

## **RECOMMENDATIONS FOR BLANKING, FORMING AND EMBOSSING OPERATIONS WITH FIBROFLEX® ELASTOMER**

FIBROFLEX® forming materials for blanking, embossing and forming are eminently suitable for use in small and medium series production. The main advantage is the reduction in tooling costs compared with traditional productions methods.

This means that, even with considerable workpiece changes or with prototypes, you can respond quickly to changing market requirements and delivery times.

Pre-coated or highly polished sheets that must not be scratched or damaged during forming are becoming increasingly important. In this case, there is often no alternative to a forming process using elastomers.

### **Cutting with FIBROFLEX®**

When blanking with elastomers, the workpiece materials, in contrast to the traditional blanking of workpiece materials, are subjected to their elastic limits, beyond which the material breaks.

The thickness of sheet steel which can be cut using FIBROFLEX® is currently % 2.0 to 2.5 mm.

The even clamping pressure which is excellent for pressing also means that parts with intricate contours can be manufactured from panels of around 0.2 to 0.01 mm in thickness. It is possible to achieve workpiece accuracy of  $\pm 0,01$  mm.

During the blanking process the press pressure first deforms the elastomer. As soon as the elastomer reaches the limits of its deformation the workpiece is cut.

The less the stretch of the sheet metal, the easier it can be cut using the elastomer blanking process. Large quantities of spring band steels, electric sheets and sheet aluminium are cut using this process. Deep-drawing sheet steel is unsuitable for the elastomer blanking process.

### **Forming with FIBROFLEX®**

When forming using elastometers, always remember the golden rule: whatever the extent of the deformation, the elastic FIBROFLEX® forming material remains constant. This means it can be displaced, but not compressed. The design must allow the elastomer to "flow" into a relief gap. Observing the volume consistency of the elastomer is one of the most important prerequisites for successfully solving a forming problem.

### **Choice of machine**

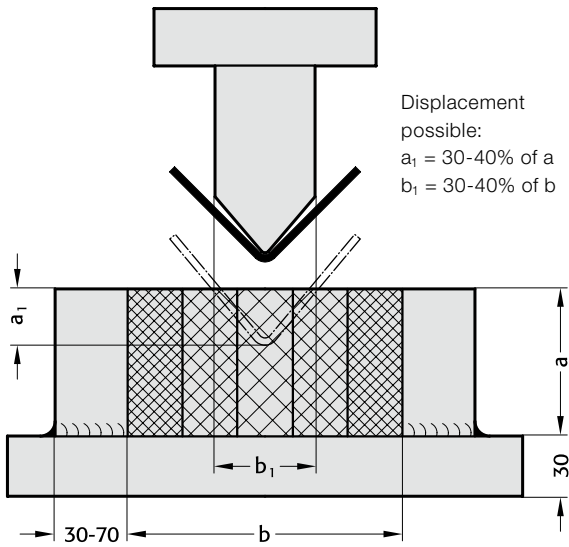
When FIBROFLEX® matrices are used for blanking, embossing and forming the machine must be able to accommodate the displacement.

Hydraulic presses are preferred over mechanical presses due to their pressure build-up. The slowly building pressure counteracts the form-altering response of the FIBROFLEX® forming material.

With mechanical presses there is a risk of a press fault on overload, when the upper dead point is approached. With FIBROFLEX® the machine is not subjected to any stresses, so even old machines can be used.

