

ELASTOMERS



FIBROFLEX® FORMING ELASTOMERS

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.

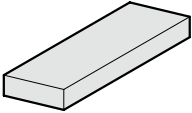
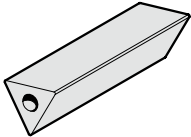
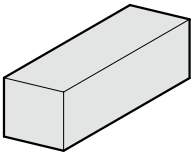
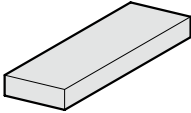
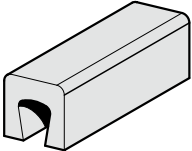
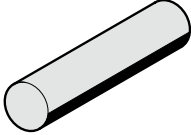
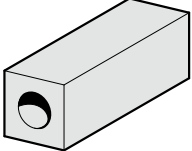
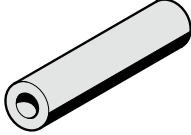
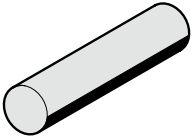

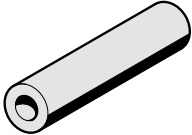
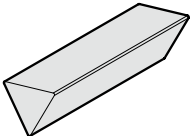
The "Application examples of forming operations" provide instructions for using alternative technology.

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.

ACCURATE PARTS TO CUSTOMERS SPECIFICATIONS

A collection of custom-machined plastic parts made from Fibroflex. The parts are in various colors (red, yellow, green) and shapes, including rings, blocks, and connectors. Some parts have the 'FIBROFLEX' logo printed on them. The parts are arranged in a cluster, showcasing the variety of shapes and sizes that can be produced.

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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 ³] | 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 ²] | 53504 | 36 | 38 | 49 |
| Elongation at fracture | [%] | 53504 | 450 | 400 | 360 |
| Tear strength | [N/mm] | 53515 | 21 | 29 | 50 |
| Abrasion resistance | [mm ³] | 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.

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.

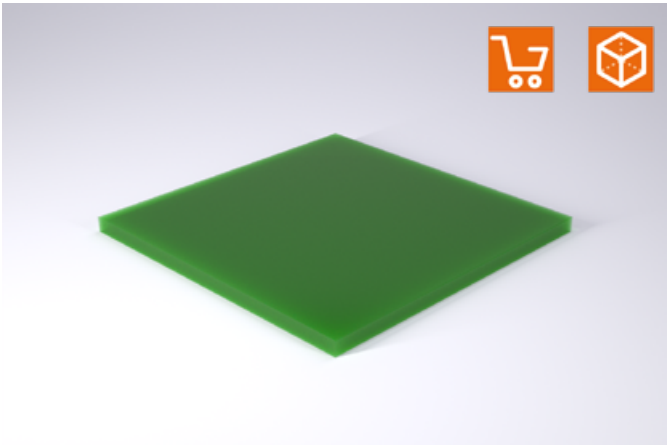
Table 1: Chemical resistance

| | |
|---------------------------------------|-----------|
| 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 ○ |

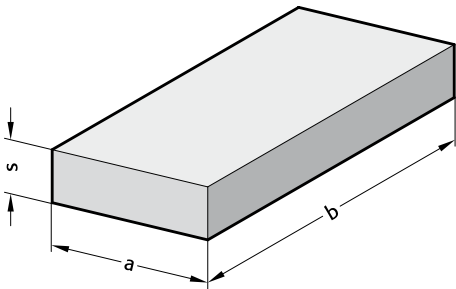
- + resistant = can be used
- conditionally resistant = conditional use
- not resistant = not recommended

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):

