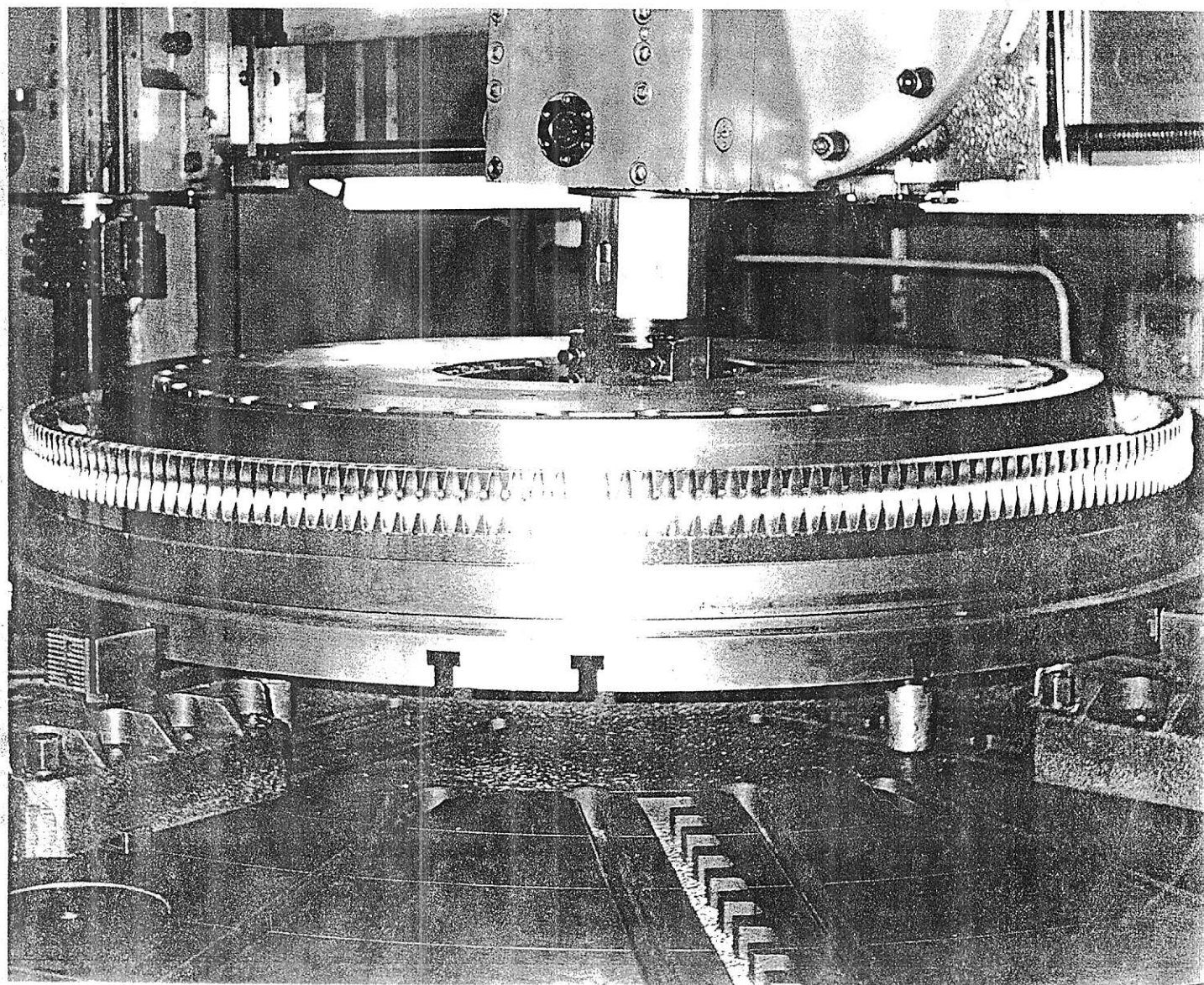




## GANTRY-TYPE VERTICAL LATHES

∅ 3200 - 8000 mm



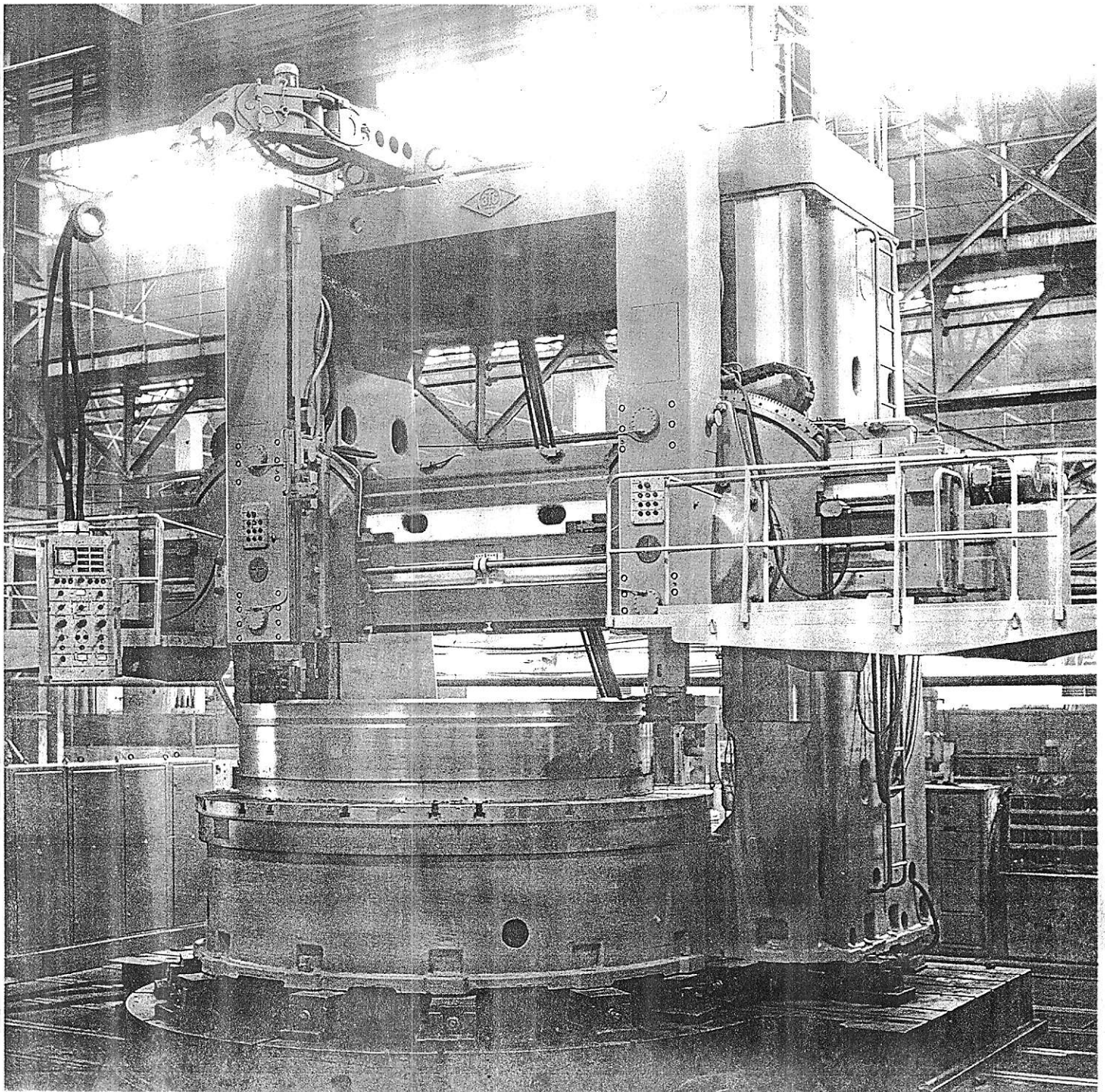
# GANTRY-TYPE VERTICAL LATHES $\varnothing$ 3200-8000 mm

**Purpose** Gantry-type vertical lathes models 1532T, 1540F1, 1540T, 1550 and 1563 and lathes developed on their basis, i.e. models KY518F1, KY487, KY478, KY415F1, KY507F1, KY564F1, KY580LF1, KY501F1, and KY565F1, are designed for rough and finish machining of steel forgings, steel and iron castings and weldments, as well as components of non-ferrous metals and alloys. Nonmetallic pieces can also be machined on the lathes.

Operation performed on the lathes include

machining of cylindrical, conical, and intricately-shaped (by copy turning) external and internal surfaces, facing, cutting-off, and turning of face and radial slots. Additional attachments supplied optionally allow the machines to carry out boring, drilling, milling and other operations.

Gantry-type vertical lathe.





# GANTRY-TYPE VERTICAL LATHES $\varnothing$ 3200-8000 mm

1540F1, 1532T, KY518F1,  
KY487, 1540T, 1550, KY514F1,  
KY478, 1563, KY580LF1,  
KY501F1, KY507F1, KY564F1,  
KY565F1

Technical characteristics indicated in this pamphlet may be changed without prior notice.

Cover: Machining on a gantry-type vertical lathe.

## Specifications

Parameters	Lathe models					
	1532T KY518F1	1540F1 KY487	1540T KY514F1	1550 KY478	1563 KY507F1 KY564F1	KY580LF1 KY501F1 KY565F1
Face plate diameter, mm	3200	4000	4000	4500	6300	7100
Max. workpiece dimensions, mm						
diameter	3200	4000	4000	5000	6300	8000
height	2000	2000 (2500)	2500	2500	3200 (5000)	3200 (5000)
Max workpiece weight, kg	50000	63000	100000	100000	160000	160000
Max. total cutting force, N	100000	100000	125000	125000	160000	160000
Max. cutting torque on face plate, Nm	125000	160000	250000 (312500)	250000	400000	400000
Max distance of carriage transverse travel, mm	1900	2300	2300	2770	3425	4370
