

## A DIE SETS



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## B PRECISION GROUND PLATES AND FLAT BARS



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## C LIFTING AND CLAMPING DEVICES



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## D GUIDE ELEMENTS



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## E GROUND PRECISION COMPONENTS



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## F SPRINGS



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## G ELASTOMERS



FIBROFLEX® and FIBROELAST® plates and profiles



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## H FIBRO-CHEMICAL TOOLING AIDS



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## J PERIPHERAL EQUIPMENT



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## K CAM UNITS



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## L STANDARD PARTS FOR MOULD MAKING



# ELASTOMERS



## FIBROFLEX® FORMING ELASTOMERS

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The occurrence of small batch lots in the press shop generally makes the more expensive dies of conventional design inadvisable – and it is in this sector in particular that FIBROFLEX® Forming elastomers can offer economical alternatives.

The use of rubber-elastic materials, which has been practised for many years, offers new, interesting solutions for the design of forming and cutting tools, for bending over in a single operation, thanks to the constantly further developed elastomers. The advantages of FIBROFLEX® tipped tools for forming coated or surface-finished sheet metal are particularly worth mentioning.

The quite outstanding elastic properties of FIBROFLEX® have made it an almost indispensable material in toolrooms everywhere and also in many sectors of general engineering. Its numerous successful uses comprise bumper stops, strippers, ejector- and forming pads, spring elements as well as noise suppression applications.

The natural and synthetic rubber grades initially used only had a limited service life because they were adversely affected by the mechanical stresses in the forming tool and the external influences of lubricants.

FIBROFLEX®, a polyurethane elastomer of very special properties, represents a synthetic material of significant advantages over all conventional rubber substances. It provides:

- extensive life span when used correctly
- highest resistance to rupturing
- inertness to all lubricants used in metal forming operations
- excellent elasticity
- good thermal resilience

FIBROFLEX® forming materials are available in a constantly expanding range of round, rectangular, triangular or U-shaped profiles, with and without cavities, as well as sheets in numerous dimensions and in 3 different Shore A hardnesses, depending on their intended use.

The "Application examples of forming operations" provide instructions for using alternative technology.

Further detailed information on elastomer tooling can be found in our free publication "Elastomers in sheet metal forming and the toolroom", which we shall gladly mail to interested customers.

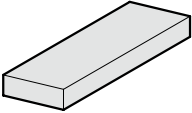
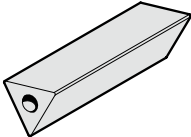
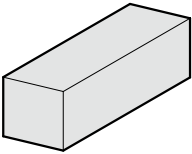
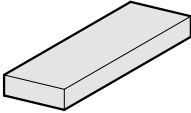
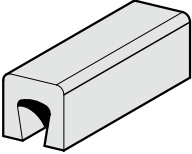
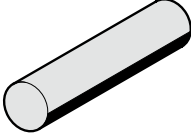
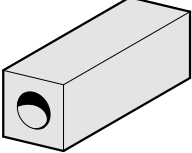
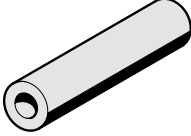
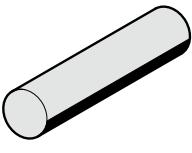

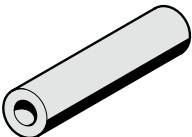
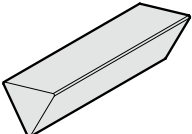
FIBROFLEX®\*  
**ACCURATE PARTS TO CUSTOMERS  
SPECIFICATIONS**

\*Polyurethan





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## FIBROFLEX® - TECHNICAL DATA

### Physical properties:

FIBROFLEX® type		DIN	5	6	7
Shore-A hardness	[Shore A]	53505	80	90	95
Density	[g/cm <sup>3</sup> ]	53479	1,07	1,11	1,13
Working temperature, max.	[°C]		-40 up to +70	-40 up to +70	-40 up to +70
Rebound elasticity	[%]	53512	63	45	38
Voltage					
At 100% elongation	[MPa]	53504	4,1	6,8	11,8
At 300% elongation	[MPa]	53504	8	15,2	30
Tensile strength	[N/mm <sup>2</sup> ]	53504	36	38	49
Elongation at fracture	[%]	53504	450	400	360
Tear strength	[N/mm]	53515	21	29	50
Abrasion resistance	[mm <sup>3</sup> ]	53516	70	50	41
Pressure forming test 70h/24°C	[%]	53517	21	26	30
Resistance to Sea Water (saline)					approximately 6 months

### Guide lines for the machining of FIBROFLEX®:

FIBROFLEX® Forming elastomers can be machined on ordinary machine tools and with conventional cutters. A keen cutting edge is mandatory.

FIBROFLEX® type	5	6	7
Colour	green	yellow	red
Shore-A hardness	80	90	95

#### Sawing:

Circular saw, carbide-tipped, coarse toothed

Rake angle 25°–30°

$v_c$ = approx. 1600 m/min.

Clearance angle 12°–15°

#### Drilling

$v_c$ = approx. 30 m/min.

#### Rotation:

Rake angle 25°

$v_c$ = approx. 140 m/min.

Clearance angle 12°– 15°

#### Milling:

Rake angle 25°

$v_c$ = approx. 100 m/min.

Clearance angle 12°– 15°

$v_c$  = cutting speed

Please note that we can supply form parts, required in larger quantities, in the ready-cast condition. Enquiries are invited.

### Note:

Upon delivery, machined special and standard parts may have visible oil residues.



# FIBROFLEX® - TECHNICAL DATA

## FIBROFLEX® - Technical data

FIBROFLEX® can be used safely at temperatures up to +70 °C.

### Cold resistance:

FIBROFLEX® will retain most of its flexibility at temperatures as low as -40° C. A gradual increase in rigidity sets in below -18 °C. Resistance to thermal shock is excellent.

### Resistance to oxygen and ozone:

No traceable influences are incurred at normal atmospheric concentrations.

### Resistance to ageing:

Ageing shows no discernible effects in conditions of normal ambient temperatures and generally constant environmental surroundings. The storage stability and long-term use of FIBROFLEX® is therefore problem-free.

### Tolerance range of FIBROFLEX®- and FIBROELAST® semi-finished items:

according to DIN ISO 3302-1 tolerance class M3

## Water resistance:

FIBROFLEX® exhibits outstanding long-term stability under exposure to water of up to +50 °C. Swelling and/or destructive influences remain absent. This typical resistance against hydrolysis is characteristic for the specific molecular structure of the elastomer. Water/oil emulsions present no problems either. This very high resistance to hydrolysis is characteristic of the specific chemical structure of the elastomer. These are clear advantages of FIBROFLEX® over other polyurethane elastomer structures.

## Resistance to oil, chemicals, and solvents

FIBROFLEX® is presenting an excellent resistance to oil and solvents and is, particularly, suiting applications in connection with lubricating oil and fuel.

Typical data of chemical resistance are shown in the following table.

