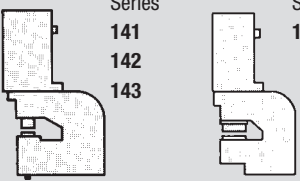

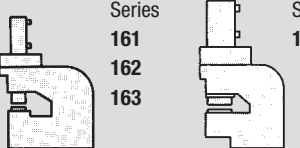
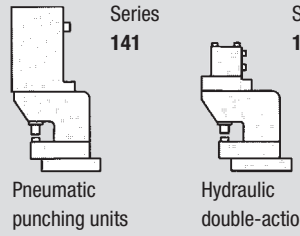

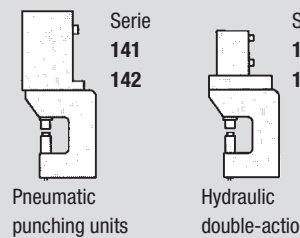


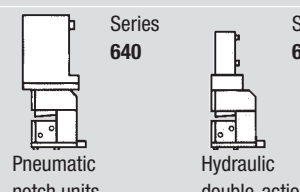

## Pneumatic and hydraulic punching units

Series	Illustration	Punch diameter range	Throat depth range	Shapes	Material thickness	Cylinder force [kN]
141 142 143 144	 <p>Series 141 142 143</p> <p>Series 144</p> <p>Pneumatic punching units</p>	2–13 8–25 25–40 40–63	100 200		max. 5	20 40 80
161 162 163 164	 <p>Series 161 162 163</p> <p>Series 164</p> <p>Hydraulic double-action punching units</p>	2–13 8–25 25–40 40–63	100 200			max. 5

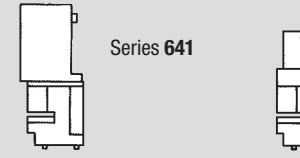

## Pneumatic and hydraulic profile punching units

Series	Illustration	Punch diameter range	Throat depth range	Shapes	Material thickness	Cylinder force [kN]
141 161	 <p>Series 141</p> <p>Series 161</p> <p>Pneumatic punching units</p> <p>Hydraulic double-action punching units</p>	2–13	50		0.3–3 max. 5	12 20 33 40 68 80 109
141 142 161 162	 <p>Series 141 142</p> <p>Series 161 162</p> <p>Pneumatic punching units</p> <p>Hydraulic double-action punching units</p>	2–13 8–25	63			0.3–3 max. 5

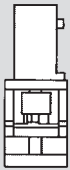
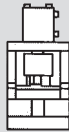

## Pneumatic and hydraulic 90° notch units

Series	Illustration	Notch size	Notch shape	Material thickness	Cylinder force [kN]
640 660	 <p>Series 640</p> <p>Series 660</p> <p>Pneumatic notch units</p> <p>Hydraulic double-action notch units</p>	63x63	e.g. 	max. 5	68 71 80 109

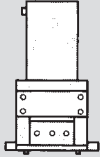

## Pneumatic and hydraulic rectangle notch units

Series	Illustration	Notch size	Notch shape	Material thickness	Cylinder force [kN]
641 661	 <p>Series 641</p> <p>Series 661</p> <p>Pneumatic rectangle notch units</p> <p>Hydraulic rectangle notch units, double-action</p>	50x50 100x75	e.g. 	0.3–3	40 68 80

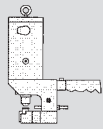

## Pneumatic and hydraulic radius cut units

Series	Illustration	Radius range	Cutting $\alpha$	Cutting shape	Material thickness	Cylinder force [kN]
646 666	 <p>Series 646 Pneumatic radius cut units</p>  <p>Series 666-30-063 Hydraulic radius cut units, double-action</p>	5 10 15 20 25 30	90°		max. 5	40 63 80

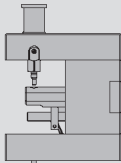
## Pneumatic and hydraulic cut-off units

Series	Illustration	Cutting width	Cut-off	Material thickness	Cylinder force [kN]
649	 <p>Serie 649 Pneumatic cut-off unit</p>	125		max. 5	40

## Mobile pneumatic units for punching and notching

Series	Illustration	Punch diameter / radius range	Cutting $\alpha$	Side length	Notch shape	Material thickness	Cylinder force [kN]
1421	 <p>1421-0512L 1421-0512R 1421-0512K</p>	<p>Ø 2-13</p> <p>R 3-R 18</p> <p>–</p>	<p>–</p> <p>90°</p> <p>max. 90°</p>	<p>–</p> <p>–</p> <p>max. 20x20</p>		max. 3	12

## Pipe punching units, press-operated, with pneumatic or hydraulic drive unit

Series	Illustration	Punch diameter range	External pipe diameter	Pipe thickness	Cylinder force [kN]
101-RLA 141-RLA 161-RLA		2-13	40-60	1-5 1-3 1-5	– 80 68

The problems encountered during non-cutting production are often similar to those which arise in metal-cutting production. For example, small series, repetitive parts or large series, which frequently take turns.

Due to the high tool costs and set-up time, the suitability of conventional punching and cutting tools for these tasks is limited. As a result, procedures like drilling, milling, sawing and heat erosion are often resorted to, although the use of modern tool units would be much more suitable for the number of pieces required.

### Low costs

Savings, as well as a reduction of the production costs, because expensive drilling and sawing work is no longer necessary.

### High profitability

The tool units can be reused as often as you like.

### Short set-up times

Simple set-up and conversion to the desired punch layout.

### Uniform construction height

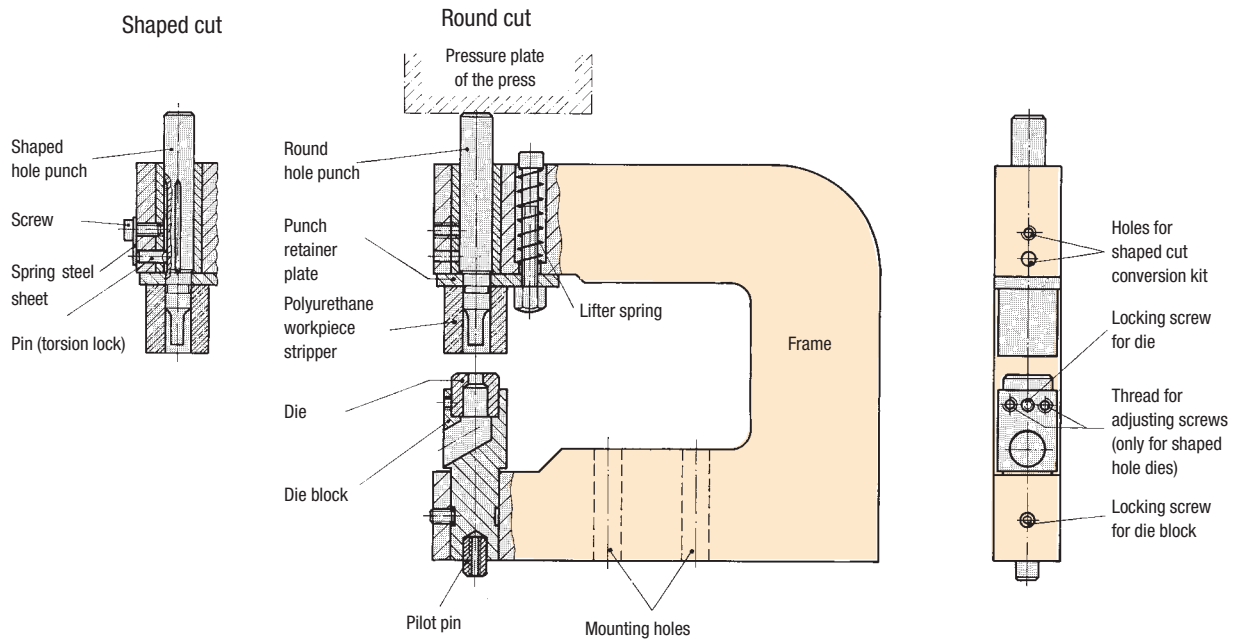
The total height and the material support height of the units are the same, therefore, all tool units can be combined.

### Stable construction

High-quality steel and spheroidal graphite cast iron prevent a risk of breakage and guarantee a long life.

