
Max. travel	420/650 mm (16.5"/25.6")
Speed	100–3 500 mm/min (3.94–138 ipm)
Reverse precision	0,02 mm (0.0008")
Smallest automatic travel	aprox. 1 mm (0.04")
Reverse delay	0–5 s
Machine table swivelling range	30/15 deg

Wheelhead

Swivel range	0/15/30 deg
Fitting taper	dia. 44 mm (1.73") 1:5,715
Drive power	3 kW (4 hp)
Grinding wheel right, dia. x width x bore	350 x 32 (50F5) x 127 mm [13.78" x 1.26" (2F5) x 5"]
Circumferential speed	30 m/s (5905 sfpm)
Speeds	1 600/1 975/2 200 rpm

Internal grinding attachment for belt-driven spindles (optional)

Adaption bore	80 mm (3.15")
Speeds	20 000/40 000/60 000 rpm



Universal workhead

Speeds	80/175/380/800 rpm
Speed range infinitely variable (optional)	30–1200 rpm
Fitting taper	MT 4
Spindle feedthrough	24 mm (0.95")
Swivelling range	0–90 deg
Driving power	0,5 kW (0.66 hp)
Load during live spindle grinding	12 Nm (9 ft lbs)
Roundness accuracy during live grinding	0,0003/0,0002 mm (0.000,012/0.000,008")

Tailstock

Fitting taper	MT 2
Travel of barrel	20 mm (0.79")
Barrel diameter	32 mm (1.26")
Fine adjustment for cylindricity corrections	±40 µm (0.0016")

Control unit

SPS control

Guaranteed working precision

Straightness of surface line

Gauge length 380 mm (14.97")	0,0015 mm (0.000,06")
Gauge length 630 mm (24.82")	0,0025 mm (0.000,10")

Connected loads

Total connected load	8 kVA
Air pressure	5 bar (72 psi)

Total weight

Distance between centres 400 mm	1 600 kg (3 520 lbs)
Distance between centres 650 mm	1 900 kg (4 180 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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ISO 9001
VDA6.4
certified



S30

The Classical
for medium-sized precision components.



Key data

The S30 is a cylindrical grinding machine for medium-sized workpieces in individual and small batch production.

It has distances between centres of 650/1000 mm and centre heights of 125/175/225 mm.

It can machine workpieces with a maximum weight of 130 kg.



The Art of Grinding.

Fritz Studer AG

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S30

If you want to have everything under control with just one lever, then the S30 was made for you. This simple and low-cost machine will allow you to produce precise, medium-sized parts. Thanks to its hydraulic control system the S30 is very easy to operate, so that the expert can give his full attention to the grinding process. Automatic grinding cycles guarantee high productivity with consistent quality.