Max. distance of slide vertical travel, mm	1250	1250	1600	1600	2000 (2500)	2000 (2500)
Max. angle of carriage inclination, degrees	- 15 + 40	- 15 + 30	- 15 + 40	- 15 + 40	- 15 + 30	- 15 + 30

## Standard supply set

Vices for workpiece gripping	4 units.
Toolholders with wedges	2 units.
Wrenches	1 set.
Tools required for machine installation and operation	1 set.
Technical documentation	1 set.

*.746*  
*134hp*

Parameters	Lathe models					
	1532T KY518F1	1540F1 KY487	1540T <u>KY514F1</u>	1550 KY478	1563 KY507F1 KY564F1	KY580LF1 KY501F1 KY565F1
Face plate speed (stepless control), rpm	0,66 - 62,1	0,52 - 48,7	0,46 - 42,5 (0,37 - 34)	0,34 - 31,2	0,28 - 25,5	0,22 - 20,1
Rates of vertical and horizontal feeds of carriages (stepless control), mm/min	0,059 - 470	0,059 - 470	0,043 - 352	0,043 - 352	0,035 - 285	0,035 - 285
Rate of approach of slides and carriages, mm/min	2715	2715	3125	3125	2500	2500
Crossrail travel speed, mm/min	430	430	240	240	300	300
Output of primary drive electric motor, KW	70	70	<i>.9225</i> 125 (180)	125	125	125
Machine-tool overall dimensions, mm						
length	5100	5900	6100	6600	8200	8615
width	9300	10100	10400	11400	14200	17600
height	7200	7700	8400	8400	9800 (12060)	9800 (12060)
Machine-tool weight, kg	90400 (95400)	105000 (107200)	134200 (130000)	140500 (145500)	223000 239000 (242500)	247300 (281000) (269000)

The lathes have a type design, i.e. identical mechanical structures, hydraulic and electrical circuitry and control systems. Manufacture of several machine-tool models with the same machining diameter and different heights, load capacities, power and speed characteristics makes it possible to meet all the demands of enterprises in vertical lathes of any size they might need. A wide range of stepless face plate speed and feed control ensures a most efficient use of high-speed-steel and tungsten carbide cutting tools.