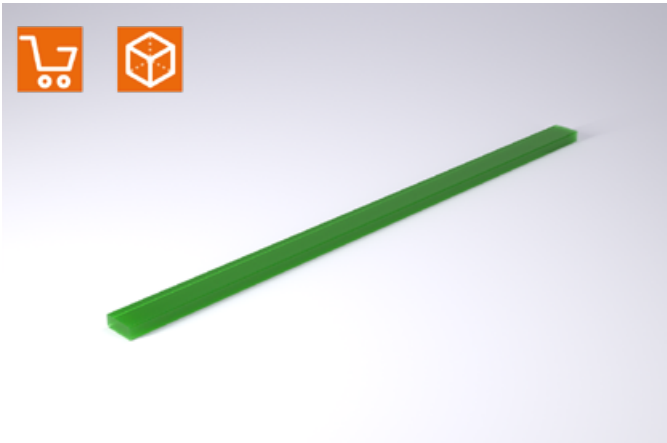
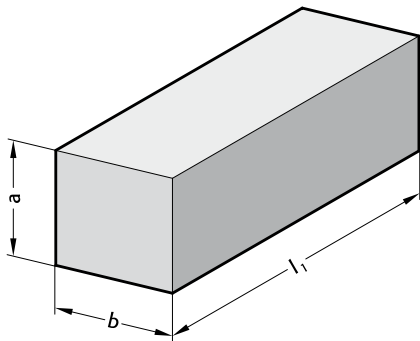
| | | |
|------------------|--------------|-------------------------|
| FIBROFLEX®-Plate | | =251. |
| Spring hardness | 80 Shore A = | 5. |
| Thickness s | 15 mm = | 015. |
| Length a | 250 mm = | 0250. |
| Width b | 250 mm = | 0250 |
| Order No | | =251. 5.015. 0250. 0250 |

251. FIBROFLEX®-Plate

| | | | | | |
|----|-----|-----|-----|-------|-------|
| a | 250 | 250 | 500 | 500 | 1,000 |
| 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

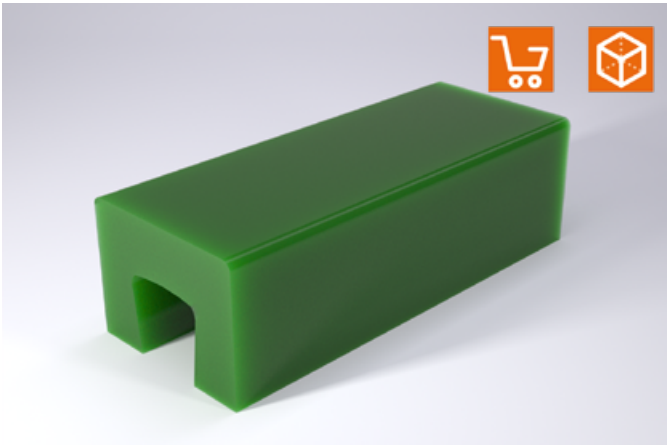
Ordering Code (example):

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

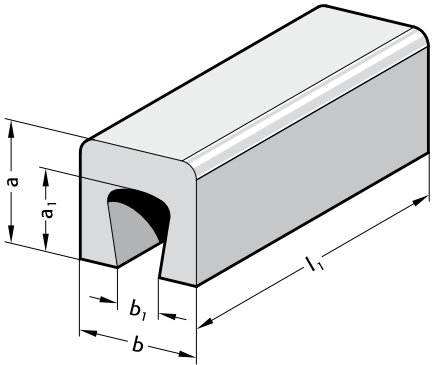
252. FIBROFLEX®-Square rod

| a | b | | l ₁ | 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):

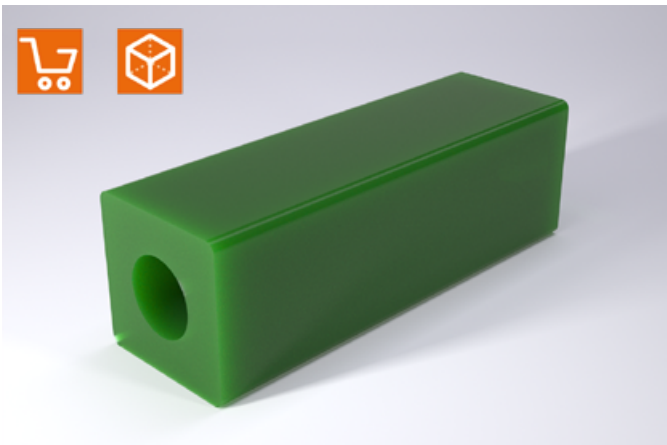
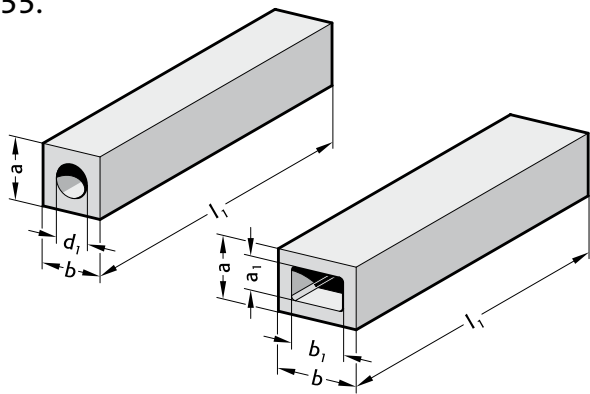
| | | |
|-------------------------|------------|-----------------------|
| FIBROFLEX®-U-Profil rod | | =250. |
| Spring hardness MAT | 80 Shore A | = 5. |
| Height a | 75 mm | = 075. |
| Width b | 100 mm | = 100. |
| Length l ₁ | 250 mm | = 0250 |
| Order No | | =250. 5.075. 100.0250 |