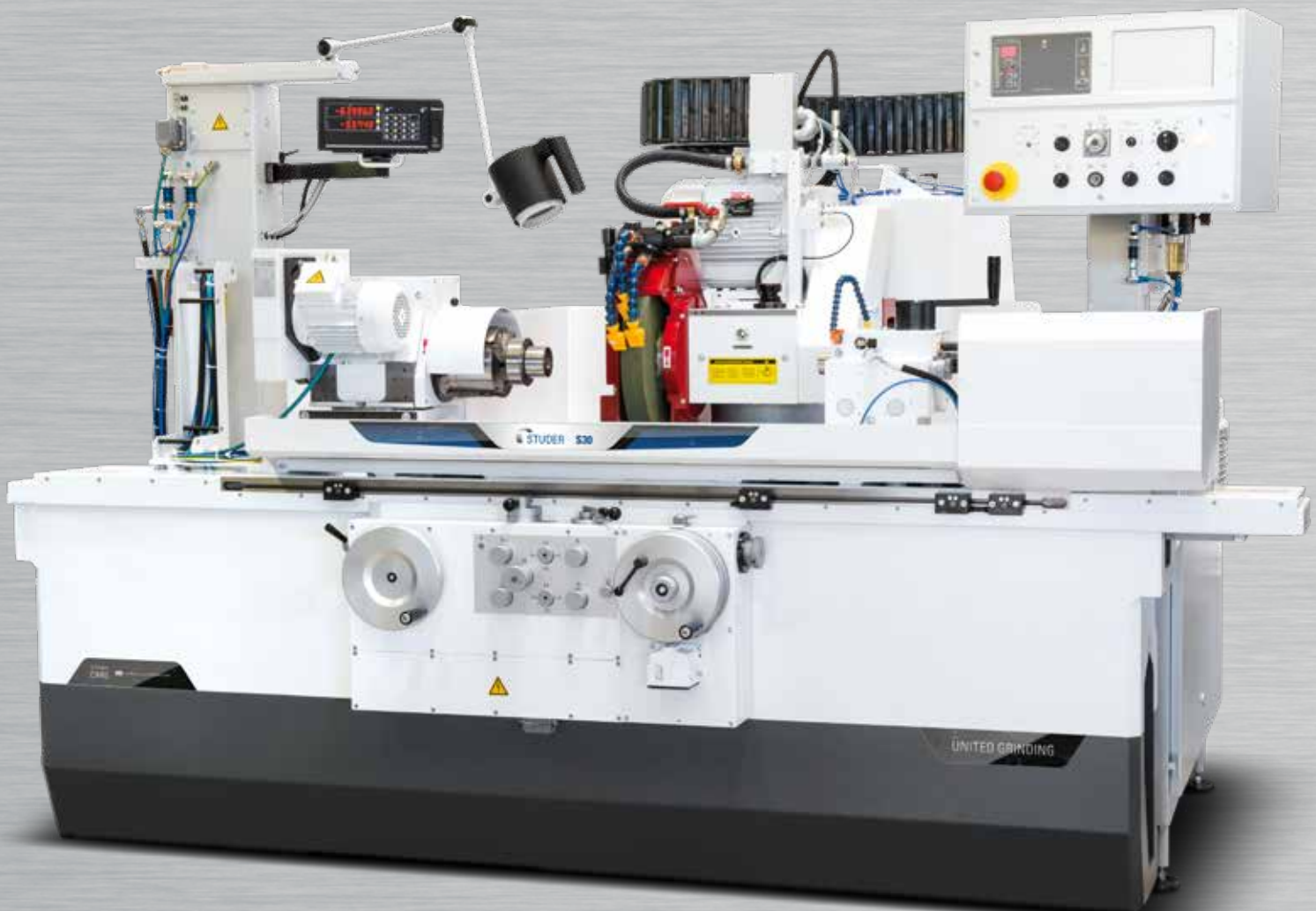
Characteristics

Dimensions

- Distance between centres 650 / 1 000 mm (25.6" / 39.4")
- Height of centres 125 / 175 / 225 mm (4.9" / 6.9" / 8.9")
- Max. workpiece weight 130 kg (286 lbs)

Features

- Optional wheelhead:
 - Turret wheelhead with grinding wheel on the left and right, plus internal grinding attachment (optional) with 5 deg manual Hirth swivel to a stop of 0 deg and 180 deg
 - External wheelhead with grinding wheel on the left
- Table can be swivelled 10 deg / 8.5 deg



- Workhead fitted with hydrodynamic bearing as standard and a roller-bearing workhead (optional) make it possible to grind between fixed centres as well as with rotating centres
- Tailstock with adjustable centre pressure and fine adjustment for quick and easy cylindricity correction
- Control cabinet permanently attached to the machine. Can be expanded for in-process gauging and Sensitron.
- Granitan® S103 mineral-cast machine base
- Automatic grinding cycle with automatic cut-out:
 - Rapid infeed
 - Grinding feed 1 and 2
 - Spark-out
- Rapid retraction of the feed handwheel to the preset grinding allowance
- Plunge grinding and travel grinding with or without rapid infeed
- External and internal grinding possible in one clamping
- Extensive range of accessories



The Universal Cylindrical Grinding Machine with hydraulic drives for the production of medium-sized workpieces.

The S30 is designed for the grinding of workpieces in single-component or small series production. It is suitable for any sector in which medium-sized components are produced. This simple, reasonably priced machine has a tried-and-tested hydraulic infeed system. It is very easy to operate and can be set up extremely quickly. This proven concept enables the specialist to devote his full concentration to the grinding process.

The Granitan® S103 machine bed provides the basis for the fitting of technologically outstanding components to form a cylindrical grinding machine guaranteeing the highest possible precision, performance and reliability levels for many years.

The efficient automatic grinding cycles with automatic cut-out are controlled hydraulically, as are all the axes. Features such as rapid infeed, grinding feed, spark-out, rapid retraction of the handwheel to the preset grinding allowance plus the cycles for plunge and traverse grinding are unique and form part of the basic equipment.