Due to a high power of the primary drive, simultaneous heavy-duty machining by two carriages can be effected.

A high structural rigidity of the machine-tools and heavy-section hardened steel slides ensure their vibrational stability under high speeds and feeds and with a large overhang of the slides.

A precision roller bearing with adjustable radial clearance serves as a central support of the face plate.

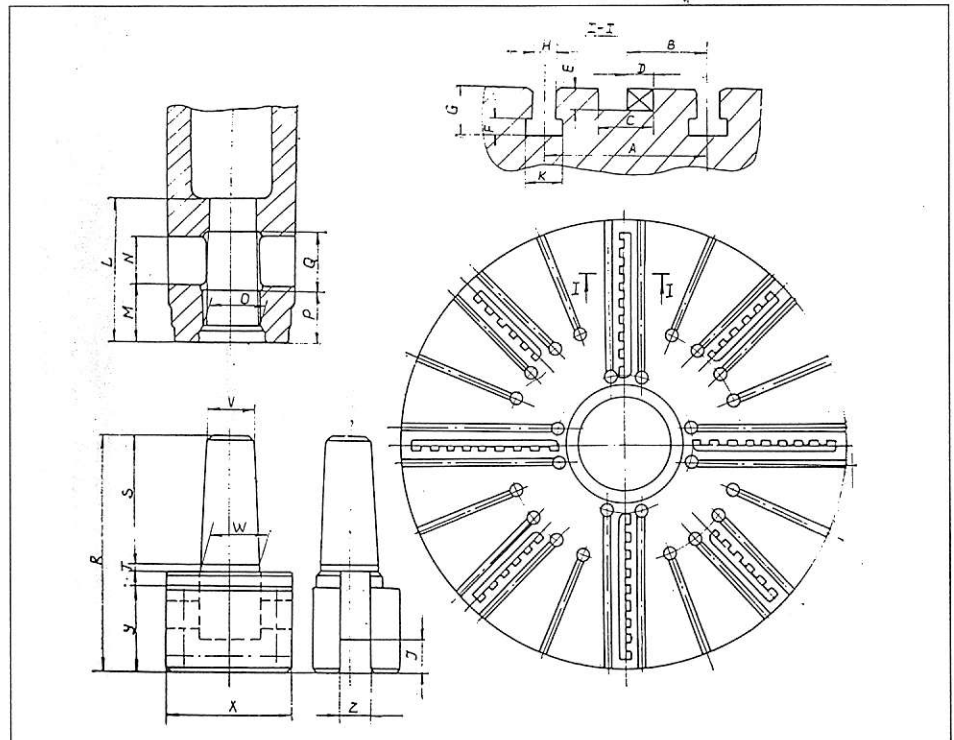
The face plate guides are fitted with anti-friction alloy plates and carefully scraped.

The face plate guides are hydraulically relieved, which, in the case of heavy-weight workpiece machining, ensures a light starting of the machine-tool and a long service life of the guides.

All principal mechanisms of the lathes are automatically lubricated. Automatic clamping and unclamping of the cross-rail, saddles and slides warrants their accurate positioning.

A special device ensures a constant cutting speed in face turning.

Face plate rotation and work feed motions are carried out independently of each



	1540F1, 1532T, KY518F1, KY487	1450T, 1550, KY514F1, KY478	1563, KY580LF1, KY501F1, KY507F1, KY564F1, KY565F1
A	300±0,5	300±0,5	360±0,5
B	150	150	180
C	100	100	120
D	50	50	60
E	40	40	60
F	29+2	29+2	34+3
G	83	83	104
H	42A4	42A4	48A4
K	70+3	70+3	80+3
L	255	334	370
M	100	140	135
N	85	95	112
O	∅ 100A <sub>3A</sub>	∅ 140A <sub>3A</sub>	∅ 160A <sub>3A</sub>
P	90	130	115
Q	105	115	152
R	422	524	590
S	232	304	340
T	10	14	16
V	∅ 88,4	∅ 124,8	∅ 143
W	∅ 100C <sub>0,016</sub>	∅ 140C <sub>0,016</sub>	∅ 160C <sub>0,016</sub>
X	230	290	320

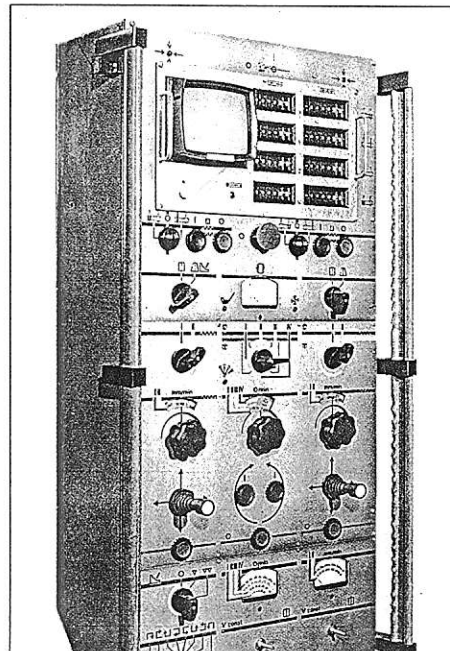
Remote control of the machines ensures a convenient readout of travels of the work elements, facilitates the operator work and minimizes the time required to control the machine. Lathes with F1 code in the model name are equipped with numerical displays permitting work element travel distances to be preset. A reliable interlock system guarantees failure-free operation of the machine-tools.

Different size lathes are very similar in design, many of their components and units are interchangeable. Such unification of component parts allows the customer to operate lathes of various sizes and to have an efficient maintenance and repair service while keeping a minimum stock of unified spare parts.

The machine tools are remotely controlled. Operation controls are located on a suspended control console. A special device allows the console to be installed at any point of the machine operation area, wherever it may be convenient for the operator.