# APPLICATION EXAMPLES OF FORMING OPERATIONS WITH FIBROFLEX® ELASTOMERS

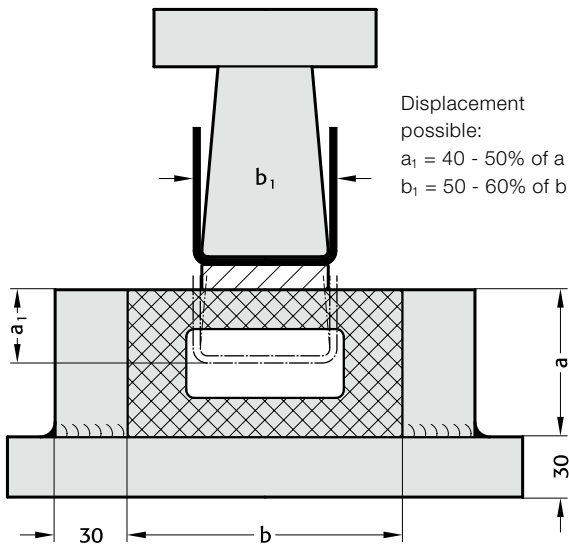
Fig. 5



## Vee-Bending

One of the easiest elastomer-forming operations is that of Vee-bending off a solid punch and into a die cushion of stacked FIBROFLEX® pads. The necessary penetration of the punch and the amount of over-bending depend on the thickness, hardness and type of the material – and furthermore on the bending radius, the length of the free legs on the piece part, and lastly on the Shore hardness of the cushion. Applicable to all kinds of bending operations is the general rule: the smaller the bending radius, the less will be the spring-back of the bend and the shallower is the required penetration of the punch. Especially with larger batch quantities it is advisable to ensure all-round retention of the stacked elastomer cushion; it also pays to make punch and cushion identical in length.

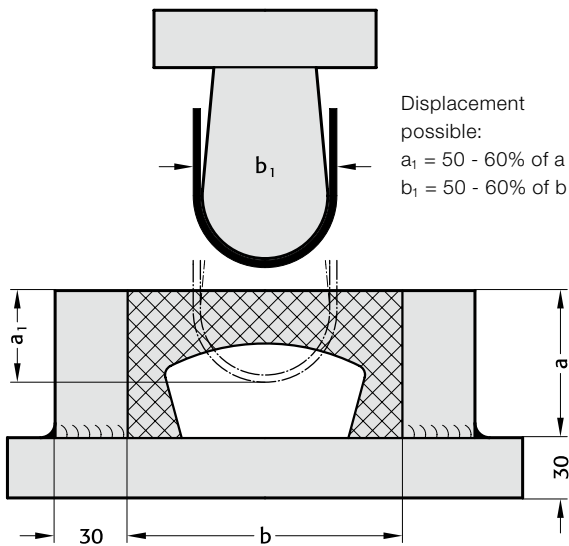
Fig. 6



## Bending of Vee- and U-Shapes

Bending of V- and U-shapes can be achieved either with stacked FIBROFLEX® pads of different hardness (Fig. 5), or with the aid of solid and hollow FIBROFLEX® Sections. These may consist of squares, channels or triangular sections. Where solid sections or sheet is used as a cushion, wear of the elastomer material can be reduced through creation of an additional displacement space at the bottom of the cushion retainer box, similar to Fig. 11, where gib inserts are placed along the corners. Hollow cushions, as well as those of a channel configuration, exhibit greater die life and are therefore the preferred choice for bending operations. In the case of a U-shaped bend with straight bottom it may be advisable to insert a packing of 3–5 mm thickness, and of the same width as the flat bottom of the bend, underneath the cushion. This measure increases the forming pressure and helps to achieve a flat bottom on the workpiece (fig. 6). The punch should be relieved on both sides in order to avail compensation possibilities for springback.

Fig.. 7

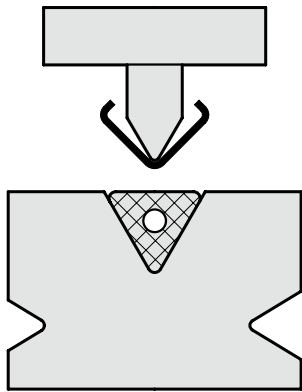


## U-Bends with large radius

U-bends with a large bottom radius are difficult to accomplish. Punch penetration must need be large; springback can be quite considerable. This is illustrated in Figs. In order to achieve good results, the use of hollow FIBROFLEX® sections or of channels becomes almost mandatory. This is illustrated in Figs. 7 and 12. Another alternative consists of machined form cushions in accordance with Fig. 13. The hollow space of the channel-shaped cushion has the effect of increasing the horizontal pressure component in the die; this also holds true for hollow die cushions. In all cases is it necessary to ensure that the cushion retainer box is sufficiently rigid.

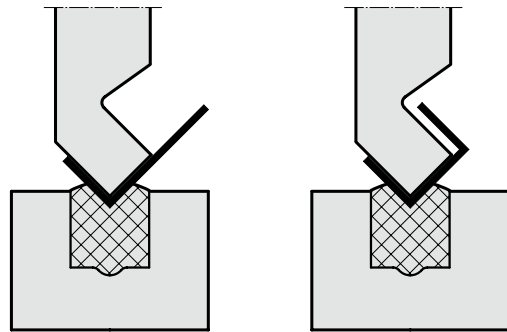
# APPLICATION EXAMPLES OF FORMING OPERATIONS WITH FIBROFLEX® ELASTOMERS

Fig. 8



FIBROFLEX® Triangular sections are shaped to fit into the existing forming grooves of bending brake dies, thus eliminating die changes and/or the provision of a die cushion retainer box as required with square cushion configurations.

