MIKRON

A33

Automatic Gear Hobbing Machine

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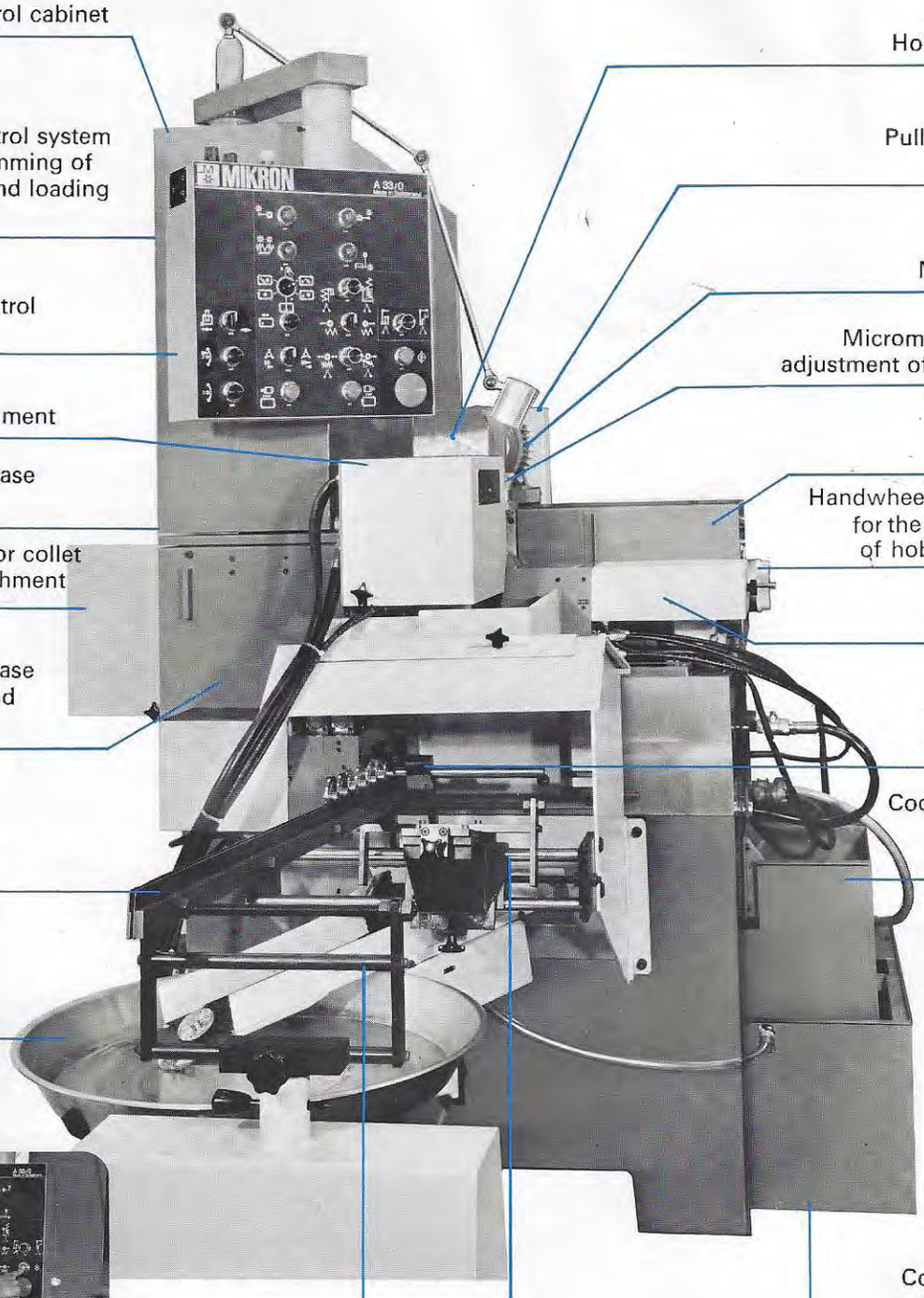
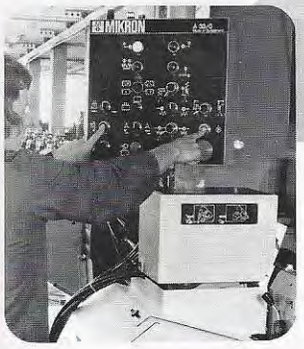




Basic machine

The new Mikron Gear Hobbing Machine A 33 is suitable to generate spur and helical gears, pinions, worm wheels and worms. The workpieces can be loaded, hobbed, deburred and unloaded automatically. The modern design is aimed at achieving high efficiency.

