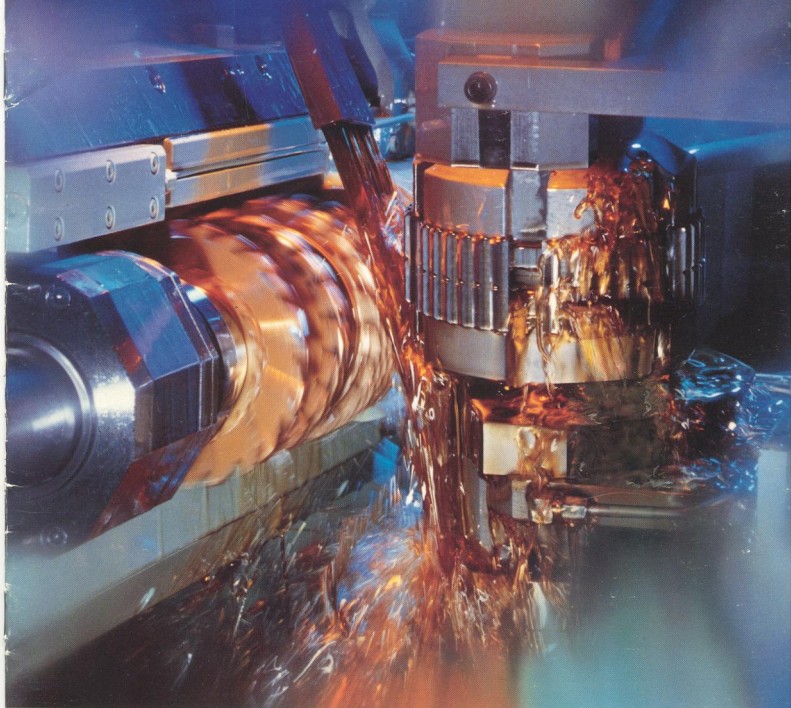




PFAUTER



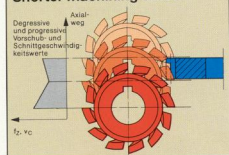
CNC
Hobbing Machine **PE 150**

The PE 150 gear hobbing machine with full numerical control:

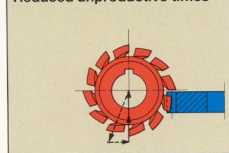
Unprecedented reduction of manufacturing costs.

Table

1 Shorter machining times



2 Reduced unproductive times



The PE 150 permits efficient utilization of the latest technology in cutting tools. Shorter production times are the result. They are further shortened by virtually eliminating safety margins for slide traveling at the beginning and the end of the hobbing cycle. Another contributing factor is the change in feed and cutting speed during hob approach and hob exit.

Unproductive times are also considerably reduced by higher rapid traverse speeds and by simultaneous operation of several axes.

Shorter set-up times

No.	(Typical steps)	Time allowed (1) in min.		Possible savings	
		conventionally controlled machines	PE 150 - fully numerically controlled	min.	by
1	Fixture change and run-out check	20	5	15	ASW FSW FSW
2	Hob arbor change	6	0	6	FSW
3	Hob change and run-out check	10	1	9	FSW
4	Mounting of index change gears	7	0	7	N
5	Mounting of differential change gears	7	0	7	N
6	Mounting of diagonal change gears	7	0	7	N
7	Setting of radial and axial feeds	2	0	2	N
8	Setting of hob speed	3	0	3	N
9	Changing of hob head helix angle	7.5	.5	7	FKS
10	Moving hob in shift start position	4	0	4	FKS
11	Setting amount, direction and number of hob shifts	3	0	3	N
12	Establishing hobbing program/adjust selector switch	3	3	0	N
13	Setting axial, tangential and radial slide travels	5	0	5	N
14	Setting hobbing depth	4	0	4	N
15	Correcting hobbing depth	4	2	2	N
16	Checking number of teeth and tooth direction	4	0	4	N
Total		96.5	11.5	85	