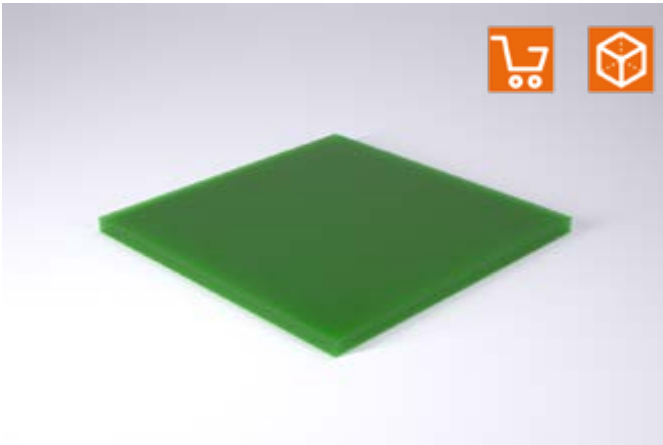
**Table 1: Chemical resistance**

Diesel Fuel	○
Mineral Fats, acc. to additives	+ up to -
Vegetabilic Fats	+
Animal Fats	+
Petrol (free of alcohols)	○
Mineral Oils – depending on additives	+
Paraffin	+ up to -
Rape Seed Oil	+
Lubricants on Mineral Oil Basis	○
Soap Emulsions	-
Vaseline	+
Water at +95 °C	-
Water at +20 °C	+ up to ○

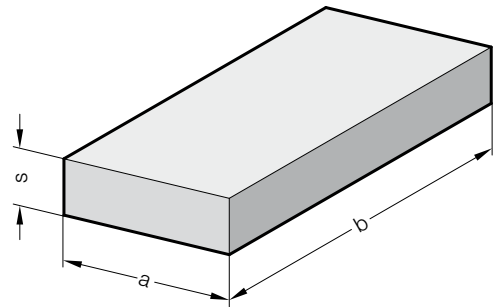
- + resistant = can be used
- conditionally resistant = conditional use
- not resistant = not recommended

Please note that blended oils and fats may have detrimental influence due to their various additives. In order to eliminate any risk, it is recommended to test the elastomer under exposure to any specific oily and/or fatty substance. Such tests ought to be run for several weeks.

# FIBROFLEX®-PLATE



251.




### Execution:

FIBROFLEX® is available in 3 Shore hardnesses:

.5.=80 Shore A = colour: Green

.6.=90 Shore A = colour: Yellow

.7.=95 Shore A = colour: Red

 Further technical data at the beginning of Chapter G.

### Ordering Code (example):

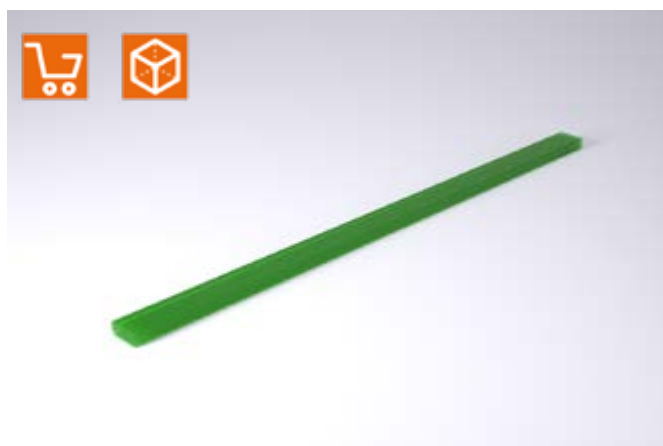
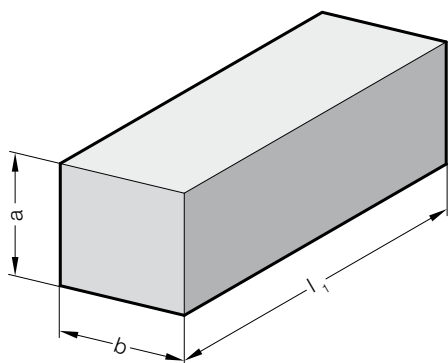
FIBROFLEX®-Plate		=251.
Spring hardness	80 Shore A	= 5.
Thickness s	15 mm	= 015.
Length a	250 mm	= 0250.
Width b	250 mm	= 0250
Order No		=251. 5.015. 0250. 0250

### 251. FIBROFLEX®-Plate

a	250	250	500	500	1000
b	250	500	500	1,000	1,000
s					
1	●	●	●	●	
2	●	●	●	●	
3	●	●	●	●	
4	●	●	●	●	
5	●	●	●	●	
6	●	●	●	●	
7	●	●	●	●	
8	●	●	●	●	●
10	●	●	●	●	●
12	●	●	●	●	●
15	●	●	●	●	●
20	●	●	●	●	●
25	●	●	●	●	●
30	●	●	●	●	●
40	●	●	●	●	●
50	●	●	●	●	●
60	●	●	●	●	
70	●	●	●	●	
80	●	●	●	●	

# FIBROFLEX®-SQUARE ROD

252.



### Execution:

FIBROFLEX® is available in 3 Shore hardnesses:

.5.=80 Shore A = colour: Green

.6.=90 Shore A = colour: Yellow

.7.=95 Shore A = colour: Red

Further technical data at the beginning of Chapter G.

### Note:

1) Dimension b machined

### Ordering Code (example):

FIBROFLEX®-Square rod	=252.
Spring hardness	80 Shore A = 5.
Height a	20 mm = 020.
Width b	50 mm = 050.
Length l <sub>1</sub>	1000 mm = 1000
Order No	=252. 5.020. 050. 1000

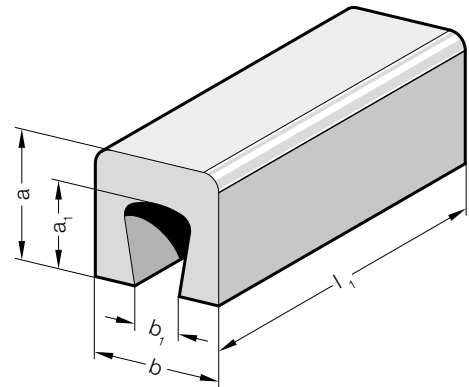
## 252. FIBROFLEX®-Square rod

a	b		l <sub>1</sub>	250	500	1000
8	8	1)				●
8	15	1)				●
8	25	1)				●
8	50	1)				●
10	10	1)				●
10	15	1)				●
10	25	1)				●
10	50	1)				●
12	12	1)				●
12	20	1)				●
12	30	1)				●
12	50	1)				●
15	15			●	●	●
15	25	1)				●
15	40	1)				●
15	50	1)				●
20	20	1)				●
20	30	1)				●
20	40	1)				●
20	50	1)				●
22	22			●	●	●
25	25	1)				●
25	40	1)				●
25	60	1)				●
25	80	1)				●
30	30			●	●	●
40	40	1)				●
40	60			●	●	●
45	45			●	●	●
50	50			●	●	●
50	180			●	●	●
60	60			●	●	●
60	80			●	●	●
80	80			●	●	●
80	100			●	●	●
100	100			●	●	●
100	125			●	●	●
100	180			●	●	●
125	125			●	●	●

# FIBROFLEX®-U-PROFIL ROD



250.



### Execution:

FIBROFLEX® is available in 3 Shore hardnesses:

.5.=80 Shore A = colour: Green

.6.=90 Shore A = colour: Yellow

.7.=95 Shore A = colour: Red

Further technical data at the beginning of Chapter G.