250. FIBROFLEX®-U-Profil rod

| a | b | a ₁ | b ₁ | l ₁ | 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 ₁ | 250 mm | = 0250 |
| Order No | | =255.5.080. 080. 0250 |

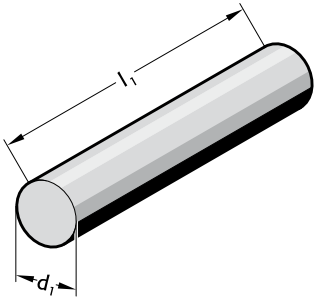
255. FIBROFLEX®-Hollow Square rod

| a | b | a ₁ | b ₁ | d ₁ | l ₁ | 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):

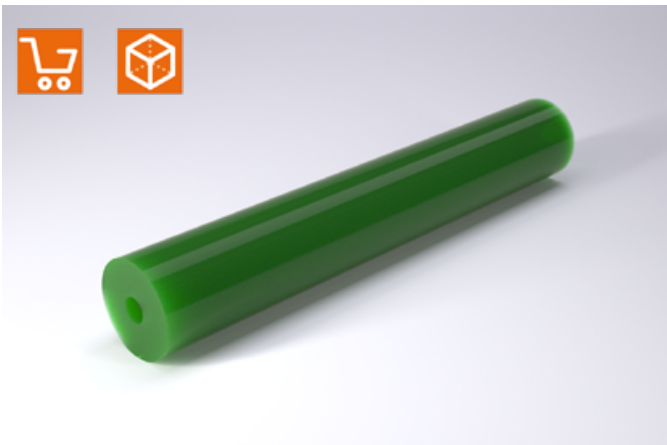
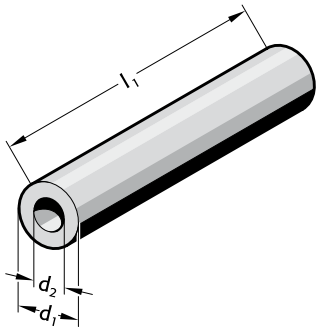
| | |
|-------------------------------|-----------------|
| FIBROFLEX®-Round rod | =253. |
| Spring hardness MAT | 80 Shore A = 5. |
| Outer diameter d ₁ | 3 mm = 003 |
| Order No | =253.5.003 |

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.

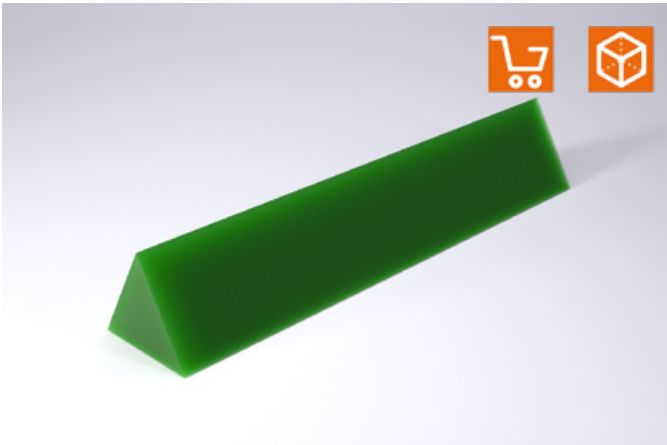
Ordering Code (example):

| | |
|-------------------------------|-----------------|
| FIBROFLEX®-Hollow round rod | =254. |
| Spring hardness MAT | 80 Shore A = 5. |
| Outer diameter d ₁ | 80 mm = 080 |
| Order No | =254. 5.080 |