The systematic development, production, assembly and testing of our products are carried out in a process-oriented manner. They comply with the stringent VDA6.4 and ISO 9001 norms.

Wheelhead

1



- Flexible
- Compact
- Internal grinding attachment

There is a choice of two variations for universal applications for external, surface and internal grinding:

- Turret wheelhead for external and internal grinding with an external grinding wheel on the right and left and one internal grinding spindle. High-precision manual indexing (5 deg) is possible using a Hirth gear within a swivel range of 0 deg to +180 deg.
- External wheelhead on the left: external grinding with wheel on the left

Grinding spindle bearing

The hydrodynamic plain bearing of the external grinding spindle guarantees many years of high run-out with minimal maintenance. It is wear-free with no clearance adjustment and low maintenance.

Internal grinding spindles

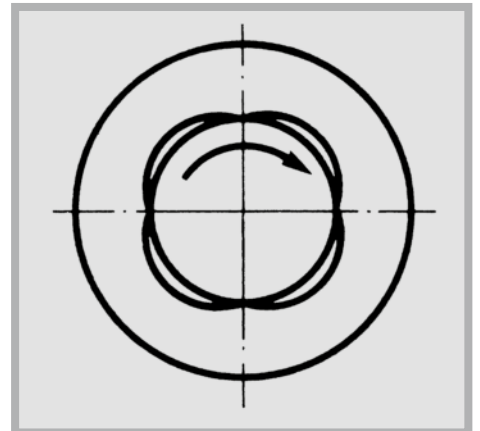
Belt-driven spindles can be used for the internal grinding attachment. The belt-driven internal grinding spindle is equipped with an oil mist lubrication device.

Nominal rpm

20 000, 40 000 and 60 000 min⁻¹.

External and internal grinding is possible in one clamping.

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- 1 Wheelhead
- 2 Hydrodynamic plain bearing
- 3 Internal grinding attachment (optional)

Workhead

1



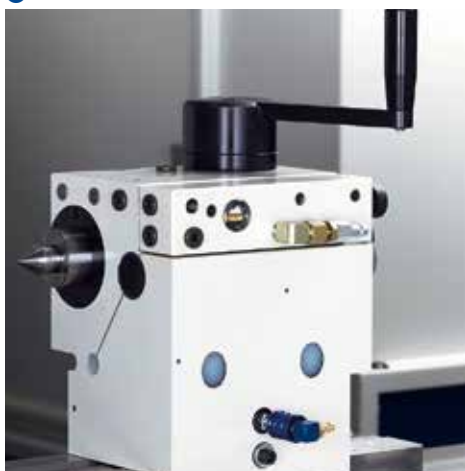
The swivelling workhead with hydrodynamic bearing makes it possible to grind between fixed centres as well as with rotating centres. The powerful workhead spindle, relieved from belt tension, rotates in a hydrodynamic multi-surface plain bearing. Roundness during live spindle grinding is 0.0003 mm (0.000,012"), with the option of 0.0001 mm (0.000,004") available. The workhead is driven by a stepped AC motor.

- Frequency converter for infinitely variable speed control (optional)
- A workhead with swivelling roller bearing is available as an option

- High roundness levels
- Low maintenance
- Grinding between centres and live spindle grinding

Tailstock

2



3



The rigid tailstock has a generously dimensioned barrel for holding Morse 3 centres. The barrel glides in covered plain bearings, and the centre pressure can be finely adjusted. The fine adjustment enables quick and easy cylindricity correction (optional), as required for the machining of high-precision workpieces.

- The tailstock can be fitted with hydraulic barrel retraction and an adjustable dressing device