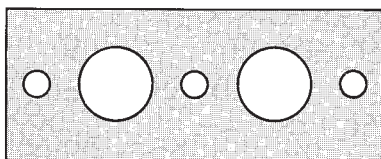
## Punching units

## Installation and machining options

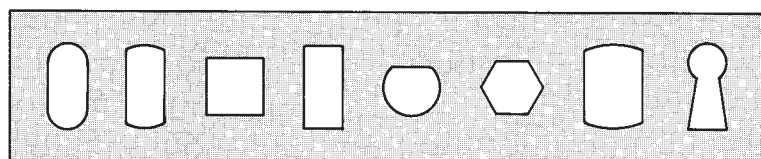


## Machining options

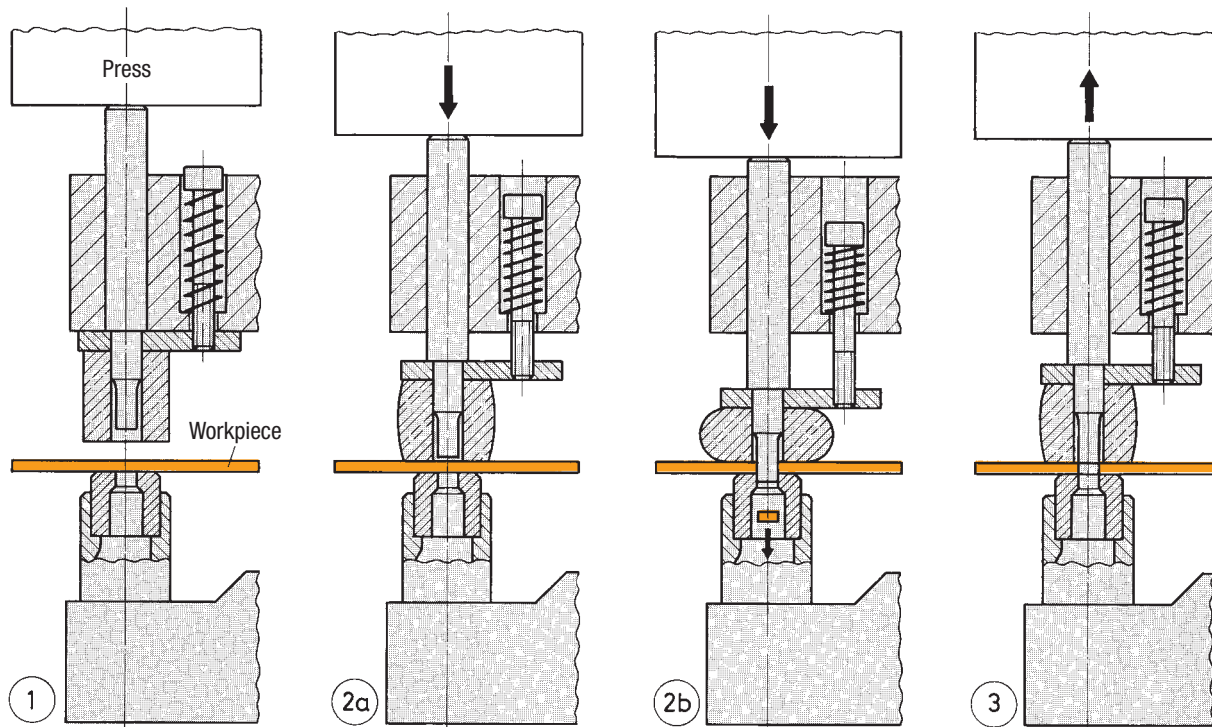
### Round cut



### Shaped cut



## Operation sequence during punching



### 1 Punching unit inoperative

The punch is held in its upper position by the punch lifter spring, as well as the punch retainer plate which is connected to it.

The workpiece is inserted.

### 2 Punching unit in operation

**2a** The press ram moves the punch and the punch retainer plate downwards. The polyurethane workpiece stripper presses the workpiece against the die.

**2b** The next press stroke carries out the punching procedure and ejection of the scissels. The punch should enter the die to a depth of approximately 1 mm.

The following step is the return stroke of the press ram.

### 3 Return stroke

The polyurethane workpiece stripper, which has been greatly deformed during the punching process, now fulfils its primary function, i.e. as a result of its pretension the punch is extracted from the workpiece.

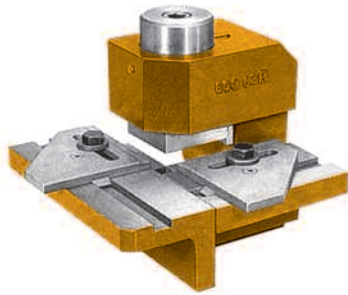
The remaining pretension of the polyurethane stripper and the punch lifter spring act at the same time as the press return stroke to pull the punch back into its initial position.

### Punching units of series 100,101,102,103,104 and 111

The operation sequence during punching described above applies generally to these punching units. Series 111 is the only one in which the arrangement of the die block is different which allows so-called block dies – dies without die blocks –, to be used for the punching of L-, U- or Z -profiles.

### Punching units of series 105,112,113 and 114

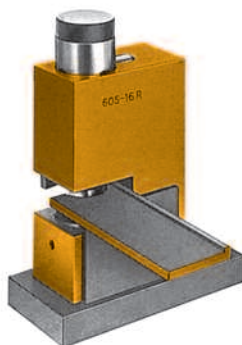
The dies of these units are arranged similarly to those in series 100 to 111. For the series 105 to 114 the polyurethane workpiece stripper is situated above or built into the frame. Via the pressure plate the press ram moves the punch, the polyurethane compression spring and the spring-loaded guide bush downwards. The guide bush presses the workpiece against the die and supports the removal of the workpiece during the return stroke. The remainder of the punching process takes place as described in »Operation sequence during punching«.



(A)  
90° notch unit with  
gauging table



(B)  
Rectangle  
notch unit



(C)  
Radius cut unit



(D)  
Cut-off unit

## 90° notch units, rectangle notch units, radius cut units, cut-off units

The sturdy, unbreakable main constructions of these units are equipped with punch and die blades of highly alloyed chrome steel. The punch blades are held by springs in their upper position, respectively pulled back to this position after the cutting process.

For 90° notch units and cut-off units the cutting edges of the punch blades are diagonal to the cutting edges of the die blades. This effectively reduces the cutting length and the cutting force required.

The die clearance is preset at the factory to 0.1 mm for material with a thickness ranging from 0.3 up to 3 mm. Metal compensation sheets for increasing the die clearance are included in the delivery.

The punch blades are resharpened on their lower edge and the die blades are resharpened at the edge facing the unit, i.e. the rear surface of the blade. By turning the die blade 180° another cutting edge is available for further work.

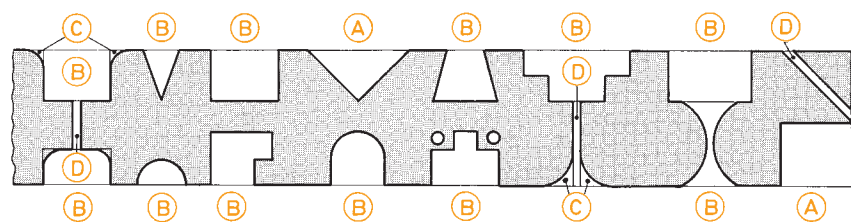
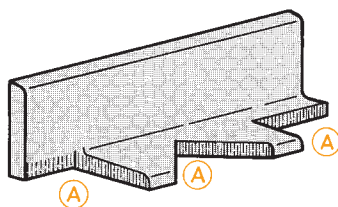
By adjusting the press stroke the difference resulting from the resharpening of the punch blade is compensated for.

In contrast to the 90° notch units and cut-off units, the cutting tools for the rectangle notch units and the radius cut units are specially made to customer specifications for the respective material thickness and the desired shape.

Examples of possible notch and cut shapes are shown in the illustrations below.

With some of the 90° notch units, it is possible to cut notches for L-profiles as far as the inside edge of the profile.

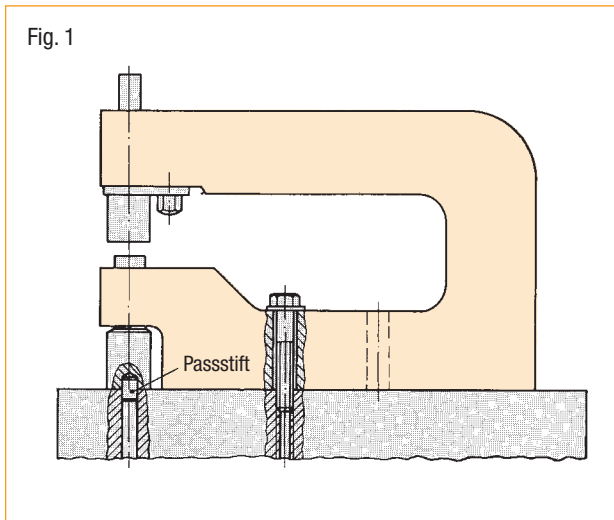
## Machining options using the tool units illustrated above



## Assembly and adjustment of the tool units

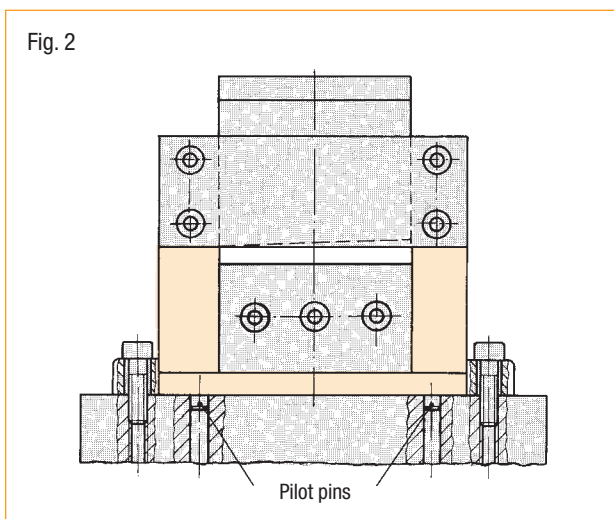
### Assembly of the punching units

All punching units are equipped with a pilot pin in the bottom, aligned with the punch and die for positioning in mounting holes or the guide grooves of positioning plates or press tables. The punching units are fixed either by screws in the mounting holes provided or by means of clamping arms and similar clamping elements. See Fig. 1.



### Assembly of the 90° notch units, rectangle notch units, radius cut units and cut-off units

These units have one or two pilot pins in the bottom side for positioning. The units are fixed by clamping arms or for some units by screws in the mounting holes provided (Fig. 2). The positioning and mounting methods described here also apply to the pneumatic and hydraulic units.



### Tool setting of punching units with templates

When several punching units are used together a template can be used to adjust the distance between the units.