Modular building system

The design is based on a system that allows simple maintenance, supervision as well as the mounting of additional parts and attachments.

Machine base

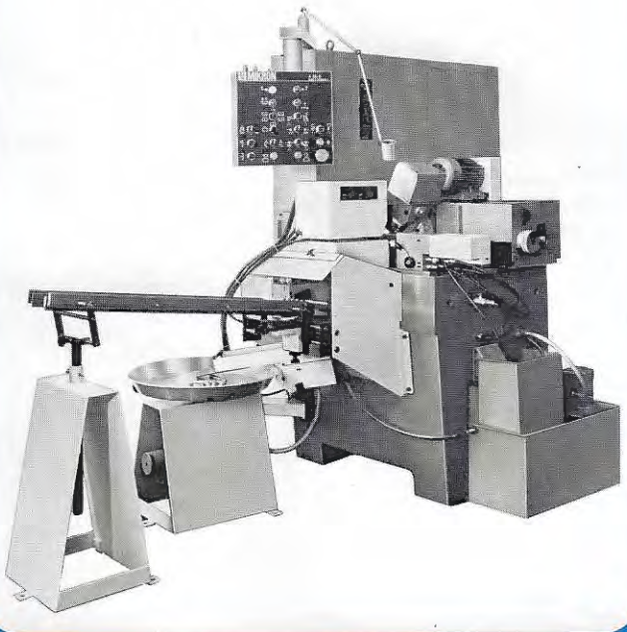
The machine base, made of cast iron, is a solid, torsion free unit. Transmission case, slide unit and tailstock are mounted on the machine base. In order to avoid unfavourable thermic effects, the coolant and the hydraulic elements are placed outside the machine.

Transmission case

The kinematic is located in the transmission case, which, together with the headstock, form one unit. The optimal layout of the kinematic permits short, rigid kinematic trains.

Tailstock

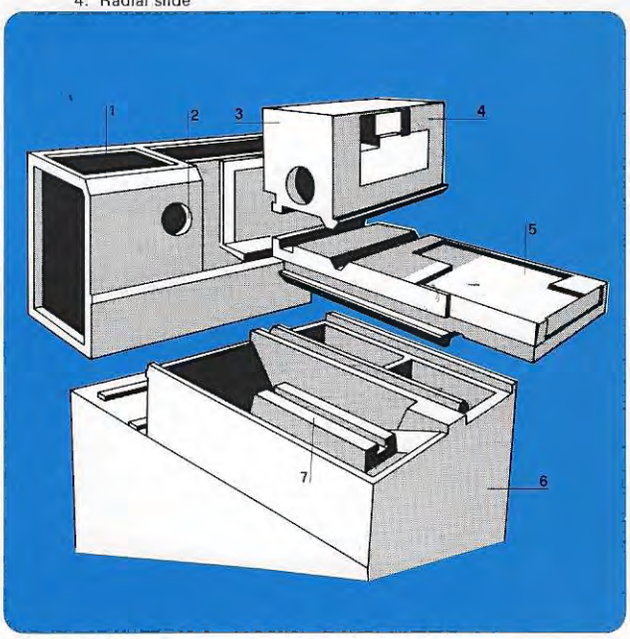
The tailstock is characterized by its high rigidity. It can be actuated either by hand or automatically. The clamping forces, which are acting upon the tailstock, are directly absorbed by the machine base.



