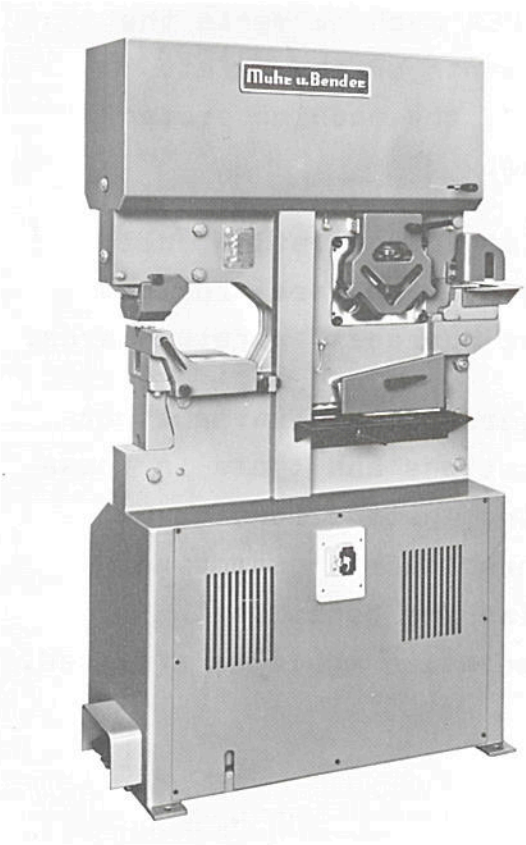
General

You have made a good choice, as you will soon realize. The experience of decades and the latest knowhow on the fields of punch and shears construction are incorporated in this MUBEA machine. As vast number of satisfied customers have confirmed many times, it is just the daily routine handling of this machine that makes its advantages particularly apparent.

In order to be able to fully utilize the machine, it is urgently recommended that you read and follow these operating instructions carefully.



Experience shows that the machine has an unusually long service life. Components, being subject to normal wear and tear can be replaced at any time. It is important that you then ask for Original MUBEA Spare Parts exclusively. Only then can the service life of the machine and uniform quality of the results of its work be attained. This also holds if you wish to extend the range of application of your machine by adding further tools. Shop practice will very soon convince you that MUBEA machines can effectively be complemented and are thus universally useable and at the same time economical in operation.

To give you a general idea of the components used in the construction of the machine and their interaction, you will find at the end of these operating instructions a complete list of parts with the respective article numbers.

In case of any questions, please do not hesitate to contact us: Our service staff will always be at your disposal.

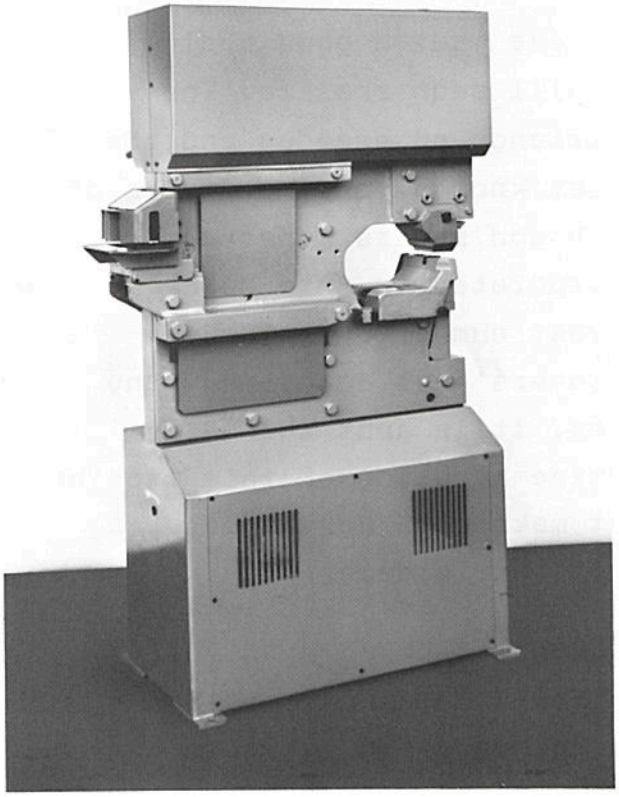
Upon request, you may conclude a maintenance contract at a favourable price. And another thing: Give the machine the care it deserves. You will find many hints and advises on this subject in this manual.

Guards

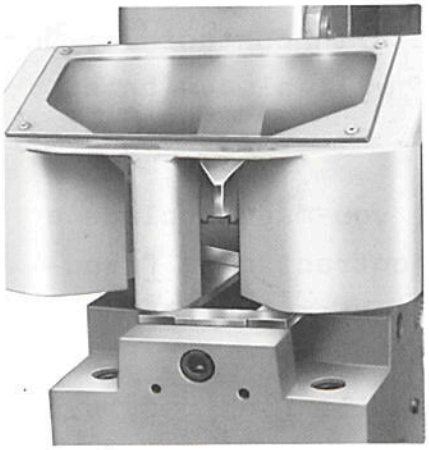
Your MUBEA machine meets the requirements of the safety rules and the machine protection law.

For safety of operation, all working stations are provided with the necessary safety guards.

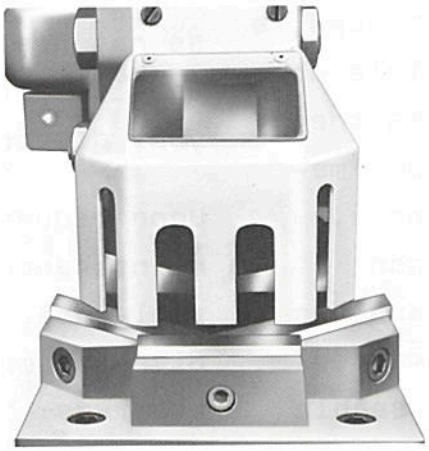
The figures of the various working stations and tools in these operating instructions do not show these safety guards as otherwise the functional representation would be affected.



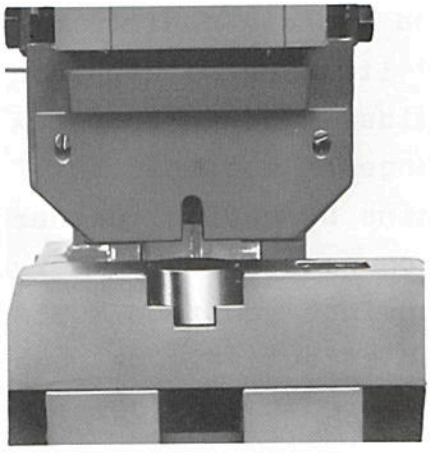
Safety guards at the discharge side for the sectional shears and flat steel bar shears



Safety guard for the rectangular coping tool



Safety guard for the triangular coping tool



Safety guard for the punch

TRANSPORT

When transporting the machine by truck, stabilize by bolting to sturdy planks.

When transport is carried out by crane, insert the hook into the eyebolt, provided for this purpose.

The weight of your machine is shown in the enclosed leaflet.

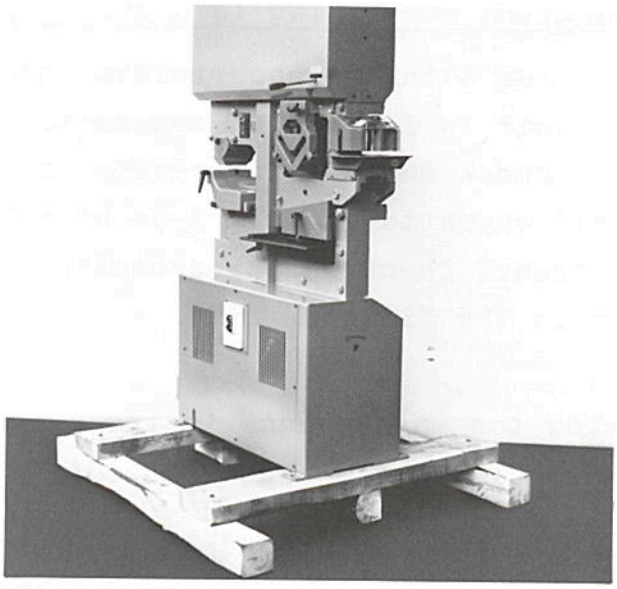


Fig. 1: Transportation of the machine by truck

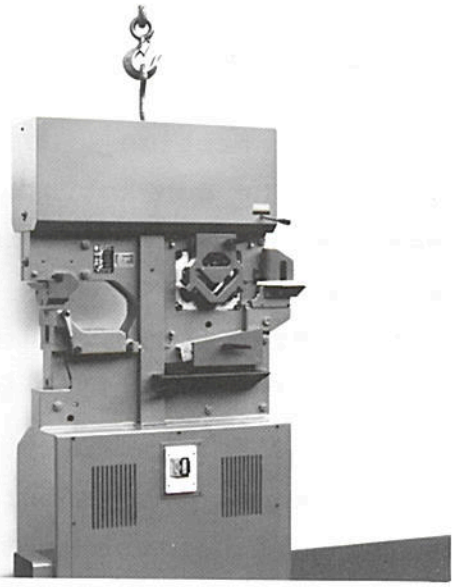


Fig. 2: Transport by crane

Assembling:

The working positions of the machine are at normal working levels, which does not require an adjustment by platforms or foundation bases. All necessary instructions to provide a foundation level with the ground for a stationary installation are given in the foundation plan enclosed. Tighten the foundation bolts after the grouting compound has set. Dowel plugs may be used instead of foundation bolts.

Check whether the machine is positioned vertically.

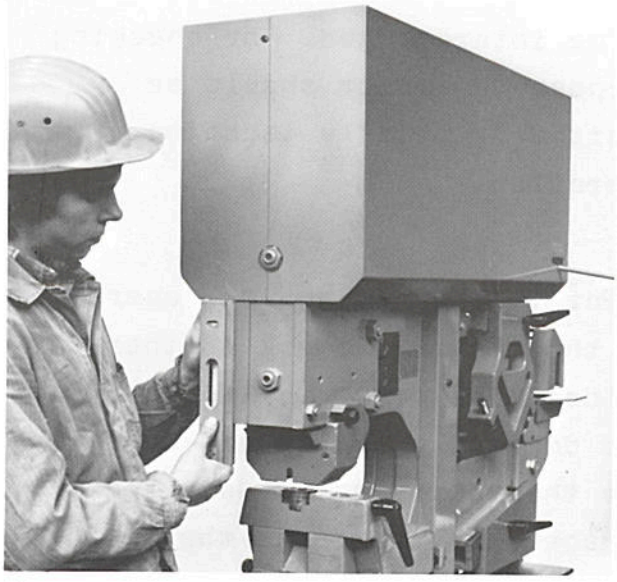


Fig. 3: Check the vertical position of the machine

CONNECTION AND TAKING INTO OPERATION

The drive with the appertaining oil reservoir is located in the machine base. Check whether the reservoir is filled up to approx. 3 cm below its cover. Checking is accomplished through the filling inlet.

Follow the maintenance instructions when refilling is accomplished!

The machine is installed ready for operation. The machine's main switch is located in the base of the machine in the protective housing of the front panel, to which the connection lines should be routed. The connections should be performed by an electrical expert in accordance with the wiring diagram (check the uniformity of the supply voltage).