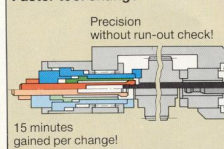
(1) Basic set-up time + personal allowance
N = Standard on PE 150

ASW = Fixture quick change
FSW = Quick hob changer
FKS = Automatic hob head swivel

Faster cycle times, reduced set-up and changeover times alone make the PE 150 more efficient than conventional hobbing machines because its price is only slightly higher. The advantages of the PE 150 become even more significant when special equipment such as crown hobbing is required. Frequent and costly workpiece changeovers increase the profitability drastically due to the shorter set-up times.

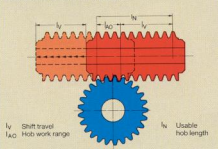
The most important benefit: unit production costs are reduced.

3 Faster tool change



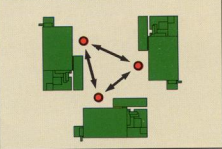
The Pfauter quick hob change system saves more than 90% of changing time and assures hob concentricity independent of the skill of the operator. It pays for itself with only one hob change per shift. For third shifts with reduced operator attendance a tool magazine with changer is available.

4 Lower tool costs



Very often hob life is not optimized especially with medium size lots. Often unused hob teeth are resharpened just because others are worn. Costly high speed tool steel is wasted and hob sharpening time unnecessarily increased. The computer controlled programming system developed by Pfauter assures utilization of the entire usable hob length. The data input is minimal - the computer does all calculations.

5 Shorter idle times



With multiple machine operation idle times can not always be avoided, for example when two machines of a group have completed their cycle at the same time. The operator can only changeover one machine while the other is idle until the first machine has been restarted.

With the PE 150 idle time is automatically reduced due to the very short changeover times. Considerable savings are the result.

Pfauter CNC hobbing machines since 1975:

Our experience is your guarantee of high availability.

More versatile, yet faster

The PE 150 is considerably faster than conventional hobbing machines as explained on page 4. The CNC gives the machine a versatility so far unknown in this field and opens new possibilities for gear designers. Cluster gears with different modules, lead angle, etc. can now be positioned and machined in one set-up (see illustrations at right). New applications are constantly added.

The standard PE 150 machine is highly versatile; special equipment is hardly necessary.

More accurate, yet more productive

The key to the remarkably rigid static and dynamic behavior of the PE 150 are the backlash-free hob and worktable drives and especially the closed loop positioning control for the table drive. Breakouts during hob exit are thus significantly reduced compared with conventional machines and the involute profiles are more accurate.

The PE 150 has few moving components. They are backlash- and maintenance-free guaranteeing the machine's accuracy for an extended period.

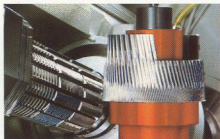
Individual drives make the PE 150 a very quiet machine. The complete machine enclosure permits either integrated or central oil mist exhaust.

CNC, yet simple operation

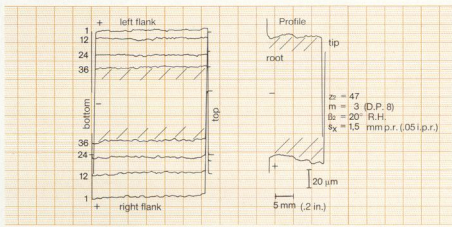
The preparation of hobbing programs is easy. For the sometimes difficult determination of the shortest slide travels the Pfauter dialogue program for a remote main frame (DNC) or for the microprocessor of the control system is available. In addition, center distances (only the span dimension difference is required) or hob diameters (after resharpening) are automatically corrected. The microprocessor also quickly recognizes illogical inputs.

The Pfauter diagnostic program simplifies maintenance procedures: errors are displayed directly on the CRT.