### Ordering Code (example):

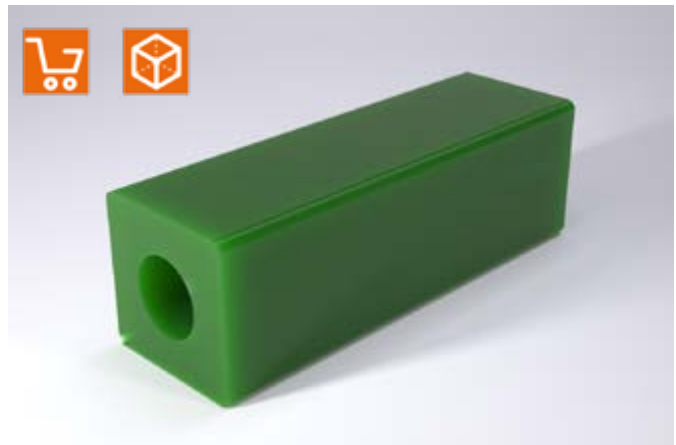
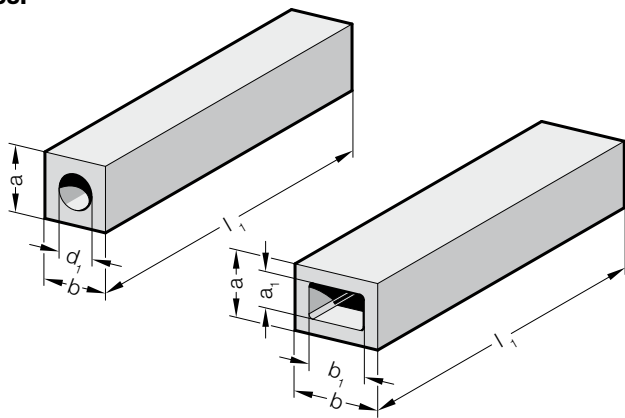
FIBROFLEX®-U-Profil rod	=250.
Spring hardness MAT	80 Shore A = 5.
Height a	75 mm = 075.
Width b	100 mm = 100.
Length l <sub>1</sub>	250 mm = 0250
Order No	=250. 5.075. 100. 0250

### 250. FIBROFLEX®-U-Profil rod

a	b	a <sub>1</sub>	b <sub>1</sub>	l <sub>1</sub>	250	500
50	50	35	20		●	●
50	75	35	30		●	●
75	100	50	40		●	●
100	200	60	120		●	●

# FIBROFLEX®-HOLLOW SQUARE ROD

255.



### Execution:

FIBROFLEX® is available in 3 Shore hardnesses:

.5.=80 Shore A = colour: Green

.6.=90 Shore A = colour: Yellow

.7.=95 Shore A = colour: Red

Further technical data at the beginning of Chapter G.

### Ordering Code (example):

FIBROFLEX®-Hollow Square rod		=255.
Spring hardness MAT	80 Shore A	= 5.
Height a	80 mm	= 080.
Width b	80 mm	= 080.
Length l <sub>1</sub>	250 mm	= 0250
Order No		=255.5.080.080.0250

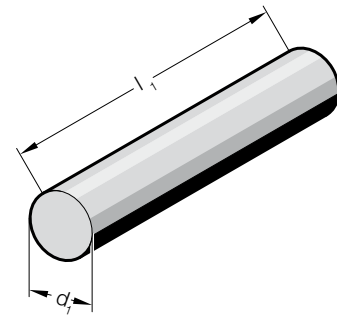
### 255. FIBROFLEX®-Hollow Square rod

a	b	a <sub>1</sub>	b <sub>1</sub>	d <sub>1</sub>	l <sub>1</sub>	250	500	1000
40	60	20	35					
45	45			20				
50	50			25				
50	180	20	120					
60	60			30		●		
60	80	30	50					
80	80			40		●		
80	100	40	60			●	●	
100	100	50	50			●		
100	125	50	70			●	●	
100	180	50	123			●	●	●
125	125	75	75					

# FIBROFLEX®-ROUND ROD



253.




### Execution:

FIBROFLEX® is available in 3 Shore hardnesses:

.5.=80 Shore A = colour: Green

.6.=90 Shore A = colour: Yellow

.7.=95 Shore A = colour: Red

 Further technical data at the beginning of Chapter G.

### Ordering Code (example):

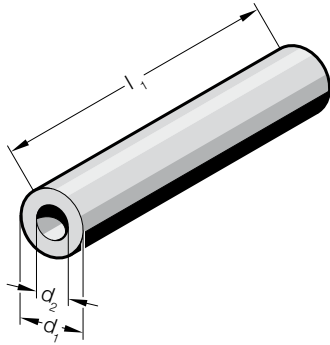
FIBROFLEX®-Round rod	=253.
Spring hardness MAT 80 Shore A	= 5.
Outer diameter $d_1$ 3 mm	= 003
Order No	=253.5.003

### 253. FIBROFLEX®-Round rod

$d_1$	$l_1$	330	500	1,000
2		●		
3				●
4				●
5				●
6				●
7				●
8				●
10				●
12				●
16		●		
20			●	
25			●	
32			●	
40			●	
50			●	
63			●	
80			●	
100			●	
125			●	
140			●	
150			●	
160			●	
180			●	
200			●	

# FIBROFLEX®-HOLLOW ROUND ROD

254.



### Execution:

FIBROFLEX® is available in 3 Shore hardnesses:

.5.=80 Shore A = colour: Green

.6.=90 Shore A = colour: Yellow

.7.=95 Shore A = colour: Red

Further technical data at the beginning of Chapter G.

### Ordering Code (example):

FIBROFLEX®-Hollow round rod	=254.
Spring hardness MAT	80 Shore A = 5.
Outer diameter $d_1$	80 mm = 080
Order No	=254. 5.080

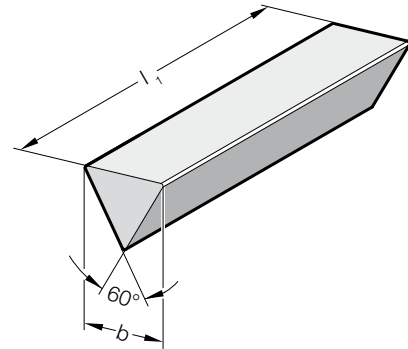
### 254. FIBROFLEX®-Hollow round rod

$d_1$	$d_2$	$l_1$	330	500
16	6.5		●	
20	8.5			●
25	10.5			●
32	13.5			●
40	13.5			●
50	17			●
63	17			●
80	21			●
100	21			●
125	27			●
140	50			●
150	50			●
160	50			●
180	50			●
200	50			●

## FIBROFLEX®-TRIANGULAR ROD (60°)



256.




### Execution:

FIBROFLEX® is available in 3 Shore hardnesses:

.5.=80 Shore A = colour: Green

.6.=90 Shore A = colour: Yellow

.7.=95 Shore A = colour: Red

 Further technical data at the beginning of Chapter G.

### Ordering Code (example):

FIBROFLEX®-Triangular rod (60°)		=256.
Spring hardness MAT	80 Shore A	= 5.
Edge length b	50 mm	= 050.
Length l <sub>1</sub>	250 mm	= 0250
Order No		=256. 5.050. 0250

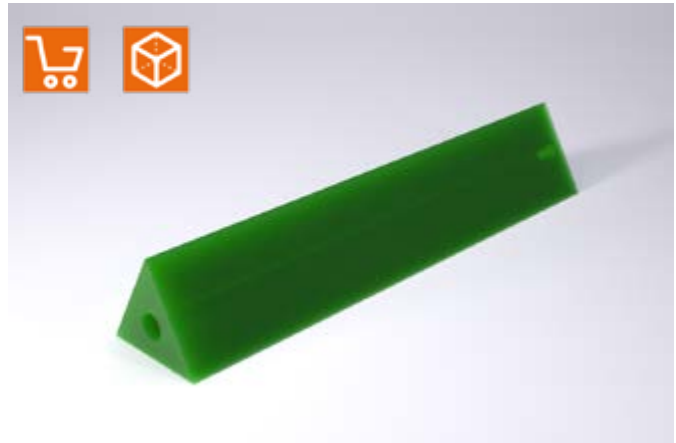
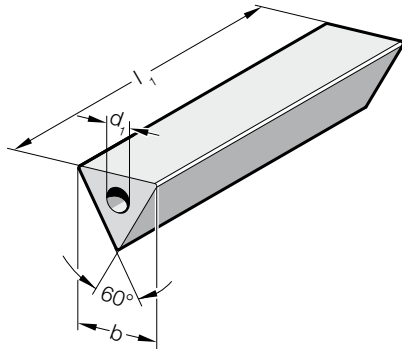
### 256. FIBROFLEX®-Triangular rod (60°)

b	l <sub>1</sub>	250	500
35		●	●
50		●	●
80		●	●



## FIBROFLEX®-HOLLOW TRIANGULAR ROD (60°)

257.