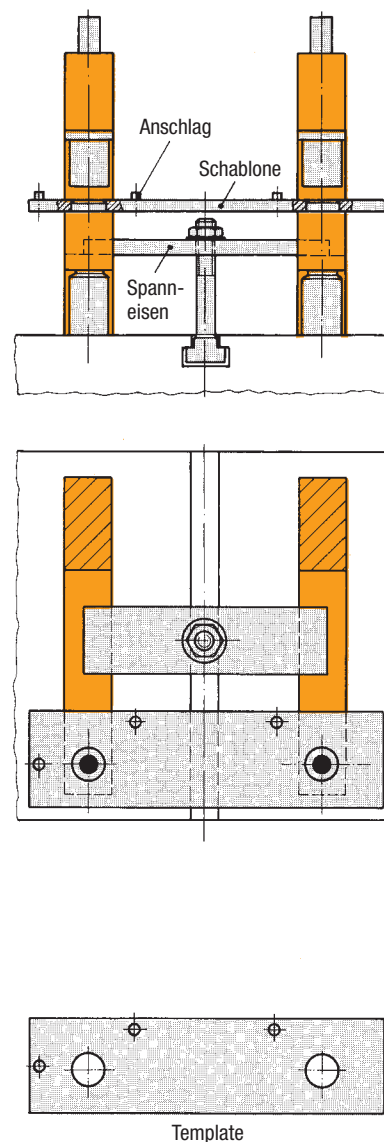
The holes in the template correspond to the outside diameter of the die of the respective punching unit. The thickness of the template should be approximately 6 mm.

The exact distance between holes is obtained by placing the template over the dies.

The punching units are fixed with screws, clamping arms and similar clamping elements.

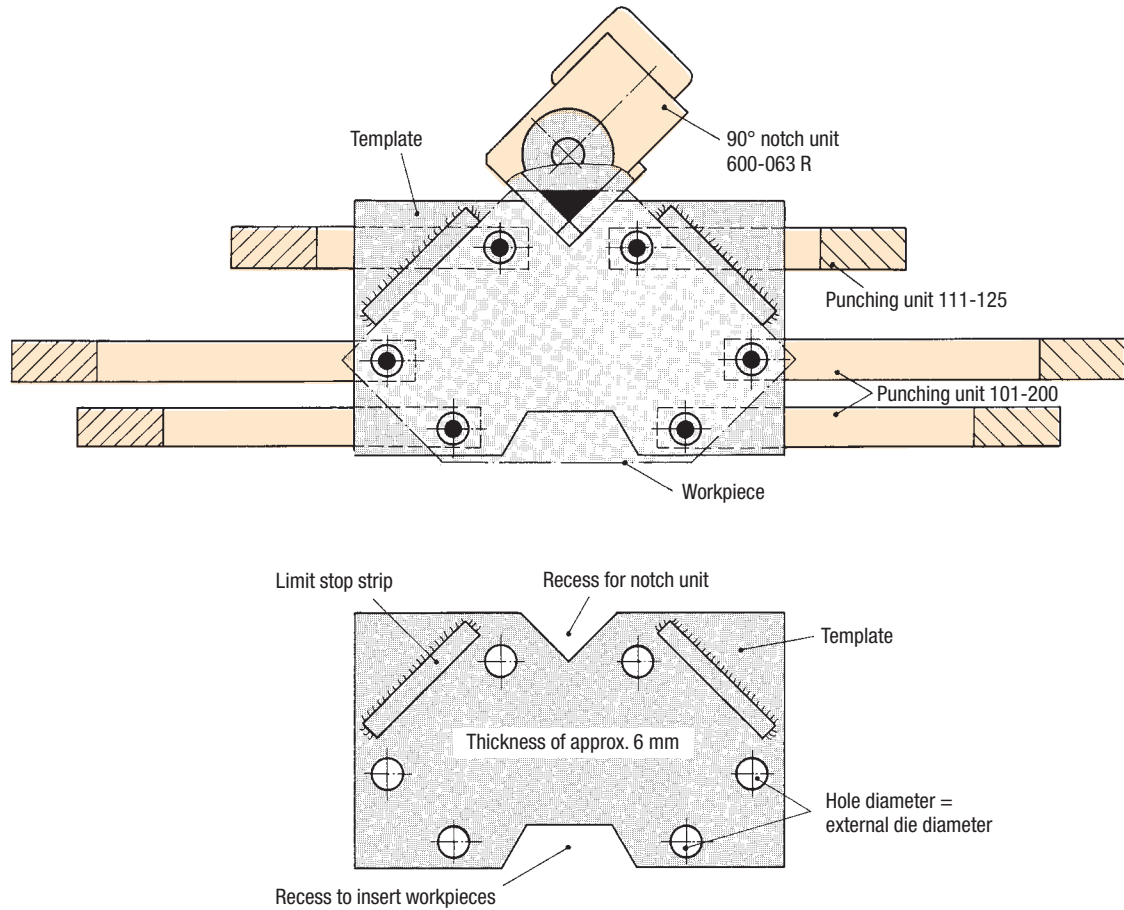
The workpiece is adjusted for processing by means of pins or limit stops in or on the template. See Fig. 3 (below) and Fig. 4 (next page).

Fig. 3: Tool setting of 2 punching units



## Tool setting of punching units with templates (continuation)

Fig. 4: Tool setting of 6 punching units together with one 90° notch unit



Punching units positioned with a template



Punching units arranged with a positioning plate

## Setting up of tool units with positioning plates

Positioning plates are suitable for the processing of different punch layouts and workpieces.

They enable the combination of punching, notch and cutting units with the required distance between them, see Fig. 5.

The positioning plate is equipped with holes  $\varnothing 10^{H7}$  which correspond to the desired punch layout. The tool units are positioned exactly in these holes by means of the pilot pins in the bottom.

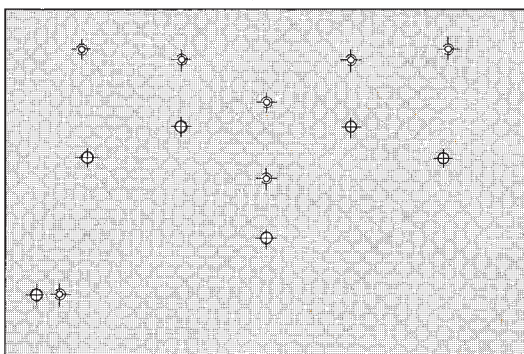
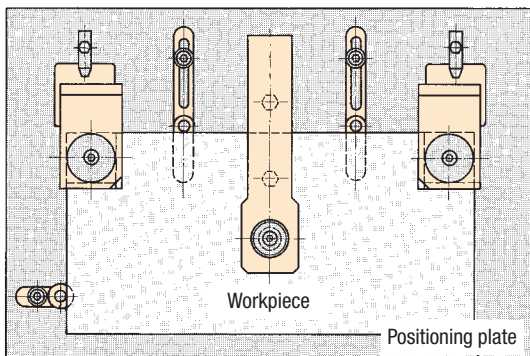
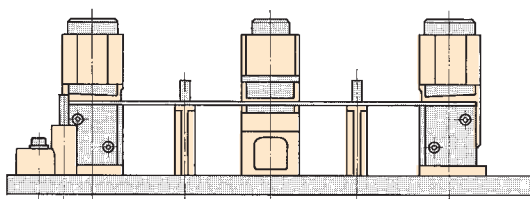
The tool units are fastened in a similar way to that illustrated in figures 1 and 2.

The workpiece limit stops and supports are mounted on the positioning plates in the desired position in the same manner, i.e. by means of positioning holes and mounting holes.

Fig. 5: Design of a combined positioning plate for the processing of 2 different workpieces

### Application example I

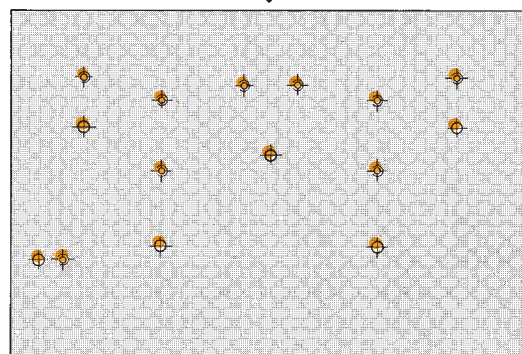
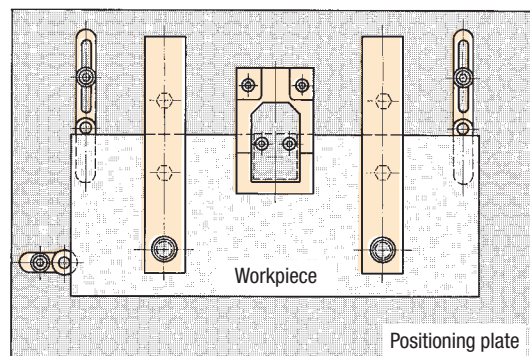
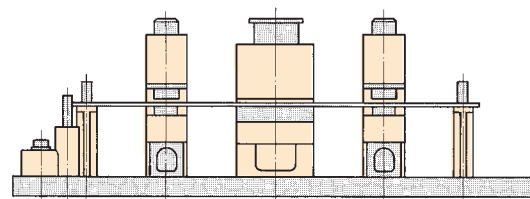
for one punching unit and two 90° notch units



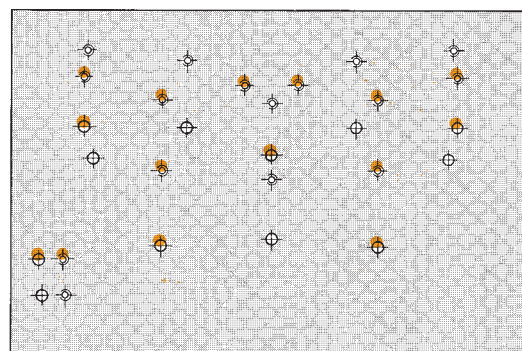
Positioning plate with positioning and mounting holes for application example I