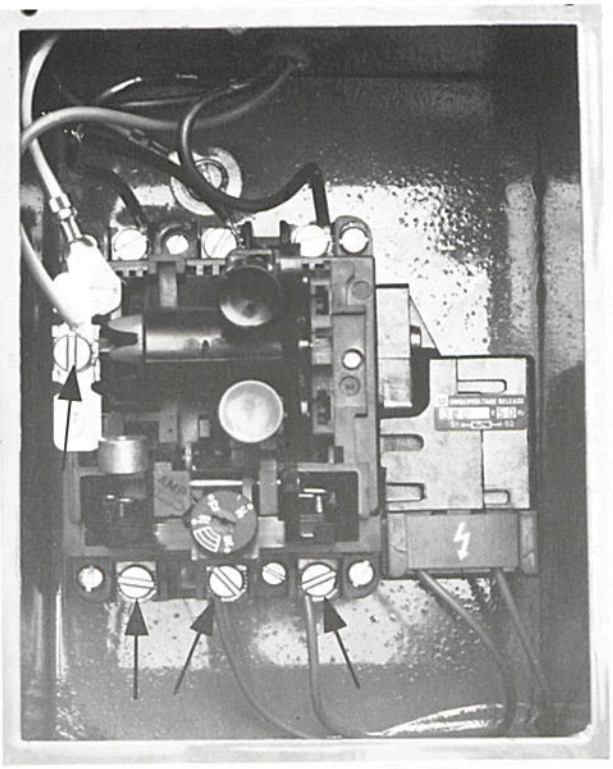


Fig. 4: Connection of the power supply

Turn on the motor briefly: if the motor does not rotate in the direction indicated by the arrow, 2 phases of the connections have to be interchanged. For checking purpose the motor should be started by briefly touching operation.

Prior to the taking into operation of the machine, check whether the slides move properly and the tools are correctly seated and adjusted. For this purpose, actuate the engagements and inche the slides gradually into the lower dead position.

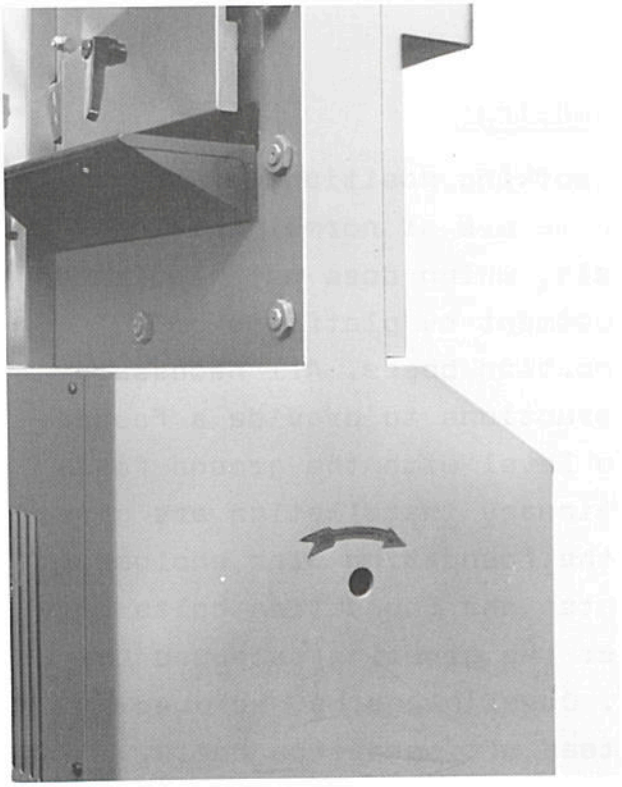


Fig. 5: Pay attention to the direction of rotation of the motor

LUBRICATION OF THE MACHINE

Lubricant

The machine has exclusively be lubricated with o i l . The same type of oil may be used for all lubrication points.

The following brands of oil may be used:

ARAL-Degenit B 220
Viscosity 130 mm^2/s at 50^oC

SHELL-Tona Oil T220
Viscosity 128 mm^2/s at 50^oC

MOBIL Oil AG-Vactra Oil Nr. 4
Viscosity 125 mm^2/s at 50^oC

ESSO AG-MILLCOT K 220
Viscosity 120 mm^2/s at 50^oC

BP-Energol HP - C 220
Viscosity 127 mm^2/s at 50^oC

Grease the machine thoroughly (refer to the lubrication chart).

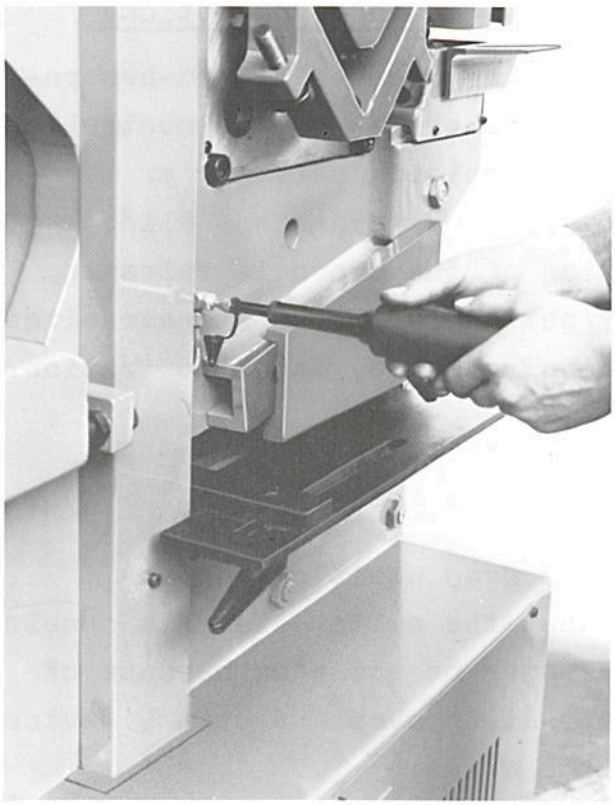


Fig. 6: Lubrication

FOR MACHINES SUPPLIED TO THE U.S.A.

Lubricate daily with oil

Lubricant:

CHEVRON VISTAC OIL 150X

Lubricating direction acc. to Lubrication chart.

For the lubrication a grease gun is used which is being supplied in the tool kit grease in accordance with the lubrication chart enclosed. Make sure that the prescribed quantities of oil are regularly injected.

ENGAGEMENT (manual operation)

Each slide can be engaged separately. The slides may be controlled in any desired position for stopping and reversing. Slide motion of the punch is released by foot operation. The shear slide is controlled by manual operation.

In the central position, the valves have free passage.

In the dead positions of the slides, the switch elements should no longer be actuated because of the buit-in overload safety device of the drive.

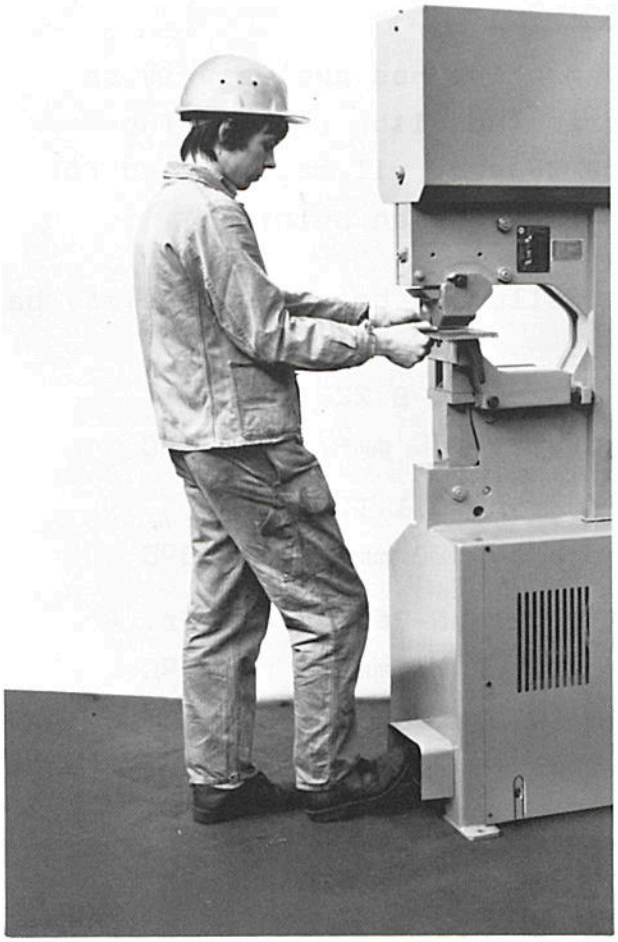


Fig. 7: Foot engagement to the punch

Fig. 9: Manual engagement to the shears

Electrical Engagement with Stroke Adjustment to the Punch (Special Equipment)

The punch has a relatively large working stroke. This large stroke is not always required for normal punching operations. To save time, the punch stroke can be exactly adjusted to the requirements. The exact stroke adjustment is particularly important if the punch is used for bending operations. With exactly adjusted working strokes, exact bends can be performed.

The working strokes are released by a displaceable foot switch which is placed, according the corresponding requirements, at the place being most convenient for the operator.

If actuating the foot switch, the slide moves downward. If the foot switch is released, the automatic return motion begins up to the dead position. If the automatic return motion shall not occur, e. g. for setting the tools, the operator switch has to be set to "setting".

Adjustment of the stroke travel is carried out by the control rings attached to the control rod. The bottom control ring is provided for the upper stroke limitation and the top control ring for the lower stroke limitation. Due to this adjustment, the stroke length as well as its position can be determined.

Electrical Engagement with Stroke Adjustment to the Shears (special Equipment)

Like the punch, the shears can also be equipped with an electrical engagement. To reduce the stroke times, in particular when coping is performed, a stroke adjustment is also provided. In this case too, the working strokes are released by means of a displaceable foot switch. The preset working stroke occurs automatically, after having briefly actuated the switch. If the automatic operation, e.g. for setting the tools, is to be disabled, the operation switch has to be set to "setting". By inching operation of the foot switch, the slide is controlled in the required position. Return occurs by changing over the operation switch. The adjustment of the stroke length and its position is performed in the same way as the stroke adjustment of the punch.

The side of the shears is additionally equipped with a plug connector for a length stop with contact switching. If the contact switch is actuated by the material being fed in, the stroke of the shears is automatically triggered.

This is a help for the operator which considerably increases the output of the machine.

THE FLAT STEEL SHEARS

1. The Blades

The top and bottom blades are exchangeable and may be used on four sides.

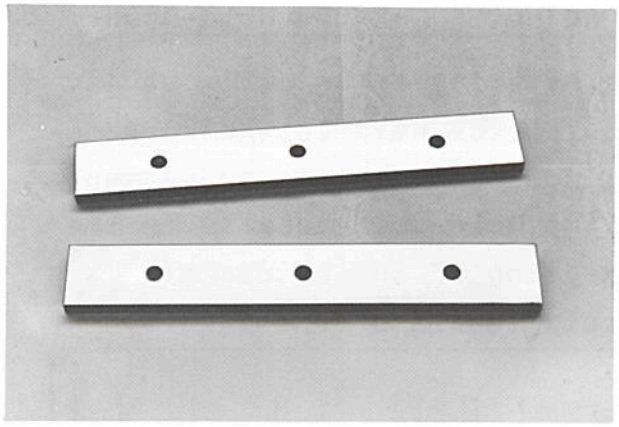


Fig. 12: Flat steel blade with 4 cutting edges

2. Resharpening

Resharpen the blades in time (at the front sides only). Resharpening must be exactly rectangular, and the front surface should be straight to ensure always a proper rest in the slide and the body. Care has to be taken that the grinding is performed uniformly in order not to change the setting angle. Worn-out blades must be replaced by new MUBEA Blades.

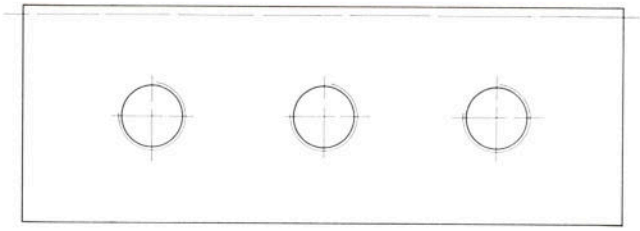


Fig. 13: Resharpening of the flat steel blades

3. The Shearing Gap

Adjust the shearing gap between the blades to 0.2 mm - 0.3 mm. Measure the shearing gap with a feeler gauge while simultaneously turning the blade slide downward slowly.

The blades are adjusted for the cutting of all material thickness being within the range of the performance. For the cutting of extremely thin material, reduce the gap by means of card board or metal shims.