### Execution:

FIBROFLEX® is available in 3 Shore hardnesses:

.5.=80 Shore A = colour: Green

.6.=90 Shore A = colour: Yellow

.7.=95 Shore A = colour: Red

 Further technical data at the beginning of Chapter G.

### Ordering Code (example):

FIBROFLEX®-Hollow triangular rod (60°)	=257.
Spring hardness MAT	80 Shore A = 5.
Kantenlänge b	50 mm = 050.
Length l <sub>1</sub>	250 mm = 0250
Order No	=257. 5.050. 0250

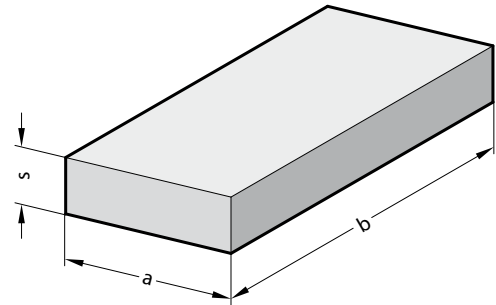
### 257. FIBROFLEX®-Hollow triangular rod (60°)

b	d <sub>1</sub>	l <sub>1</sub>	250	500
35	8		●	●
50	12		●	●
80	20		●	●

# FIBROELAST®-PLATE



2511.3.



**Material:**

Polyester-based polyurethane  
Hardness 65 Shore A

**Colour:**

white

**Note:**

Other plate thicknesses available upon request.

**Physical properties:**

Shore hardness A: 65  
100% modulus of elasticity: 2,4 [N/mm<sup>2</sup>]  
300% modulus of elasticity: 4,6 [N/mm<sup>2</sup>]  
Tensile strength: 26 [N/mm<sup>2</sup>]  
Elongation: 550 [%]  
Tear resistance: 46 [kN/m]

Permanent set (70°C): 45 [%]  
Rebound elasticity: 58 [%]  
Maximum deformation: 40 [%]

**Ordering Code (example):**

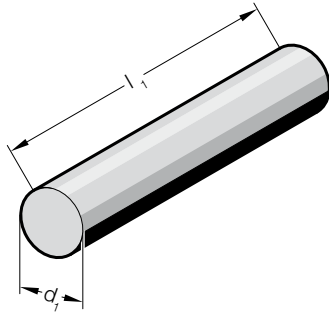
FIBROELAST®-Plate	=2511.3.
Thickness s	6 mm = 006.
Width a	500 mm = 0500.
Length b	500 mm = 0500.
Order No	=2511.3. 006. 0500. 0500

**2511.3. FIBROELAST®-Plate**

a	250	250	500	500
b	250	500	500	1,000
s				
1	●	●	●	●
2	●	●	●	●
3	●	●	●	●
4	●	●	●	●
5	●	●	●	●
6	●	●	●	●
7	●	●	●	●
8	●	●	●	●
10	●	●	●	●
12	●	●	●	●
15	●	●	●	●

## FIBROELAST®-ROUND ROD

2531.4.



### Material:

Polyester-based polyurethane  
Hardness 70 Shore A

### Colour:

white

### Physical properties:

Shore hardness A: 70  
100% modulus of elasticity: 3,0 [N/mm<sup>2</sup>]  
300% modulus of elasticity: 6,0 [N/mm<sup>2</sup>]  
Tensile strength: 28 [N/mm<sup>2</sup>]  
Elongation: 500 [%]  
Tear resistance: 58 [kN/m]  
Permanent set (70°C): 45 [%]  
Rebound elasticity: 55 [%]  
Maximum deformation: 40 [%]

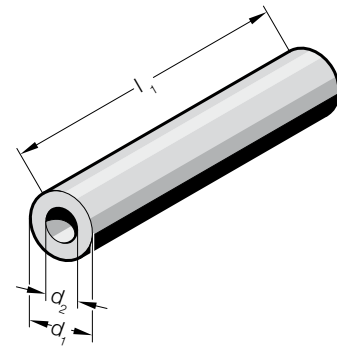
### 2531.4. FIBROELAST®-Round rod

Order No	$d_1$	$l_1$
2531.4.016	16	330
2531.4.020	20	500
2531.4.025	25	500
2531.4.032	32	500
2531.4.040	40	500
2531.4.050	50	500
2531.4.063	63	500
2531.4.080	80	500
2531.4.100	100	500
2531.4.125	125	500

## FIBROELAST®-HOLLOW ROUND ROD



2541.4.



### Material:

Polyester-based polyurethane  
Hardness 70 Shore A

### Colour:

white

### Note:

FIBROELAST®-Hollow round rods can also be used as springs.

### Physical properties:

Shore hardness A: 70  
100% modulus of elasticity: 3,0 [N/mm<sup>2</sup>]  
300% modulus of elasticity: 6,0 [N/mm<sup>2</sup>]  
Tensile strength: 28 [N/mm<sup>2</sup>]  
Elongation: 500 [%]  
Tear resistance: 58 [kN/m]

Permanent set (70°C): 45 [%]  
Rebound elasticity: 55 [%]  
Maximum deformation: 40 [%]

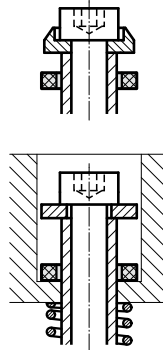
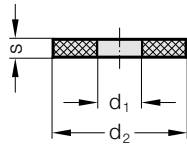
### 2541.4. FIBROELAST®-Hollow round rod

Order No	d <sub>1</sub>	d <sub>2</sub>	l <sub>1</sub>
2541.4.016	16	6.5	330
2541.4.020	20	8.5	500
2541.4.025	25	10.5	500
2541.4.032	32	13.5	500
2541.4.040	40	13.5	500
2541.4.050	50	17	500
2541.4.063	63	17	500
2541.4.080	80	21	500
2541.4.100	100	21	500
2541.4.125	125	27	500

# SHOCK ABSORBING WASHER

2450.

Mounting example



## Material:

Polyurethan (FIBROFLEX®)

## Execution:

2450.6. (90 Shore A) available from stock

2450.5. (80 Shore A) and

2450.7. (95 Shore A) available upon request

## 2450. Shock absorbing washer

$d_1$	$d_2$	s	$d_1$	$d_2$	s	$d_1$	$d_2$	s
6.4	16	3	21	30	5	32	49	8
11	17	3	13.5	32	4	17	50	6
8.5	20	3	25	32	6	26	50	6
14	23	4	18	32	7	37	53	8
12	24	5	21	35	7	32	60	10
10.5	15	4	23.5	34	4	17	63	6
10.5	25	4	26	35	6	37	65	10
13	19	4	17	38	5	42	70	10
13	25	4	21	38	6	21	80	10
14	26	5	13.5	40	5	21	100	10
15.5	23	4	32	40	6	27	125	10
17	26	4	27	41	7			
18	27	4	31	42	6			
22	28	6	37	46	6			

## Ordering Code (example):

Shock absorbing washer	=2450.
Shore-A hardness MAT 90 Shore A	= 6.
Inner diameter $d_1$ 23.5 mm	= 23.
Outer diameter $d_2$ 34 mm	= 034.
Thickness s 4 mm	= 04
Order No	=2450. 6. 23.034. 04



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

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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.