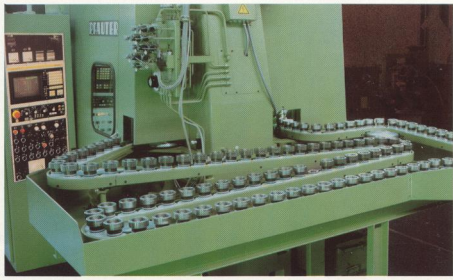
New applications



Accuracy



Loading and unloading systems retrofitted in minutes



High degree of automation, yet flexible

Loading and unloading systems designed especially for the PE 150 can be retrofitted in minutes for different workpieces. Their storage capacities can be expanded to allow unattended operation. Workpiece change takes a few seconds. Simple quick change tooling is also available.

6

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Most hobbing machine manufacturers insist that their machines are extremely stiff both statically and dynamically. High thermal stability is also emphasized. What do you compare then?

Our experience of more than 80 years in the design and building of hobbing machines is probably secondary to our reputation for highly accurate machines. This applies especially to the PE 150. The consistent accuracy however, is reflected only after years of operation in a high resale value. The remarkably low downtime and low maintenance costs are likewise difficult to calculate at the time of purchase.

But the PE 150 embodies many intelligent ideas. Three of them are worth remembering:

1. The machine bed:

It is not only rigid but also designed to maintain thermal stability. The forced coolant circulation floods front and rear bed walls to the top eliminating any temperature differences.

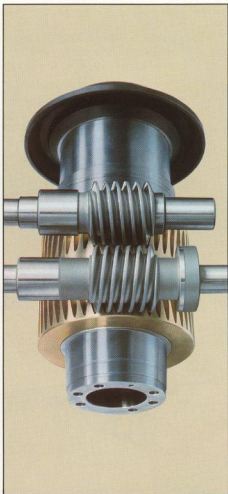
2. The double index drive:

Hydraulic preloading increases its rigidity and assures permanent backlash- and maintenance-free operation of the table drive. Furthermore, errors on helical gears in hob approach and exit zones, especially when using opposite leads of hob and workpiece, are practically eliminated.

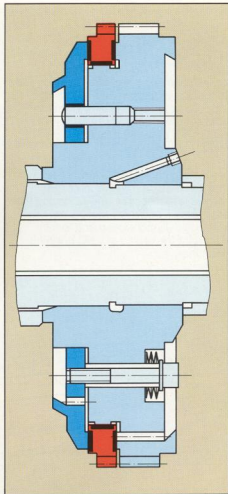
3. The backlash-free hob drive:

Relative motions between the gear elements are reduced to a minimum by incorporating a friction gear with one more tooth. Preloading and friction lining provide a braking effect which prevents a lifting of the flanks in response to changing cutting force loads. The insignificant relative movement also avoids any thermal problems.