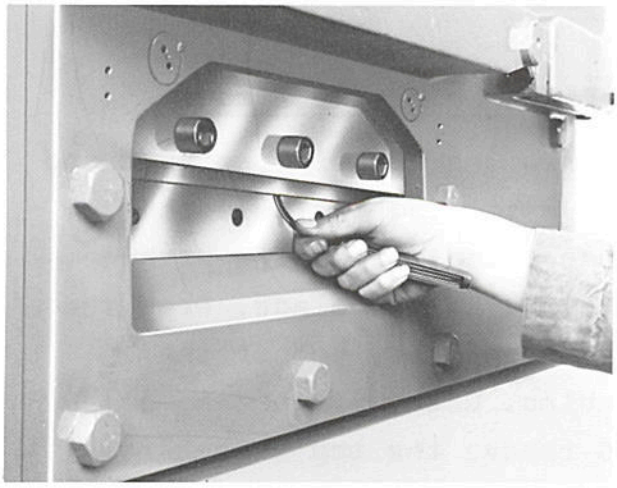


Fig. 14: Checking of the shearing gap

4. Adjusting of the Hold-Down

The material to be cut must securely be held in the horizontal position. Faulty adjustment of the hold-down results in the damageing of the blades or forcing apart of the shears.

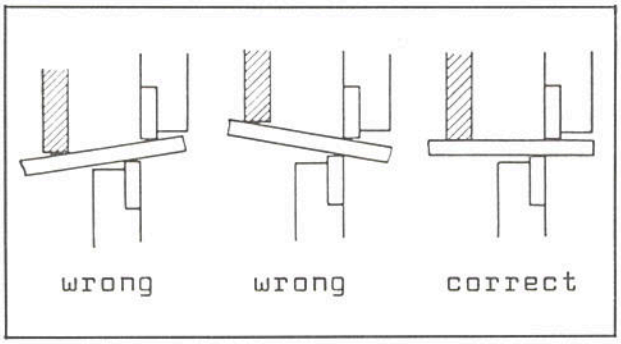


Fig. 15: Correct and wrong setting of the hold-down

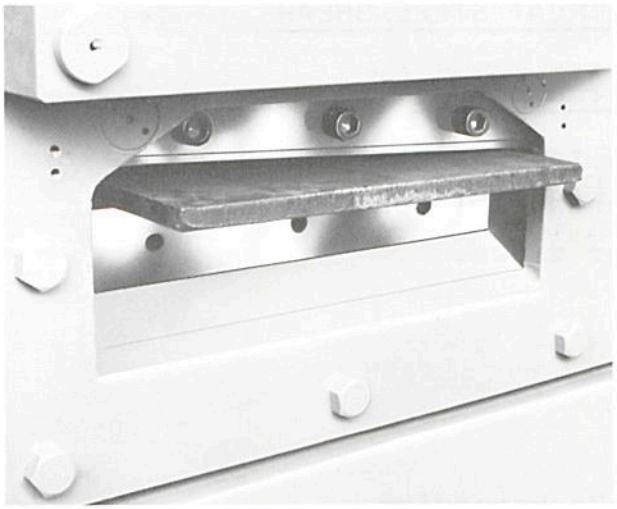


Fig. 16: Cutting of flat steel

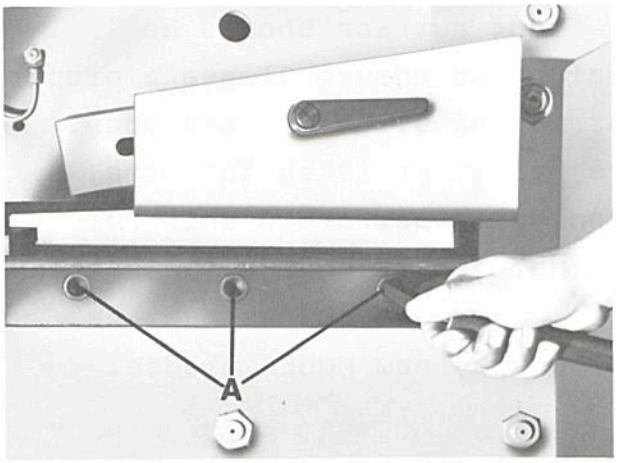


Fig. 17: Exchange of the flat steel bottom blade

5. Exchange of the Blades

Unscrew the mounting screw A and remove it, together with the support table from the machine. Take the bottom blade, from the discharge side, out of the machine. Unscrew mounting screw and remove the top blade from the machine (see fig. 17 and 18). Mount in the reverse sequence.

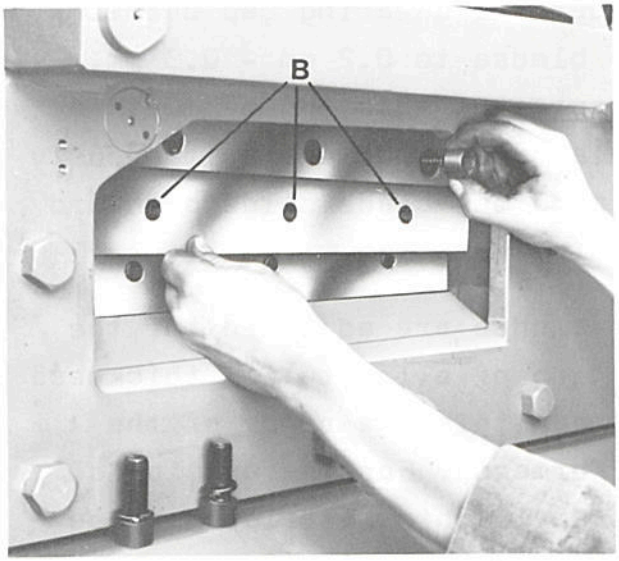


Fig. 18: Changing of the flat steel top blade

6. Readjustment of the Slide Guide

If after a longer period of use there is an indication that the shearing gap at the flat steel blade has changed, or that the slide has to much clearance, the lateral slide guides have to be readjusted.

Prior to the readjusting, the sectional blades, the flat steel blades and the notching tools have to be removed from the machine.

For the readjustment the safety screws A have to be loosened and the guide screws B have to be readjusted. For the present, the guide screws are fastened and then loosened for appr. 1/16 rotation. This is required to give a good running fit for the slide. This adjustment has to be performed with all 6 guide screws (see fig. 19 and 20).

After the adjustment being completed, the guide screws B are bored with Ø 4.5 mm and secured by the safety screws A.

Now the flat steel blades are mounted and the shearing gap is checked with the blade slide being lowered (refer also to section 3, flat steel shears). In case of the clearance being either too small or too large, the shim has to be ground or to be inserted. After the mounting of the flat steel blades and their control, the sectional blades and the coping device are mounted.

Here too, the shearing gaps have carefully to be checked.

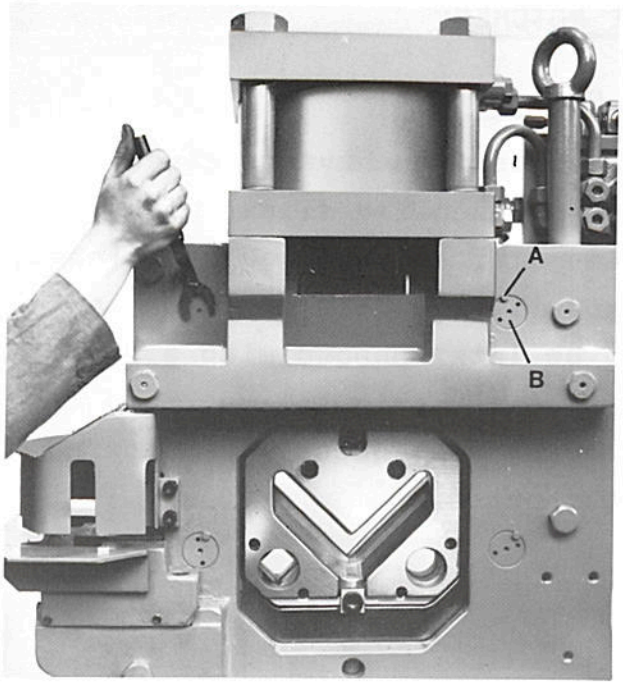


Fig. 19: Adjustment of the slide guide, top

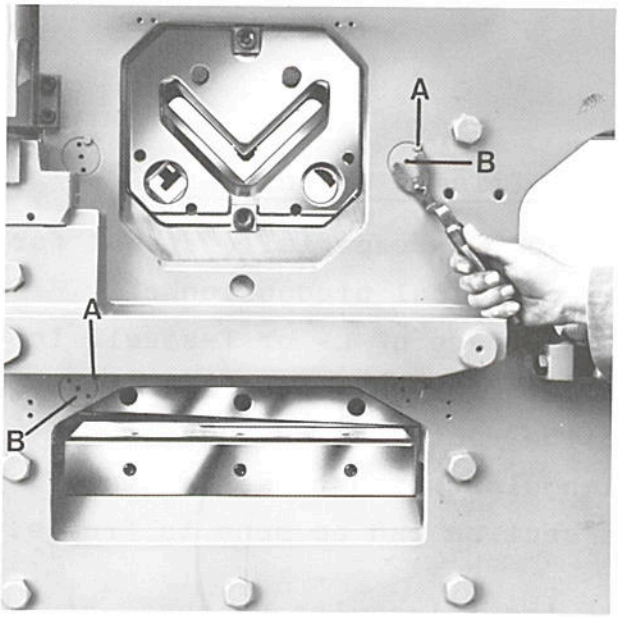


Fig. 20: Adjustment of the slide guide, middle

THE NOTCHER

1. General

On request you have received a machine supplied either with triangular or rectangular notcher, respectively. Each of these tools may be interchanged with a minimum of manipulation, they also can subsequently be ordered and mounted.

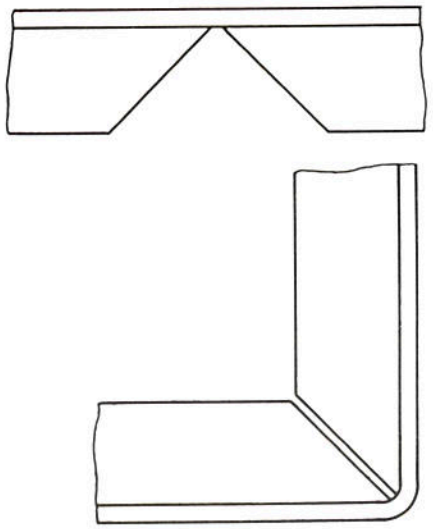


Fig. 21: Triangular Notching for the bending of frames

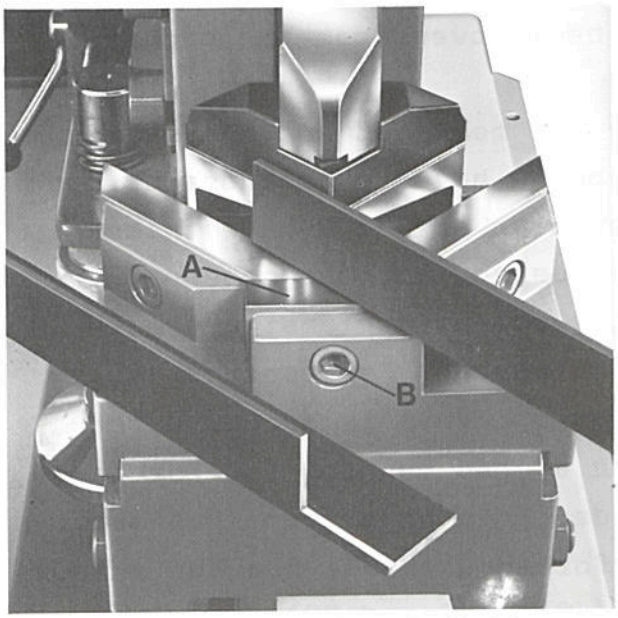


Fig. 22: Rectangular Notchings with the Triangular Notcher

2. The Triangular Notcher

This tool is especially useful for the economical production of frames, made of L- or T-steel. In order to prevent upsetting in the section root, the peak of the triangular notcher is flattened. The section can be bend to frames.

With the triangular notcher, rectangular end-notchings at the L-steel are obtained by inserting the material at an angle of 45°C.