Granitan® S103 mineral-casting machine base

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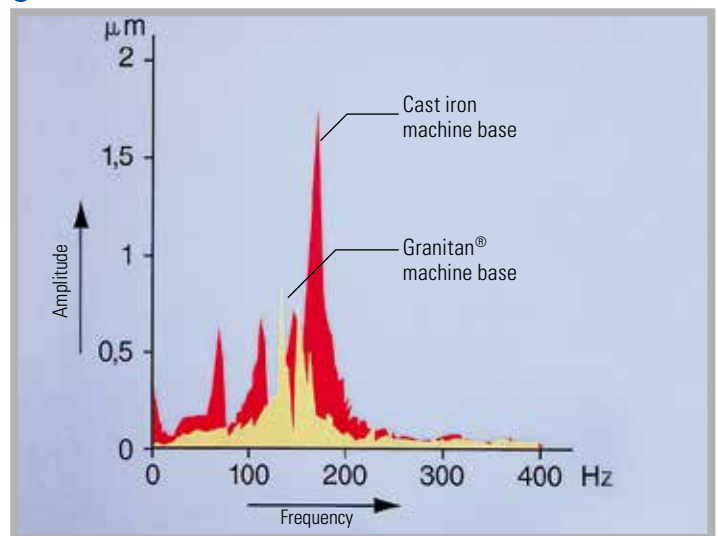


- Vibration-damping
- Thermal stability
- Non-wearing

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 surface quality 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 non-abrasive 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.

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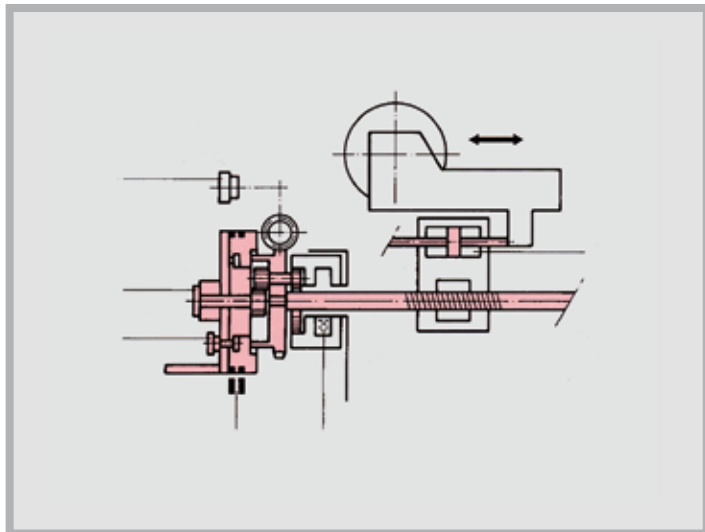
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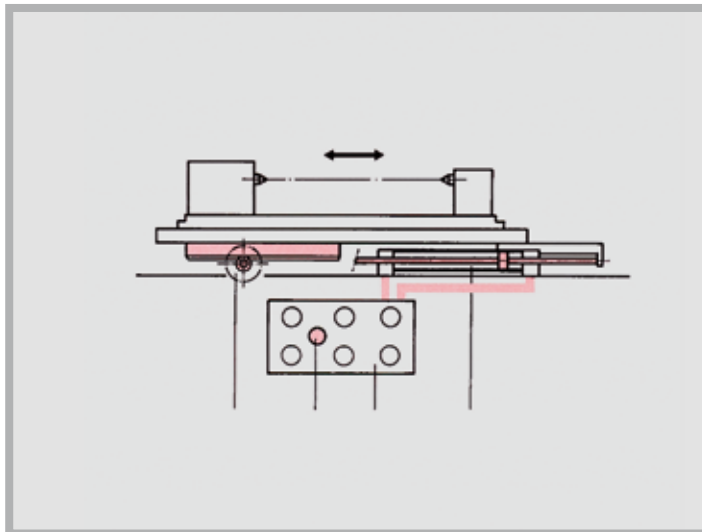
- 1 Machine base with longitudinal and cross guides
- 2 Vibration behaviour of grey cast iron and Granitan® S103
- 3 Guideways with patented surface structure

Longitudinal and cross slides

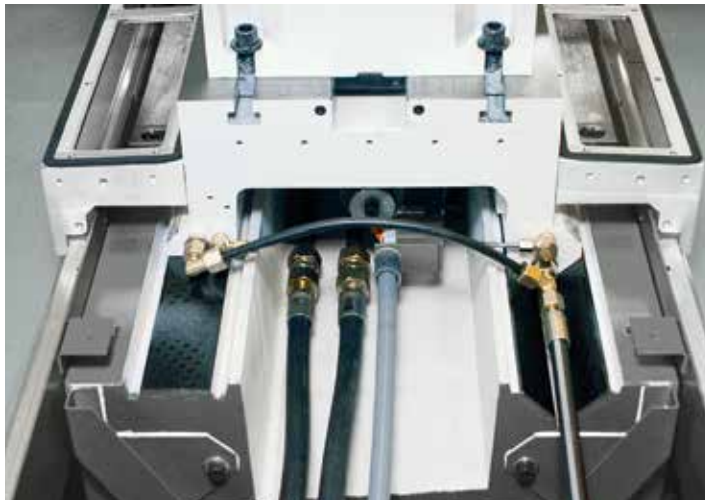
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- Low coefficient of friction
- Hydraulic rapid approach
- No-play feed system
- Low wear
- Repeatable accuracy

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 (0.000,10") over 610 mm (24") measured length.