The power supply switch and controls of a number of auxiliary motions of the machine are operated from a stationary console.

Control box.



The structural system of the machine-tool is comprised of the gantry, the base and the crossrail, rigidly interconnected to form a robust frame structure capable of accepting dynamic cutting loads.

### Gantry

The gantry of the machine consists of two cast in iron boxsection uprights and a welded top beam rigidly connecting the uprights. The bottom part of the gantry is rigidly fixed to the base, thus forming a frame structure capable of withstanding significant loads without deformations or vibrations.

The uprights have rectangular-section guides over which the carriage-bearing crossrail travels.

The top beam mounts crossrail drive reduction gears and electric motors.

### Crossrail

The crossrail of the machine-tool is a cast iron beam carrying the vertical carriages, feed boxes and clamping mechanisms. The crossrail section, shaped as a box with properly designed ribs, imparts it an adequate rigidity.

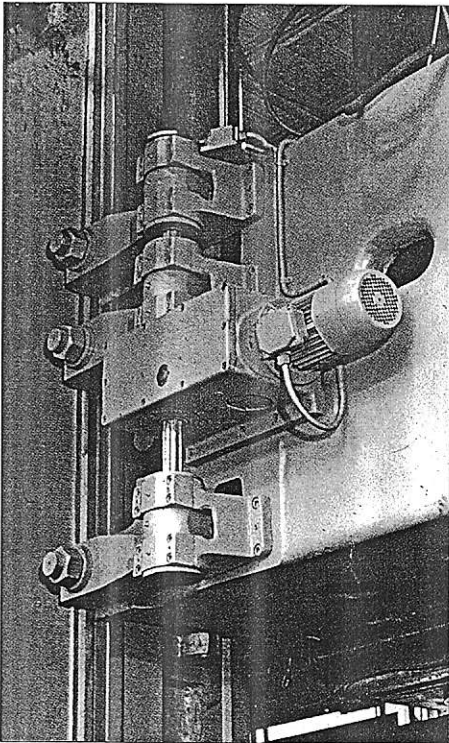
The crossrail is mounted on flat guides of the uprights and travels up and down along them under the action of two lead screws driven by its own AC electric motor through special reduction units.

The crossrail has horizontal guides directing the carriages. The crossrail guides are carefully machined.

The crossrail is fixed on the gantry uprights by two special automatic grips located on the rear side on the crossrail. The crossrail grips are electromechanical lever-type devices. The force produced by the grip mechanisms gives rise to friction between the support surfaces of the uprights and the crossrail, the force of this friction exceeding forces produced by the cutting forces and the carriage weight, so that during machine running the crossrail

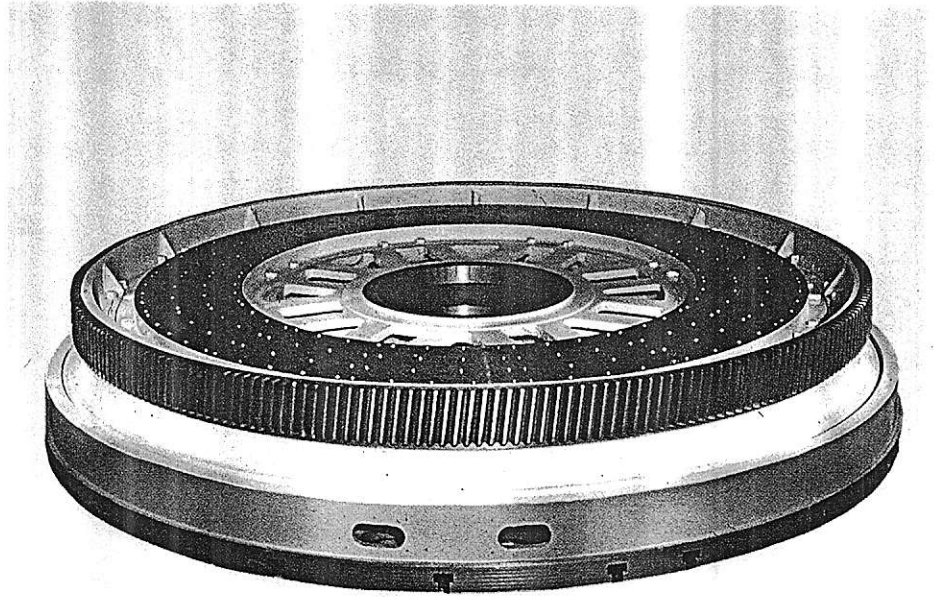


Crossrail clamp mechanism.



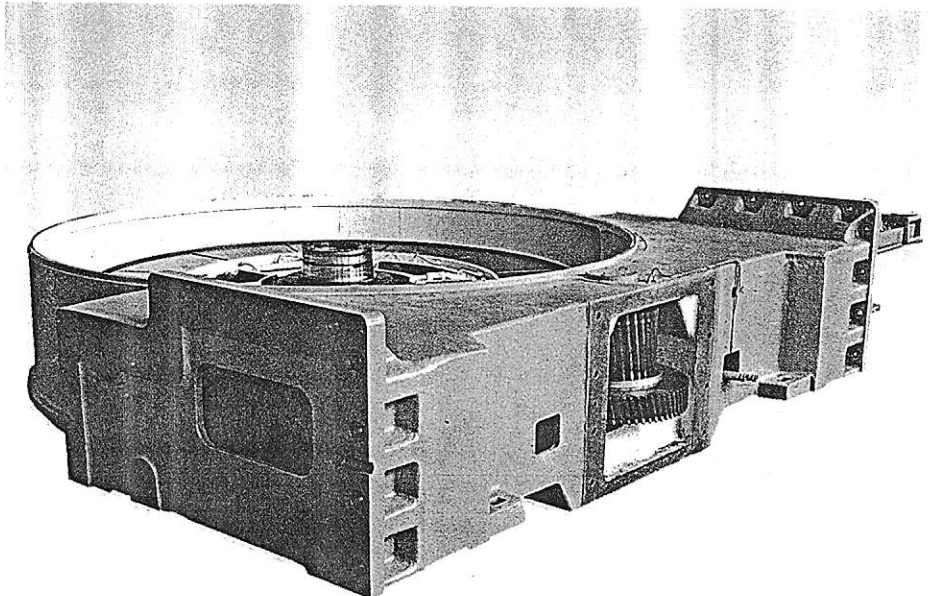
Face plate.