### Application example II

for two punching units and one rectangle notch unit



Positioning plate with positioning and mounting holes for application example II



Combined positioning plate with positioning and mounting holes for application examples I and II

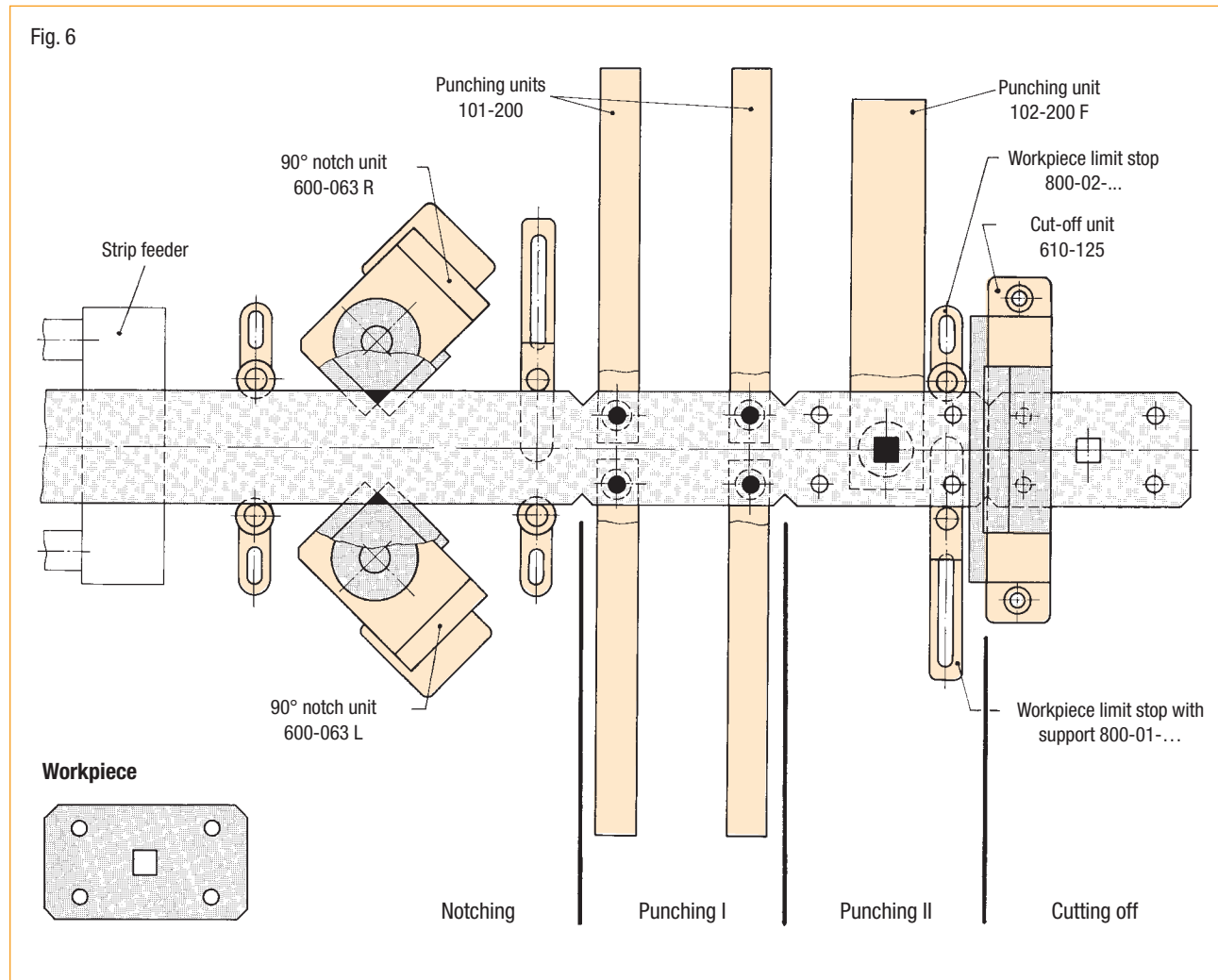


## Automation

For large numbers of workpieces, there is frequently a requirement for automation technology, especially if workpieces are not inserted individually but introduced in the form of rods or strips. In this case it is advisable to combine punching and notch units with cut-off units (see Fig. 6).

The material can be fed in manually against a fixed limit stop or by means of an automatic advancing device. The precision of this device is decisive for the precision of the workpiece. In both cases, flawless guidance of the material has to be guaranteed.

Punched holes which are very close together can be produced by positioning the punching units with an offset of one working step. Every press stroke yields a finished workpiece.



## Please note

All tool units, except press-independent units, have an universal installation height of 190 mm in a closed position. This means that the lower edge of the punch and the upper edge of the die are at the same level.

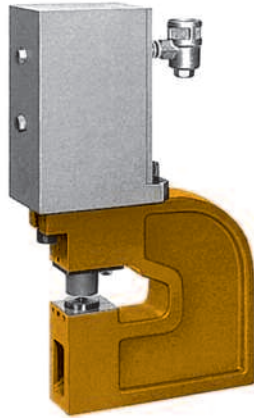
For notch and cut-off units the closed position of 190 mm is reached, when the upper blade is inserted to its full length.

The lower position of the press ram is adjusted in such a way that the distance between the upper edge of the press table and the lower edge of the press ram amounts to  $189 \pm 1$  mm.

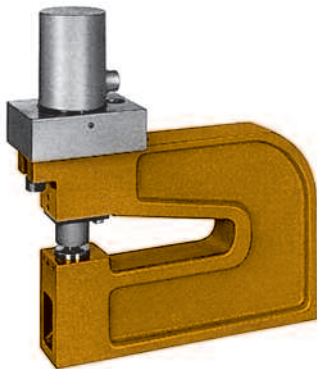
The tool units will be damaged if the setting is less than 185 mm.

## Note

The forces in this catalogue are indicated in kN (kilo Newton).  
 1 kN = 1,000 N



Punching unit, pneumatically operated



Punching unit, hydraulically operated



90° notch unit, hydraulically operated



Cut-off unit, pneumatically operated

### Pneumatic and hydraulic tool units

In addition to the press-operated tool units, a large number of punching units, notch units and cut-off units equipped with their own drive are offered in this catalogue. These units do not require a press. They are equipped either with powerful, patented pneumatic power cylinders or with double-action hydraulic cylinders.

Pneumatic or hydraulic tool units can be used wherever there is no suitable press available or the appropriate press is being used for other parts.

The tool units are suitable for the treatment of big, bulky and moulded workpieces which are processed outside the press area, i.e. the units can be used at any location.

The only prerequisite is the availability of air or oil pressure.

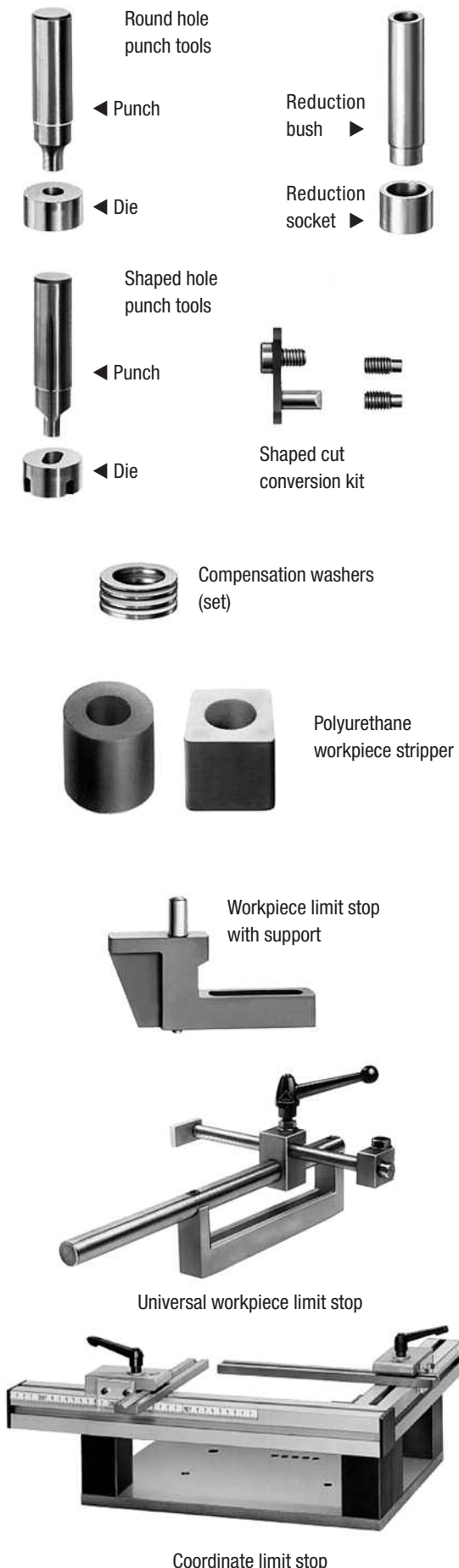
The restrictions on pneumatic or hydraulic tool units are the load capacity and the cutting force required. Prior to using these units it is, therefore, necessary to determine the cutting force. The cutting force charts provide a quick overview.

As illustrated on the left, the most important difference to the press-operated tool units is the top mounted drive cylinder.

The cutting process for punching, notching and cutting is the same as that which has been described for the press-independent tool units.

In contrast to tool units which operate independently from presses, the tool frame has to withstand the effective cutting force during processing. Solid construction of the tool frames is, therefore, a prerequisite.

For this reason the height of the material support for these tool units is 125 mm.