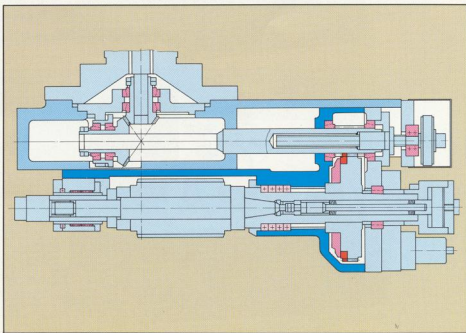
14



15



16

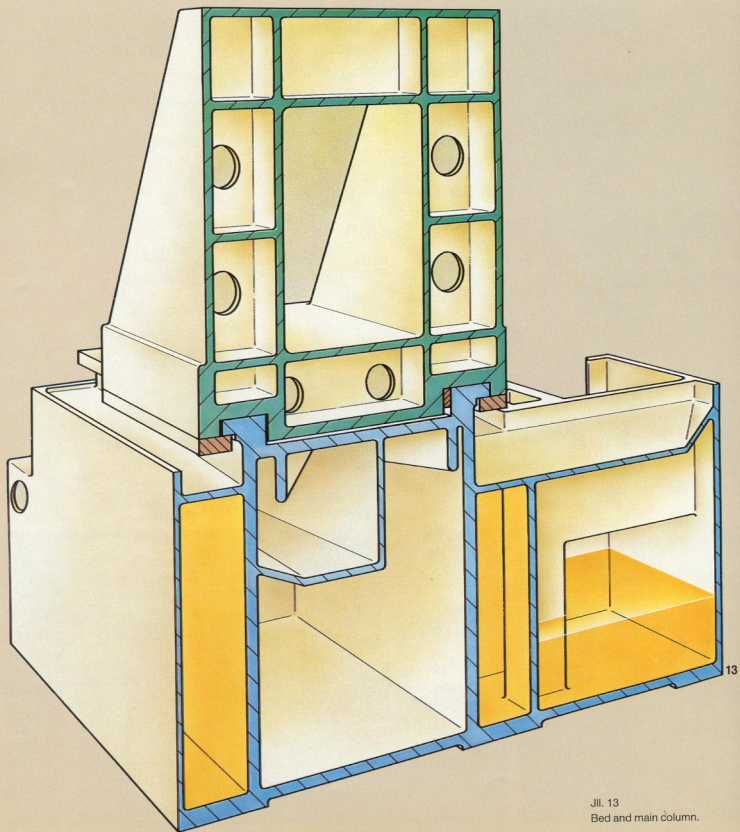


Jll. 14
Double index drive.

Jll. 15
Backlash-free hob drive.

Jll. 16
Standard hob head.

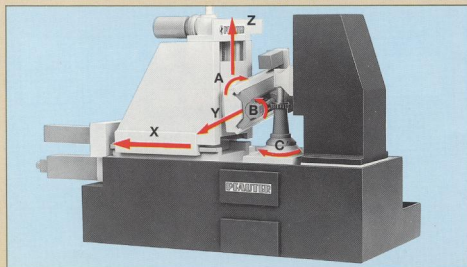
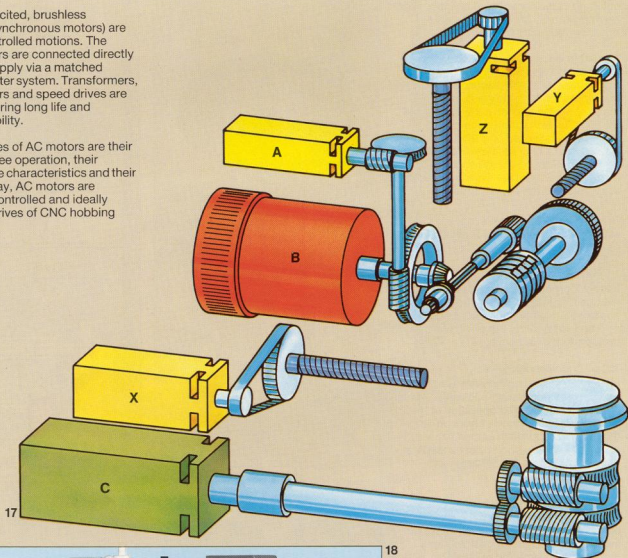
**The PE 150:
The mechanics
and the control system.**



A drive concept for maximum reliability

Permanently excited, brushless servomotors (synchronous motors) are used for all controlled motions. The individual motors are connected directly to the power supply via a matched modular converter system. Transformers, valves, collectors and speed drives are eliminated assuring long life and increased reliability.