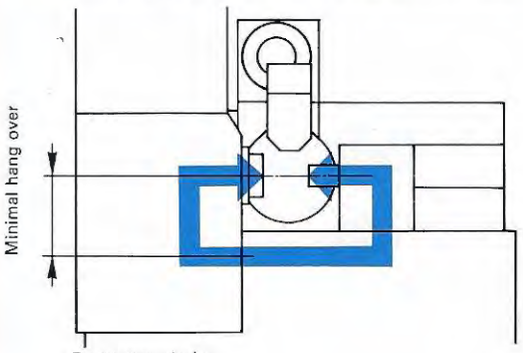
Hobbing slide

The axial slide with its long and wide guiding ways grant the necessary basis for optimal rigidity. The assembly of the hobbing slide consists of three levels, i.e. the leadscrew, the axial and the radial guide ways. Due to the fact that these three levels are closely superposed the hobbing forces are diminished during operation.

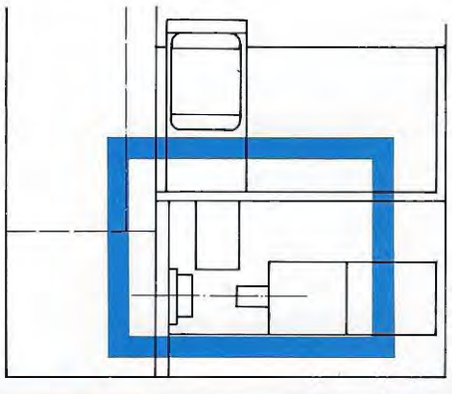
1. Transmission case
2. Bore for work arbor
3. Fitting area of the hobbing head
4. Radial slide
5. Axial slide
6. Machine base
7. Tailstock support



The clamping forces are directly absorbed by the machine base



Frame type design



Easy operation

Simple, easily comprehensible and good accessibility of the control and set-up elements.

Intermediate rapid traverse / deburring control

Additional limit switch cams and a corresponding programming system enable the interruption of the axial feed and the rapid traverse can be engaged at a selectable length or position. The radial slide can simultaneously be withdrawn during rapid traverse. The cams control also the deburring device, which by means of these cams is swivelled out before ending the axial travel and is swivelled in after the latter starts. By this the service life of the deburring tool is increased.

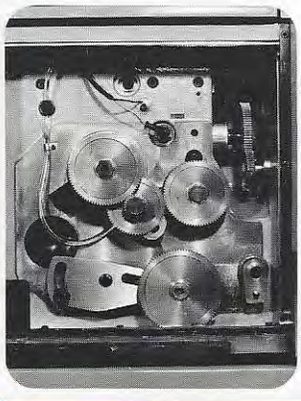
Feeds

The radial slide is hydraulically driven. The infeed stroke can be subdivided in rapid traverse and feed travel. The feed speed is infinitely adjustable by means of a throttle valve.
The feed speed of the axial slide can be chosen by means of change wheels. The rapid traverse drive is carried out by means of a separate rapid traverse motor.

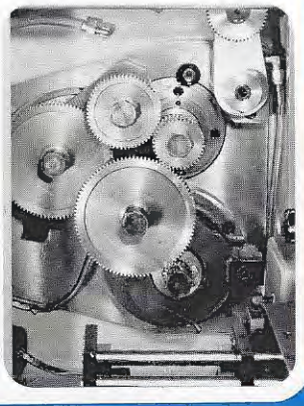
Change gear train

For all the change gears only a single wheel type is necessary. The change of the axial feed direction as well as the change-over for left or right threaded leads is carried out over a quadrant with reversing wheel. The quadrant can be adjusted.
For the reversing of the sense of rotation of the indexing wheel, a separate reversing gearing is mounted.

Transmission case for lead gears



Transmission case for indexing and feed



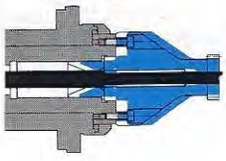
Number of hob revolutions

The number of hob revolutions is chosen by means of two pulleys and change gears in the hobbing head, (coefficient 1.2).

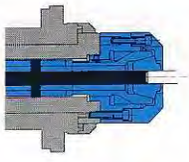
Workpiece clamping

A cylindrical guide way at the headstock side enables either the use of collet chucks or different sizes and shapes of work holding fixtures corresponding to the respective workpiece.
In the tailstock there can be inserted, as required, fix centers, steady rests as well as revolving work arbors.