With appropriate feeding, any length desired may be obtained.

For the notching of T-steel in the cross, remove the front diagonal blade A by loosening of the screw B, so that the flange of the T-steel can be inserted.

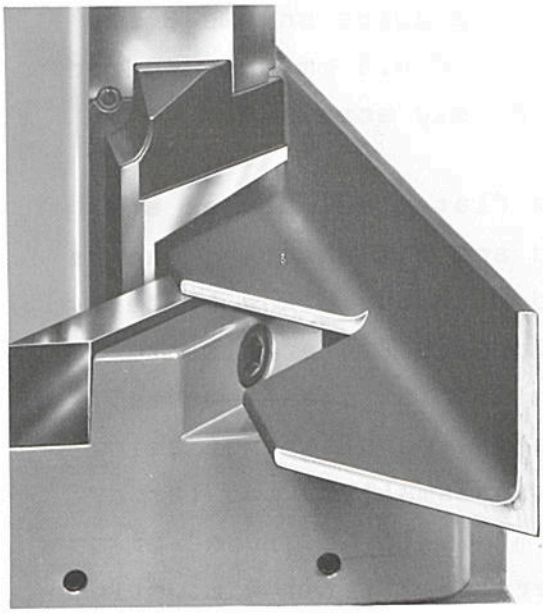


Fig. 23: Cross notching in T-steel

3. The Rectangular Notcher

Particularly suitable for the notching and coping of sectional flanges and webs. Wider and deeper notches can be accomplished by successive cuts. If triangular notches are to be made, the material is inserted at an angle of 45°. However, this technique is not suitable for the production of frames, because of the sharp points being formed.

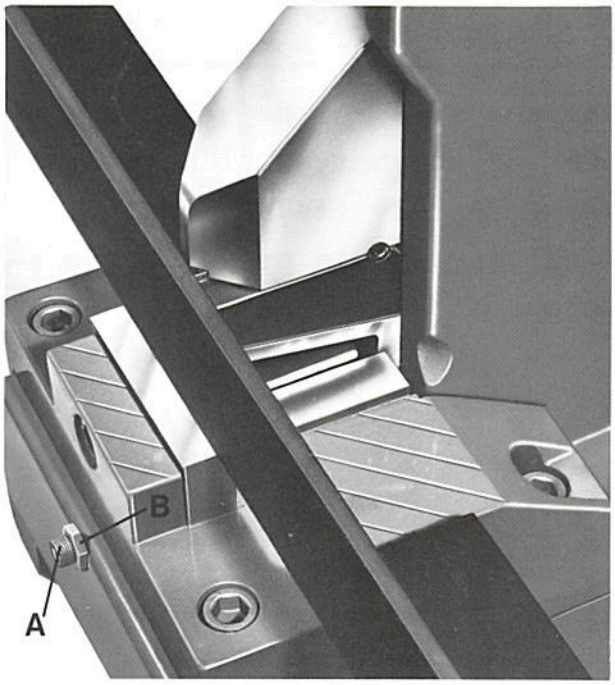


Fig. 24: Wide rectangular notching

4. Adjustment of the Coping Tools

The coping saddle is universally adjustable, allowing the tool base easily to be adjusted to the top blade.

Pay attention to a uniform shearing gap.

The shearing gap is adjusted for maximum performance. In case of very thin material to be processed, the shearing gap has to be reduced. Lower the blade slide until the top blade inserts into the tool base Measure with the feeling gauge. In order to adjust, (see fig. 26) loosen the saddle screws A for the rectangle and the triangle, and adjust the saddle by means of the adjustment screws B for the rectangle and the triangle to the correct position. Fasten the saddle screw and tighten the pressure screw A (refer to fig. 24) and secure it with the nut B.

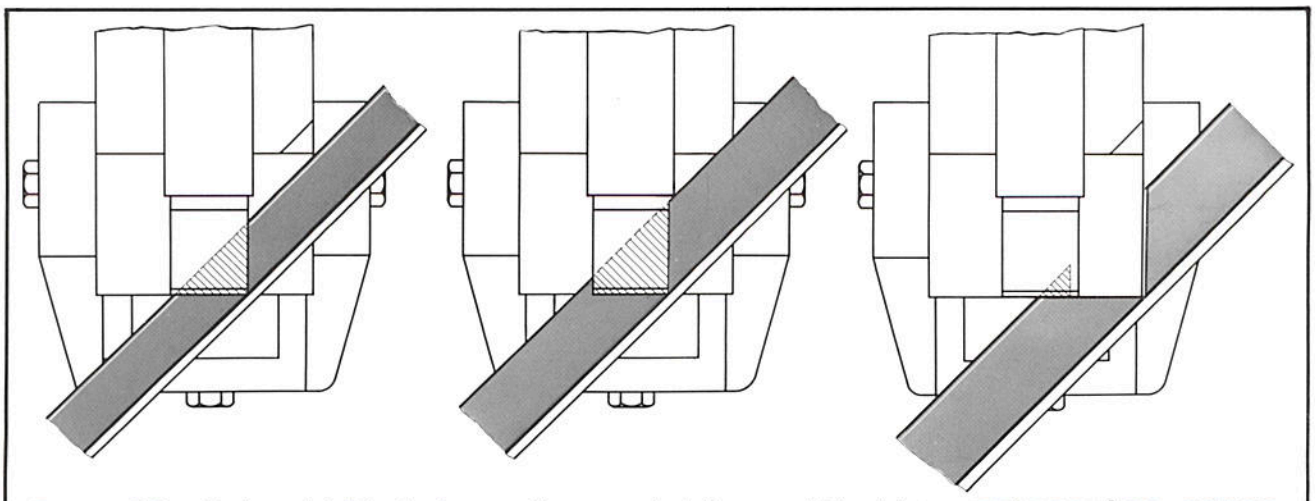


Fig. 25: Makeshift triangular notching with the rectangular coper

5. Sharpening of the Rectangular and Triangular Notcher

Grind the upper blade at its lower and the bottom blade at its upper face only (take care that the cutting gap is properly set when mounting the blades, frequently wipe the cutting edges with oil).

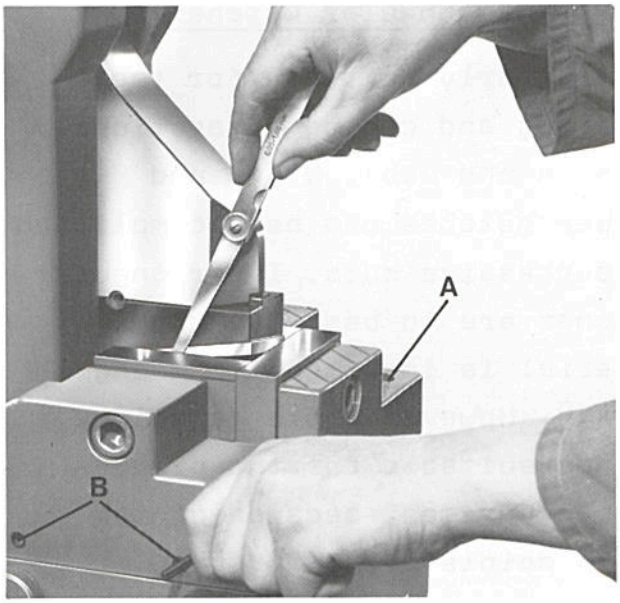


Fig. 26: Checking of the cutting gap

6. Special Tools

Instead of the normal triangular and rectangular notching and coping tools, various special notching and coping tools, such as coping tools for rounding off of fish plates, or coping of flat steel to be welded to round rods or pipes, may be used.

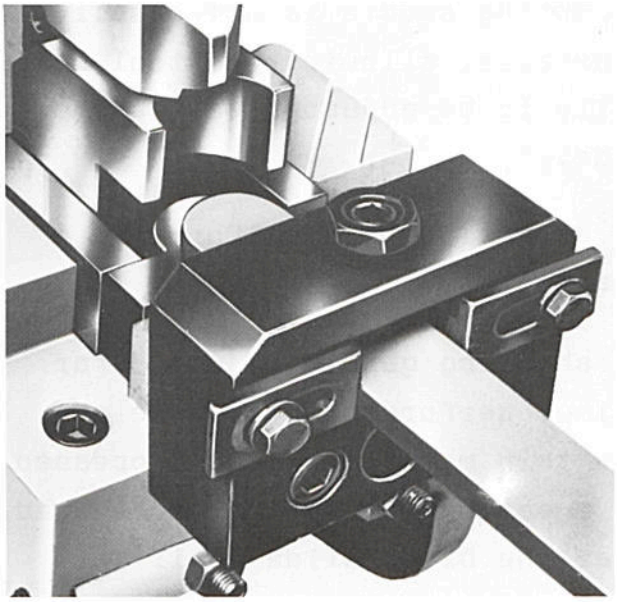


Fig. 27: Rounding off of flat steel

7. Special Accessories

If you want to notch and cope without marking, we are able to supply special support tables, raster guide rails etc.

Please let us have your enquiries. We will establish for you the most economic procedure.

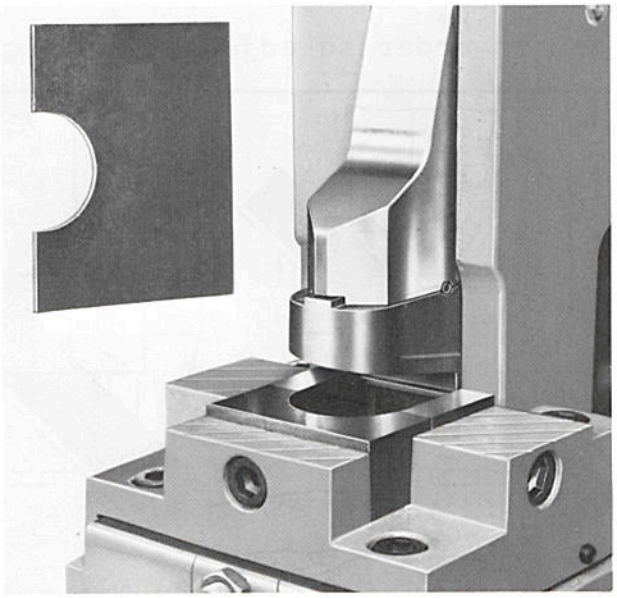


Fig. 28: Rounding out of flatsteel

Important Note:

A safety guard is mounted to the coper notcher.

WE STRONGLY ADVISE TO HAVE THE SAFETY GUARD ALWAYS READY FOR OPERATION.

THE SECTIONAL STEEL SHEARS

1. General

The special advantage of the sectional steel shears is the very long, rigid slide. The movable sectional blade is firmly mounted in the slide. The sectional blade itself does not move. In this way, jamming cannot occur.

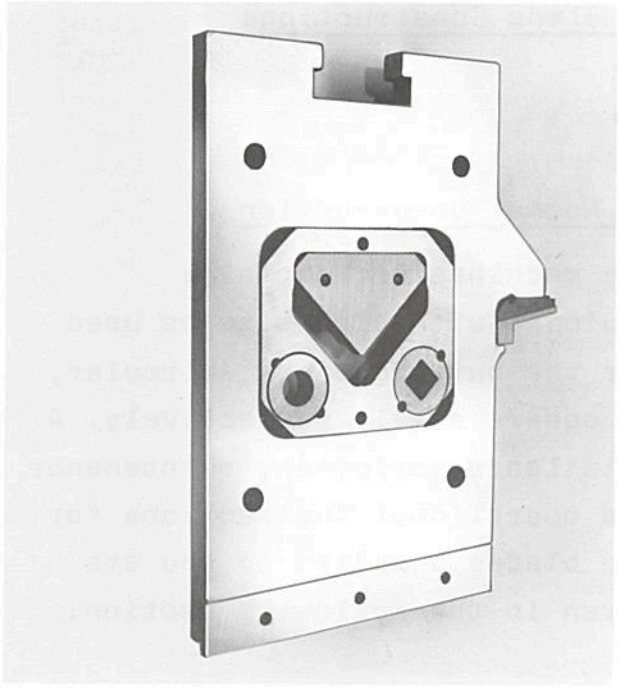


Fig. 29: Fixed mounting of the movable sectional blade in the sectional slide

2. Readjustment of the slide guide

The guide bars, made of special sliding material, on which the slide traverses, are adjustable. This guaranties a long operational life for a clearance-free guiding. This is an important safety measure for the large loads occurring in the sectional shears. The readjustment of the slide is performed as described for the flat steel shears, section 6.