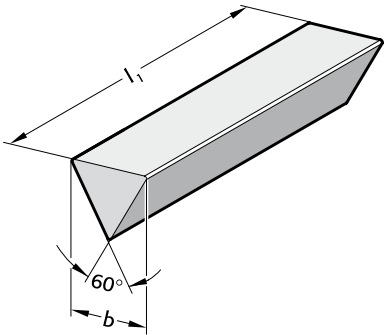
254. FIBROFLEX®-Hollow round rod

| 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):

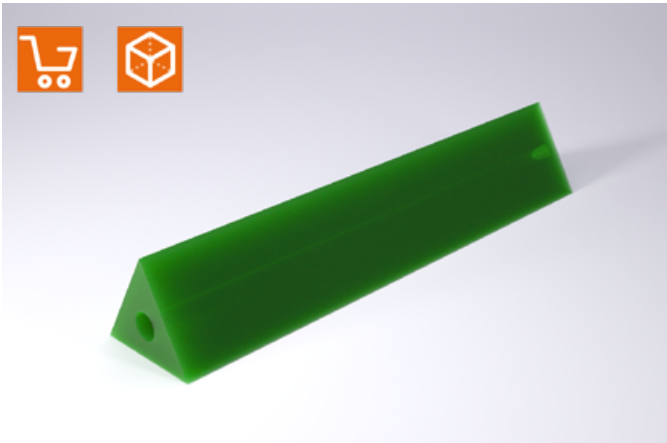
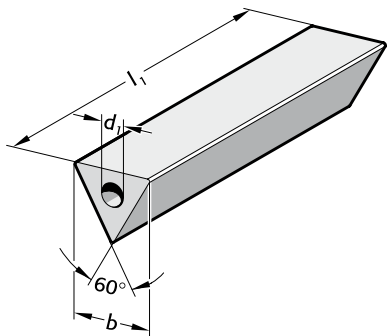
| | | |
|---------------------------------|------------|-------------------|
| FIBROFLEX®-Triangular rod (60°) | | =256. |
| Spring hardness MAT | 80 Shore A | = 5. |
| Edge length b | 50 mm | = 050. |
| Length l ₁ | 250 mm | = 0250 |
| Order No | | =256. 5.050. 0250 |

256. FIBROFLEX®-Triangular rod (60°)

| b | l ₁ | 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.

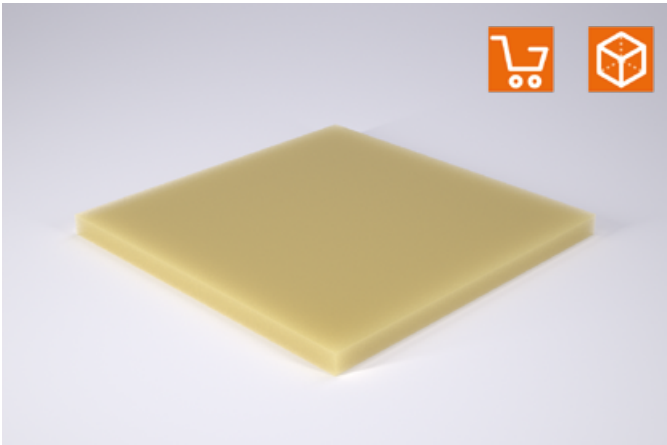
Ordering Code (example):

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

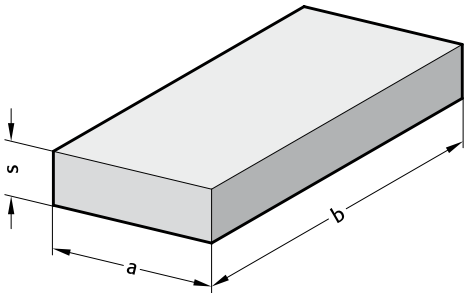
257. FIBROFLEX®-Hollow triangular rod (60°)

| b | d ₁ | l ₁ | 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/mm²]
300% modulus of elasticity: 4,6 [N/mm²]
Tensile strength: 26 [N/mm²]
Elongation: 550 [%]
Tear resistance: 46 [kN/m]

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

Ordering Code (example):