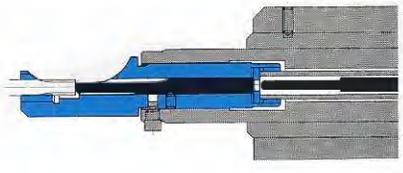
Example centering pin



Example Rubber Flex collet clamping W 18

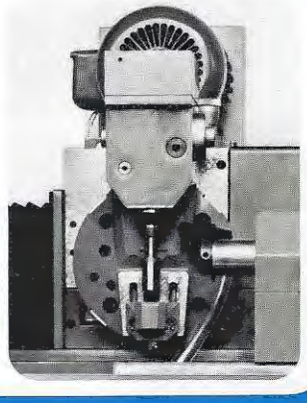


Example steady rest with ejector



Hob clamping

Hob spindles with interchangeable hob arbors for different hob bores are available.

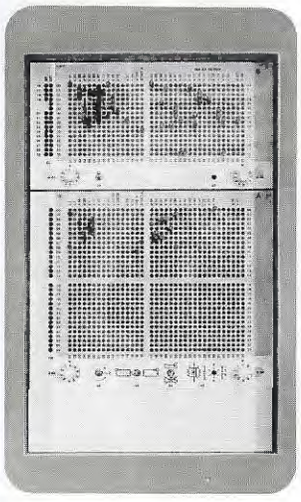


Electrical Controls

The controls are placed in a separate control cabinet. All the machine movements are sequentially controlled by means of a step switch. This grants a high functional and operational safety. The sequence of operations is freely programmed by means of a diode plug inserted in a pin board control system. The advantage of this control is that the operations can be actuated individually or simultaneously, so that minimal non-productive times are achieved and a great variety of workpieces can be produced.

Pin board control system

The work cycle is determined by means of diode plugs inserted in a pin board control system. Punched templates for standard programs and, if required, also for special programs are available. The latter can also be freely programmed following the prescriptions of an instruction manual.

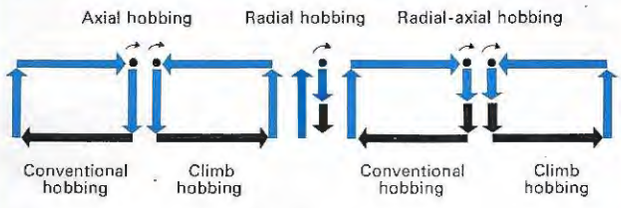


Control panel

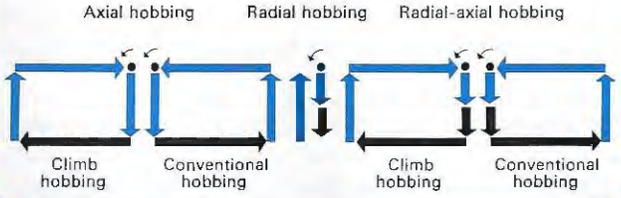
The swivelling control panel permits a rapid and safe set-up

Example of possible hobbing cycles

Thrust of the hob in the direction of the headstock (normal case)



Thrust of the hob in the direction of the tailstock



Maintenance, service, safety

Centralized lubrication

During operation the kinematic, the leadscrew and the guiding ways are continuously lubricated with pressure oil.

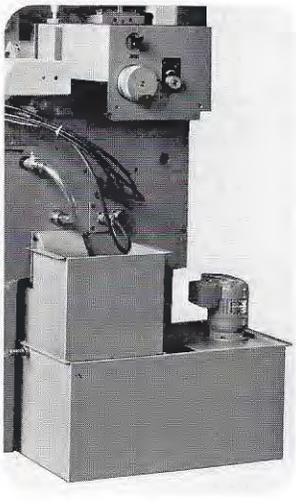
Hydraulic elements

The hydraulic equipment of the machine is easily accessible. It is fitted with a safety switch, which stops the machine when the pressure decreases by 50%. The oil pressure filter is fitted with an optical dirt accumulation indicator.