Fig. 9



Depending on stock specifications the bending of a channel section may either be done off a Vee-shaped punch as a voluntary choice – or it may become an absolute necessity. Two operational sequences are required, and a goose-necked punch configuration is essential.

Fig. 10

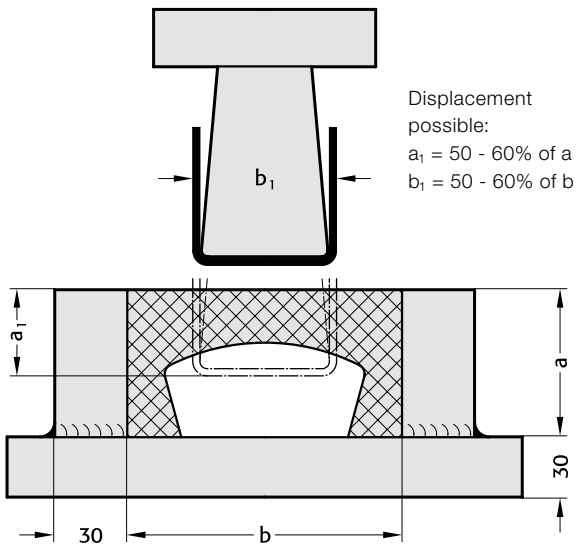


Fig. 11

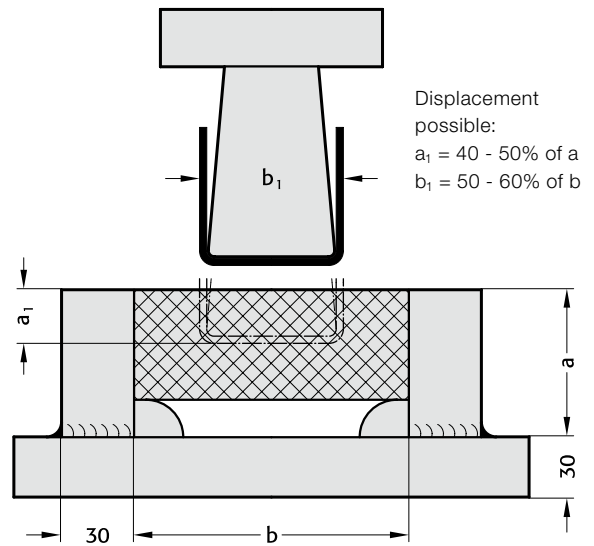


Fig. 12

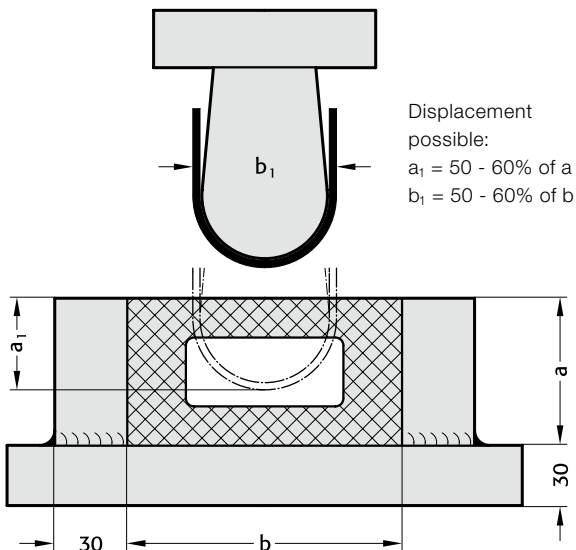
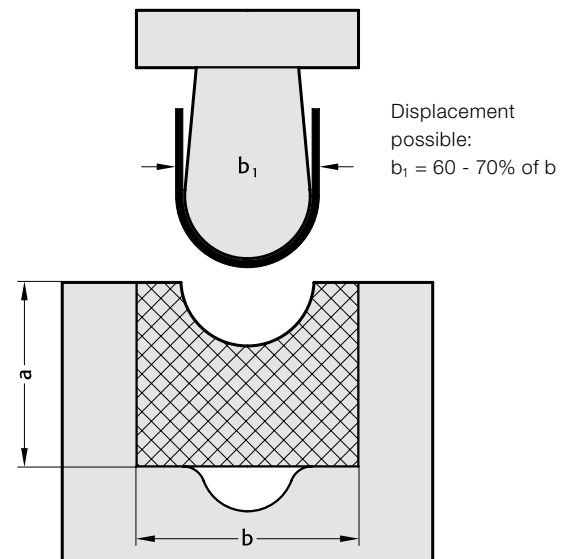