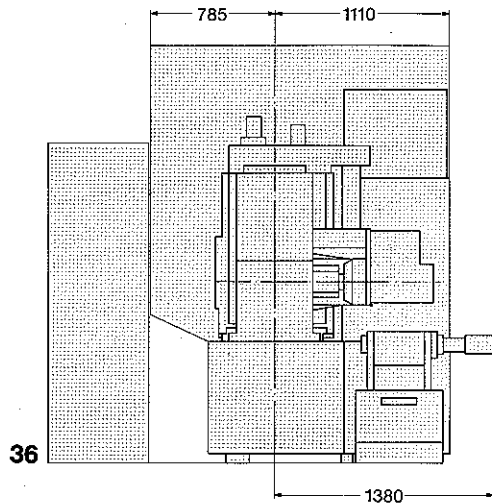
Main advantages of AC motors are their maintenance-free operation, their favorable torque characteristics and their small size. Today, AC motors are electronically controlled and ideally suited for the drives of CNC hobbing machines.



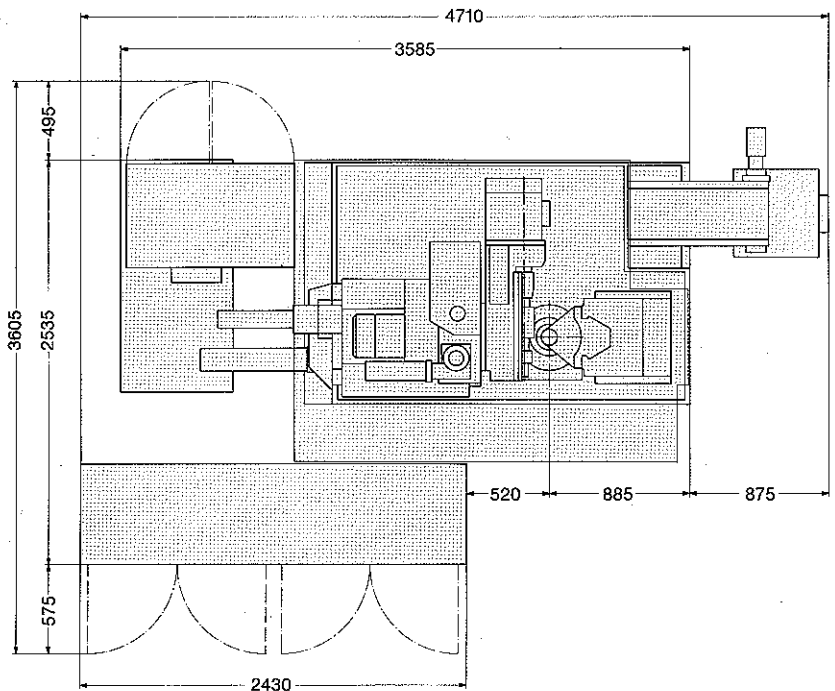
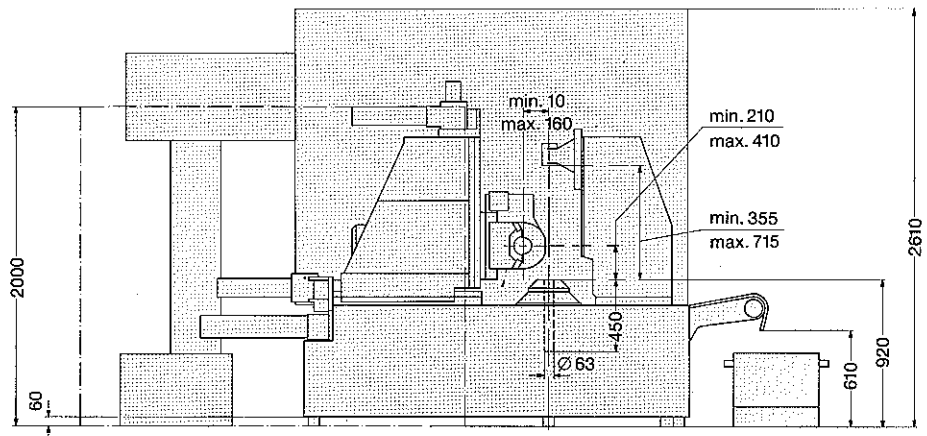
JII. 17
Drive kinematics of the PE 150
showing the drives and their respective axes.