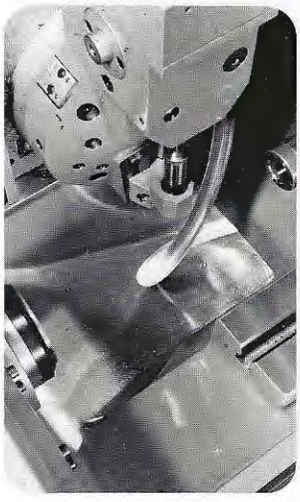
Coolant equipment

The machine is provided with an efficient coolant pump. The coolant tank with separate chip collector are placed outside the machine and are consequently easily accessible. It is therefore possible, if necessary, to use a coolant tank with a special filter instead of the standard coolant system.

Coolant tank with chip flow

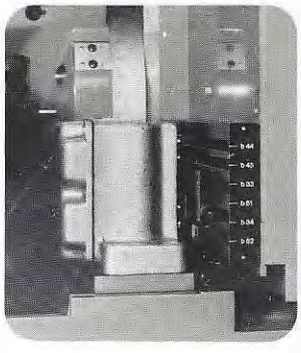


Hobbing area with functional chip flow



Limit of travel movement

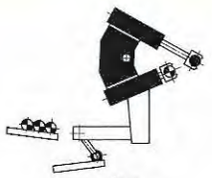
The axial slide travel is set-up by limit switch cams; it has also an over travel safety (Fig. Limit of travel).



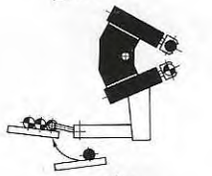
Safety prescriptions (precautions)

The USA – OSHA (Occupational Safety and Health Administration) instructions have been taken into consideration.

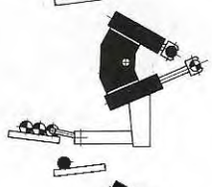
Automatic loading



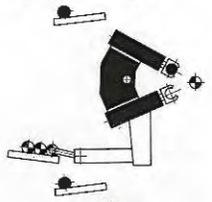
1. Unloading jaw drives forwards and picks-up the hobbed piece. At the same time the transporter deposits the finished workpiece in the container for hobbed parts.



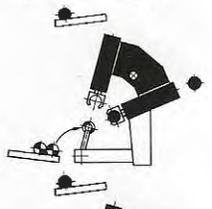
2. Transporter swivels towards the blank magazine. Unloading jaw drives backwards with the hobbed workpiece.



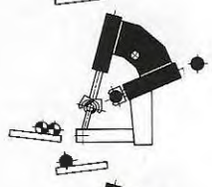
3. Loading jaw drives forwards with the blank. Clamping system closes. The blank is clamped.



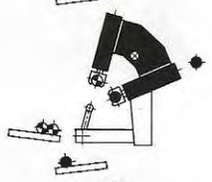
4. Loading jaw drives backwards. Hobbing cycle starts.



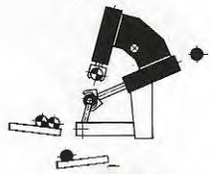
5. Swivelling segment and transporter swivel in their change-over position.



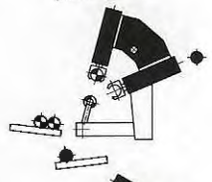
6. Loading jaw drives forwards and picks-up blank from the transporter.



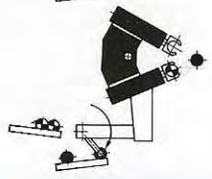
7. Loading jaw drives backwards.



8. Unloading jaw drives forwards and passes the hobbed piece to the transporter.



9. Unloading jaw drives backwards.



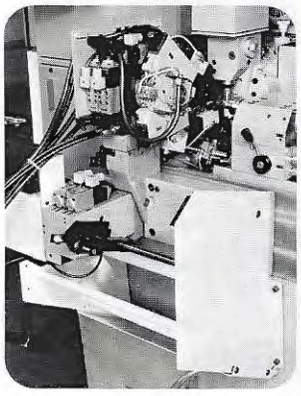
10. Swivelling segment swivels towards the machine and the transporter swivels at the same time towards the container for hobbed parts.

The loading concept features minimal set-up and change-over costs per workpiece and is aimed at achieving the largest possible range of parts spectrum. By that smaller and average series can be automatically and economically hobbed.
Large magazine capacity for blanks and hobbed pieces. The hobbed pieces are carefully unloaded and put into a container or stored away.

