ARB 651

Con-rod boring and grinding machine

Fig. 1
View of ARB 51 boring and grinding machine setup for use

The new ARB 651 boring and grinding machine from Berco offers the user of engine repair machine tools the ideal unit for correct reconditionig of the con-rod of small and medium-large internal combustion engines, compressor etc.
The compact, rational ARB 651 is a perfect combination of power, control and processing system, which provides a practical, accurate and economical solution to all operaing requirements.
Fitted with two heads, one of boring and the other for grinding (featuring planetary grinding-wheel motion), the ARB 651 can be used not only for con-rod reconditioning, but also for boring and grinding finned single-cylinder engine blocks or for repairing small automobile and motorcycle components.
A range of specific and universal tools and equipment to meet various requirements of this kind are available as optional accessories.
Reliable and very easy to use, the machine has the following main features:

- Base
  In high-strenght cast-iron, this undergoes stabilizing treatment to ensure maintenance of precision over time.

Fig. 2

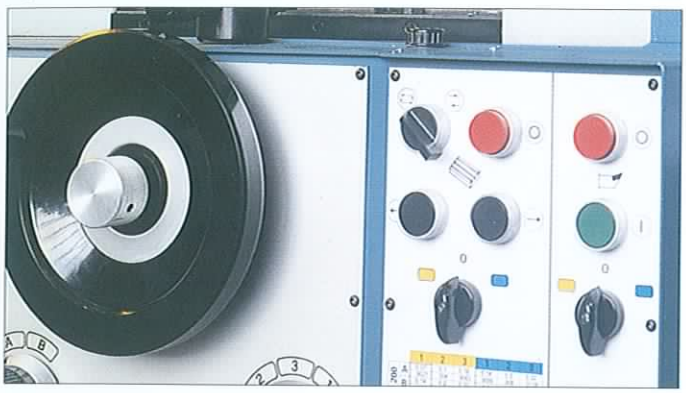


Fig. 2
Partial view of control box
Fig. 3
Boring
Fig. 4
Wet-grinding

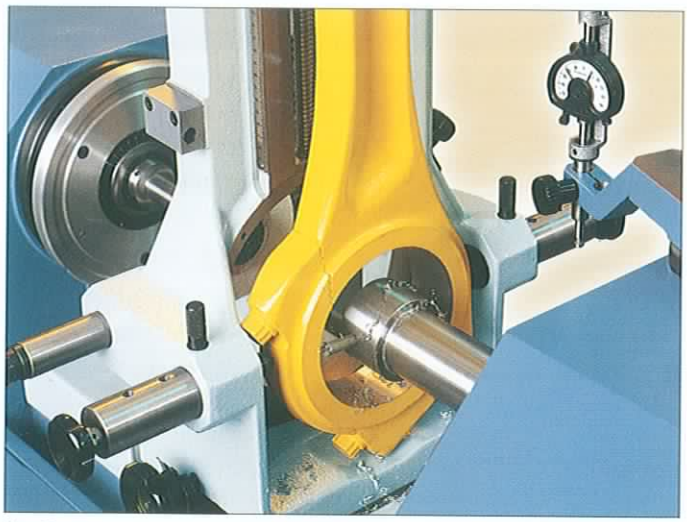


Fig. 3

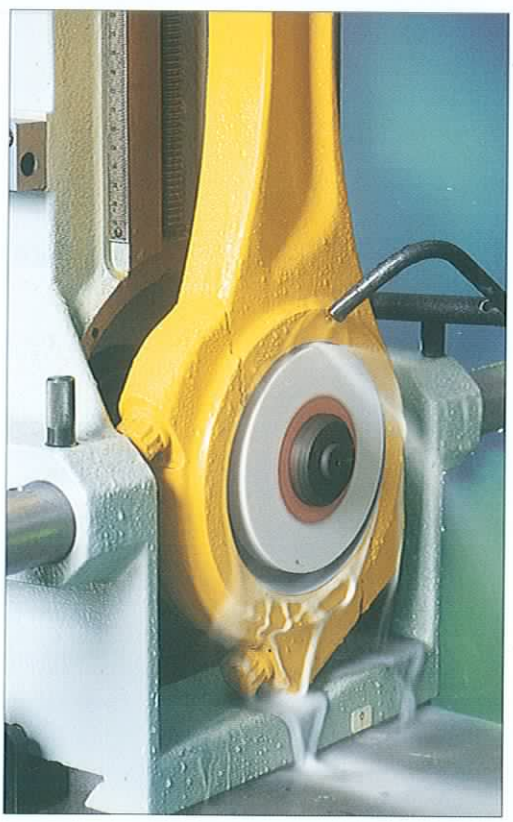


Fig. 4

- Table
  Again in stabilized cast-iron, this assembly runs on appropriately sized dove-tail ways and is kept adjusted by a tapered gib. It can be moved by hand, using a handwheel, or automatically, as follows:
  - from left to right and vice-versa,with stop at preset point, for routine boring operations;
  - backwards and forward, with turnaround at preset points, for grinding operations.
- Controls
  These are all located together on the front of the machine: the electrical controls for operation and speed setting of the table and boring and grinding heads are on the right and left, while the controls for mechanical table operation are in the centre. The drive mechanism, speed reducer and speed change gear-box are housed in the same compartment, and are all oil-bath assemblies.
- Con-rod setup
  Three different systems are available:
  - using three-blade self-centering mandrels. This system allows the original distance between the centre-lines of the con-rod big and little end holes to be measured and retained by means of an indexed scale and vernier.
  - using a V-square. This system is applied when the piston-pin is to be used for positioning, as for example in the case of small con-road.
  - with a universal setup plate (optional accessory). Required where the big-end side plane must be used for positioning.
- Grinding and boring heads
  The heat-treated spindles of the two heads turn on precision bearing in oil bath.
- Safety
  The machine is fitted with two types of safety device: electrical devices offering protection against variations in power supply voltage, overloads etc., and mechanical devices guarding against incorrect manoeuvres, collisions etc.
- Electrics
  Low voltage system complying with current accident prevention regulations.