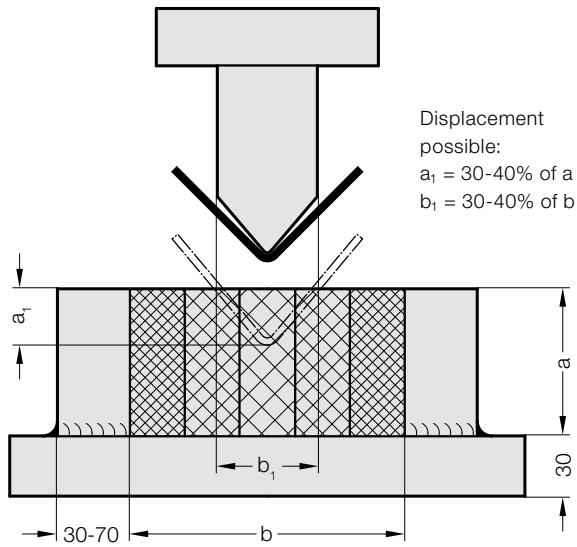
Hydraulic presses are preferred over mechanical presses due to their pressure build-up. The slowly building pressure counteracts the form-altering response of the FIBROFLEX® forming material.

With mechanical presses there is a risk of the press being destroyed 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

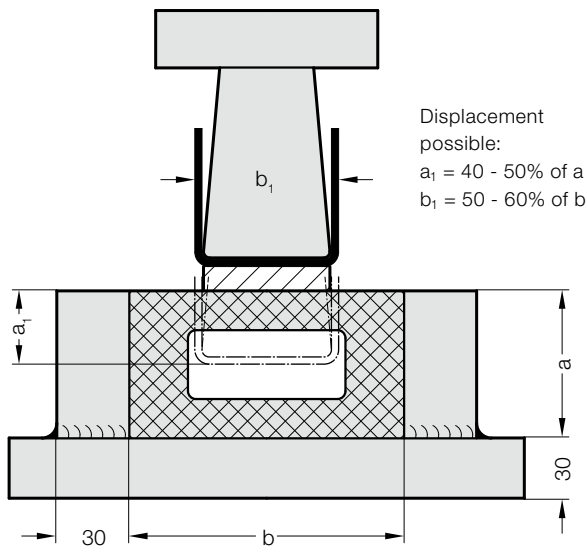
Fig. 5



## 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.

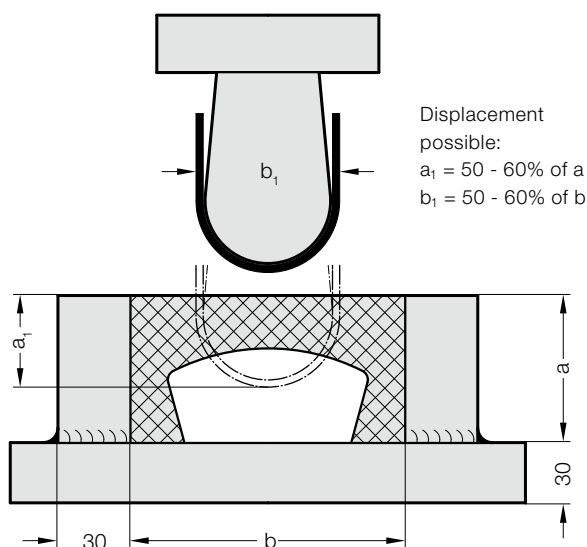
Where solid sections or sheet is used as a cushion, wear of the elastomer material can be reduced through creation of an additional displacement space at the bottom of the cushion retainer box, similar to Fig. 11, where gib inserts are placed along the corners.

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 of 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.

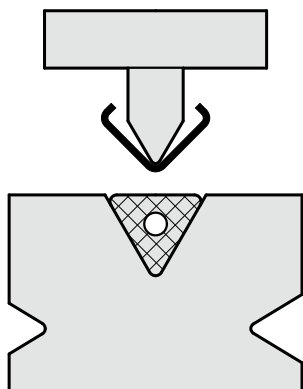
The hollow space of the channel-shaped cushion has the effect of increasing the horizontal pressure component in the die; this also holds true for hollow die cushions.

In all cases is it necessary to ensure that the cushion retainer box is sufficiently rigid.



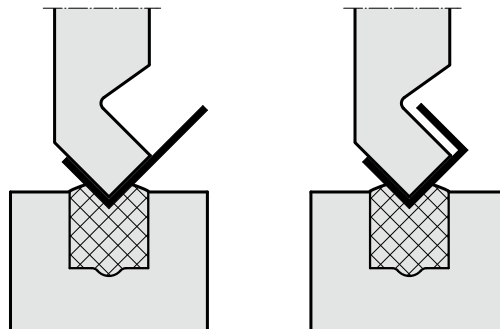
# APPLICATION EXAMPLES OF FORMING OPERATIONS WITH FIBROFLEX® ELASTOMERS

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.

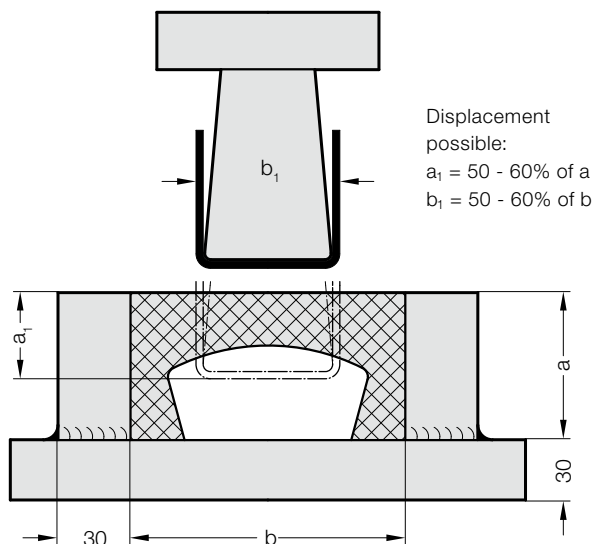
Fig. 9



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.

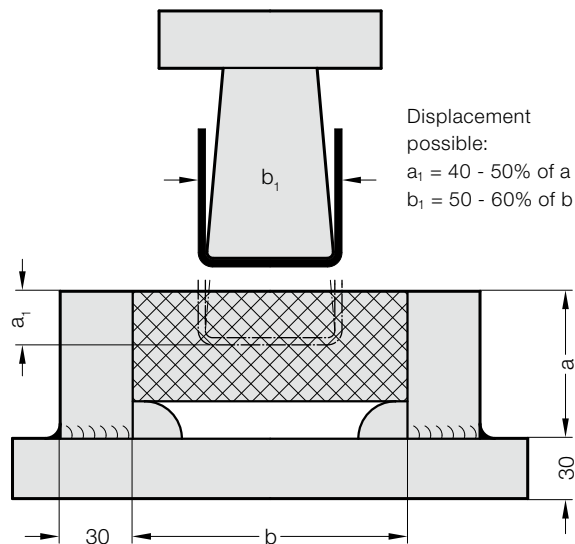
Two operational sequences are required, and a goose-necked punch configuration is essential.