Fig. 13





# BLANKING AND FORMING WITH FIBROFLEX®-ELASTOMERS



# BLANKING AND FORMING WITH FIBROFLEX®-ELASTOMERS

## Description

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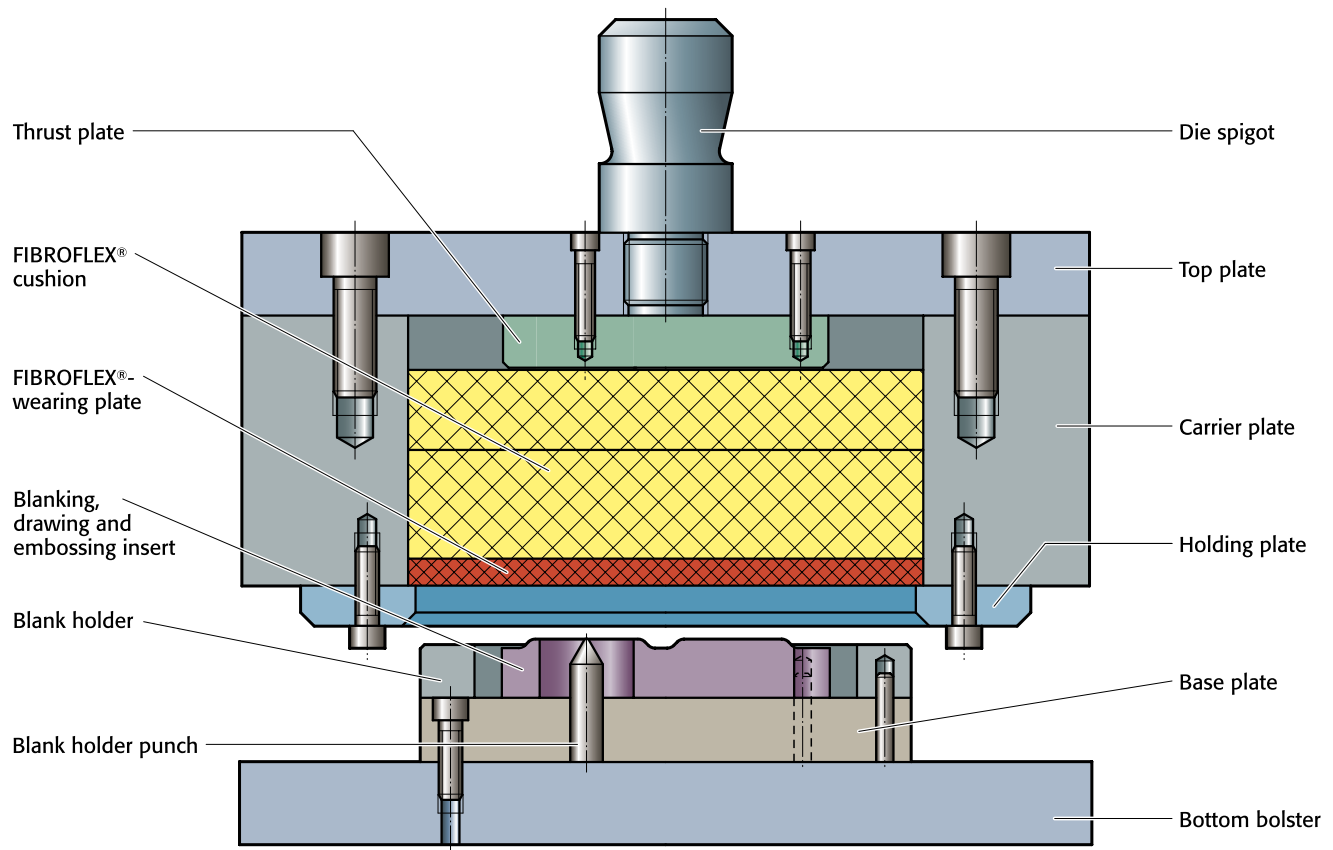
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## FIBROFLEX® FORMING TOOL: CUTTING - EMBOSSING - PUNCHING



### Combined blanking - embossing - punching

The workpiece is completed at one pass.