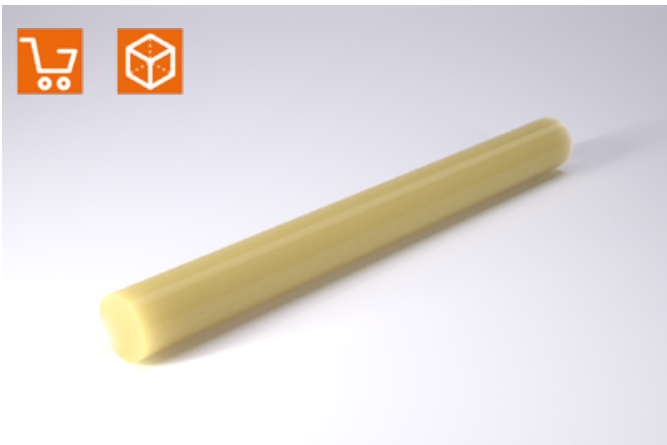
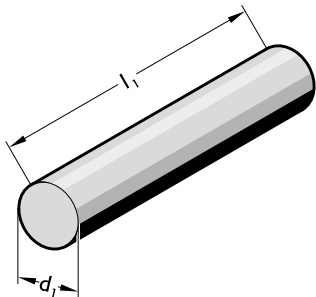
| | | |
|-------------------|--------|--------------------------|
| FIBROELAST®-Plate | | =2511.3. |
| Thickness s | 6 mm | = 006. |
| Width a | 500 mm | = 0500. |
| Length b | 500 mm | = 0500 |
| Order No | | =2511.3. 006. 0500. 0500 |

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/mm²]
300% modulus of elasticity: 6,0 [N/mm²]
Tensile strength: 28 [N/mm²]
Elongation: 500 [%]
Tear resistance: 58 [kN/m]
Permanent set (70°C): 45 [%]
Rebound elasticity: 55 [%]
Maximum deformation: 40 [%]

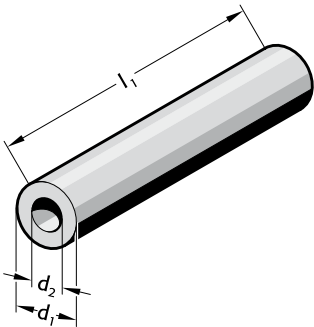
2531.4. FIBROELAST®-Round rod

| 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/mm²]
300% modulus of elasticity: 6,0 [N/mm²]
Tensile strength: 28 [N/mm²]
Elongation: 500 [%]
Tear resistance: 58 [kN/m]

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

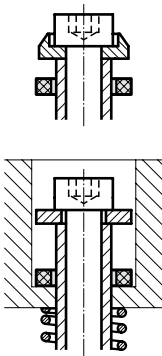
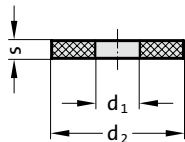
2541.4. FIBROELAST®-Hollow round rod

| Order No | d ₁ | d ₂ | l ₁ |
|------------|----------------|----------------|----------------|
| 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

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

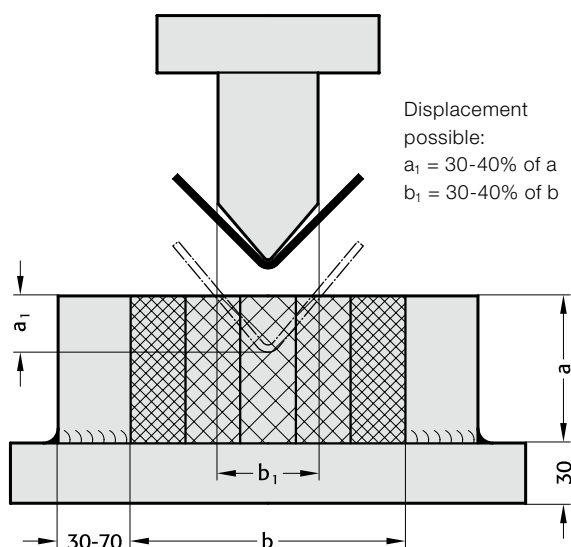
When FIBROFLEX® matrices are used for blanking, embossing and forming the machine must be able to accommodate the displacement.