Fig. 10



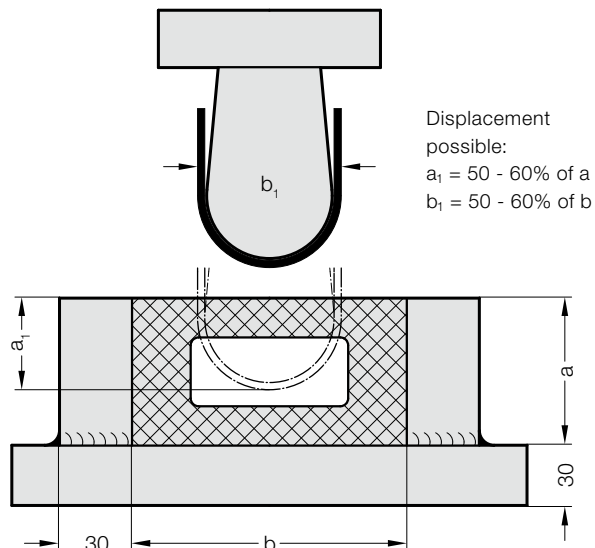
Displacement possible:  
 $a_1 = 50 - 60\%$  of  $a$   
 $b_1 = 50 - 60\%$  of  $b$

Fig. 11



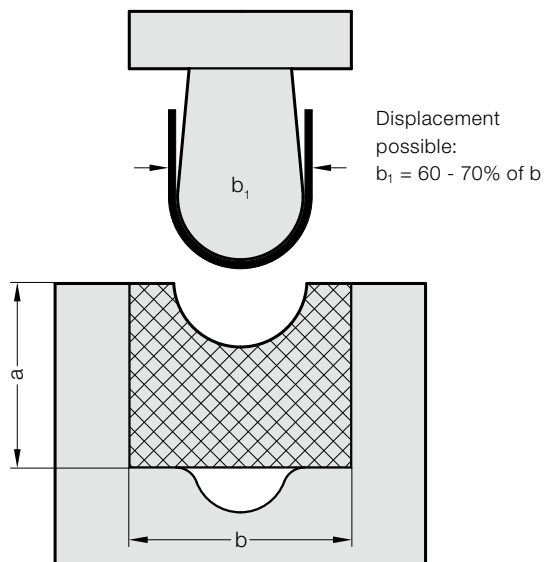
Displacement possible:  
 $a_1 = 40 - 50\%$  of  $a$   
 $b_1 = 50 - 60\%$  of  $b$

Fig. 12



Displacement possible:  
 $a_1 = 50 - 60\%$  of  $a$   
 $b_1 = 50 - 60\%$  of  $b$

Fig. 13



Displacement possible:  
 $b_1 = 60 - 70\%$  of  $b$





## **BLANKING AND FORMING WITH FIBROFLEX®-ELASTOMERS**

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### **Description**

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### **Choice of machine**

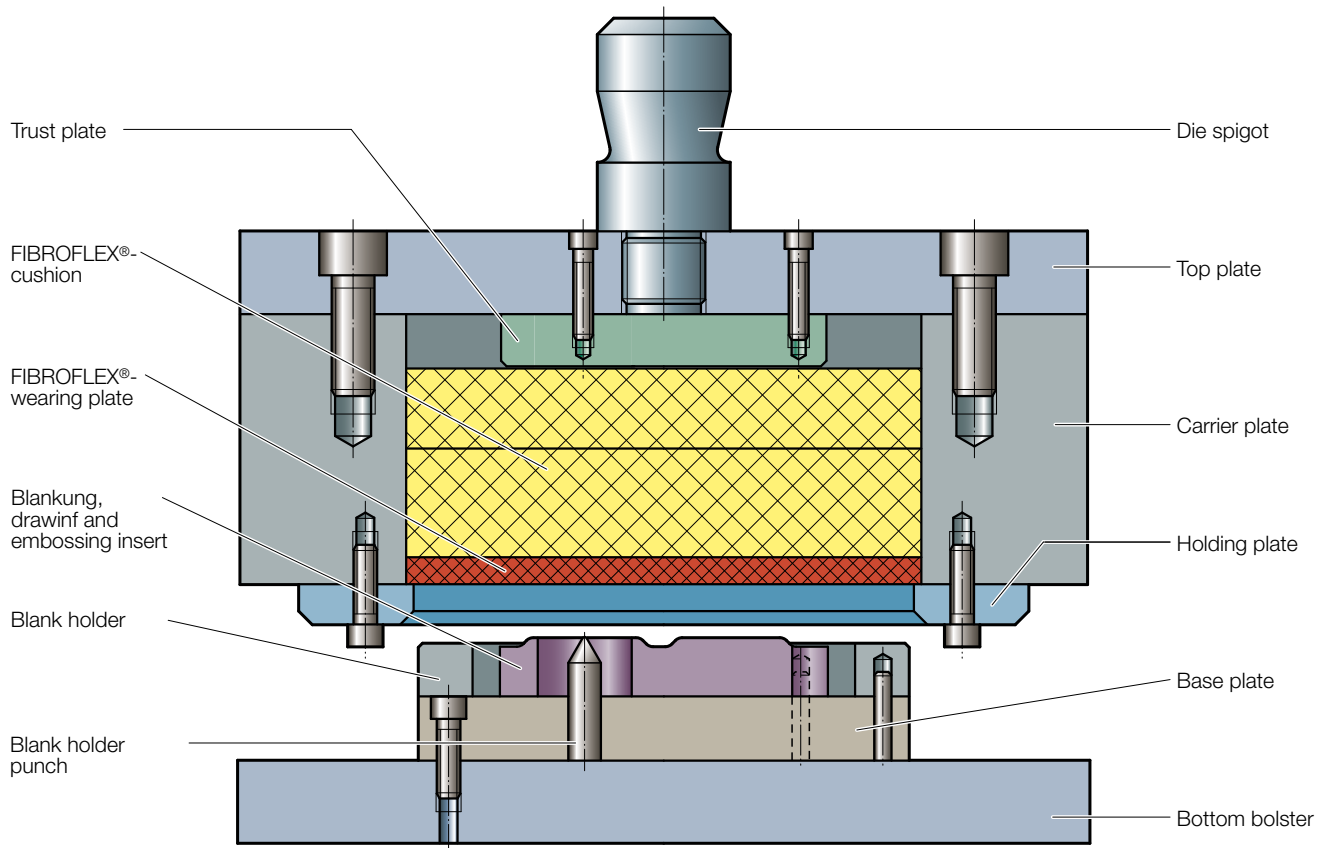
When FIBROFLEX® matrices are used for blanking, embossing and forming the machine must be able to accommodate the displacement.

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 the press being destroyed on overload, when the upper dead point is approached.

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



### Combined blanking – embossing – punching

The workpiece is completed at one pass.