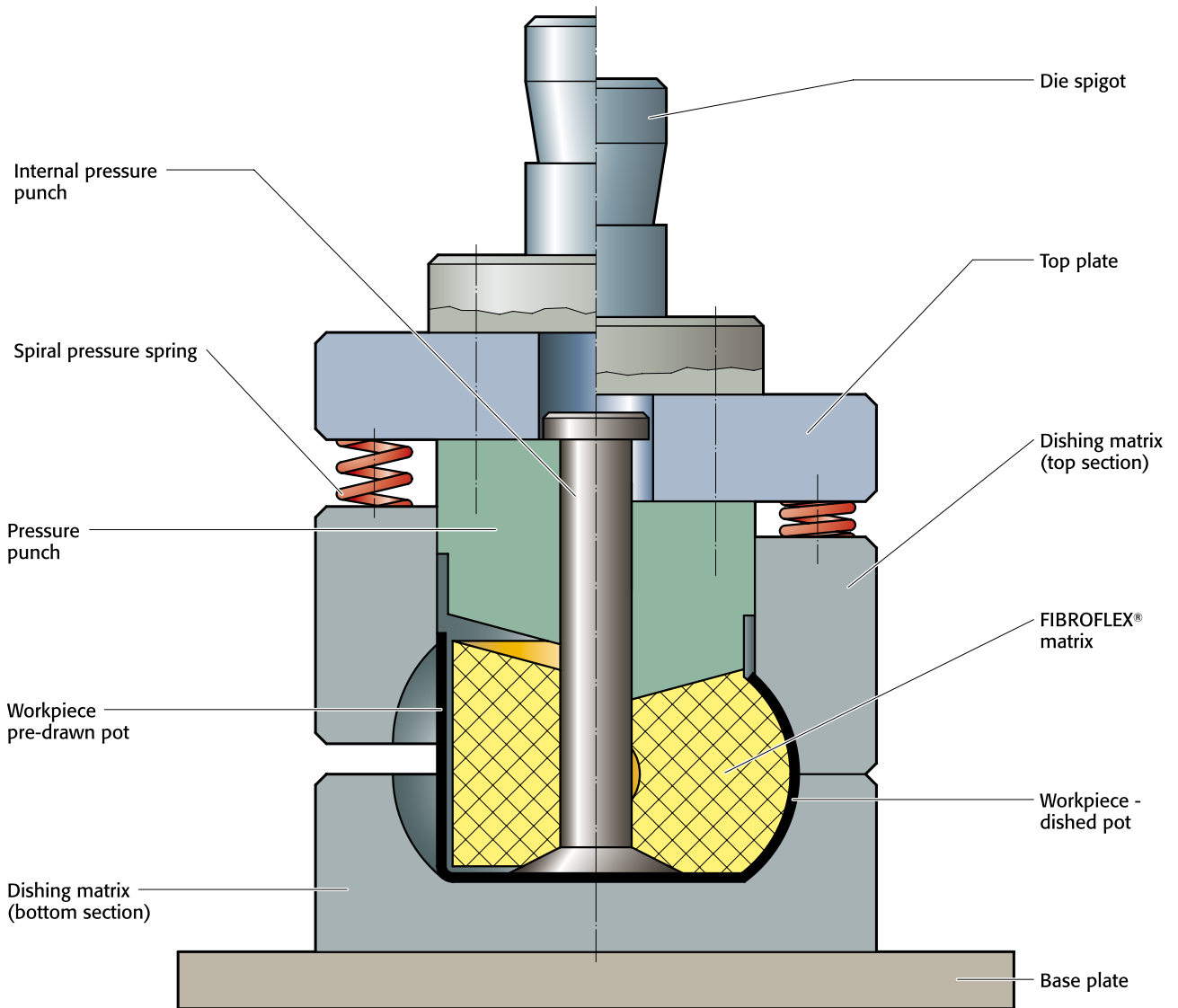
The shape is determined by the combined blanking, hole cutting and embossing matrix blank holder punch, without a reverse shape mould on the cushion side.