Loading/unloading

The loading attachment 40 consists of a swivelling arm and a transporter. Both these hydraulically controlled elements carry out the workpiece transportation i.e. the blank is picked up outside the machine, loaded in between the work holding fixtures. The hobbed workpiece is unloaded and deposited outside the machine. The loading attachment 40 remains unchanged for the whole range of parts spectrum, irrespective of the chosen magazine type.

The following features characterize the loading attachment:



Loader and transporter when cover removed

Automatic loading cycle

The loading cycle includes loading and unloading as well as clamping and unclamping. Due to the two loader-slides and the flexibility of the program i.e. programming by means of the pin board control system, the change of a workpiece can be carried out in up to minimum 3 seconds (depending upon the shape of the workpiece). This enables commercial efficiency and economy.

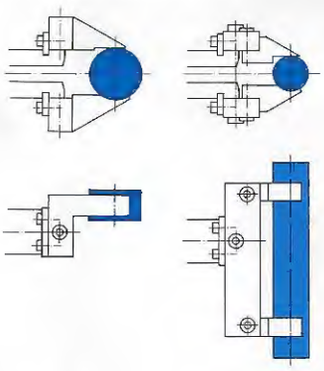
Short set-up time

For the set-up of the loading attachment only a few simple adjustments are necessary. The sequential control allows a step by step logical proceeding.

Low tooling cost

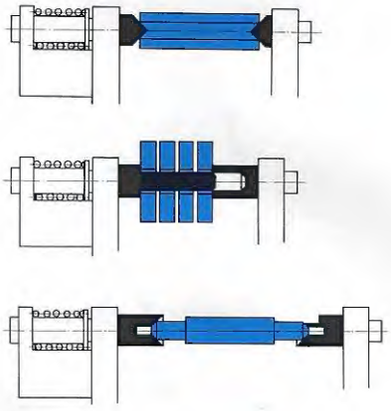
As workpiece dependent tools only two simple j are needed. These jaws are hydraulically opened closed by means of spring pressure. The al mentioned clamping tools can be manufacture any workshop.

Loading jaw for disk and shaft shaped workpieces



The blanks are taken face sided by the transporti the end of the magazine by means of male, fer centres or pins. By that the blanks are automati positioned in the axial and radial direction conveyed to the loading attachment. This positio permits a simplification and in consequenc reduction in price of the workpiece dependent p of the magazine, as no accurate guiding is requ either along the magazine or at the end of it.

Examples for the pick-up of the workpiece by transporter



High flexibility

This loading system is characterized by h flexibility, due to the fact that the piece is picekd and unloaded outside the machine. Storage voli for several hours as well as the linking with o machines are possible.

Manual loading of pieces (for small series always possible as the loading attachment can swivelled out. A safety limit switch prevents loading movement in the swivelled out position.

Double pass cycle

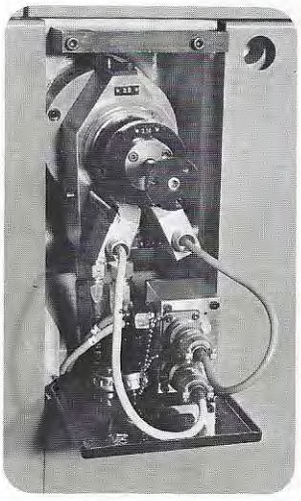
This additional attachment permits the hobbing of the workpiece in two passes, whereat the second pass plunge depth is about 0,2 mm. If required it is available with the same feed rate for both passes or, by means of a supplementary element in the kine-matic, the feed rate of the second pass can be either increased or decreased by a factor 3.

Collet clamping attachment

It closes the collets by a drawing or pushing force. In addition it is equipped with an ejector with hydraulic control.

Centering pin actuating attachment

This appliance actuates the centering pin or the ejector in the work arbor of the headstock. Depending on the diameter, expansion pins can be used as centering pins too.