Bedplate.



the grip drives fixing the crossrail in a preset position.

The electric interlock is designed in such a way that the grips are automatically released as soon as the crossrail drive push-button is pressed. When the crossrail is stationary, the grips are always clamped. Crossrail motion is only possible with the face plate immobile and the feed switched off.



### Base and face plate

The base and the face plate are designed as rigid castings made of a high-quality cast iron. Mounted on the rear side of the base is a couple of skew gears one of which is meshed with the face plate ring gear and the other, with the output gear of the gear box. The gear box is also rigidly fixed here. The face plate rotates on flat guideways reinforced with plates of an antifriction zink alloy with a high resistance to wear and scoring. This material warrants high speed sliding when coupled with cast iron.

The face plate is centered by an adjustable-clearance double-row roller bearing, therefore errors in workpiece anchoring can only be due to manufacturing inaccuracies of the bearing and its deformations. The shape of the guideways is simple to produce, so that a high machining accuracy and, thereby, a high precision of face plate travel in the axial direction, can be achieved. The guideways are lubricated through a system of radial grooves having gently sloping sides. As a result, rotation of the face plate gives rise to hydrodynamic pressure in the oil film. There are also closed grooves located between the sloping-edge grooves, which serve to pressurize oil when the machine operates at slow speeds and a heavy workpiece weight, i.e. when hydrodynamic forces are inadequate for the development of a reliable oil film.

The hydrodynamic pressure created in the closed grooves reduces the torque due to friction in the guideways, facilitates the loads as the face plate starts rotating, and protects the guideways against semi-dry friction.

### Primary drive

The face plate is rotated by an adjustable DC electric motor through a four-speed gearbox.

The drive from a DC motor provides a way of steplessly controlling the speed of face plate rotation in the process of machine operation, which makes it possible to select the best feeds and speeds, change them in the process of machining of one workpiece as a function of variations in the machining allowance, tool wear and local differences in material properties. It becomes possible to use a constant cutting speed while turning the faces and intricately-shaped surfaces, when the turning radius varies irregularly.

At every gearbox ratio the electric motor is controlled to obtain a constant torque until the speed drops to the minimum, and to obtain a constant power output after the speed has attained 1/2 of its rated value.

At the lowest gearbox ratio the entire range of the electric motor speed is used, at higher stages, only the constant-power regulation range. This approach ensures protection of the drive mechanisms against overloads in the entire speed range. Mechanical gear switching in the gearbox is performed by gear-type flexible couplings with the use of an electrohydraulic mechanism controlled from the machine control console.

The panel with electrohydraulic actuators of the principal drive gearbox shifting and independent lubrication stations of the gearbox and their control instruments are arranged in the gearbox well and are easily accessible for repair and adjustment. All gears of the gearbox are quenched and

mechanisms.

All shafts are mounted in antifriction bearings. Most gears in the gearbox are installed on their own pairs of bearings, due to which their axes maintain adequate stability under load a good contact over the tooth length is ensured in the drive.

### Carriages

Each machine has two vertical carriages installed respectively on two saddles. A robust quenched steel slide, with a toolholder and a cutting tool fixed on its end, and a high structural hardness of the carriage body components ensure high cutting forces and heavy-section chip removal in roughing without any loss of the initial high accuracy required for finishing operations.

The saddle together with the carriage travels on the crossrail guideways under the effect of a lead screw driven from the feed box.

The slide shaped as an octahedron rides vertically on the carriage guides. It is driven by a lead screw geared to the feed shaft which, in turn, is also rotated by the feed box.

The carriage with the slide can be inclined to the right or to the left with respect to the face plate centreline.

The guides of the slides and saddles are fitted with bronze strips. The slides and saddles are equipped with automatically operated hydromechanical grip devices. The grips are operated by electrohydraulic slide valves interlocked with the feed circuit in such a way as to immobilize the saddle on the crossrail while the slide is moving, and vice versa.

A tapered hole in the slide is provided for



The machine with gear box.

Feed box.

Gearbox.

lathes to machine workpieces shaped as solids of revolution with a curvilinear generatrix.

The copy template is fixed on a special bracket provided on the crossrail. A five-station three-terminal follower slides along the template and sends electric pulses to the electromagnetic clutches of the feed box.

On lathes equipped with digital display devices, displacement transducers are mounted on carriages and saddles, and respective length scales are provided on the slides and the crossrail.