The thrust plate in the carrier produces a concentration of pressure which produces a better result in the active tool range. The thrust plate also provides the necessary compensation for constant volume.

When producing workpieces of a different shape, only the tool elements in the lower section which produce the shape have to be exchanged.



## FIBROFLEX® FORMING TOOL: BULGING A POT

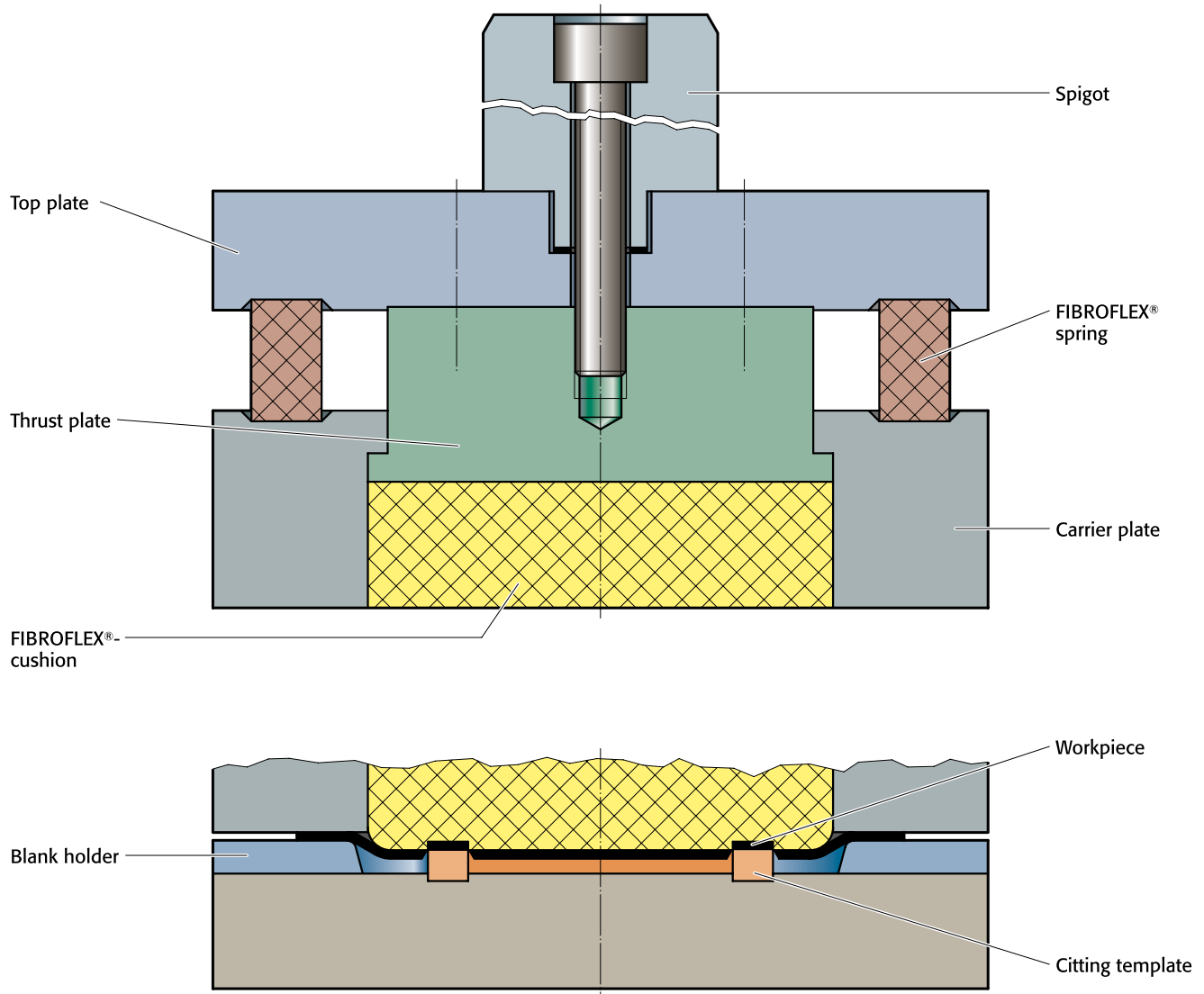


### Bulging a pot

For flaring and bulging operations we recommend the use of FIBROFLEX® concave profiles wherever possible. The wedge shape of the elastomer and the shape of the pressure and counter pressure punches both encourage the elastomer to deform in the required direction. The basic principle of consistent volume of the FIBROFLEX® forming material must also be observed when bulging. (Displaced volume = bulging volume - see also "Recommendations for cutting, embossing and forming with FIBROFLEX® forming materials")