3. Removing of Scale

The slide is equipped with scale removing channels. The width of these channels is sufficient to let the dry scale easily fall through. In case of a collection of scale in these channels, they have to be rinsed with petroleum.

4. The Hold-Down

The hold-down has to be adjusted that the required angularity will be obtained. Attention has to be payed that the root of the angular steel rests on the tip of the pressure screw.

5. Blade Constructions

A) Normal Construction

The machines are normally equipped with blades to be used for the cutting of L-, circular, or square steel, respectively. A detailed description, maintenance and operational instructions for the blades supplied to you are given in the following section.

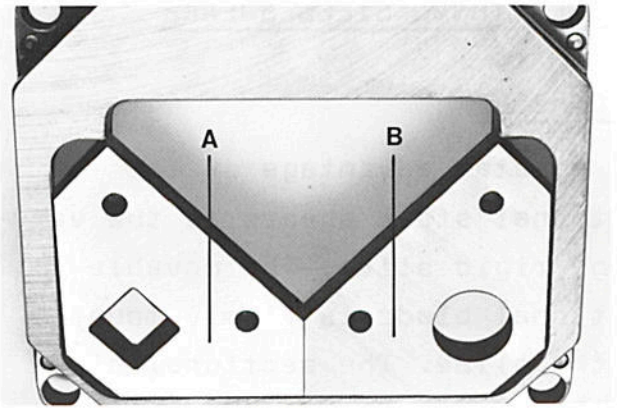


Fig. 30: Fixed sectional blade

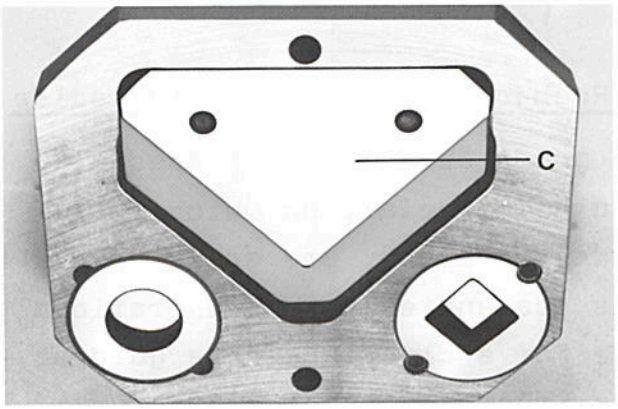


Fig. 31: Movable sectional blade

1. Dismounting of the Sectional Blades

(see fig. 32 + 33)

a) Loosen clamping lever and move sectional hold-down to the right. (By pressing in or withdrawing of the lever head, the clamping lever can be disengaged and be brought into any desired position).

b) Unscrew the 4 cheese-head A screws.

c) Take the fixed sectional blade B out of the machine.

d) Loosen the mounting screws C in the movable blade D.

e) Loosen thread pin E

f) Take the movable sectional blade D out of the machine (if the blades are only to be cleaned, the movable blade may be left in the machine).

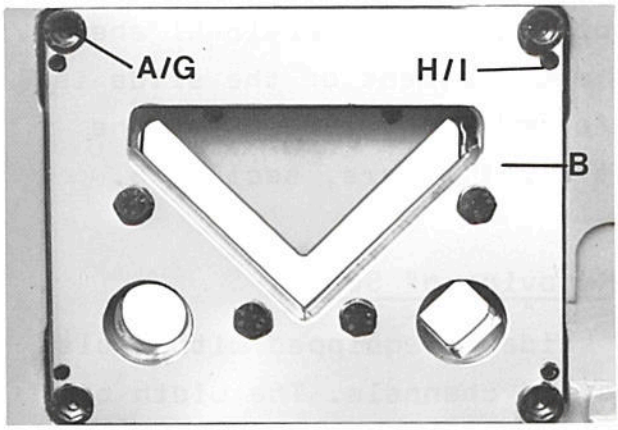


Fig. 32: Sectional blade, seen from body side

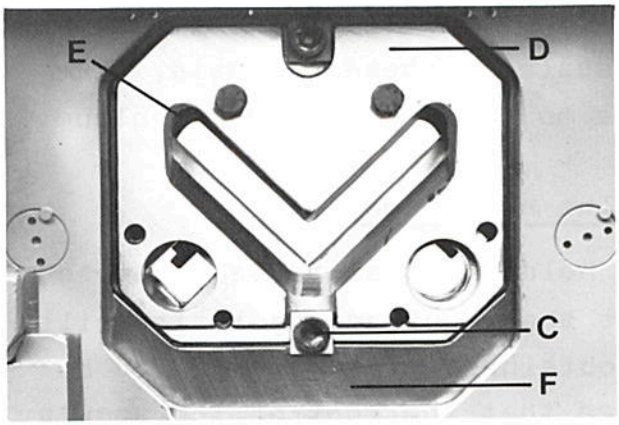


Fig. 33: Sectional blade, seen from side of the cover plate

2. Mounting of the Sectional Blades

(see fig. 32 + 33)

a) Insert the movable sectional blade D into the sectional slide F and press backward until it rests against the stop.

b) Tighten thread pin E.

c) Tighten the mounting screws C with the washers.

d) Insert the fixed sectional blade B into the body.

e) Insert the cheese-head screws A together with the cup springs G and tighten.

f) Fasten threaded pins H.

g) Loosen the cheese-head screw A by one full rotation and tighten all 4 threaded pins H by approx. 1/8 rotation to the right. This is neccessary in order not to draw the two blades one on top of the other, but leaving a cutting gap.

h) Tighten the chees-head screws A by means of a wrench extension (appr. 300 mm) and secure the threaded pins H with the locking cap I.

i) Attach the sectional hold-down and fasten with the clamping lever.

3. Cleaning of the Sectional Blades

No extensive maintenance is required for the sectional blades, as they do not have trouble-prone parts. Depending on the amount of

scale produced during operation, they have to be dismounted and cleaned from time to time.

a) Dismounting of the sectional blades according to the instructions given in section 1.

b) Dismount used blades A, B and C (see fig. 30 + 31).

c) Thoroughly clean the sectional and the insertion blades.

d) Assemble in reverse sequence.

e) Mount the sectional blades as described in section 2.

ATTENTION: In order to keep the falling-in scale dry, the sectional blade must be free from grease.

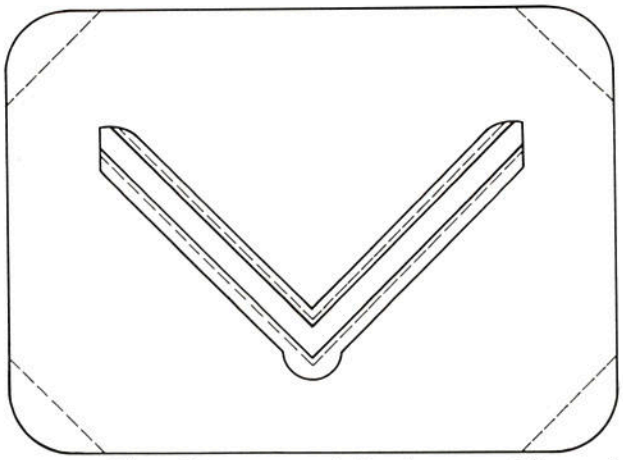


Fig. 34: Sharpen blades uniformly

4. Resharpening of the Sectional Blades

The individual blades have to be sharpened at the faces uniformly only. In case of an improper sharpening i.e. the edges will not meet in one point, the cutting quality will remarkably be decreased.

Sharpen the insertion blades only so far, that the blade in the lowest position of the slide will fully and equally cover the cutting edges. Otherwise, replace the blade by a new one. (You will find the article number, which is identical with the order number on the blade). Remember: Order only original MUBEA blades.

The insertion blade in the movable blade is pointed, allowing all kind of sections - even sharp-edged sections - to be cut. For angular steels of given dimensions, having root radii, the blades can be provided with exact radii which will prevent a distortion of the section root.

B) SPECIAL CONSTRUCTION

a) Quick-Change Blades

If you have to process frequently changeing U-, I- or other sections, it is advisable to use MUBEA Quick-Change Blades, consisting of a blade frame and insertion blades. You only need to buy the less expensive insertion blades for each section you have to cut.

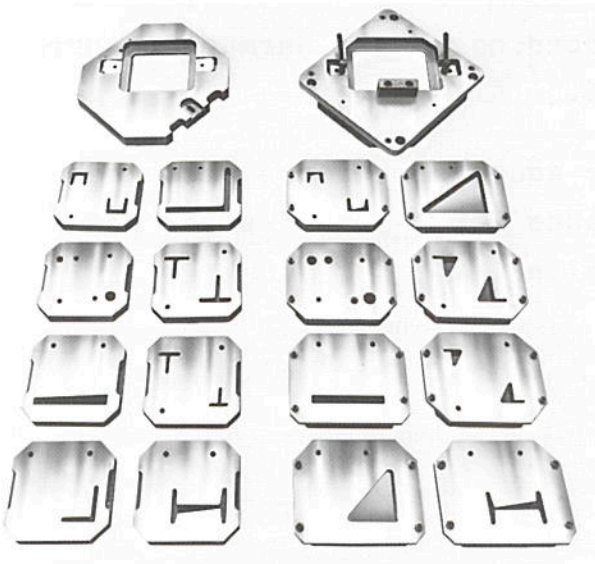


Fig. 35: Quick-change blades for the sectional shears

The exchange of the blades requires some instants only. Without any tool, the clamping levers can be loosened, the insertion blades be taken out and the new blades inserted.

A further important advantage of the quick-change blades is the constant working level for alternating sections.

This feature is very important with machines having a conveyor, built in front.

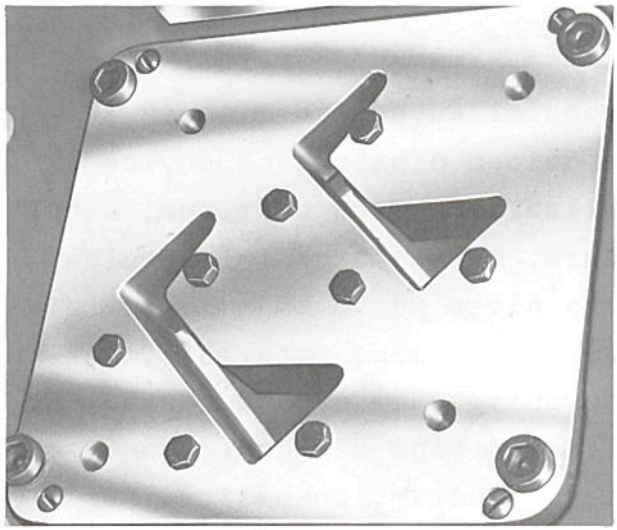


Fig. 36: Sectional blade for U-steel, construction PMF

b) Sectional Blades for Special Sections

We supply sectional blades for the cutting of U-, I-, Z- or other special sections with fixed cutting insertions. Depending on the size of the sections, several cut-openings can be made into one pair of blades.

Standardized sectional blades are provided for U- and I-sections according to the German Standard DIN.

For equal dimensions, combined blades for U- and I-steel are available.