JII. 18
Linear and rotary axes.

Specifications



Jll. 36
Dimensions of the PE 150



Capacities

Nominal workpiece diameter	150 mm
Nominal module in steel with a tensile strength of approximately 600 N/mm ²	4 mm*
Maximum axial travel	200 mm
Minimum/maximum table speed:	
– Standard two-start index drive	1/125 rpm
– Optional four-start index drive	2/250 rpm
Hob head swivel:	
– Standard	+30/– 45 °
– Optional (for high helix angles)	+30/– 150 °
Maximum hob shift	170 mm
Hob speed range:	
– Standard	150 to 600 rpm
– Optional	200 to 800 rpm
– Optional	300 to 1200 rpm
– Optional	400 to 1500 rpm
Feeds	
(axial, radial, tangential)	1 to 1500 mm/min
Rapid traverse speeds	
– (axial and radial)	5000 mm/min
– (tangential)	3000 mm/min
Minimum/maximum center distance between hob and workpiece axis	10/160 mm
Worktable diameter	160 mm
Hob arbor taper	ISO 40
Maximum hob dimensions:	
– Diameter	130 mm

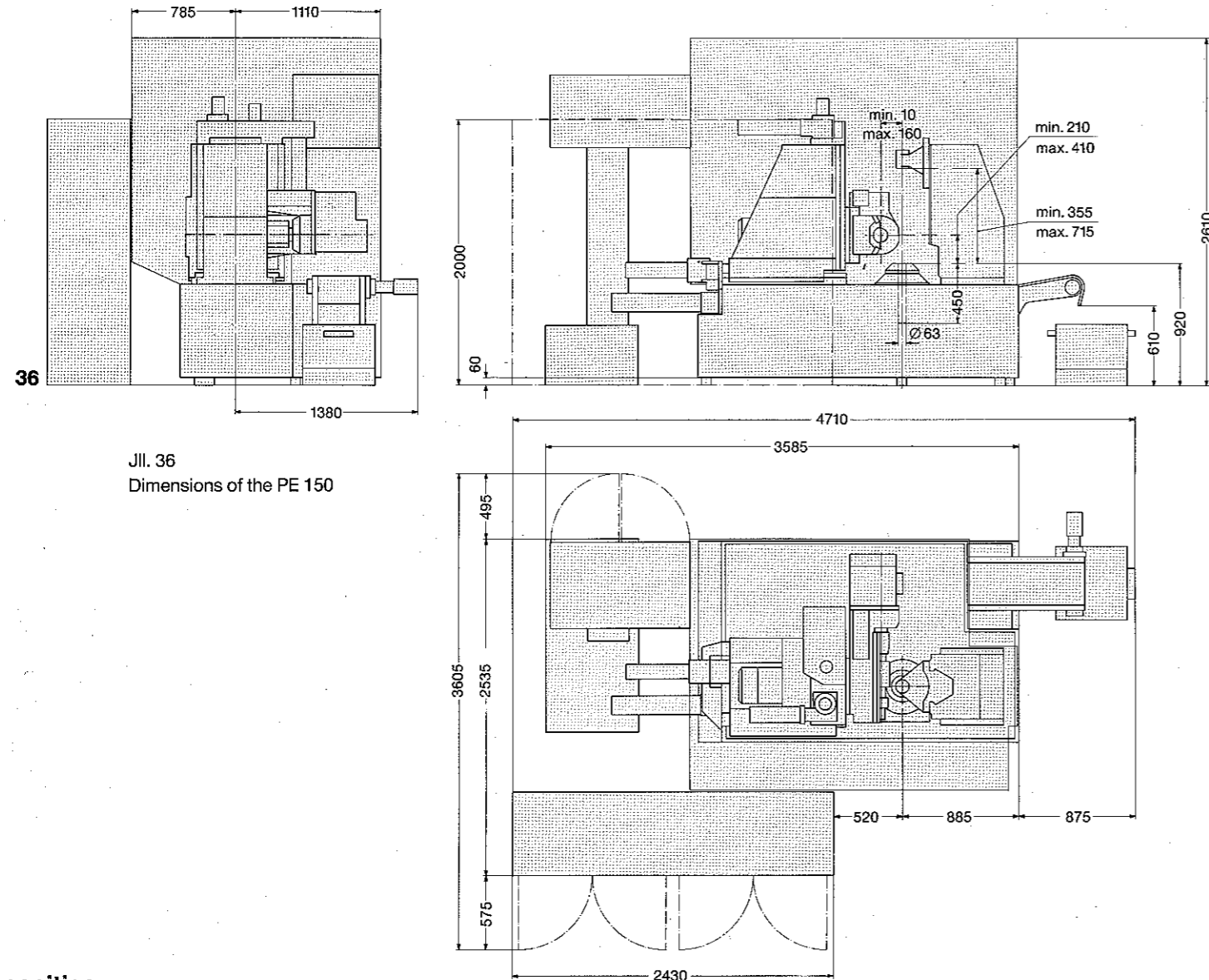
Electrical drive

Voltage	220/380 V
Frequency	50 Hz
(other voltages and frequencies on request)	
Hob drive:	
Frequency-controlled AC motor	
– Standard	7.5 kW
– Optional	12 kW
All other drives are AC-frequency-controlled servomotors.	
Total power rating	approximately 50 kVA

Weights and floor space requirements

Weight of machine (without tailstock column)	approximately 7500 kg
Weight of machine (with tailstock column)	approximately 8100 kg
Floor space required including chip box (doors open):	
– Length	4710 mm
– Width	3605 mm
– Height	2610 mm
Weight of export packing	approximately 1100 kg

Specifications



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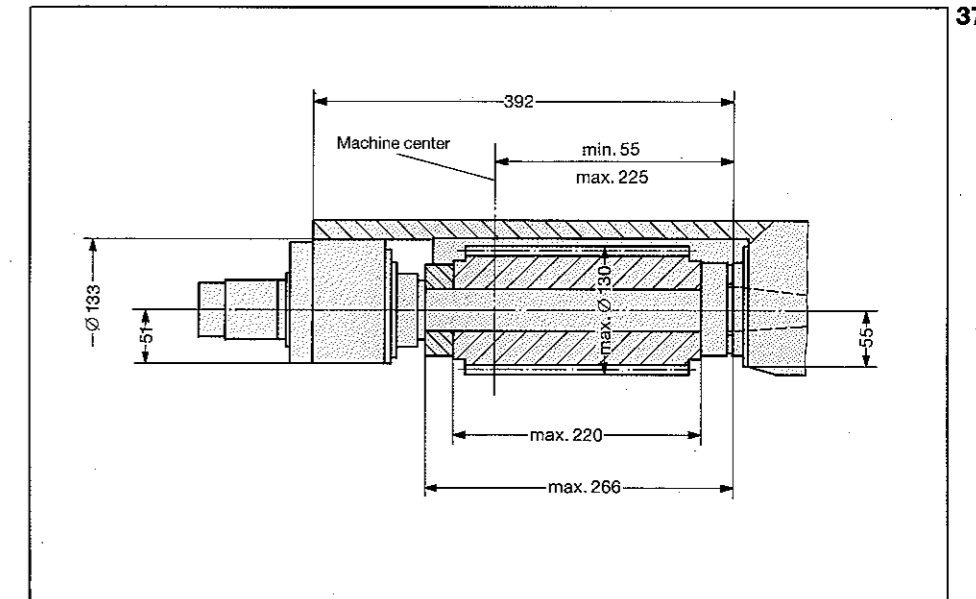
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Work area



Jll. 37
Hob mounting (standard hob head).