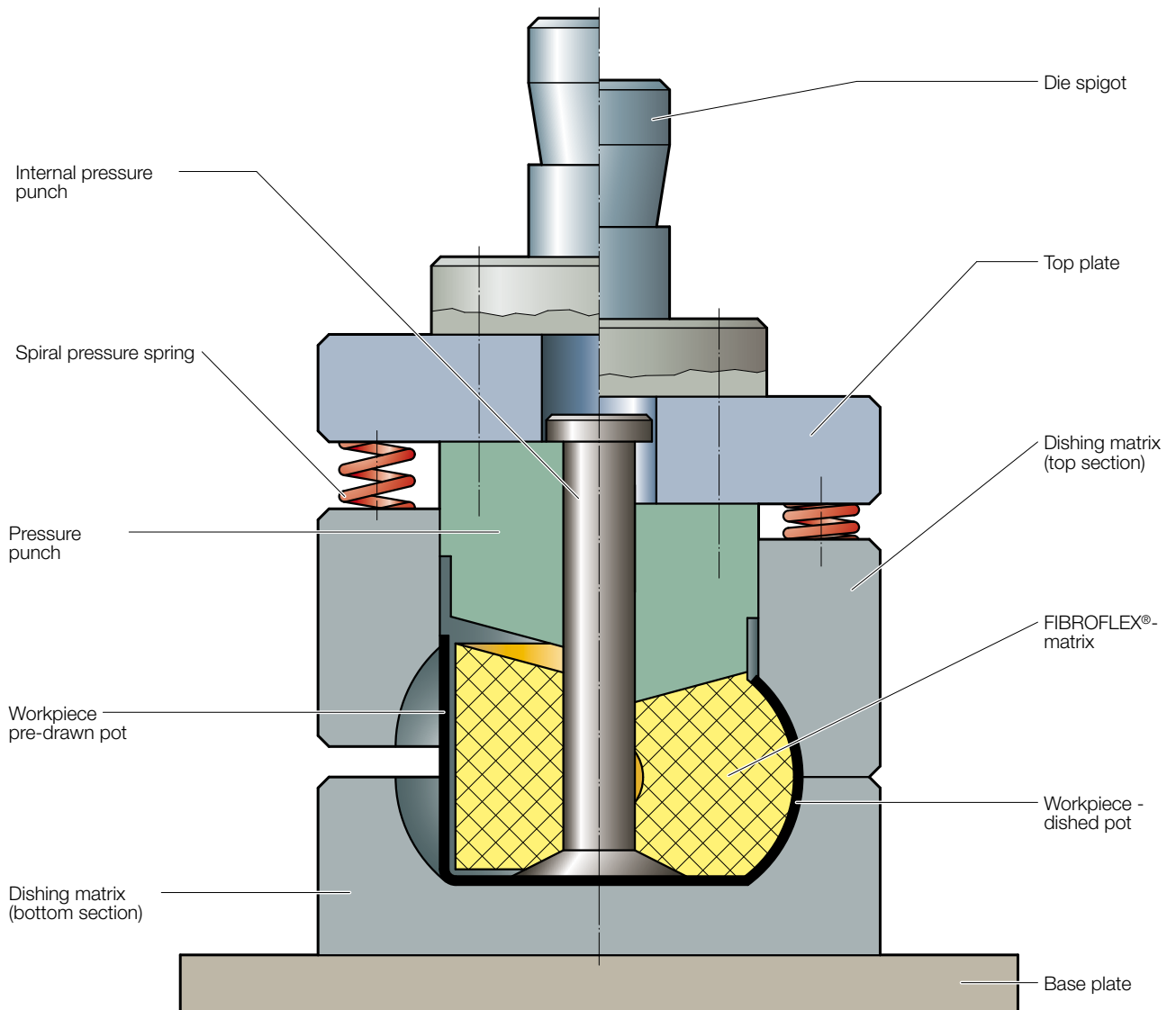
The shape is determined by the combined blanking, hole cutting and embossing matrix blank holder punch, without a reverse shape mould on the cushion side.

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.



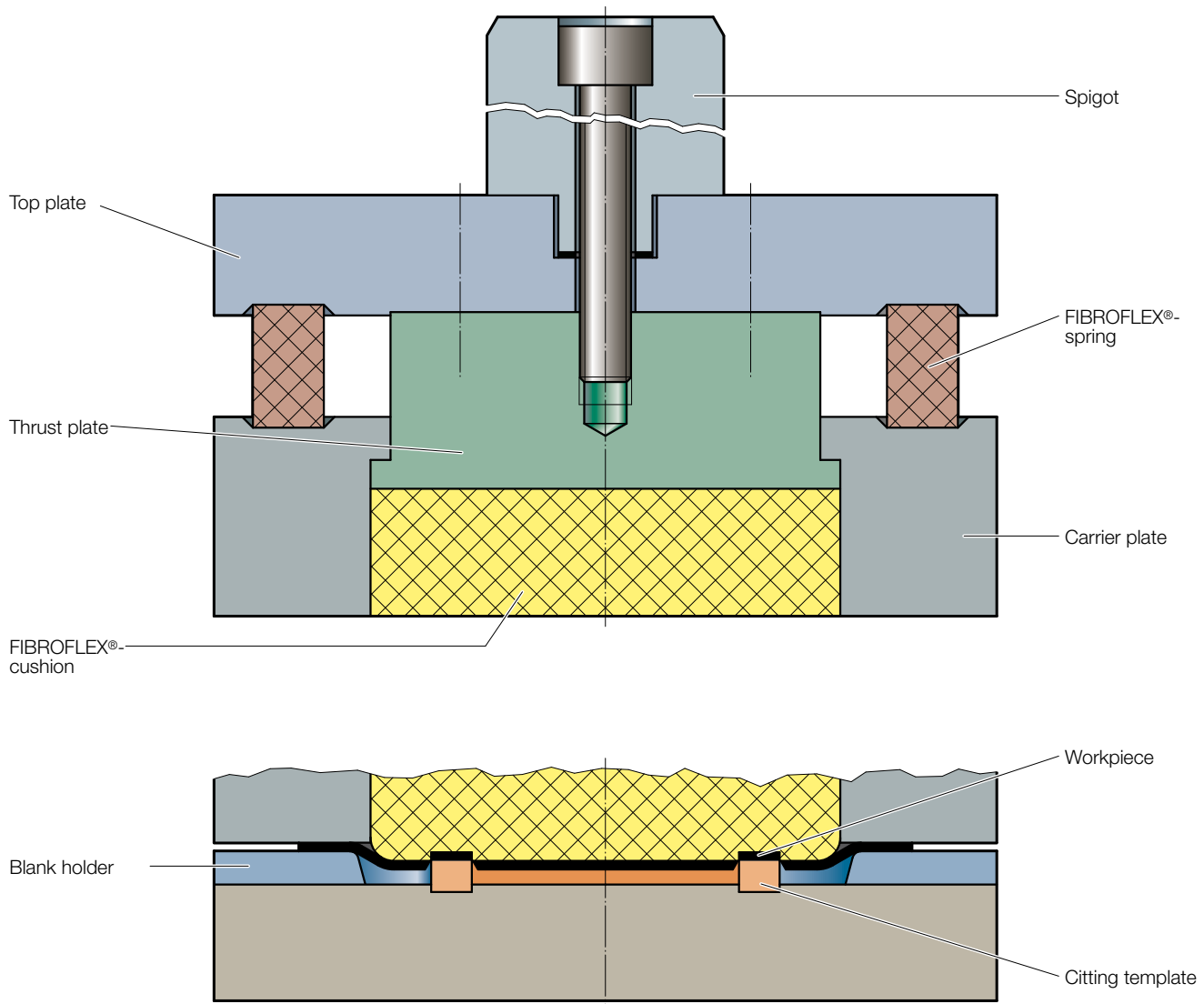
## FIBROFLEX® FORMING TOOL: BULGING A POT