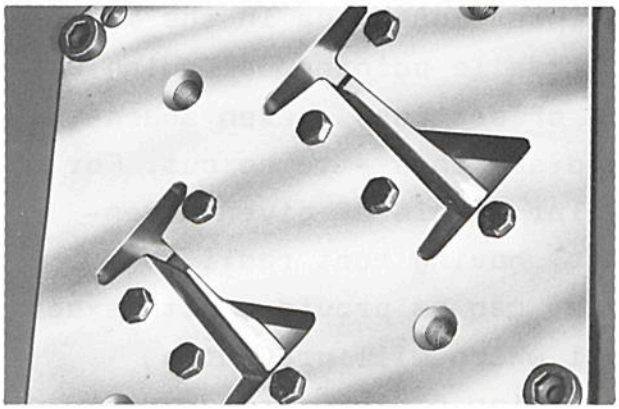


Fig. 37: Sectional blade for I-steel, construction PMF

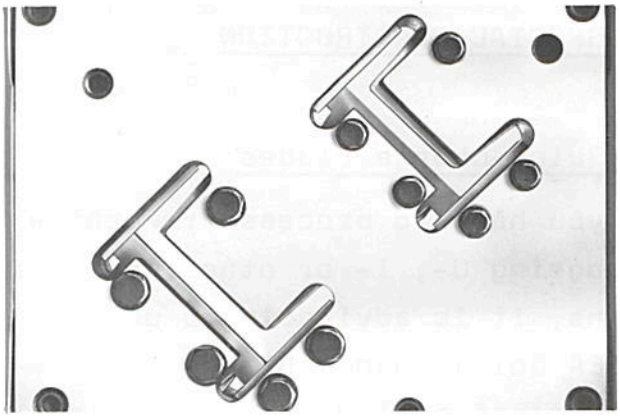


Fig. 38: Combined sectional blade PME, fitted for U-steel

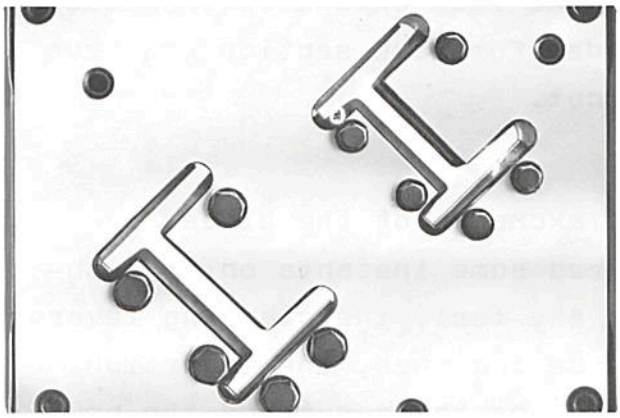


Fig. 39: Combined sectional blade PME, fitted for I-steel

c) Pipe Coping

A special advantage lies in the low-priced pipe coping device, available for the sectional steel shears. By means of this equipment, pipes up to 60 mm outer diameter and a max. material thickness up to 6 mm can be coped. For differing pipe diameters, only the two cutting insertions for the movable and the fixed blade are required.

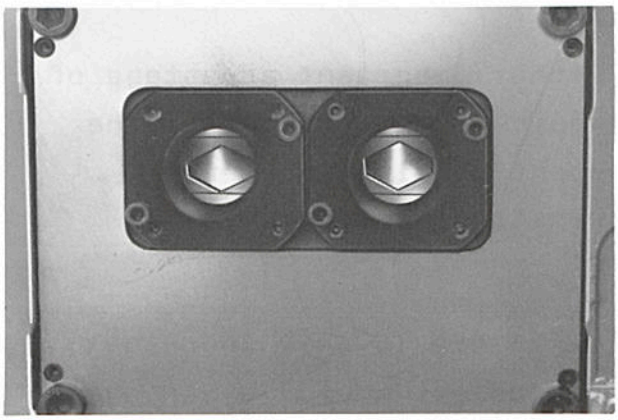


Fig. 40: Pipe coping device

THE PUNCH

PUNCHING DEVICES AND TOOLS ARE ALLOWED ONLY IF THEY ARE SUFFICIENTLY SECURED AGAINST FINGER INJURIES UP TO THE POINT OF SHEARING OPERATION

Fig. 41: Punching slide

1. General

The MUBEA-Punch is especially advantageously designed, exeeding the scope of a normal punch unit considerably, since many tasks can be handled which formerly required the use of an eccentric press.

The mounting of the very long punch slide has a large, nearly quadratic cross section. This enables to mount without problems large and outrigging tools, because, on account of its length, tilting forces can easily be compensated.

Even the most complicated punching operations and copings can be performed with the various special tools, such as multi-punch-, follow-on tools and guide cuts from the MUBEA tool department.

2. Readjustment of the slide guide

The guide bars, made of special sliding material, on which the long slide moves, are universally adjustable. This guarantees a universal, clearance-free guiding, even after a long period of operation.

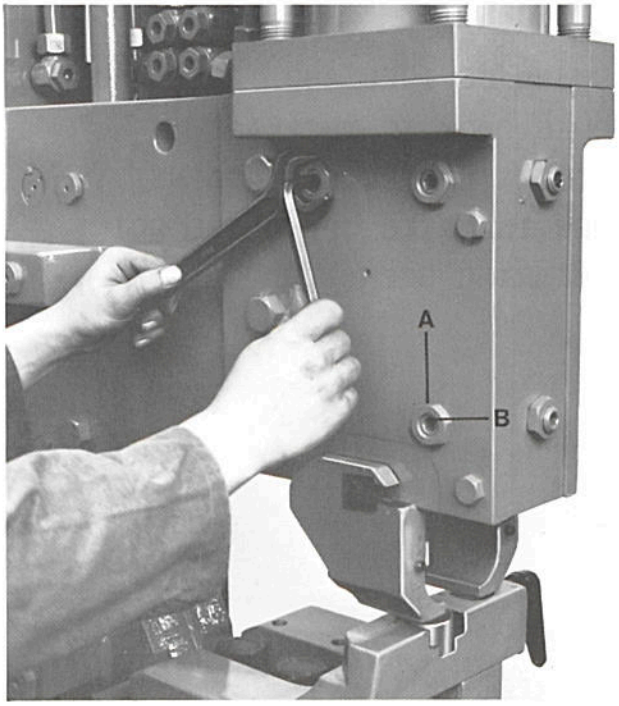


Fig. 42: Readjustment of the slide guiding, laterally

Readjusting is performed as follows: (see fig. 42 + 43)

To begin with, loosen the lock nuts A by rotating counterclockwise. Tighten the pressure screws B to a perceptible resistance. After that, loosen the pressure screws again by a rotation of 1/16 and tighten the lock nut A. This is necessary, to give the slide a good running fit.

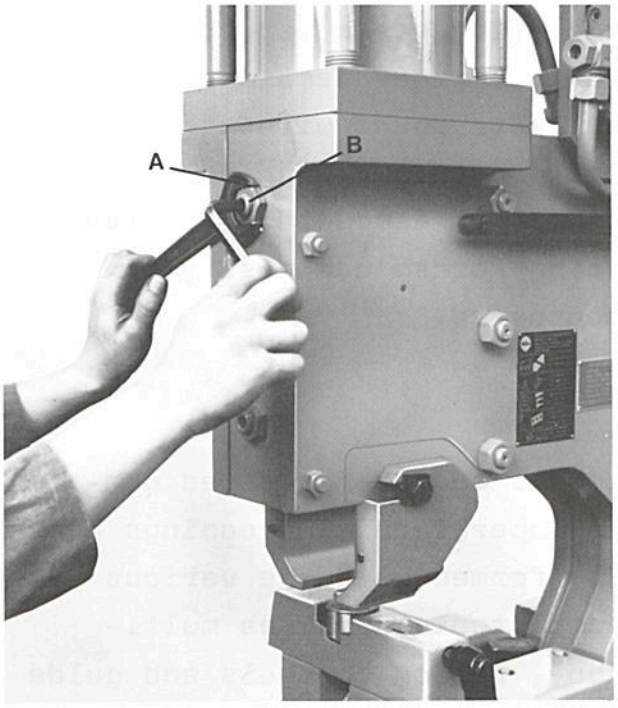


Fig. 43: Readjustment of the slide guiding, from the front

3. Saddle and Saddle Support

The construction of the MUBEA-punches intentionally provides a special saddel support B/C which is to support the punch saddle A. The advantage of this construction is that the saddle can neither be elastic nor tilt and the punching pressure is vertically led into the machine body.

The saddle support can remain mounted for punching operations, and has to be removed for the punching of U- and I-steel. Only the mounting screw D has to be loosened.

This construction is especially advantageous for the supporting of large, outrigging tools, because they can safely be supported in all directions, and therefore extensively be guarded.

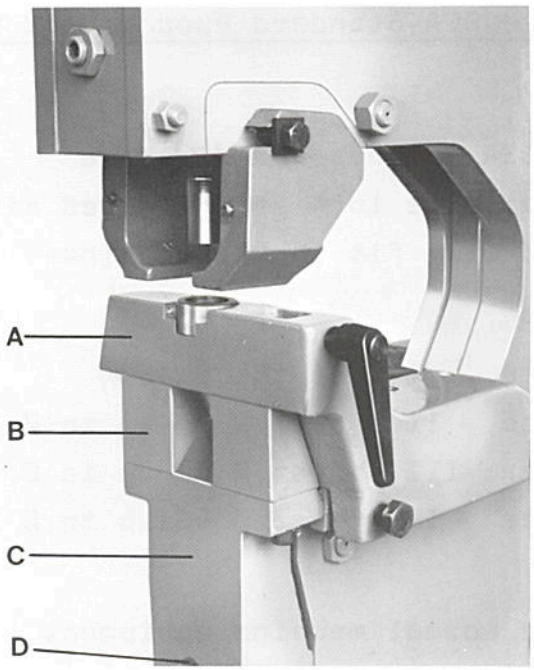


Fig. 44: Saddle with saddle support

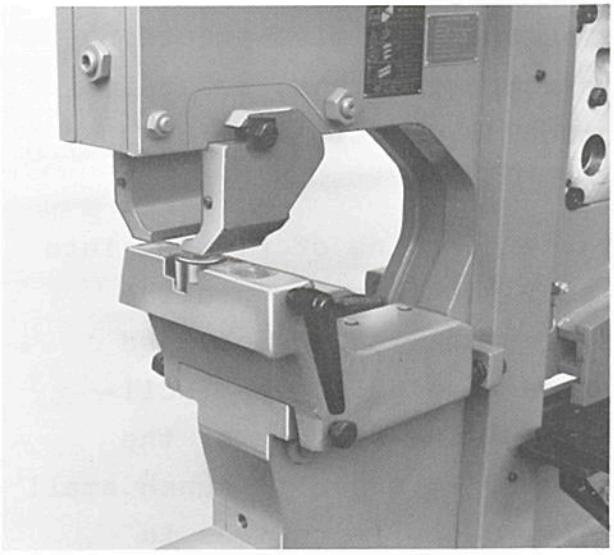


Fig. 45: Saddle without saddle support

4. MUBEA-Standard Punches and Dies

MUBEA punches and dies are available in 4 standardized sizes and will fit in all machines.

Size	I	up to Ø 15
Size	II	over Ø 15 up to Ø 30
Size	III	over Ø 30 up to Ø 40
Size	IV	over Ø 40 up to Ø 50

The normal machine equipment allows the use of punches and dies up to size II.

For punches and dies exceeding this standard range, refer to section 10, Special tools.

Fig. 46: Flange die for I-steel

For the punching of flanges into U- or I-sections, we provide flange dies with an inclined surface fitting to the inclination of the flanges of the sections. In order to punch small L-, T-, U- or I-profiles in accordance with the back-pitch near the web, flange or leg, eccentric dies are required, having the bore near the edge of the die. When mounting the eccentric die, the punch saddle has to be moved backward, until punch and borehole of the die are coaxial.

Fig. 47: Eccentric die for small L-steels

Please ask for the detailed catalogue on MUBEA Standardized Punches and Dies.

5. Adjustment of the Punch and the Die

Punch and die have allways to be positioned concentrically. The cutting gap shall be appr. 5 % of the material thickness (for the punching of a 10 mm thick material, the diameter of the die bore is 1 mm larger than the diameter of the die. The cutting gap is then 0.5 mm). Please specify the material thickness to be punched when ordering.

The saddel can be moved forward and backward after loosening of the mounting screws A and the shifting screws B. The lateral locking is accomplished by means of the adjustment screws C.