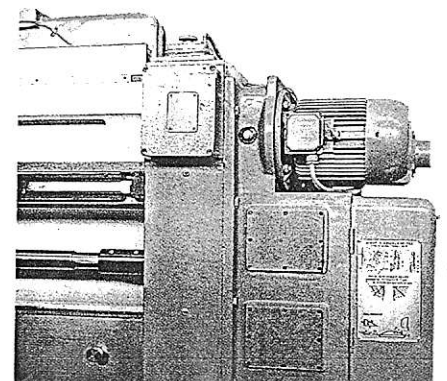
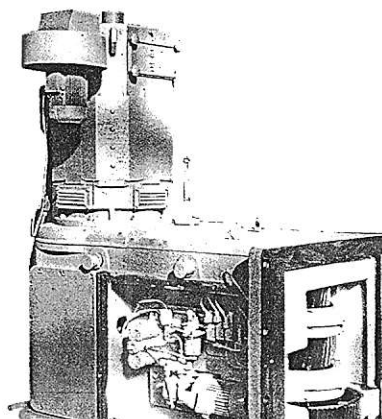
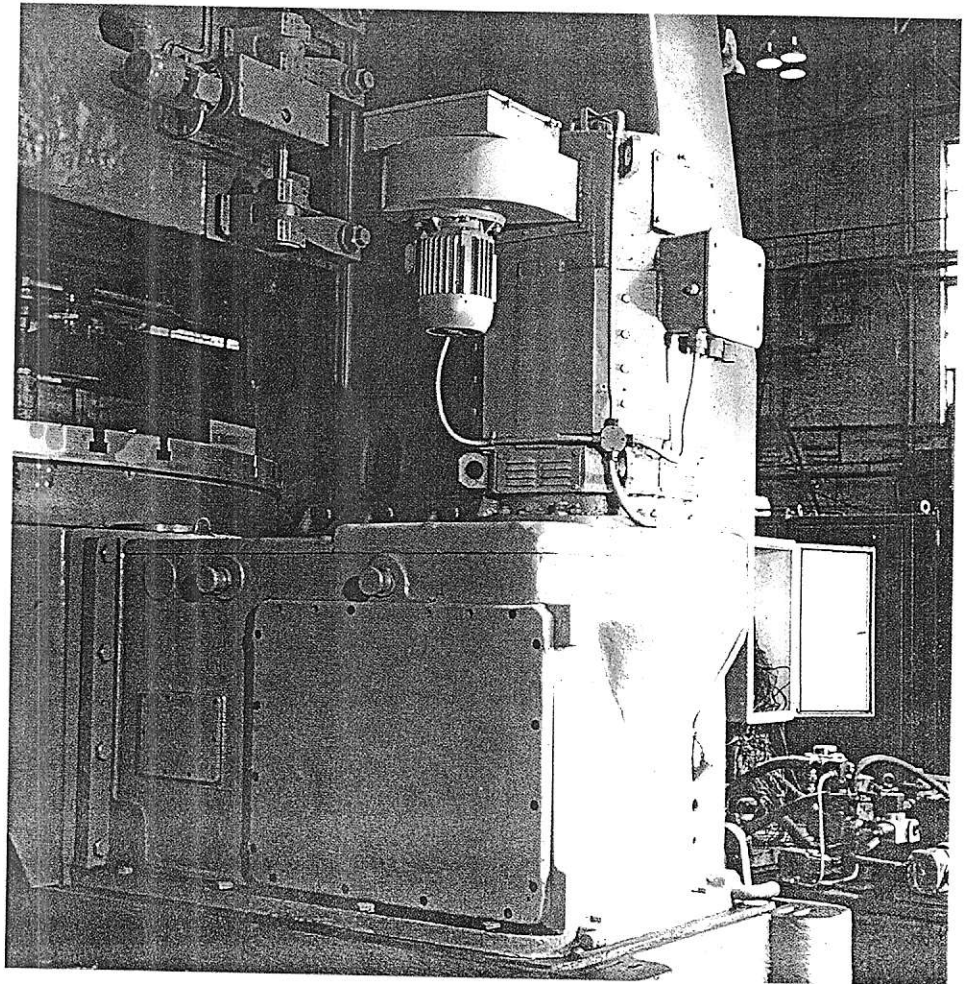
The left-hand turning carriage may be replaced with a special combination carriage which, in addition to the standard slide, has a boring spindle with an individual primary motion drive. When the lathe is equipped with a vertical boring spindle, it becomes possible to machine holes off the workpiece centreline and to perform milling work without reinstalling the workpiece on another machine-tool.

The boring spindle runs in precision anti-friction bearings.

The spindle rotation drive is from an induction electric motor through an eight-speed gearbox. Its vertical feed is ensured by a lead screw connected to the feed box of the lathe.

Mechanisms of the combination carriage have an independent lubrication system from a gear pump arranged on the carriage.

The 1532T, 1540F1, KY501F, KY507F1 and KY487 machines may also have an additional side carriage located on the right-hand upright guides. Installation of a side carriage does not limit the machine-tool capability to accept maximum diameter workpieces



**Note:** The electrical equipment can be optionally supplied with characteristics required by the customer.

body, fitted with bronze strips. Special mechanisms are provided for clamping the slide on the body and the carriage on the upright guides.

Horizontal and vertical approach and work travels of the side carriage are performed through gear-pinion drives from an individual feed box.

Carriage work travel controls are arranged on a special console located directly on the carriage.

In standard supply sets of the KY565F1, KY507F1, KY564F1, KY580LF1 and KY501F1 lathe models, the combination carriage substitutes for the left-side turning carriage.

At the same time standard sets of the KY5077F1, KY564F1, KY580LF1 and KY501F1 machine-tool models include a side carriage.

### Feed drive

Work feeds, approach and adjustment travels of carriage slides and saddles in the horizontal and vertical directions are powered from feed boxes mounted on crossrail ends.

For stepless variation of feed rate in the range from 1 to 200, the feed drives make use of DC electric motors. The total range of feed rate control is from 1 to 8000, which is due to the provision of a gear couple with a 1:40 ratio in the feed box. The couple consists of spur gears and is actuated by two electromagnetic clutches. Thanks to the stepless variation of the feed rate, an optimal rate of stock removal under changing machining conditions can be selected. Slow speed motions of the carriages are performed by the same electric motors, they are remotely controlled

through respective cinematic chains in the feed boxes.

The electrical equipment installed in the machines is powered from three-phase 380 V 50 Mz AC mains. The primary drive and the feed drives are designed according to the "controllable converter - DC motor" system. Static thyristor converters are used in the system.

Auxiliary drives are operated from three-phase AC induction motors.

The control equipment is arranged in control cabinets installed near the machine-tool. Control circuits operate at 110 V DC and 110 V AC.

The electric circuitry is equipped with zero phase-sequence protection against spontaneous starting of the electrical equipment after a break in power supply. The electric motors and equipment are also protected against short circuits and overloads.

The electrical circuitry includes reliable interlocks which make incidents improbable.