## FIBROFLEX® UNIVERSAL BLANKING AND FORMING CARRIER



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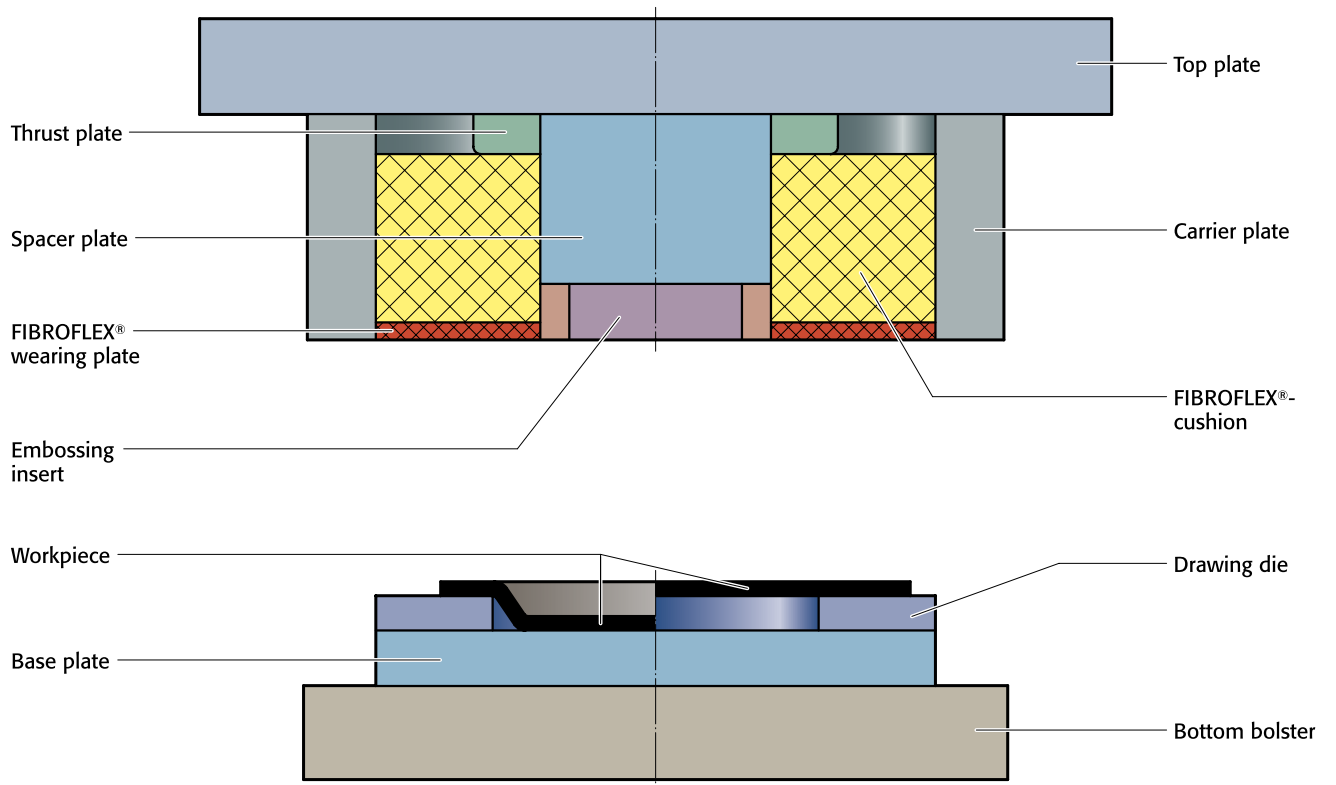
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## FIBROFLEX® FORMING TOOL: DRAWING – EMBOSSING