### 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



### 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 up to 2.5 mm.

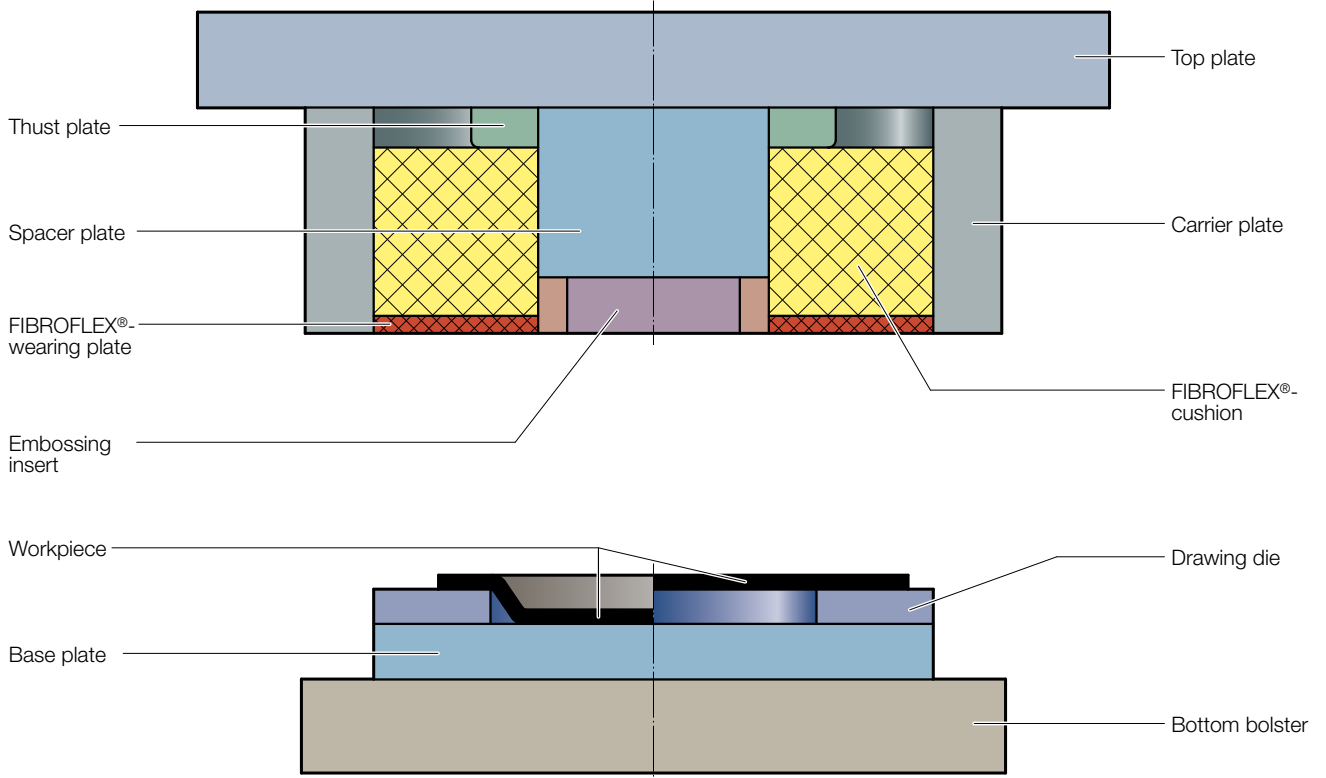
The even clamping pressure which is excellent for pressing also means that parts with intricate contours can be manufactured.

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. Spring band steels, electric sheets and sheet aluminium all cut well using this process. Deep-drawing sheet steel is unsuitable for the elastomer blanking process.

# 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:

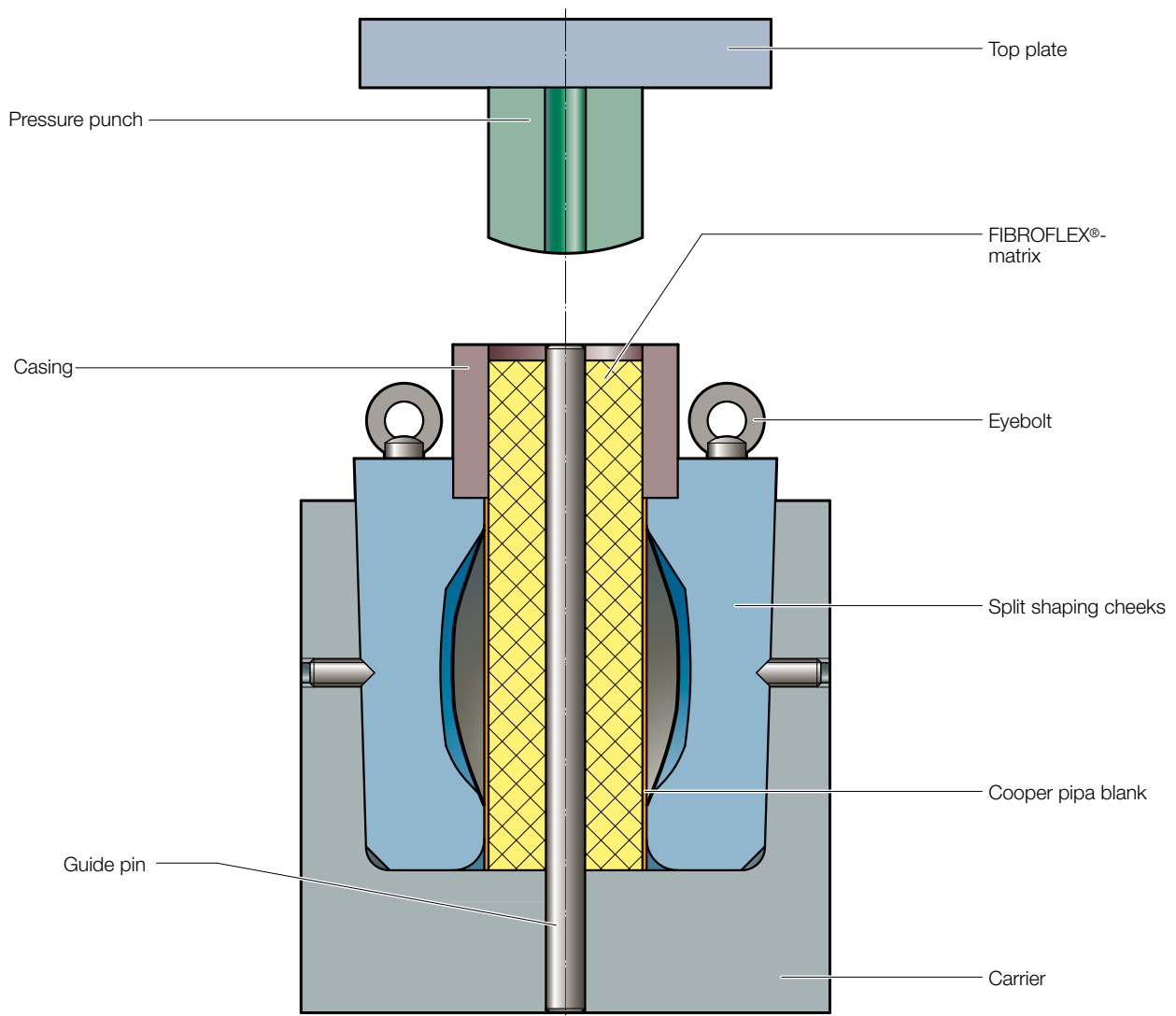
80 Shore A – 35%

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.