Collet clamping attachment

Accessory groups in preparation

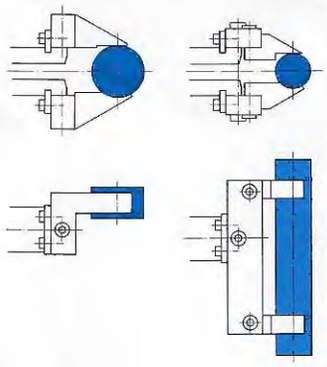
- Hydraulically controlled copying attachment for the generation of crown hobbing
- Hobbing head with automatic shifting of the hob
- Special tailstock for large helix angles
- Kits for the reduction of the radial slide stroke during hobbing > 80 mm (manual loading) as well as the reduction of the plunge time (autom.)

Storage

Low tooling cost

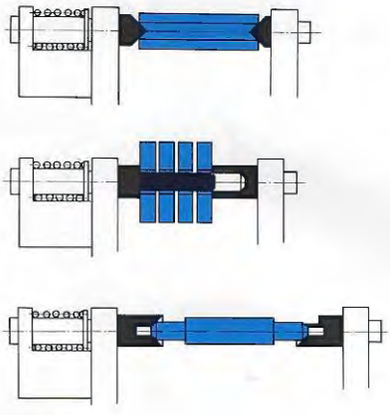
As workpiece dependent tools only two simple jaws are needed. These jaws are hydraulically opened and closed by means of spring pressure. The above mentioned clamping tools can be manufactured in any workshop.

Loading jaw for disk and shaft shaped workpieces



The blanks are taken face sided by the transporter at the end of the magazine by means of male, female centres or pins. By that the blanks are automatically positioned in the axial and radial direction and conveyed to the loading attachment. This positioning permits a simplification and in consequence a reduction in price of the workpiece dependent parts of the magazine, as no accurate guiding is required either along the magazine or at the end of it.

Examples for the pick-up of the workpiece by transporter



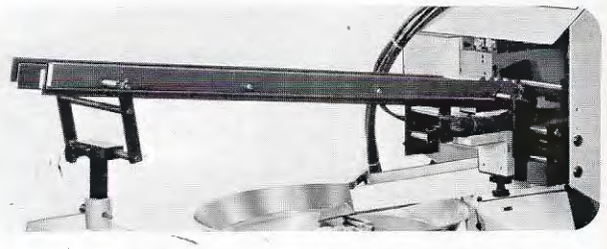
High flexibility

This loading system is characterized by high flexibility, due to the fact that the piece is picekd-up and unloaded outside the machine. Storage volume for several hours as well as the linking with other machines are possible.

Manual loading of pieces (for small series) is always possible as the loading attachment can be swivelled out. A safety limit switch prevents any loading movement in the swivelled out position.

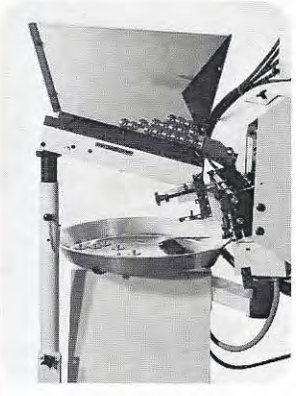
Blank magazine

The **rail magazine** consists of guidings made of sheet metal and threaded bolts with spacers. It is suitable for a far reaching range of workpiece shapes and sizes, as well as for two piece and stack loading. The inclination of the rail magazine and the position of the end of the magazine are adjustable.



Capacity of the magazine: (Examples)		
	with 4 mm dia.	260 pieces
	with 30 mm dia.	35 pieces
	with 72 mm dia.	15 pieces

The **hopper magazine** consists of a workpiece container and a mobile element, which enables the conveying of the workpiece to the end part of the magazine. This type is suitable for disk and hub shaped parts as well as shafts with sufficient length of the cylindrical portion.
Two piece-and stack loading are rendered possible. The hopper type magazine is characterized by a great admission capacity.



Capacity of the magazine: (Examples)

Disk shaped pieces

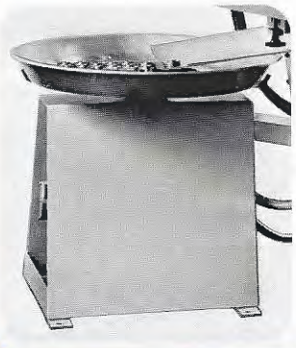
with 10 mm dia.	1300 pieces
with 35 mm dia.	120 pieces
with 72 mm dia.	25 pieces

Shaft shaped pieces

with 6 mm dia.	4100 pieces
with 10 mm dia.	1300 pieces
with 25 mm dia.	250 pieces

Both magazines present the following advantages:

- Favorable price and rapid change-over to a new workpiece
- Easy accessibility of the magazine for refilling
- Simple replacement of magazines.