## Punching tools and accessories

### Round hole punch tools

When punching, the diameter of the punch tool corresponds to the nominal diameter of the hole. When ordering a complete punch tool kit, (punch and die), or a single die, the die is produced with the die clearance required taking the max. material thickness and material strength into account. The die clearance is the difference between the die diameter and the punch diameter. The thickness of the material to be punched should not exceed 0.8 times that of the punch diameter, as this would result in premature wear and tear to the tool.

For a number of punching units for round cuts smaller hole diameters than those indicated in the overviews and tables can be produced by using **reduction bushes** and **reduction sockets**. The appropriate polyurethane workpiece stripper is included.

### Shaped hole punch tools

The special design of shaped hole punch tools enables them to be installed in the shaped cut punching units simply and quickly. The punch and die can be used »lengthways« and »crosswise«.

Two adjusting screws on the lower part of the frame allow the die to be positioned in line with the punch and secured against twisting.

### Shaped cut conversion kit

If required at a later date, punching units for round cuts can be converted quickly and easily for the use of shaped cuts by means of conversion kits.

### Compensation washers

Compensation washers are required after sharpening to adjust the die to the height of the material support.

### Polyurethane workpiece stripper

The punched workpiece has a tendency to cling to the punch. With the aid of the workpiece stripper which must have a stripping force of approximately 15 ( of the cutting force, the workpiece is removed from the punch.

Polyurethane workpiece strippers are highly resistant to wear and are insensitive to oil and grease.

For especially high stripping forces needed for thick workpieces, reinforced workpiece strippers are available for some punching units.

### Workpiece limit stop with support

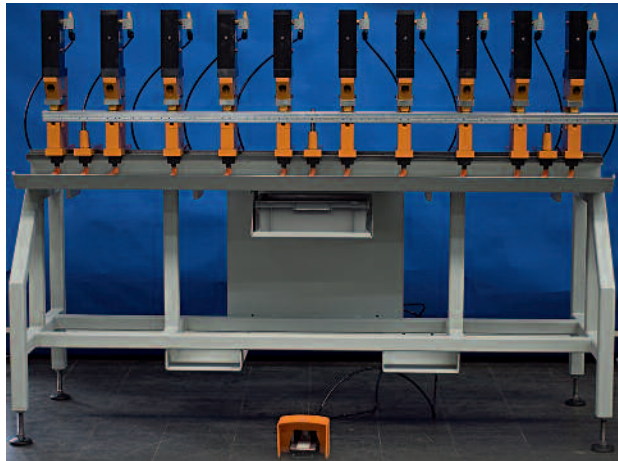
Workpiece supports and limit stops are important accessories for the feeding of the workpiece or strip material.

### Universal workpiece limit stop

This versatile device forms the ideal connection between the workpiece support and limit stop. Examples of a wide variety of uses are illustrated.

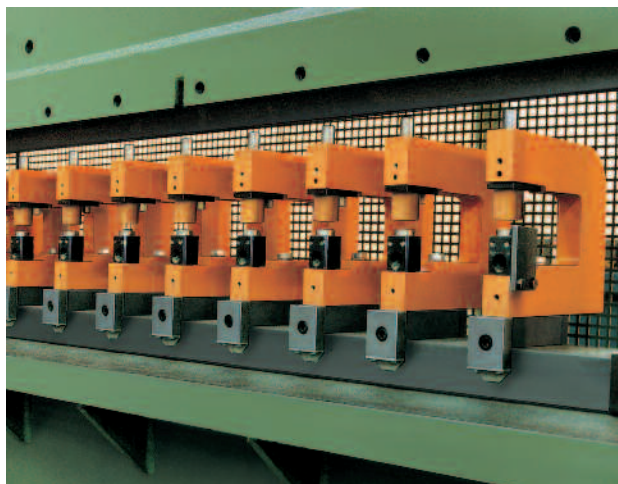
### Coordinate limit stop

Coordinate limit stops enable the distance between holes to be quickly and easily set. Time consuming set-up work with limit stops is unnecessary.



### Application examples

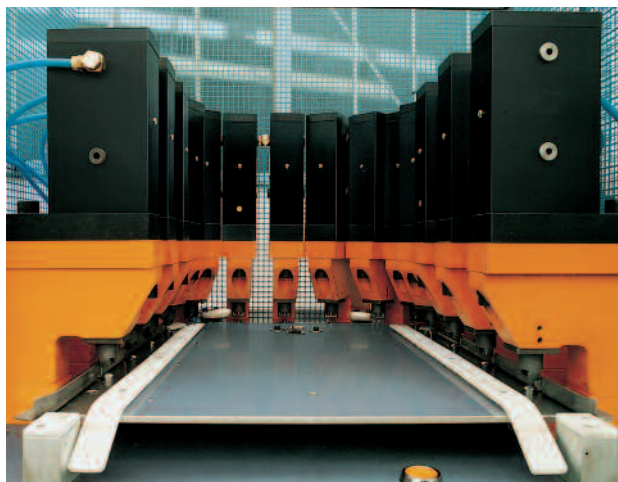
The illustrated examples are typical applications for the tool units presented in this catalogue for units with press-dependent and press-independent operation.



Tool units for punching in a bending press



Tool units for punching in an eccentric press



Pneumatic single-action punching units for punching shaped cuts



Hydraulic double-action punching units mounted on movable elements for punching steel from coil strips in different widths.

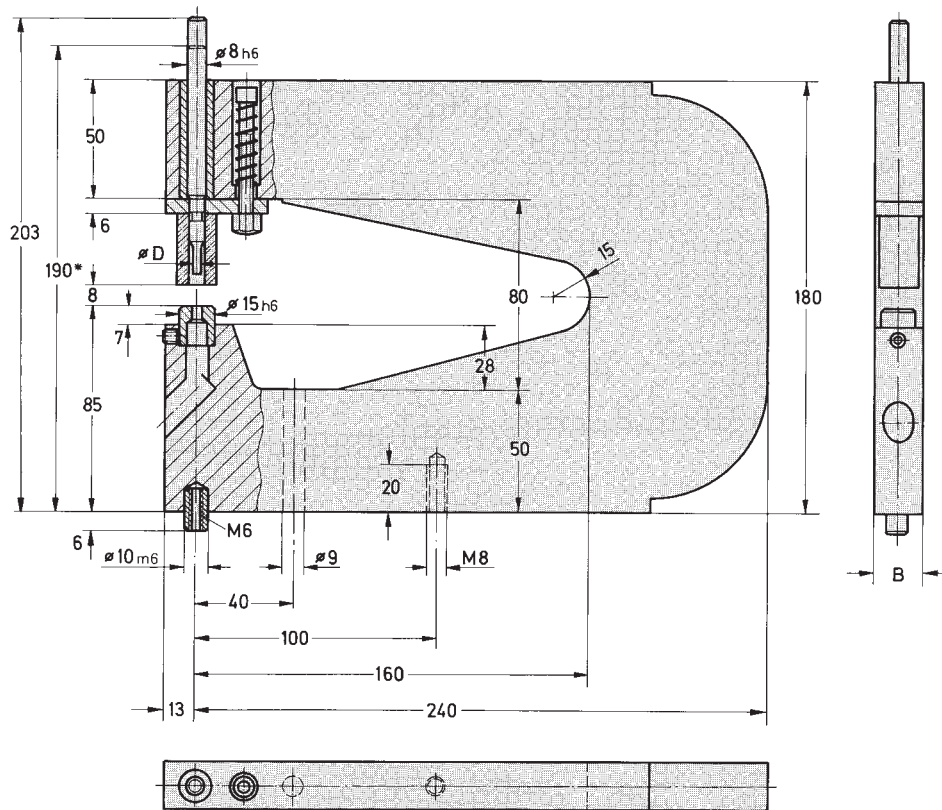
# Punching unit, hole $\varnothing$ 2–7 mm



- Only round cut ●
  - Hole diameter with material thickness 3 2–7 mm<sup>1)</sup>
  - Hole diameter with material thickness 5, max. 5 mm
  - Material thickness for steel St 60 0.3–5 mm
- <sup>1)</sup> Hole  $\varnothing$  6 to 7 mm only in material thickness up to 3 mm.

**Punching tools** (punch and die) have to be ordered separately.  
 See table below.

**Accessories** See pages accessories.



\* Lower edge of punch and upper edge of die are flush

Punching unit without punching tools					Punching tools have to be ordered separately		
Order No.	Throat depth range	Hole $\varnothing$ D	Width B	Weight ~ [kg]	Round punch ●		
					Punch kit Order No.	Punch Order No.	Die Order No.
100-160	160	2–7	20	5.2	500- $\varnothing$ -BL-ST	300- $\varnothing$	400- $\varnothing$ -BL-ST

Insert in Order No.:  $\varnothing$  = hole  $\varnothing$ , BL = material thickness, ST = material and strength. See also **punching tools**