Longitudinal slide on the Z axis

The longitudinal slide with swivelling table is driven manually via the handwheel or automatically via hydraulic cylinders with infinitely variable speed control. The quick-reacting hydraulics with soft and very precise conversions ensure high precision during rapid speed changes. Optional: fine adjustment plus air lift to the swivelling table for rapid cylindricity corrections and precise setting of taper angles. Digital display of the position of the longitudinal slide.

Cross slide on the X axis

The drive is via a handwheel or automatically via a rolling ball spindle and hydraulic motor. The mechanics of the wheelhead axis include a fine adjustment device, enabling infeed corrections in the range of fractions of a micrometre. Optional: Sensitron contact control unit, OD gauge, digital cross slide position display.

- 1 Illustration of the wheelhead axis
- 2 Illustration of the longitudinal axis
- 3 V and flat guideway (cross slide)

Machine control and operation

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2



- Control cabinet EMV-tested
- Ergonomically arranged controls

The control cabinet is permanently attached to the machine, making it ready for operation immediately. The control is reliable and maintenance-free. The electrical equipment complies with the relevant safety norms and is EMV-tested. A clear device layout ensures optimum ease of operation.

Automatic grinding cycle with automatic cut-out:

- Rapid infeed
- Grinding feed
- Spark-out
- Rapid retraction of the feed handwheel to the preset grinding allowance

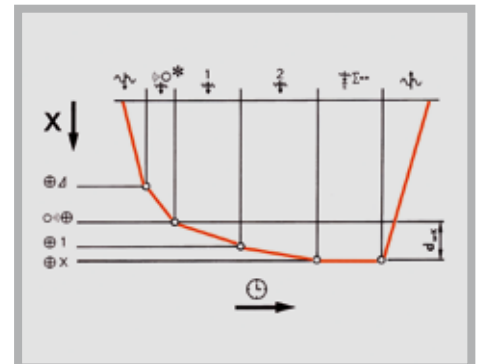
Grinding programs:

- Plunge grinding with short longitudinal slide stroke or travel grinding with continuous infeed
- Travel grinding with intermittent infeed on the left, right or both ends of the stroke

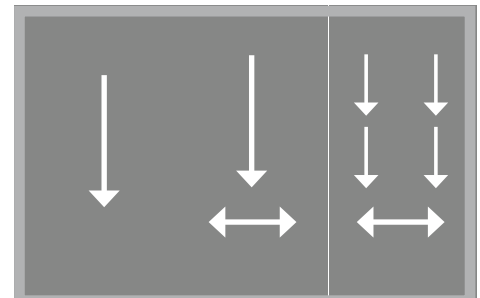
The Sensitron contact control unit including vibration pick-up provides for automatic switch-over of infeed to grinding feed.

This contact detection enables the machine to achieve touching speeds of 0,06 – 30 mm/min (0.002 – 1.18 ipm). This option reduces grinding and setup times to a minimum.

3



4



Customer Care

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- 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**

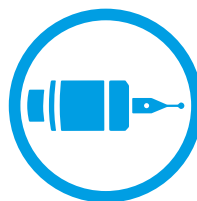
Training
Production support

**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")
Height of centres	125 / 175 / 225 mm (4.9" / 6.9" / 8.9")
Max. workpiece weight between centres	130 kg (286 lbs)