Devices and setup fixtures

Fig. 5

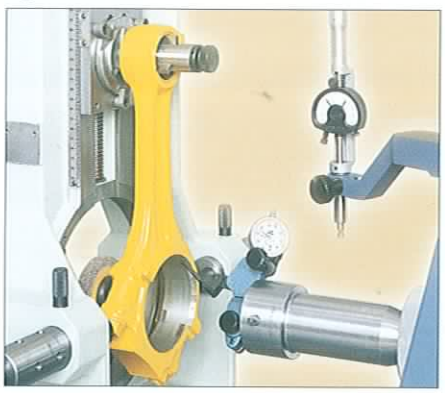


Fig. 6

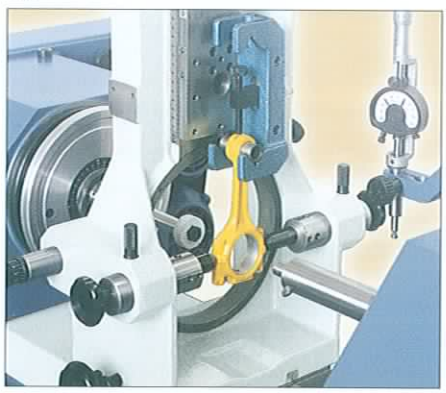


Fig. 7

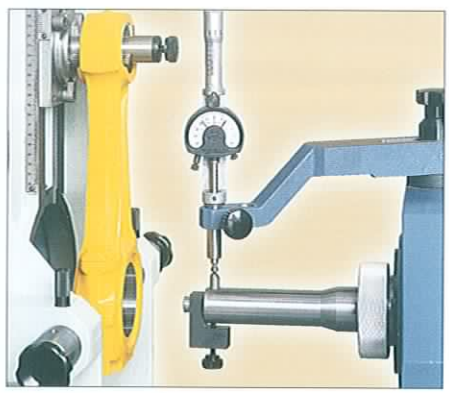


Fig. 8

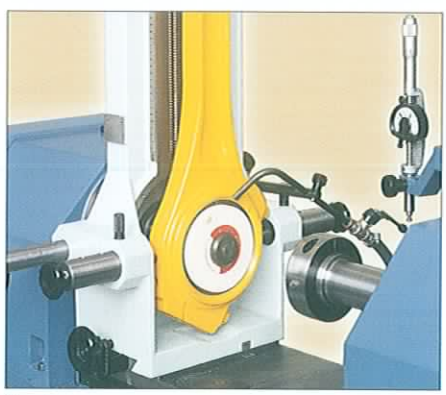


Fig. 9

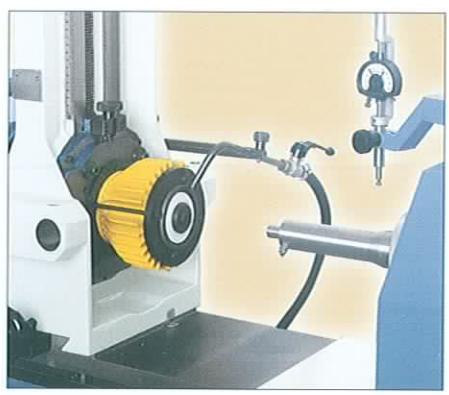


Fig. 10

Fig. 5
Centering-device with con-rod on self-centering mandrel

Fig. 6
Con-rod setup using V-square

Fig. 7
Tool adjuster and measuring device

Fig. 8
Con-rod setup using universal fixture

Fig. 9
Grinding equipment

Fig. 10
Setup fixture for finned cylinder block

Standard outfit

Fig. 11

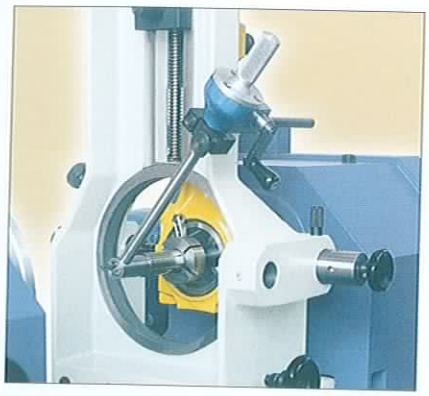


Fig. 12

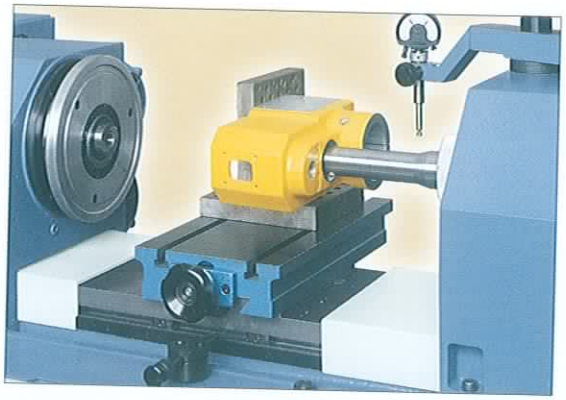


Fig. 13

Standard outfit

- 1 box containig centering, clamping and boring accessories;
- 1 spindle for boring diameters 17 ÷ 37 mm ($^{43}/_{64}$" - $1^{29}/_{64}$") complete with 2 brazed tools;
- 1 spindle for boring diameters 37 ÷ 95 mm ($1^{29}/_{64}$" - $3^{47}/_{64}$") complete with 2 brazed tools;
- 1 spindle for boring diameters 75 ÷ 110 mm ($2^{61}/_{64}$" - $4^{21}/_{64}$") complete with 1 brazed tool;
- 1 toolholder ring assembly for boring diameters 110 ÷ 150 mm ($4^{21}/_{64}$" - $5^{29}/_{32}$") mounted on assembly A00A28735;
- 1 tool adjuster device;
- 1 tool setting device with micrometer and dial indicator in millimetres or inches;
- 1 centering device with dial indicator in millimetres or inches;
- 5 centering cones for diameters 17 ÷ 126 mm ($^{43}/_{64}$" - $4^{61}/_{64}$");
- 1 V square for micro-engine con-rod set up;
- 1 expanding mandrel for diameters 17 ÷ 31 mm ($^{43}/_{64}$" - $1^{7}/_{32}$") complete with blades and retaining springs;
- 1 expanding mandrel for diameters 31 ÷ 63 mm ($1^{7}/_{32}$" - $2^{31}/_{64}$") complete with blades and retaining springs;
- 1 expanding mandrel for diameters 63 ÷ 125 mm ($2^{31}/_{64}$" - 5") complete with blades and retaining springs;
- tool box for grinding accessories;