# Punching unit, hole $\varnothing$ 2–13 mm



Round and shaped cuts 

Hole diameter with material thickness 3 2–13 mm<sup>1)</sup>

Hole diameter with material thickness 5, max. 11 mm

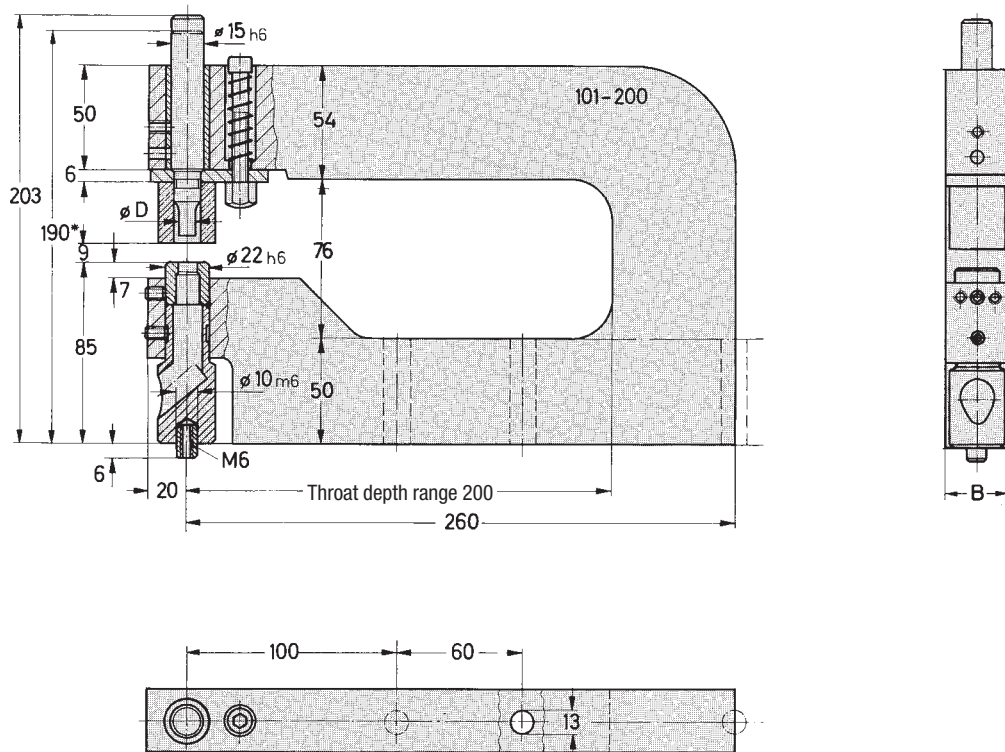
Material thickness for steel St 60 0.3–5 mm

<sup>1)</sup> Hole  $\varnothing$  12 to 13 mm only in material thickness up to 3 mm.



It is possible to punch holes with  $\varnothing$  2–7 mm by using reduction bushes and reduction sockets, which enable the use of the punch and die from the next smaller size of punching units.

**Punching tools** (punch and die) have to be ordered separately.  
See table below.

**Accessories** See pages accessories.

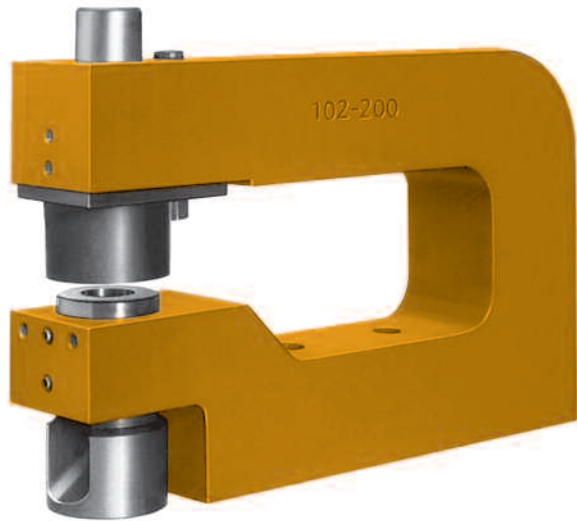


\* Lower edge of punch and upper edge of die are flush

Punching unit without punching tools					Punching tools have to be ordered separately			
Order No.	Throat depth range	Hole $\varnothing$ D	Width B	Weight ~ [kg]	Round punch 		Shaped punch 	
					Punch kit Order No.	Punch Order No.	Die Order No.	Punch kit Order No.
101-200 F	200	2–13	30	7.8	501- $\varnothing$ -BL-ST	301- $\varnothing$	401- $\varnothing$ -BL-ST	501-Formloch-BL-ST

Insert in Order No.:  $\varnothing$  = hole  $\varnothing$ , BL = material thickness, ST = material and strength. See also **punching tools**

# Punching unit, hole $\varnothing$ 8–25 mm



Round and shaped cuts 

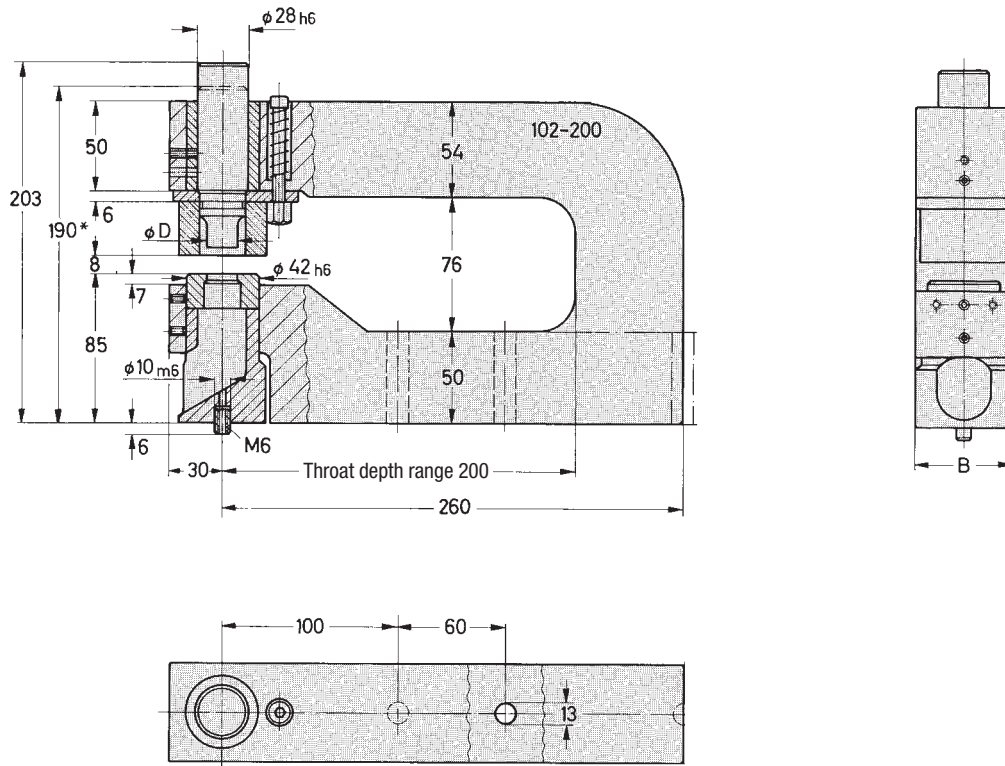
Hole diameter **8–25 mm<sup>1)</sup>**

Material thickness for steel St 60 **0.3–5 mm**



<sup>1)</sup> It is possible to punch holes with  $\varnothing$  2–8 mm by ordering a reduction bush and reduction socket

**Punching tools** (punch and die) have to be ordered separately.  
See table below.

Accessories See pages accessories.



\* Lower edge of punch and upper edge of die are flush

Punching unit without punching tools					Punching tools have to be ordered separately			
Order No.	Throat depth range	Hole $\varnothing$ D	Width B	Weight ~ [kg]	Round punch 		Shaped punch 	
					Punch kit Order No.	Punch Order No.	Die Order No.	Punch kit Order No.
102-200 F	200	8–25	55	15	502- $\varnothing$ -BL-ST	302- $\varnothing$	402- $\varnothing$ -BL-ST	502-Formloch-BL-ST

Insert in Order No.:  $\varnothing$  = hole  $\varnothing$ , BL = material thickness, ST = material and strength. See also **punching tools**



Round and shaped cuts 

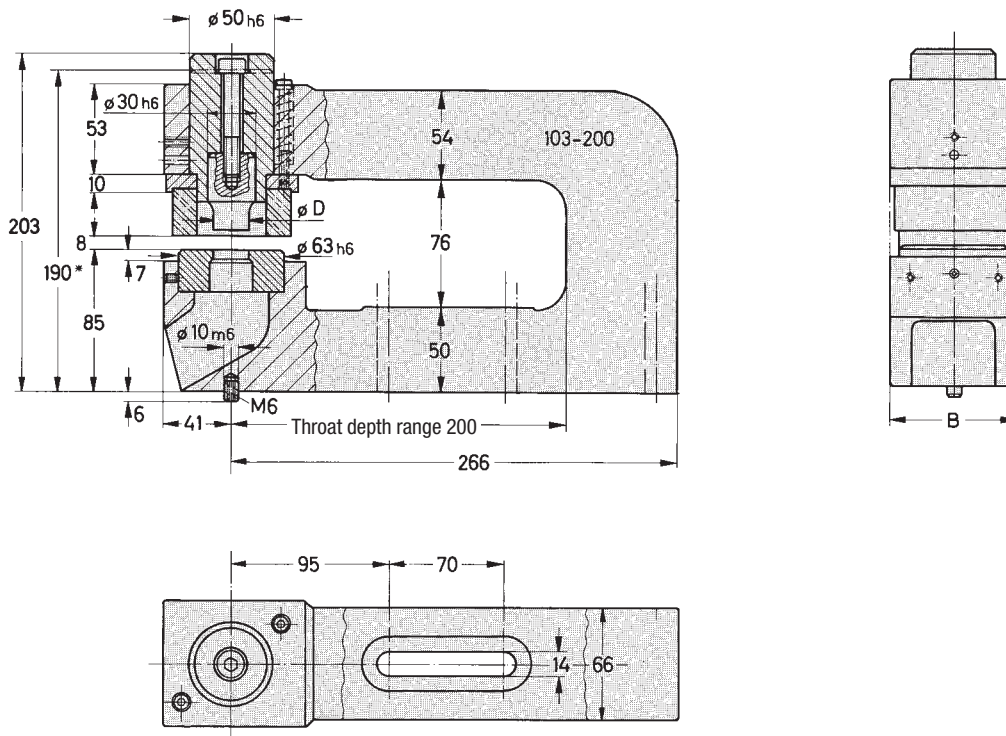
Hole diameter 25–40 mm<sup>1)</sup>

Material thickness for steel St 60 0.3–5 mm



<sup>1)</sup> Punching tools for holes with Ø 20–25 mm are available on request in special sizes

**Punching tools** (punch and die) have to be ordered separately.  
See table below.

Accessories See pages accessories.