Container for hobbed parts

The **simple container** for light parts is an interchangeable standard container, which is placed on a support directly under the transporter.

The **universal container** consists of a removable rotary plate as well as of a vibrating channel. This magazine grants a safe unloading of all workpiece shapes.

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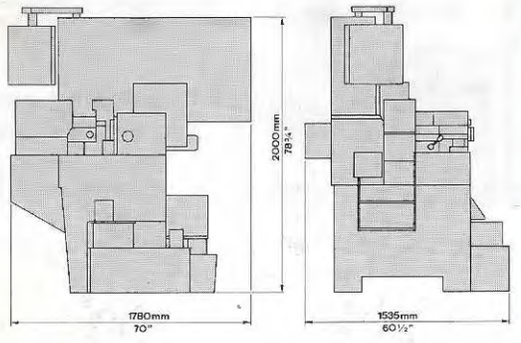
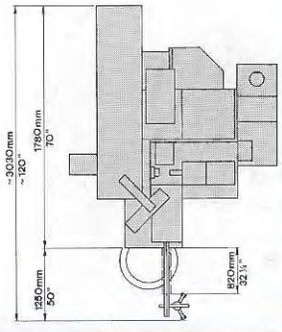
Technical data

Workpiece dia. with 32 mm hob dia. manual loading	80 mm (3.2")
Workpiece dia. with 40 mm hob dia automatic loading	4-72 mm (.156"-2.83")
Workpiece dia. with radial stroke reduction (special accessory with manual loading)	100 mm (3.9")
Clamping length	2-200 mm (.078"-7.8")
Axial hobbing length	150 mm (5.9")
Module (approx. value)	2 (D.P. 12)
Number of teeth with standard indexing mechanism (excl. prime numbers more than 130 teeth)	3-1200
Helix angle (right and left) with standard tailstock with special tailstock	45° 90°
Max. hob diameter	50 mm (1.9")
Shifting of the hob	25 mm (.98")
Radial feed, infinitely variable	0,2-200 mm/min (.008"-7.8")
Axial feed, 17 steps	0,5-2 mm/ workp. rev. (.002"-.078"/ workp. rev.)
Hob. r.p.m., 14 steps (50 cycles) (60 cycles)	 212-2000 r.p.m. 250-2000 r.p.m.
Hob driving motor n = 1400	1,5 kW, 1.97 HP.
Weight of the basic machine	1800 kg (4000 lbs)
Weight, loading attachment included approx.	2200 kg (4850 lbs)





Standard accessories

1 electrical control, complete
1 coolant equipment, tank included
1 set of hobbing head change gears for gear ratios 1:2 and 1:1
1 set (11 pieces) change gears for feed
2 pulleys 98 dia. and 116 dia. for hob speeds:
from 600, 840, 1200 and 1680 r.p.m. (50 cycles)
from 710, 1000, 1400 and 2000 r.p.m. (60 cycles)
1 set of wrenches
1 Operators' Manual
electrical and hydraulic diagrams

Special accessories

- Counter
- Machine illumination
- Deburring attachment (disk or tool bits)
- Pulleys
- Hydraulically controlled clamping device for drawing and pushing (actuation of the clamping tools)
- Hydraulically controlled actuating device for centering pin
- Double pass cycle
- Coupling shaft for different feeds during roughing and finish cutting, when double pass cycle is used
- * Hydraulically controlled copying apparatus for generating crown gears
- * Hobbing head with automatic shifting of the hob
- * Special tailstock for hobbing of helix angles exceeding 45°
- * Radial stroke limit for workpiece diameters up to 100 mm (3.9")
- Loading attachment
- Rail magazine
- Hopper magazine
- Ready parts container

* Please ask term of delivery.

Our designs are subject to constant improvements. We therefore reserve the right to make changes without further notice. Specifications in this catalog are for guidance only.

Your agent:

C475.3000 Printed in Switzerland

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