Cross slide: X axis

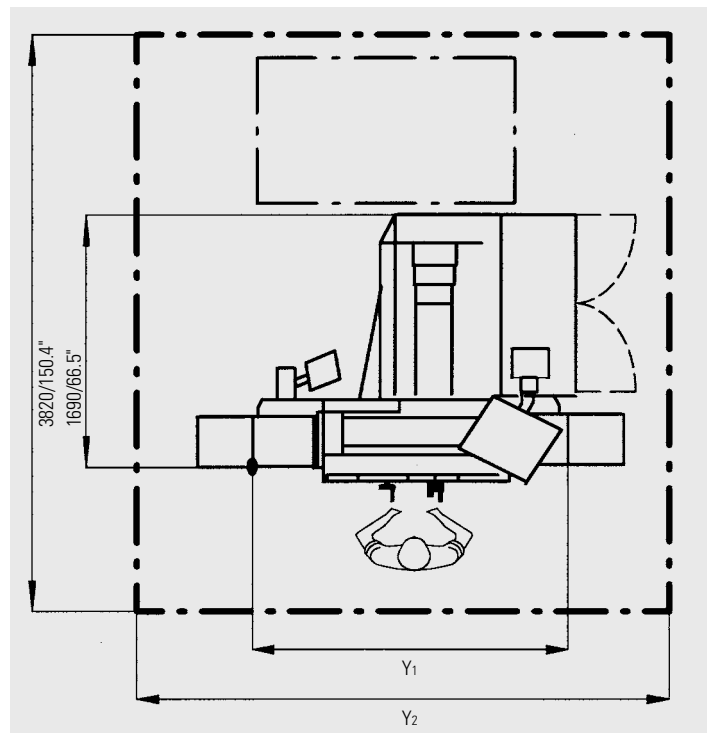
Rapid infeed	60 mm (2.36")
Max. travel	255 mm (10.2") [plunge depth 3,4 mm (0.134")]
Speed	0,012 – 6 mm / min (0.000,5 – 0.24 ipm)
Incremental feed	0,001 – 0,05 mm (0.000,04 – 0.002")
Spark-out time	0 – 6 s
Handwheel rotation	4 mm (0.16") / dia.

Longitudinal slide: Z axis

Max. travel	700 / 1 050 mm (27.5" / 41.3")
Speed	50 – 5 000 mm / min (1.97 – 197 ipm)
Reverse delay	0 – 6 s
Minimum automatic table travel	1,5 mm (0.06")
Reverse precision at constant speed	0,02 mm (0.000,8")
Machine table swivel range	10 deg / 8,5 deg

Wheelhead

Swivel range	0 deg to +180 deg
Fitting taper	dia. 63 mm (2.5")
Driving power	5,5 kW (7.5 hp)
Speeds	1 670 / 2 110 rpm
Grinding wheel left, dia. x width x bore	400 x 63 (80F5) x 127 mm (dia. 500 mm Option) [16" x 2.5" (80F5) x 5"]
Grinding wheel right, dia. x width x bore	400 x 40 x 127 mm (16" x 1.6" x 5")
Circumferential speed	35 m/s (6888 sfpm) to 50 m/s (9840 sfpm)
Internal grinding spindle for belt-driven spindles	optional
Adaption bore	100 mm (3.94")



Distances between centres

	Y1	Y2
650 mm	2 035 / 80,1"	3 500 / 137,8"
1 000 mm	2 735 / 107,7"	3 900 / 153,5"

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.

Workhead swivelling

hydrodynamic bearing

roller bearing

Speed range	30–1 000 rpm	35/90/210/520 rpm
Fitting taper	MT 5	MT 5
Bar capacity	dia. 30 mm (1.2")	dia. 38 mm (1.4")
Driving power	0,55 kW	0,55 kW
Load during live grinding	100 Nm (74 ft lbs)	100 Nm (74 ft lbs)
Roundness accuracy during live grinding	0,0003/0,0002/0,0001 mm (0.000,012" / 0.000,008" / 0.000,004")	0,0005 mm (0.000,02")

Tailstock

Fitting taper	MT 3
Barrel stroke	35 mm (1.37")
Barrel diameter	50 mm (1.97")
Fine adjustment for cylindricity corrections	±40 µm (0.0016")

Control

Hydraulic infeed system

Guaranteed working precision

Gauge length 610 mm (24")	0,0025 mm (0.000,10")
Gauge length 950 mm (37.4")	0,003 mm (0.000,12")

Connected loads

Total connected load	13 kVA
Air pressure	5 bar (73 psi)

Total weight

Distance between centres 650 mm	3 400 kg (7 480 lbs)
Distance between centres 1 000 mm	3 500 kg (7 700 lbs)



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