\* Lower edge of punch and upper edge of die are flush

Punching unit without punching tools					Punching tools have to be ordered separately			
Order No.	Throat depth range	Hole Ø D	Width B	Weight ~ [kg]	Round punch 		Shaped punch 	
					Punch kit Order No.	Punch Order No.	Die Order No.	Punch kit Order No.
103-200 F	200	25–40	75	14	503-Ø-BL-ST	303-Ø	403-Ø-BL-ST	503-Formloch-BL-ST

Insert in Order No.: Ø = hole Ø, BL = material thickness, ST = material and strength. See also **punching tools**

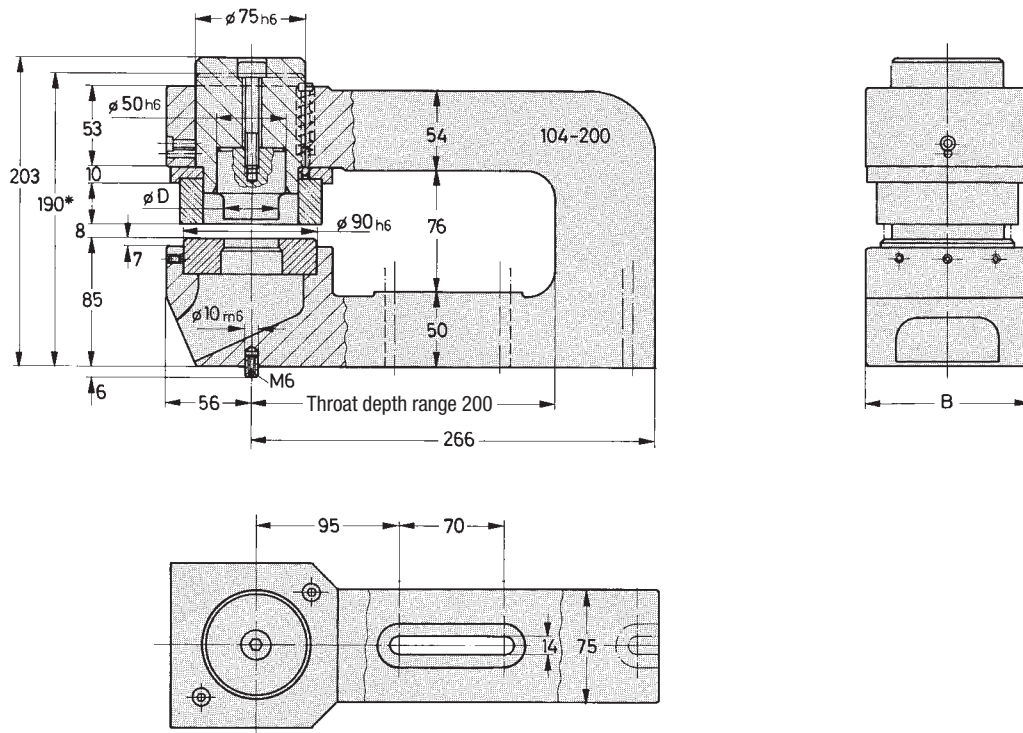


# Punching unit, hole $\varnothing$ 40–63 mm





Round and shaped cuts   
 Hole diameter **40–63 mm**  
 Material thickness for steel St 60 **0.3–5 mm**

**Punching tools** (punch and die) have to be ordered separately.  
 See table below.  
**Accessories** See pages accessories.

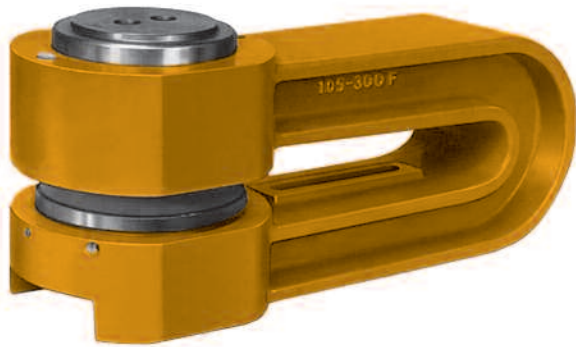


\* Lower edge of punch and upper edge of die are flush

Punching unit without punching tools					Punching tools have to be ordered separately			
Order No.	Throat depth range	Hole $\varnothing$ D	Width B	Weight ~ [kg]	Round punch 		Shaped punch 	
					Punch kit Order No.	Punch Order No.	Die Order No.	Punch kit Order No.
104-200 F	200	40–63	108	20	504- $\varnothing$ -BL-ST	304- $\varnothing$	404- $\varnothing$ -BL-ST	504-Formloch-BL-ST

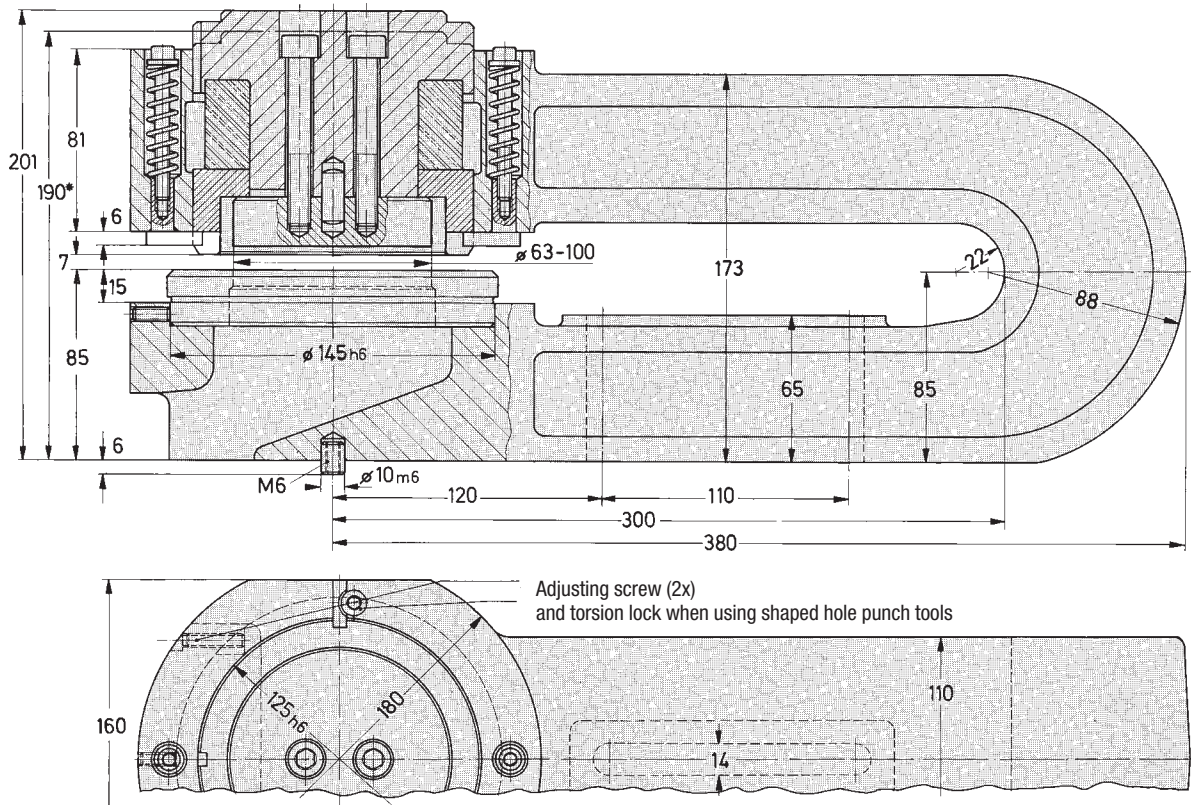
Insert in Order No.:  $\varnothing$  = hole  $\varnothing$ , BL = material thickness, ST = material and strength. See also **punching tools**

# Punching unit, hole Ø 63–100 mm



**Round and shaped cuts** ● + ●●●●  
**Hole diameter** 63–100 mm  
**Material thickness for steel St 60** 0.75–5 mm

**Punching tools** (punch and die) have to be ordered separately.  
 See table below.  
**Accessories** See pages accessories.