After the exact adjustment of punch and die, the adjustment screws C, the shift screws B and the mounting screws for the saddle A have to be fastened again.

During the punch process, the position of the tools has to be checked from time to time. For this purpose the punch is stepwise inched to the die. This procedure has to be repeated with each exchange of tools.

Punch-marked material may be encountered with the built-in machine control either with the slow drive or in the inching mode. Erroneous punching is therefore out of question.

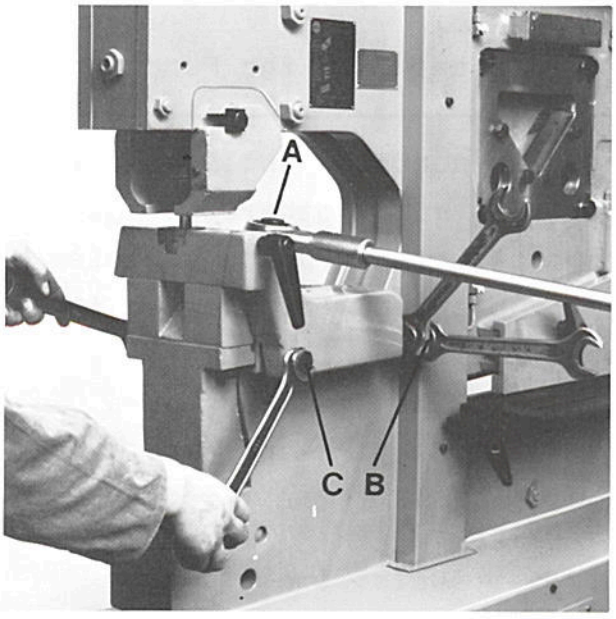


Fig. 48: Adjustment of the punch and the die

6. Safeguard against Twisting for Forming Punches

Square-, slot- or other forming punches have to be secured against twisting. For this purpose, a notch is provided at each punch support at the fitting surface of the punch and each forming punch at the head surface. A centering pin has to be placed into this notch.

7. The Wiper

The rigid and inflexible wiper is fastened directly with the machine body by means of the two mounting screws A. Differences in level between the die and the wiper can be equalized with the washers, having different thickness, supplied with the equipment.

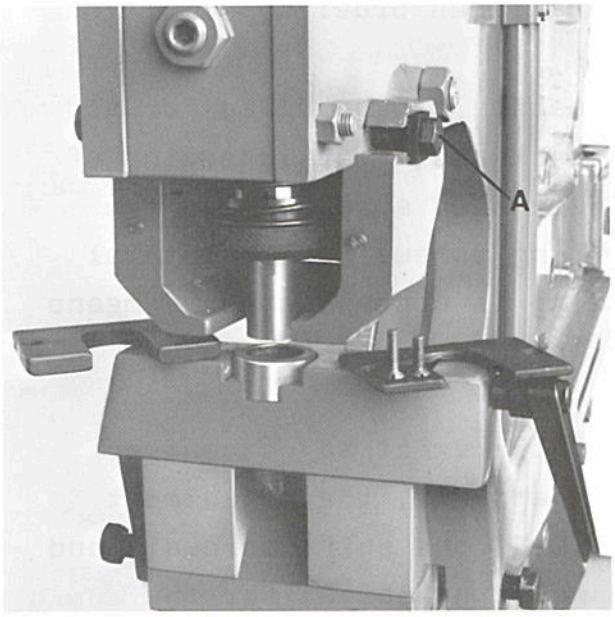


Fig. 49: Wiper

8. Resharpening of the Punching Tools

Resharpen punching tools at the face only, since otherwise the clearance between punch and die will be changed. In order to increase the service life of the tools, wipe the cutting edges with oil from time to time.

In many cases it is simpler to order new tools: this is more economic and the sharpening is accurate.

9. Quick Change for Punches and Dies

As a standard, the machine is equipped with a quick-change device for circular punches and dies. With a few manipulations only, the tools may quickly and easily be exchanged.

This installation is especially economic for the processing of small series requiring a frequent change of tools. Forming punches and dies may also be clamped with this device, but they require a checking of the cutting gap. Often, the saddle has to be newly adjusted. In addition to the new adjustment, as with the fastening of the coupling nut, the outer ring for the punch has to be refastened after the first punching, since the centering ring has been pressed into the setting notch not before the first punching.

In case of processing of larger series, it is advisable to apply the more rigid mounting of the punches by means of coupling nuts. The change of the quick change device for the coupling nut is accomplished by loosening the threaded pin A (fig. 50), which frees the centering ring. The latter may then be removed. After these manipulations already, the punching device is ready for the fastening of the coupling nut. The mounting of the quick-change is accomplished in reverse sequence.

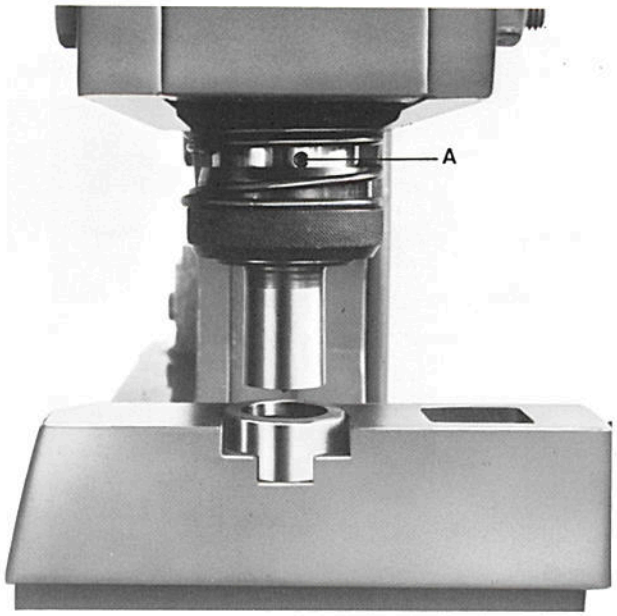


Fig. 50: Quick-Change Device for Punches

If, for any reason, the punch cannot be clamped securely, the basic position of the centering ring has to be corrected. This is performed by loosening the threaded pin A and by slightly adjusting the centering ring. After this, the threaded pin has to be secured again.

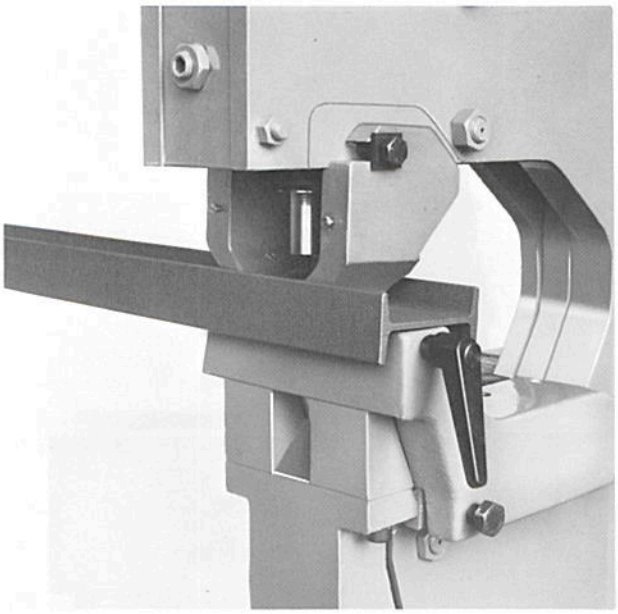


Fig. 51: Punching of I-steel in the cross bar

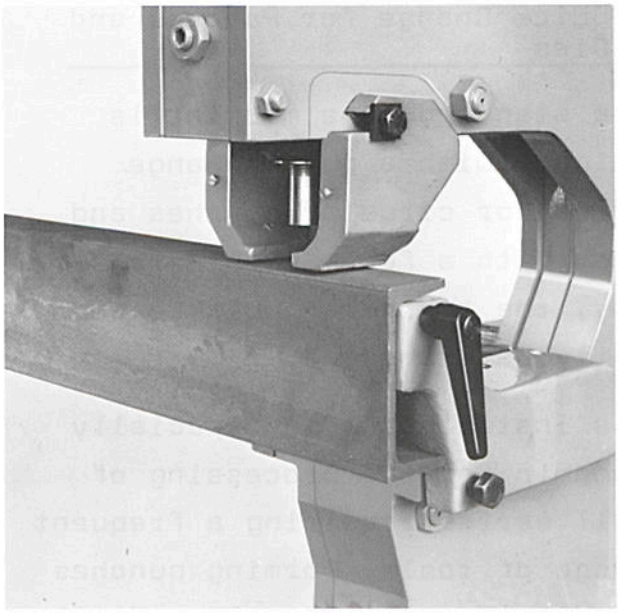
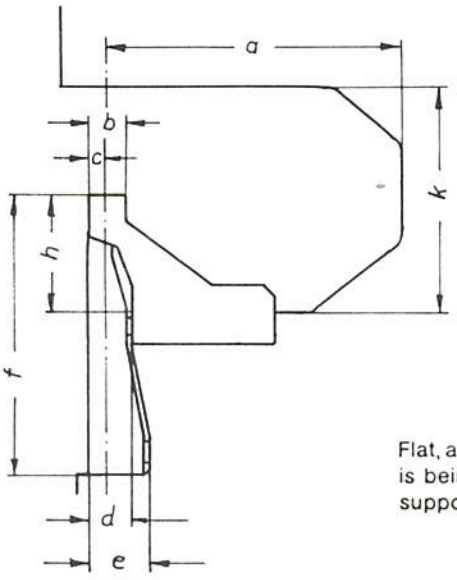
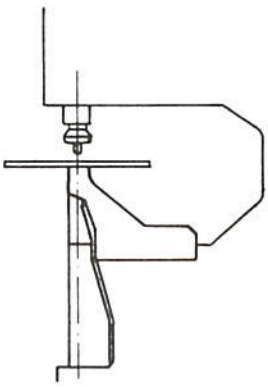
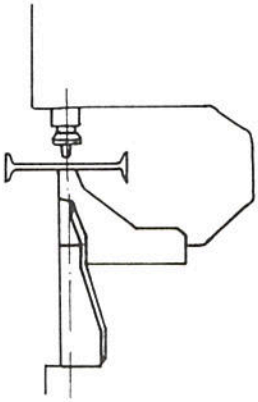


Fig. 52: Punching of U-steel in the flange

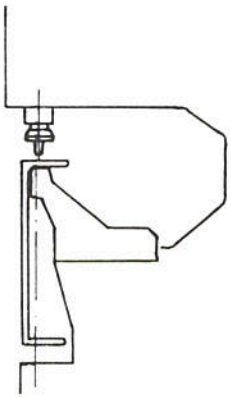




Flat, angel and tee material is being punched with saddle support always.



Channels and beams in the web are being punched with saddle support always.



Channels and beams are being punched in the flange without saddle support.

KL SH	550		900		1100	
	mm	inch	mm	inch	mm	inch
a	320	12 19/32"	500	19 11/16"	500	19 11/16"
b	47,5	1 7/8"	68	2 11/16"	68	2 11/16"
c	22,5	57/64"	30	1 3/16"	30	1 3/16"
d	55,5	2 3/16"	70	2 3/4"	70	2 3/4"
e	74,5	2 15/16"	125	4 59/64"	142	5 19/32"
f	305	12"	605	23 13/16"	640	25 13/64"
h	130	5 7/64"	205	8 5/64"	210	8 17/64"
k	240	9 29/64"	375	14 49/64"	410	16 1/8"

Fig. 53: Dimensions of the punch saddles, Model KLSH

10. Special Tools

The comprehensive MUBEA program for standard tools enables us to supply at short notice all normally used special tools. The particular feature of the MUBEA punch design additionally offers a large variety of facilities for the application of special tools which cannot comprehensively be described. You will attain a better survey from the MUBEA picture information.

a) Stationary Three-Punch Tool

If holes having differing diameters are to be punched in a short, alternating sequence, it is advisable to use a three-punch tool which allows to punch 3 different diameters in one working operation, without the need of a change of the tool: the desired punch can be drawn by means of a slide bar into the working position.

b) Displaceable Two-Punch Tool

This tool allows to punch simultaneously two holes, either of equal or of different diameter in different distances. The desired distance can be read from a scale and adjusted, for the punch and the die, with one operation. No other adjustment is required after this operation.

c) Special Punch Equipment for the Mounting of Punches and Dies with Cutting Diameters up to 50 mm

In this tool carrier all punch tools, such as circular, square, rectangular and slotted hole tools can be mounted.