### Drawing and embossing

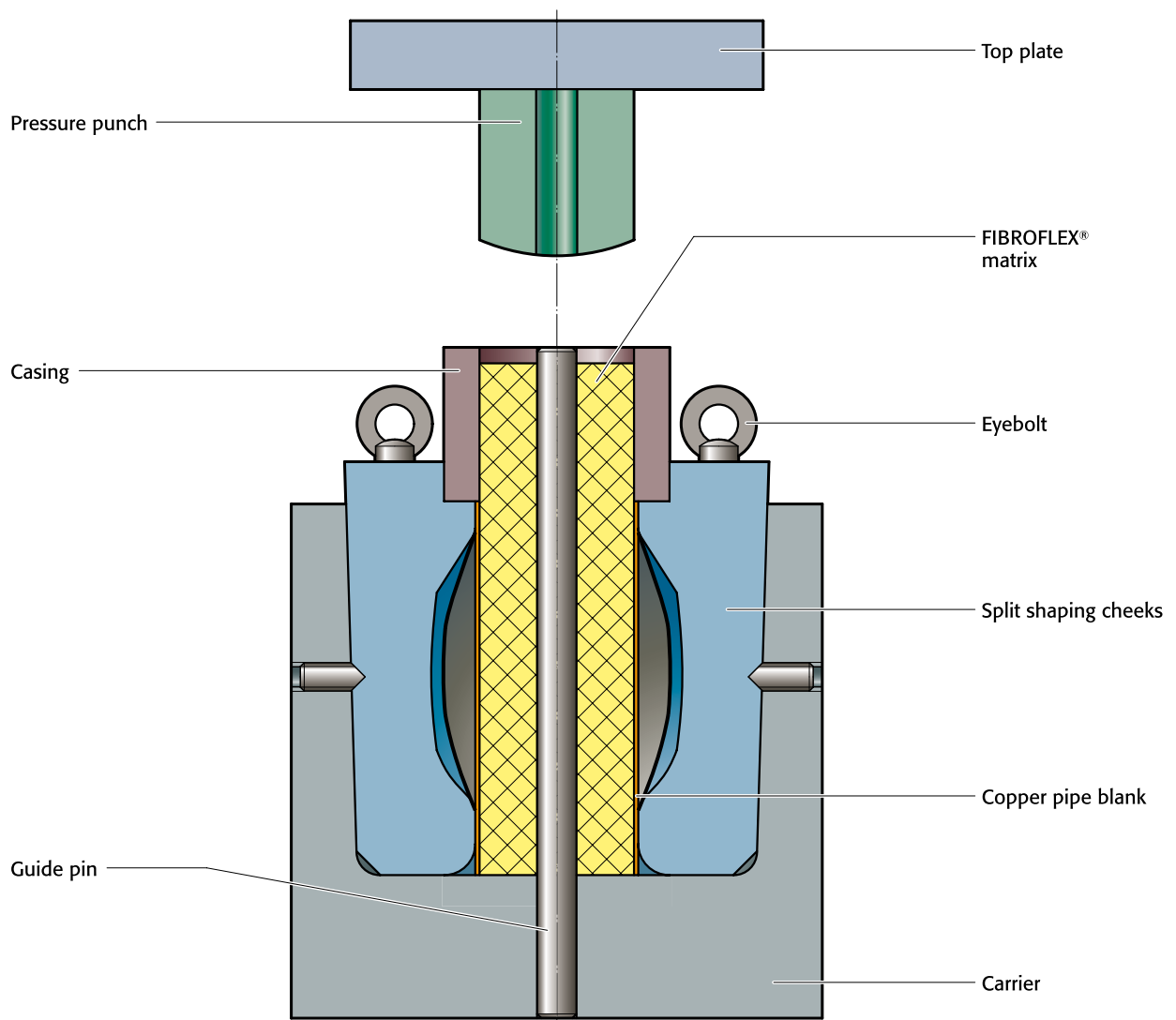
The limits for flaring and bulging depend on the workpiece material, its thickness and hardness and also the height of the FIBROFLEX® cushion. Maximum permissible deformation of the FIBROFLEX® cushion:

80 Shore A – 35%

90 Shore A – 30%

95 Shore A – 25%

## FIBROFLEX® FORMING TOOL: FLARING PIPES



### Flaring pipes

When flaring using FIBROFLEX®, split cheeks with a conical external surround are required to allow the workpiece to be released. Depending on wall thickness, flaring ratios of 1.2 can be achieved. Above a workpiece diameter-to-length ratio of 2 : 1 it is advisable to use concave cushions with bolt guides.