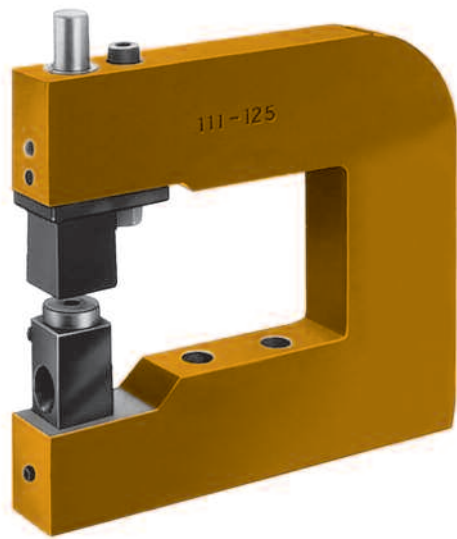


\* Lower edge of punch and upper edge of die are flush

Punching unit without punching tools					Punching tools have to be ordered separately			
Order No.	Throat depth range	Hole Ø D	Width B	Weight ~ [kg]	Round punch ●		Shaped punch ●●●●	
					Punch kit Order No.	Punch Order No.	Die Order No.	Punch kit Order No.
105-300 F	300	63–100	160	42	505-Ø-BL-ST	305-Ø	405-Ø-BL-ST	505-Formloch-BL-ST

Insert in Order No.: Ø = hole Ø, BL = material thickness, ST = material and strength. See also **punching tools**

# Punching unit, hole Ø 2–13 mm



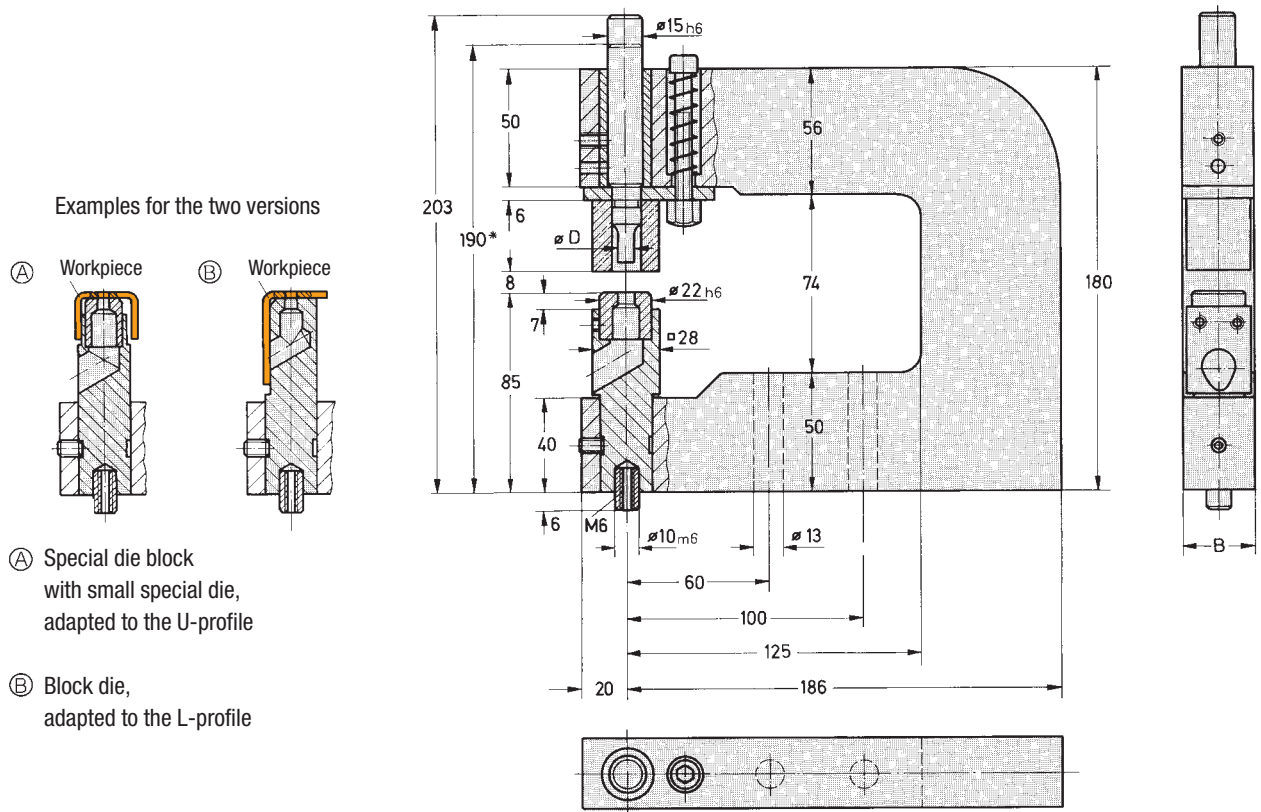
- Round and shaped cuts
- Hole diameter with material thickness 3 2–13 mm<sup>1)</sup>
- Hole diameter with material thickness 5, max. 11 mm
- Material thickness for steel St 60 0.3–5 mm
- <sup>1)</sup> Hole Ø 12 to 13 mm only in material thickness up to 3 mm.

Punching units of series 111 are particularly suitable for punching small profiles. For special applications, either a special die block with a small special die (see illustration) can be used or a one-piece block die (see illustration).

In both cases, the punching of very small profiled parts is possible after removing the standard die block.

**Punching tools** (punch and die) have to be ordered separately.  
See table below.

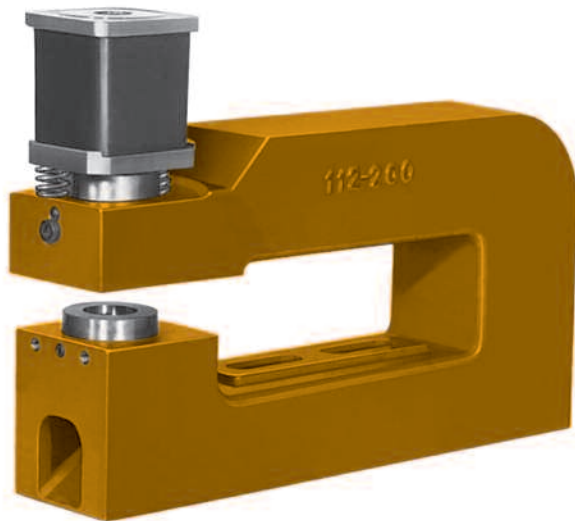
**Accessories** See pages accessories.



Punching unit without punching tools					Punching tools have to be ordered separately			
Order No.	Throat depth range	Hole Ø D	Width B	Weight ~ [kg]	Round punch		Shaped punch	
					Punch kit Order No.	Punch Order No.	Die Order No.	Punch kit Order No.
111-125 F	125	2–13	30	6	501-Ø-BL-ST	301-Ø	401-Ø-BL-ST	501-Formloch-BL-ST

Insert in Order No.: Ø = hole Ø, BL = material thickness, ST = material and strength. See also **punching tools**

# Punching unit, hole $\varnothing$ 8–22 mm



Round and shaped cuts 

Hole diameter **8–22 mm**

Material thickness for steel St 60 **2–10 mm**

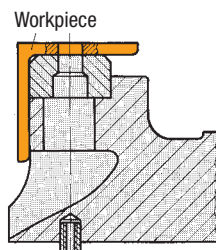
With small modifications these punching units are suitable for punching L-, U-, or Z-profiles, see application example.

**Punching tools** (punch and die) have to be ordered separately.

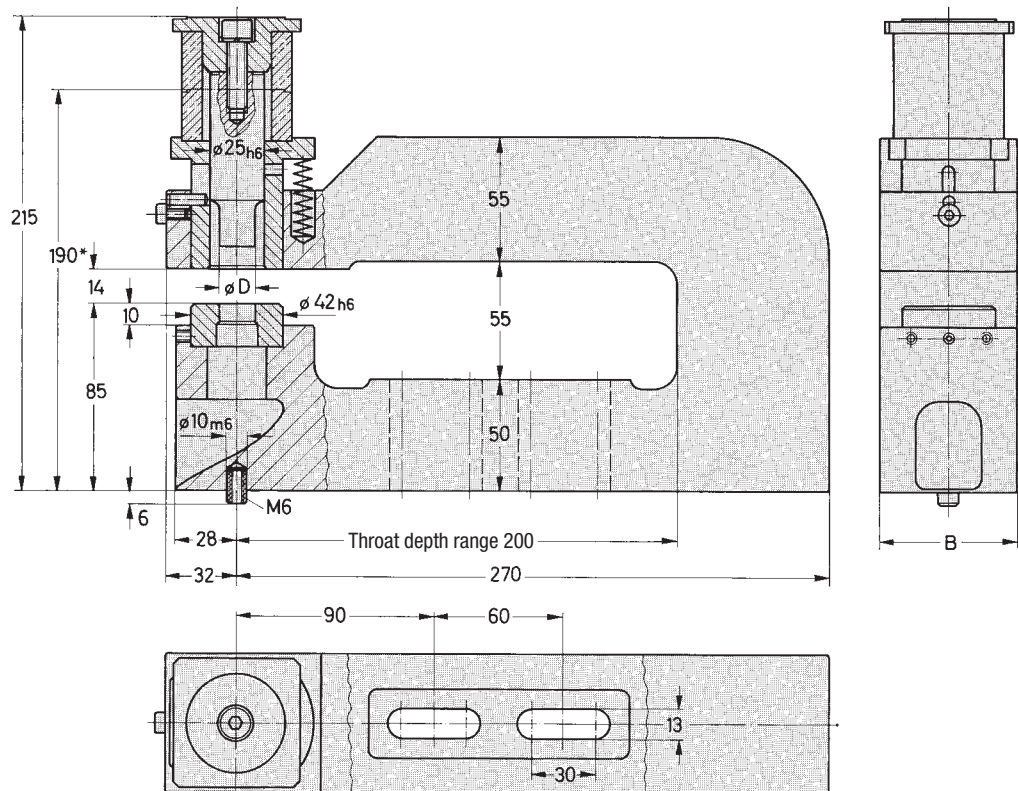
See table below.

**Accessories** See pages accessories.





Example



Punching unit adapted to the L-profile



\* Lower edge of punch and upper edge of die are flush

Punching unit without punching tools					Punching tools have to be ordered separately			
 Order No.	Throat depth range	Hole $\varnothing$ D	Width B	Weight ~ [kg]	<b>Round punch</b>  Punch kit Order No.	<b>Shaped punch</b>  Die Order No.	<b>Punch kit</b>  Order No.	
<b>112-200 F</b>	200	8–22	63	16	512- $\varnothing$ -BL-ST	312- $\varnothing$	402- $\varnothing$ -BL-ST	512-Formloch-BL-ST

Insert in Order No.:  $\varnothing$  = hole  $\varnothing$ , BL = material thickness, ST = material and strength. See also **punching tools**