- 7 grinding wheels for steel and bronze, to grind diameters 30 ÷ 125 mm ($1^{3}/_{16}$" - 5");
- 7 grinding wheels for cast-iron, to grind diameters 30 ÷ 125 mm ($1^{3}/_{16}$" - 5");
- 1 grinding wheel dresser without diamond;
- 2 grinding wheel spindles;
- 6 grinding head pulleys;
- 1 con-rod locking centre;

Fig. 11
Con-rod facing tool
Fig. 12
Additional table for machining various parts
Fig. 13
Device for direct tool setting in relation to piston-pin diameter

Extra outfit

Fig. 14

Fig. 15

Extra outfit

- A00.72248
  tool cabinet;
- C465900020
  0.5 Kr diamond, fitted to holder;
- A00A28655
  centering cone for diameters 125 ÷ 152 mm (5" - $5^{63}/_{64}$");
- A00A28725
  spindle for boring 13 ÷ 18 mm ($^{33}/_{64}$" - $^{45}/_{64}$") complete with brazed tools;
- A00A29636
  grinding spindle assembly for diameters 125 ÷ 150 mm (5" - 6");
- A01.21986
  expanding mandrel for diameters 12 ÷ 14 mm (0.472" - 0.551");
- A02.21901
  expanding mandrel for diameters 14 ÷ 17.5 mm ($^{35}/_{64}$" - $^{11}/_{16}$");
- A00.46801
  setup fixture for con-rod and motorcycle cylinders;
- A00A28850
  con-rod setup fixture (like A00.46801, without vertical adjustment);
- P01A29500
  direct-reading sizing device complete with metric dial indicator;
- (Imperial P02A29500)
  A00.46848
  tool box containing facing spindle and accessories;
- A00A29650
  additional table for various functions;
- P06A29350
  coolant system comprising tank, electric pump and accessories;
- A00.46843C
  tool grinding attachment with three-phase electric motor;
- A00.46858
  tool grinding support assy;
- A00.67506
  diamond grinding wheel;
- U900202060
  locking screws for insert U010354000;
- U900202060
  locking screws for inserts U010101060 e U010101070;
- U900990000
  locking spanner;
- P00.46870
  set of three blades for diameters 123 ÷ 138 mm ($4^{27}/_{32}$" - $5^{7}/_{16}$");
- P00.46871
  set of three blades for diameters 138 ÷ 153 mm ($5^{7}/_{16}$" - $6^{1}/_{16}$");
- A00.50587
  retaining spring for blade P00.46871.