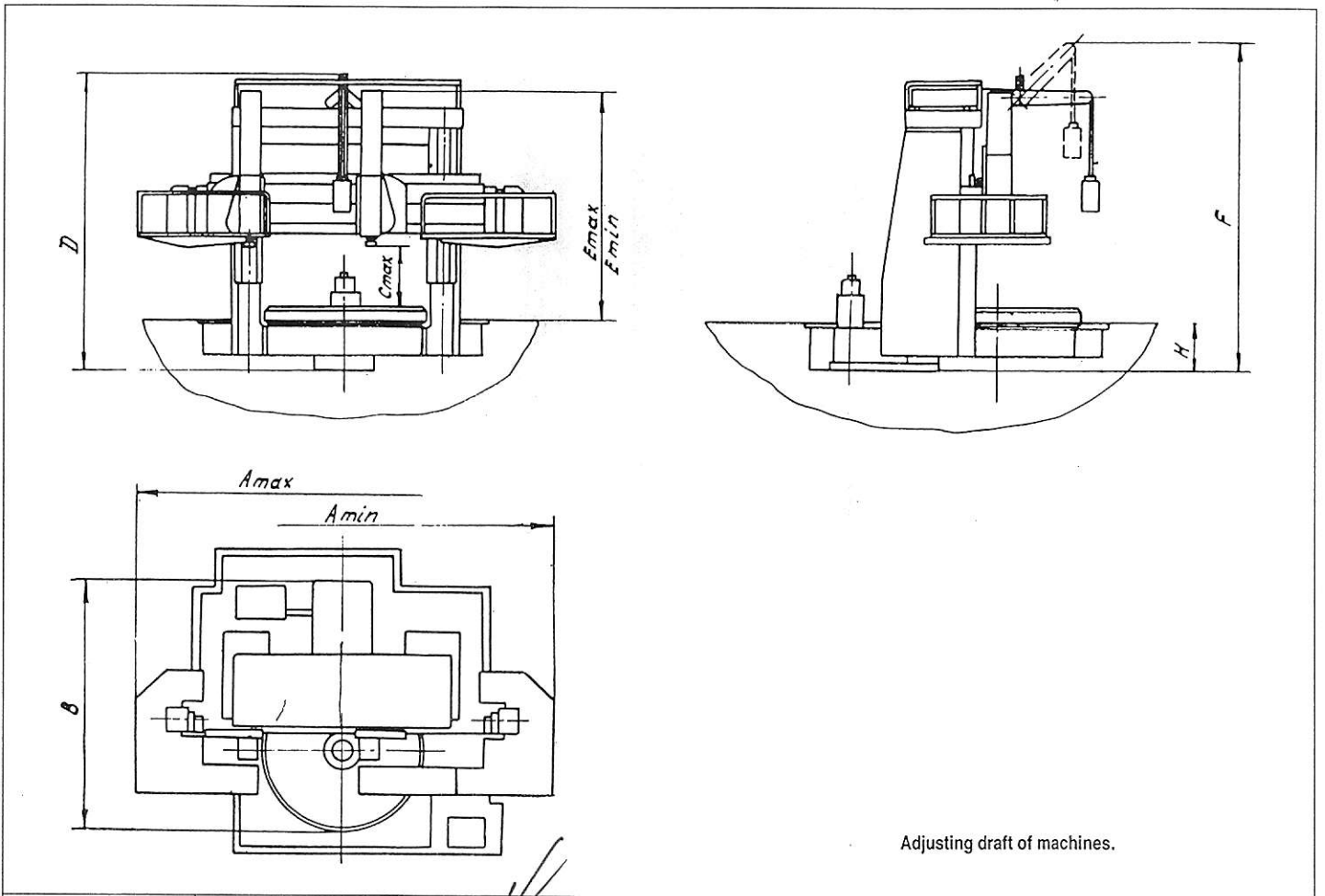
## Machine installation

The machines are mounted and levelled on special adjustable shoes bearing on concrete foundation. After the machine has been levelled, its base and uprights are bolted to the shoes.

Proper installation of the machine-tools is a prerequisite for their accurate and

failure-free operation.

Upon the customers' request, workers experienced in equipment installation may be directed to render technical assistance and provide consultations in the course of machine erection and commissioning.



Item	Lathe model					
	1532T KY518F1	1540F1 KY487	1540T KY514F1	1550 KY478	1563 KY507F1	KY580LF1
A max	9345	10145	10410	11410	14200	17600
A min	—	—	—	—	12800	14500
B	5120	5920	6060	6560	8213	8615
C max	2013	2013	2530	2530	3230	3230
D	6010	6010	7310	7310	8370	8370
E max	5573	5573	6780	6780	8210	8210
E min	3700	3700	4470	4470	5320	5320



## Optional set (supplied at extra price)

The machine-tools may be supplied with special attachments permitting additional operations to be performed without setting up the workpiece on another machine-tool. See Table A.

Description	L a t h e m o d e l									
	1532T KY518F1	KY487 1540F1	KY501F1	1540T KY514F1	1550 KY478	KY507F1	KY565F1	KY564F1	1563	KY580LF1
Slide carriage	+	+	-	-	-	-	-	-	-	-
Milling head	+	-	+	+	+	+	+	+	+	+
Fixture for taper turning by the two-feed technique	+	+	+	+	+	+	+	+	+	+
Combination carriage (replacing the left hand carriage)	+	+	-	+	+	-	-	-	+	-
Left-hand turning carriage (replacing the left-hand combination carriage)	-	+	+	-	-	+	+	+	-	+
Grinding head	-	-	+	-	-	+	-	-	-	-

### Combination carriage

The combination carriage is an unit which combines a turning carriage with a boring one in a single assembly.

The combination carriage is installed on the left-hand saddle to replace the left vertical carriage. It is used both for standard turning work and for boring, milling and drilling operations.