The complete outfit consists of: punch carrier M 64, coupling nut M 64 with 50 mm opening. Inset with 40 mm opening, wiper, saddle 80 mm opening, die carrier 80/60 and saddle support.

The dies are clamped with a coupling nut. Fundamentally, all forming punches are provided with a notch, allowing to insert the tools lengthwise and transverse into the machine. Please specify the material thickness to be punched as well as the material tensile strength on ordering.

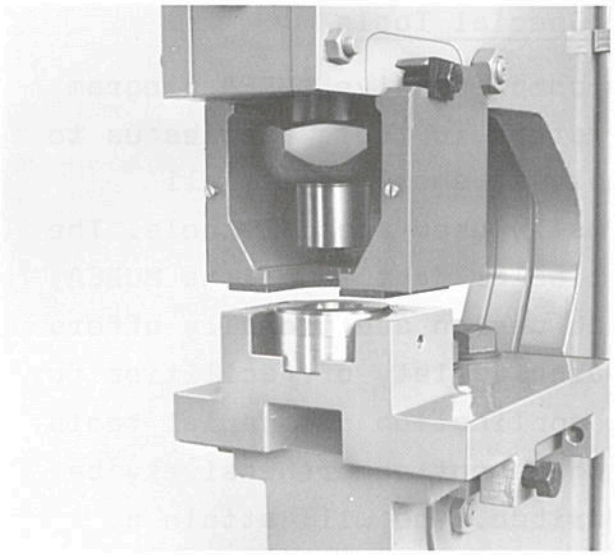


Fig. 56: Special punch equipment for mounting of punches and dies up to 50 mm cutting diameter

d) Special Punch Equipment for the Mounting of Punches and Dies greater than 50.5, up to 100 mm Cutting Diameter

In this tool carrier, consisting of punch carrier, wiper, saddle headpiece, saddle and saddle support, all punching tools, such as circular, rectangular, square and slotted hole tools can be mounted.

When ordering forming punches (slotted hole and rectangular) it has to be stated, whether the tools are to be mounted lengthwise or traverse in the machine. In addition, the material thickness to be punched has to be specified. At any rate, the strength has to be stated. The punches are mounted with a wedge.

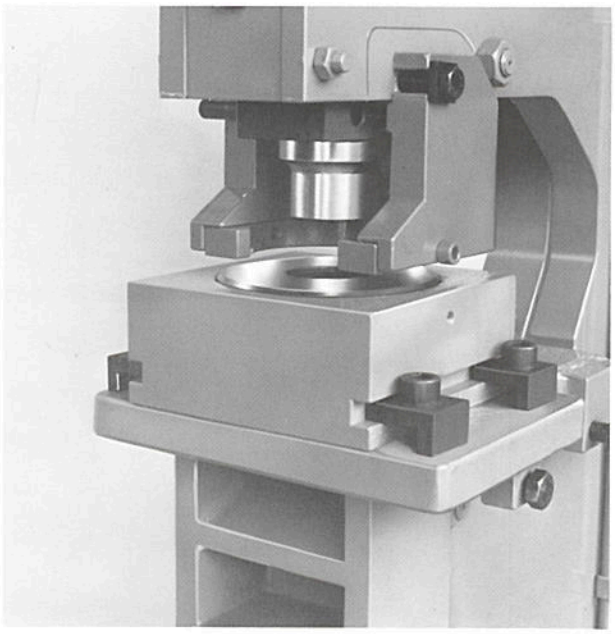


Fig. 57: Special Punching Equipment to Carry punches and dies greater than 50.5 mm and up to 100 mm cutting diameter

e) Pipe Notching Tool

Pipe notching tools serve to notch pipes, so that they can be rectangularly welded without any finish. This equipment allows to notch pipes up to an outer diameter of 60 mm, having a max. thickness of 6 mm. For different pipe diameters, only the cutting inserts for the moveable and the fixed blade are required. When inquiring, please specify:

a) pipe dimensions to be notched

b) Outer diameter of the pipe to be notched

c) Material of the pipe to be notched.

MAINTENANCE PRESCRIPTIONS
for HYDRAULIC PLANT

A. General

For functioning and service life of the hydraulic plant it is extremely important to observe the following maintenance prescriptions.

B. Filling Up the Oil Reservoir

Before starting, oil level of the oil reservoir should be checked. The oil level shall be about 3 cm below the reservoir cover. Checking is performed by means of the gauge stick at the filling filter. Filling should be carried out only via the filter element. After filling, the filler has to be perfectly closed.

For filling the plant there has to be used only high-grade branded hydraulic oil. At medium ambient temperatures (5°C to 35°C) there should be employed H y d r a u l i c O i l H L P 46 (viscosity classification: ISO VG 46 DIN 51 519). At extreme low or high temperature, the manufacturer should be consulted.

All reputable oil manufacturers supply suitable oils. As mixing of the hydraulic oil of various manufacturers is not advisable, there should be always refilled the same type. The oil type of machines filled in the factory is stated on the oil reservoir.

C. Starting

At setting going of the plant there has by all means to be observed the correct direction of rotation of the motor. To avoid damages of the pump, the motor must start up in inching operation. The engagements should then not be actuated. When having ascertained the correct direction of rotation, the motor must be kept running for about 3 to 4 min. without actuating the engagements. To ensure escaping of the air

eventually existing in the system, each cylinder has afterwards to be moved out and in repeatedly without load over the whole stroke. After perfect venting, the plant can be started up under load.

The max. operating pressure adjusted in the factory is specified on the reference plate at the oil reservoir. Checking of the pressure can be carried out by means of a manometer at the measuring connection above the oil reservoir.

The stated max. operating pressure should not be exceeded.

D. Maintenance

Current checking of the oil level in the oil reservoir is necessary in order to avoid greater damages.

After approx. 10 operating hours the return filter fixed on the oil reservoir has to be cleaned for the first time. Cleaning should be done in rinsing oil or petroleum. Throw-away filter cartridges have to be replaced. After having fitted the clean and/or new filter element the plant is again ready for work. Further filter cleaning should be done at normal fouling about every 600 operating hours.

The fist oil change should be carried out after approx. 600 operating hours. Afterwards the oil has to be renewed every 1 200 to 1 500 operating hours. After draining of the waste oil, the oil reservoir and the whole system have to be cleaned with rinsing oil. Water, leaches and petroleum are not suitable as purifying agents. After complete cleaning, the plant has to be closed and to be filled up with new, unused hydraulic oil. All filters have to be cleaned at every oil change. Of course, there has to be taken care of greatest cleanliness on refilling.

During operation there have to be permanently controlled the oil level, the leakage of the plant, fastening of the units and pipes as well as state of the hydraulic oil and the filters.

E. Eliminating troubles

Fault 1: Excessive noise in the plant

Cause	Reason	Elimination
1.1 Cavitation in the pump	1.1.1 Hydraulic oil too cold (below + 5°C)	Heat the hydraulic oil to the temperature of + 5°C
	1.1.2 Viscosity of the hydraulic oil is too high	Replace the hydraulic oil by a suitable one (see section "Filling Up the Oil Reservoir)
	1.1.3 Steam generation	The max. oil temperature of + 70°C is exceeded. Refill hydraulic oil or replace it by prescribed one
	1.1.4 Failure of the pump	Exchange the pump
	1.1.5 Sealed reservoir	Clean vent-filter in the cover of the filler
1.2 Foam formation or air pockets in the pressure fluid	1.2.1 Pressure fluid level in the reservoir is too low	Fill up on the correct level
	1.2.2 Wrong hydraulic oil	Replace by suitable oil
	1.2.3 Entering of air caused by the screwed joints in the suction pipe	Retighten or replace the screwed joints
1.3 Mechanical vibrations	1.3.1 Vibrations of the pipings	retighten the attachments
1.3.1 Pump	1.3.1.1 Used up or damaged	Replace
1.3.2 Drive motor	1.3.2.1 Used up or damaged	Repair or replace

Cause	Reason	Elimination
1.3.3 Safety or pressure limiting valve	1.3.3.1 Flatters	Adjust correctly or replace

Fault 2: No pressure or unsufficient pressure

Cause	Reason	Elimination
2.1 Pump does not feed correctly	2.1.1 Air enters into the suction pipe	See 1.2.3
2.2 High pump temperature	2.2.1 Used up or damaged pump	Replace the pump
	2.2.2 Unsufficient viscosity of the hydraulic oil	See 1.1.3
2.3 Leakage losses of the pressure side in the return motion	2.3.1 Mechanic control valve not connected through	Reset limitations of the engaging path
	2.3.2 Wrong adjustment of the pressure	Correct the adjustment
	2.3.3 Safety valve does not shut as there are dirt and defective parts	Clean, ascertain the damage, replace or renew
	2.3.4 Way valve open as there are dirt or defective parts electric fault	Clean the damaged unit, repair or replace
	2.3.5 Damaged cylinder bore, piston rod or piston seal	Renew the damaged parts
2.4 Failure of the pump	2.4.1 Damaged pump, defective drive, unsuitable viscosity of the liquid, etc.	See faults 1.3.1.1., 1.1.2

Cause	Reason	Elimination
4.4 Leak losses from the pressure side in the return motion	4.4.1 See faults 2.3.1 to 2.3.5	See faults 2.3.1 to 2.3.5
4.5 Pump rotates in the wrong direction	4.5.1 Wrong direction of rotation of the motor	Reverse polarity of the electric connections

Fault 5: Too high temperature of the pressure fluid

Cause	Reason	Elimination
5.1 Overflow losses	5.1.1 Pressure adjustment too high	Correct the adjustment
5.2 Leak losses from the pressure side in the return motion	5.2.1 Bad functioning of the valves and defective seals	See faults 2.3.1 to 2.3.5
	5.2.2 Wrong viscosity of the hydraulic oil (too low, too high)	Drain the hydraulic oil and use the prescribed oil
5.3 Overheated pump	5.3.1 Wear of the pump	Replace the pump
5.4 Too quick circulation of the pressure fluid	5.4.1 Pressure fluid level has become too low in the plant	Filling up of the plant on the prescribed level (see section "Filling up the Oil Reservoir")

Fault 3: Anomalous pressure or flow fluctuations and vibrations

Cause	Reason	Elimination
3.1 Cavitation in the pump	3.1.1 See faults 1.1.1 to 1.1.5	See faults 1.1.1 to 1.1.5
3.2 Foam formation or air pockets in the liquid	3.2.1 See faults 1.2.1 to 1.2.3	See faults 1.2.1 to 1.2.3
3.3 Mechanic vibrations	3.3.1 See faults 1.3.1	See faults 1.3.1
3.4 Flattering pressure limitating or safety valves	3.4.1 See faults 1.3.3.1	See faults 1.3.3.1
	3.4.2 Damaged valve seat	Repair or renew
3.5 Valves seize	3.5.1 Fouling	Drain the hydraulic oil, clean plant and parts, fill up with clean oil
	3.5.2 Defective or distorted	Replace the unit, eliminate distortion
3.6 Air pockets in the plant which cause irregular or yielding motion	3.6.1 Plant is not completely vented	Vent the plant (see section "Starting")
	3.6.2 Electric equipment defective	Trace and eliminate the error

Fault 4: Unsufficient or no feed current

Cause	Reason	Elimination
4.1 Cavitation in the pump	4.1.1 See faults 1.1.1 to 1.1.5	See faults 1.1.1 to 1.1.5
4.2 Foam formation or air pockets in the pressure liquid	4.2.1 See faults 1.2.1 to 1.2.3	See faults 1.2.1 to 1.2.3
4.3 Used up pump	4.3.1 See faults 1.1.4	See faults 1.1.4