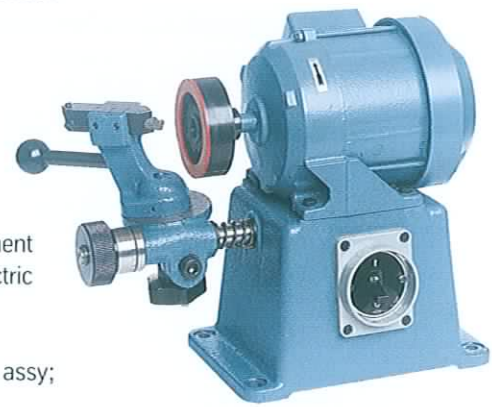


Fig. 16

Fig. 14
Tool box with grinding accessories
Fig. 15
Tool box with setup and boring accessories
Fig. 16
Tool grinding device

Standard and optional tooling

Grinding wheels for cast-iron, bronze and steel

Grinding wheel	Dimensions mm	Capacity mm dia.
U800104160*	30X13X13	30÷46
U800504050*	$1^{3}/_{16}$"X$^{33}/_{64}$"x$^{33}/_{64}$"	$1^{3}/_{16}$"X$1^{13}/_{16}$"
U800104180*	40X13X13	40÷56
U800504060*	$1^{37}/_{64}$"X$^{33}/_{64}$"x$^{33}/_{64}$"	$1^{37}/_{64}$"X$2^{13}/_{64}$"
U800104200*	55X13X20	55÷71
U800504070*	$2^{11}/_{64}$"X$^{33}/_{64}$"x$^{25}/_{32}$"	$2^{11}/_{64}$"X$2^{51}/_{64}$"
U800104210*	70X13X20	70÷86
U800504080*	$2^{3}/_{4}$"X$^{33}/_{64}$"x$^{25}/_{32}$"	$2^{3}/_{4}$"X$3^{25}/_{64}$"
U800104220*	85X13X20	85÷101
U800504090*	$3^{11}/_{32}$"X$^{33}/_{64}$"x$^{25}/_{32}$"	$3^{11}/_{32}$"X$3^{31}/_{32}$"
U800113070*	95X13X20	95÷111
U800513000*	$3^{47}/_{64}$"X$^{33}/_{64}$"x$^{25}/_{32}$"	$3^{47}/_{64}$"X$4^{3}/_{8}$"
U800113100*	110X13X20	110÷126
U800513020*	$4^{21}/_{64}$"X$^{33}/_{64}$"x$^{25}/_{32}$"	$4^{21}/_{64}$"X$4^{61}/_{64}$"
U800113110*	125X13X25	125÷141
U800513030*	$4^{59}/_{64}$"X$^{33}/_{64}$"x$^{63}/_{64}$"	$4^{59}/_{64}$"÷$5^{55}/_{64}$"
U800113120*	140X13X25	140÷155
U800513040*	$5^{33}/_{64}$"X$^{33}/_{64}$"x$^{63}/_{64}$"	$5^{33}/_{64}$"÷$6^{3}/_{32}$"

For steel, cast-iron, bronze

For cast-iron

For steel, bronze

N.B. - All parts marked with asterisk (*) are of standard outfit.