Parameters	M a c h i n e - t o o l m o d e l s		
	1532T, KY518F1, 1540F1 KY487	1540T, 1550, KY514F1, KY478	1563, KY507F1, KY501F1, KY580LF1, KY564F1, KY565F1
Max. travel distance of carriage slide, mm	1250	1600	2000
Vertical feed rate of slide and horizontal feed rate of carriage, mm/min:			
minimum	0,059	0,0435	0,0352
maximum	470	352	285
Approach rate of slide and carriage, mm/min	2540	2950	2500
Carriage inclination angle, degrees	- 15 + 10	- 15 + 25	- 15 + 30
Taper size in boring spindle	Morse 5	Morse 5	Metric 80
Max. travel distance of boring spindel, mm	800	800	1000
Boring spindle speed of rotation, rpm:			
minimum	25	25	16
maximum	630	630	400
Max. torque of boring spindel, N.m	1600	1600	3500
Vertical feed rate of boring spindle, mm/min:			
minimum	0,059	0,0435	0,0352
maximum	470	352	285
Number of speeds of boring spindle rotation	8	8	8
Approach rate of boring spindle, mm/min	2540	2950	2400
Axial component of cutting force on boring spindle, N	20000	20000	30000
Min. output of primary drive electric motor of boring spindle, kW	7,5	7,5	10
Output of carriage inclination electric motor, kW	-	-	1,3

### Side carriage

The side carriage is installed on the guides of the right-hand upright of the gantry. Vertical and horizontal translations of the carriage and the slide are driven from an independent feed box.

Side carriage.

Milling head.

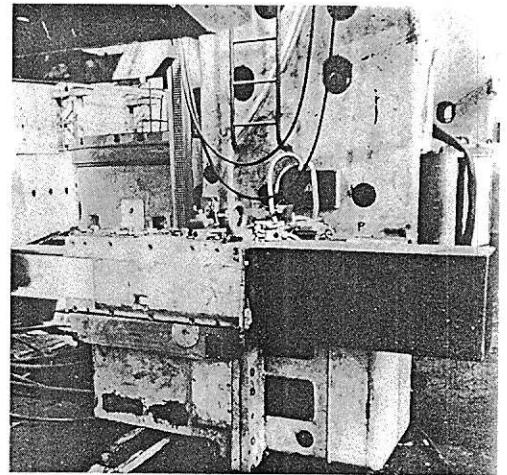
Rotary grinding head.

### Milling head

The milling head is mounted on the slide instead of the toolholder; it is fixed with wedges.

The milling head spindle is driven from an in-built electric motor through change gears.

The spindle is installed in precision bearings.



### Inclinable grinding head

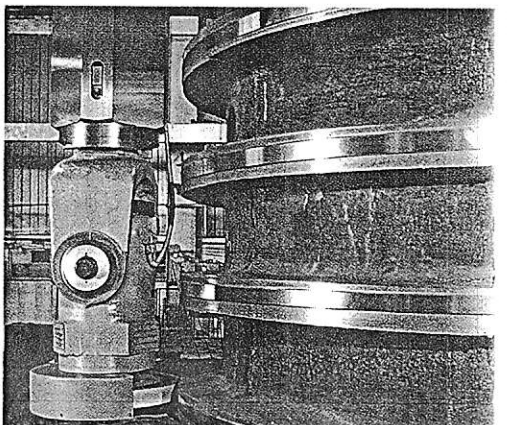
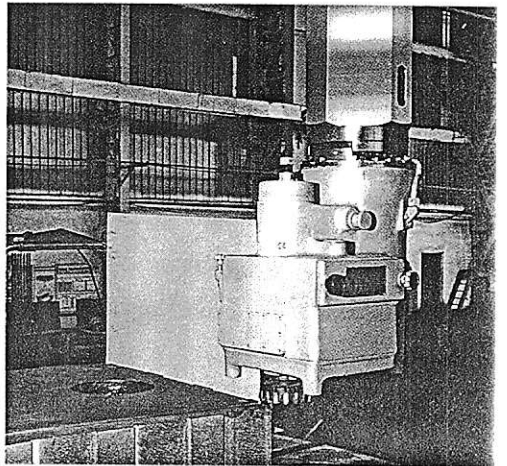
The shank of the inclinable grinding head is installed in the taper hole of the slide and fastened there with a wedge.

The grinding wheel is rotated from an in-built electric motor.

The circular feed is provided by the rotation of the workpiece clamped on the face plate.

Axial feed and infeed are achieved by way of moving the slide and the carriage.

A dust collector is supplied with the inclinable grinding head.



Technical characteristics indicated in this pamphlet may be changed without prior notice.

Parameters	Machine-tool models		
	1532T, KY518F1, 1540F1, KY487	KY501F1	KY507F1
Carriage vertical travel distance, mm	1870	4600	2800
Slide horizontal travel distance, mm	950	1250	1250
Vertical and horizontal feed rate, mm/min	0,059 to 470	0,035 to 285	0,035 to 285
Approach rate, mm/min	2540	2500	2500
Carriage weight (neglecting balance weight), kg	2500	11000	11000

Parameters	Machine-tool models		
	KY487, KY518F1, 1540F1, KY487	KY514F1 1540T, 1550, KY487	KY501F1 KY507F1 KY564F1 KY565F1 1563 KY580LF1
Numer of speeds	10	10	10
Speed of rotation, rpm	80 to 675	80 to 675	80 to 675
Min. output of electric motor, kW	2,8	4,5	4,5
Weight, kg	200	360	380

Parameters	Machine-tool models	
	KY501F1	KY507F1
Max. grinding wheel diameter, mm	450	
Spindle speed, rpm	1440	
Electric motor output, kW	2,8	

### Fixture for taper turning by the two-feed technique

The fixture comprises a change gear train and a special toolholder. Selection of change gears allows a cinematic link to be created between horizontal and vertical translations of the slide, thereby making the cutter fixed in the toolholder move under the preset inclination to the table centreline.

The fixture weighing 220 kg produces cones with generatrix inclination angles between 3 and 87 degrees.