Brazed tools for boring cast-iron, bronze and steel

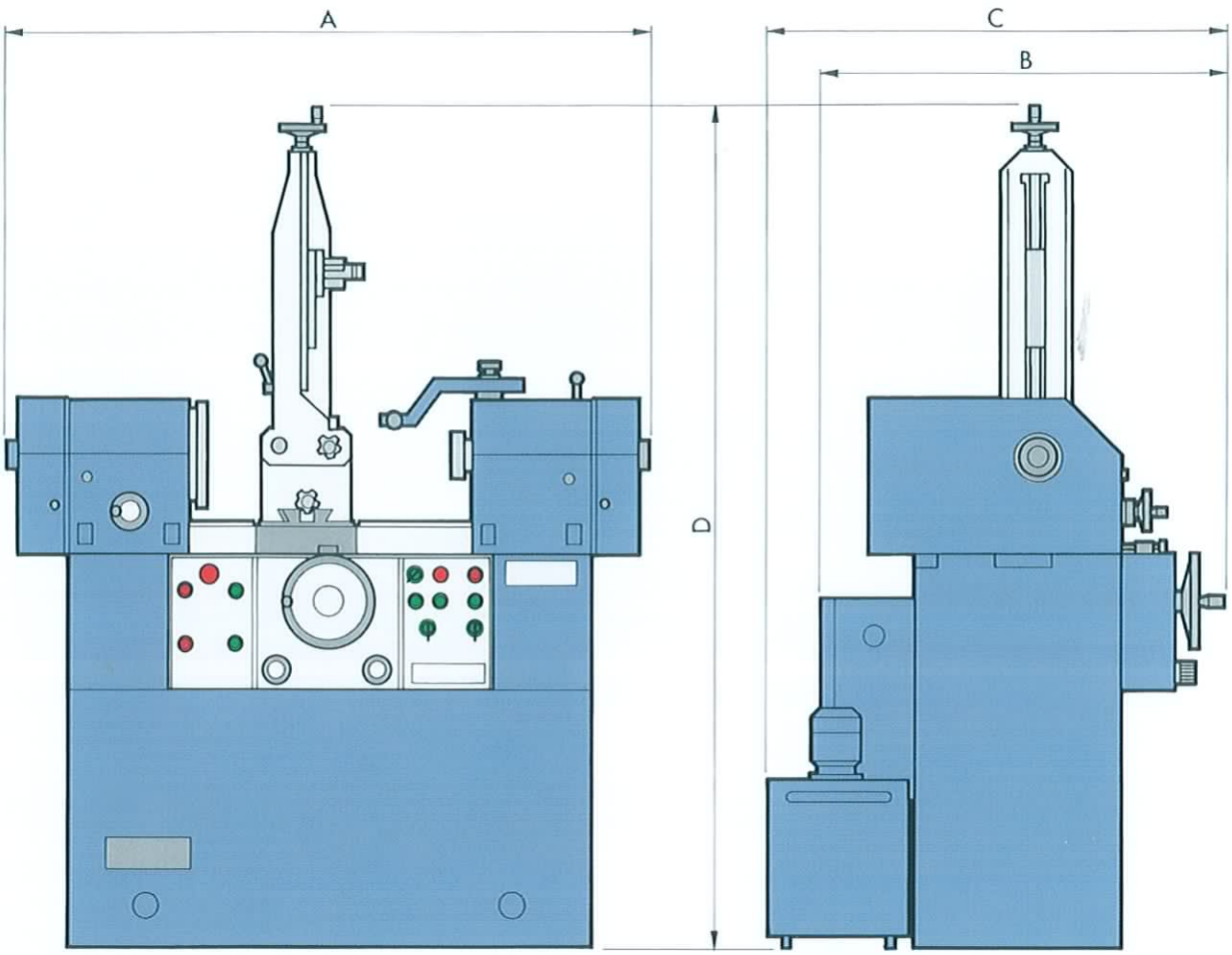
Tool	Length mm	Spindle	Toolholder Ring	Boring capacity mm dia.
U202268101*	15 ($^{19}/_{32}$")	A00A28729	-	17÷23 ($^{43}/_{64}$"÷$^{29}/_{32}$")
U202265021				
U202268051*	21 ($^{53}/_{64}$")	A00A28729	-	22÷37 ($^{55}/_{64}$"÷$1^{29}/_{64}$")
U202265031				
U202268281*	35 ($1^{3}/_{8}$")	A00A28731	-	37÷55 ($1^{29}/_{64}$"÷$2^{11}/_{64}$")
U202265071				
U202268311*	54 ($2^{1}/_{8}$")	A00A28731	-	55÷95 ($2^{11}/_{64}$"÷$3^{47}/_{64}$")
		A00A28735	-	75÷110 ($2^{61}/_{64}$"÷$4^{21}/_{64}$")
U202265091		A00A28735	A00A28737	110÷150 ($4^{21}/_{64}$"÷$5^{29}/_{32}$")

Insert toolholder and inserts for boring cast-iron, bronze and steel

Insert toolholder Insert	Length mm	Spindle	Toolholder Ring	Boring capacity mm dia.
A00A28727 U010354000	16,5 ($^{21}/_{32}$")	A00A28729	-	17÷23 ($^{43}/_{64}$"÷$^{29}/_{32}$")
A00A28747 U010354000	22 ($^{55}/_{64}$")	A00A28729	-	23÷37 ($^{29}/_{32}$"÷$1^{29}/_{64}$")
A00.46900 U010101060	37 ($1^{29}/_{64}$")	A00A28731	-	37÷55 ($1^{29}/_{64}$"÷$2^{11}/_{64}$")
A00.46902 U010101060	37 ($1^{29}/_{64}$")	A00A28731	-	37÷55 ($1^{29}/_{64}$"÷$2^{11}/_{64}$")
A00.46904 U010101060	54 ($2^{1}/_{8}$")	A00A28731	-	55÷95 ($2^{11}/_{64}$"÷$3^{47}/_{64}$")
		A00A28735	-	75÷110 ($2^{61}/_{64}$"÷$4^{21}/_{64}$")
		A00A28735	A00A28737	110÷150 ($4^{21}/_{64}$"÷$5^{29}/_{32}$")
A00.46906 U010101060	54 ($2^{1}/_{8}$")	A00A28731	-	55÷95 ($2^{11}/_{64}$"÷$3^{47}/_{64}$")
		A00A28735	-	75÷110 ($2^{61}/_{64}$"÷$4^{21}/_{64}$")
		A00A28735	A00A28737	110÷150 ($4^{21}/_{64}$"÷$5^{29}/_{32}$")

N.B. - All insert toolholder are complete with screw andspanner, without insert.
Inserts are supplied only in the minimum quantity of 10 pieces.

Technical data



Working capacity			
With standard tooling:			
boring capacity (min. and max. dia.)	mm	17÷150	$^{43}/_{64}$" - 6"
grinding capacity (min. and max. dia.)	mm	30÷125	$1^{3}/_{16}$" - 5"
With extra tooling:			
boring capacity (min. and max. dia.)	mm	13÷150	$^{33}/_{64}$" - 6"
grinding capacity (min. and max. dia.)	mm	30÷150	$1^{3}/_{16}$" - 6"
Min. and max. con-rod center distance	mm	55÷650	$2^{11}/_{64}$" - $25^{19}/_{32}$"
Height of spindle C/L over table	mm	160	$6^{5}/_{16}$"
Speeds and feeds			
Boring spindle rotation speeds	r.p.m.		200 - 315 - 530 - 650 - 1090
Grinding spindle rotation speeds	r.p.m.		3000 - 6000 - 9100
Grinding spindle revolution speeds	r.p.m.		50 - 90 - 140
Radial grinding travel (max. eccentricity of wheel C/L)	mm	8	$^{5}/_{16}$"
Max. table traverse	mm	400	$15^{47}/_{64}$"
Table feed speeds, per minute (12)	mm	14÷130	$^{35}/_{64}$" - $5^{1}/_{8}$"
Manual fast table speed, per turn of the handwheel	mm	40	$1^{37}/_{64}$"
Motor ratings			
Motor, feed change (2)	kW		0,15 - 0,09 (0,2 - 0,12 CV)
Motor, boring head (2)	kW		0,55 - 0,3 (0,75 - 0,4 CV)
Motor, planetary movement of grinding head	kW		0,37 (0,5 CV)
Motor, spindle grinding head	kW		0,55 (0,75 CV)
Motor, cooling system	kW		0,1 (0,12 CV)
Dimensions and weights			
Length (A)	mm	1385	$54^{17}/_{32}$"
Width, without cooling system (B)	mm	905	$35^{5}/_{8}$"
Width, wiyh cooling system (C)	mm	1275	$50^{3}/_{16}$"
Height (D)	mm	1820	$7^{21}/_{32}$"
Approx. weight, with standard outfit	kg	784	1725lb
Approx. weight with standard outfit, ocean packed	kg	984	2165lb

Motor rating is referred to 50 Hz frequency.
Measurements, weights and execution are not binding on manufacturers and can be changed without previous notice.