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

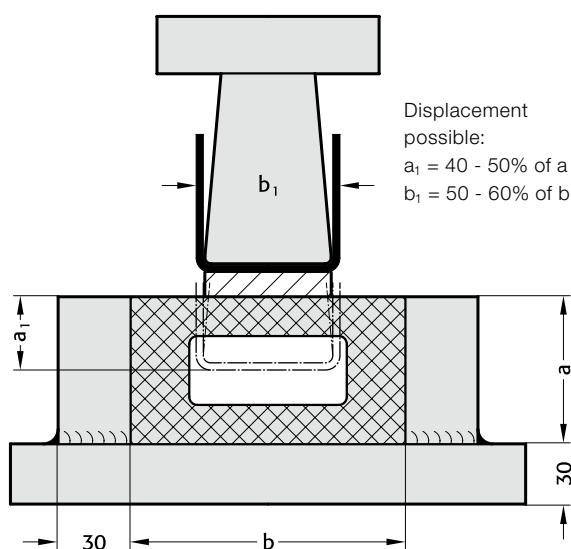
Fig. 5



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.

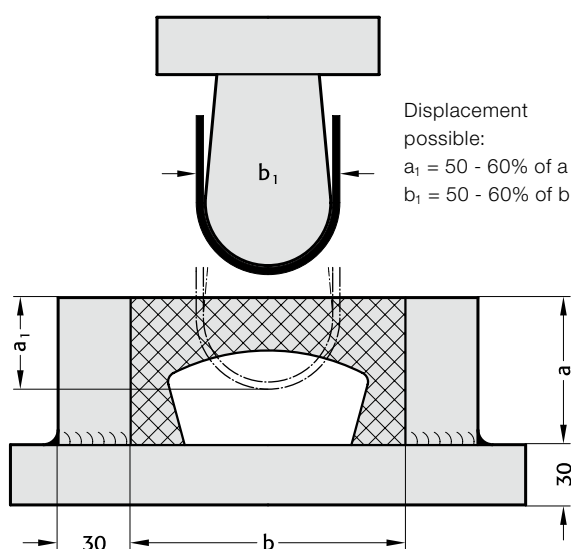
Where solid sections or sheet is used as a cushion, wear of the elastomer material can be reduced through creation of an additional displacement space at the bottom of the cushion retainer box, similar to Fig. 11, where gip inserts are placed along the corners.

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.

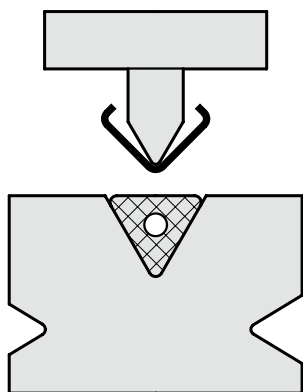
This is illustrated in Figs. 7 and 12. Another alternative consists of machined form cushions in accordance with Fig. 13.

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.

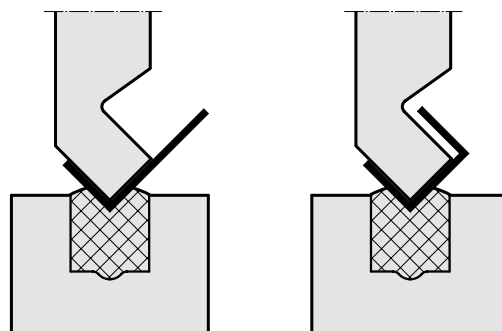
APPLICATION EXAMPLES OF FORMING OPERATIONS WITH FIBROFLEX® ELASTOMERS

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.

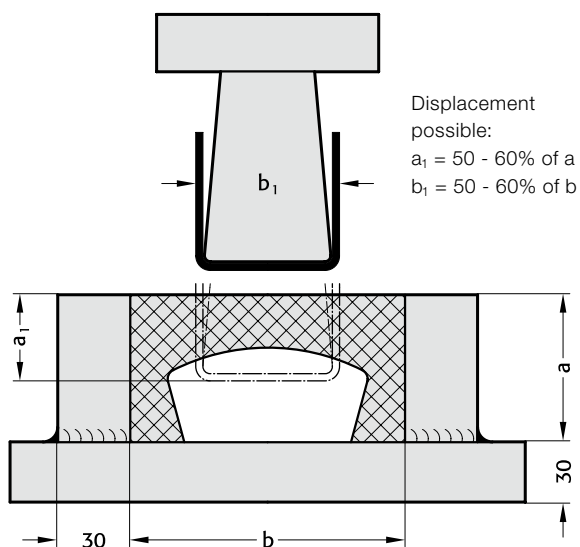
Fig. 9



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.

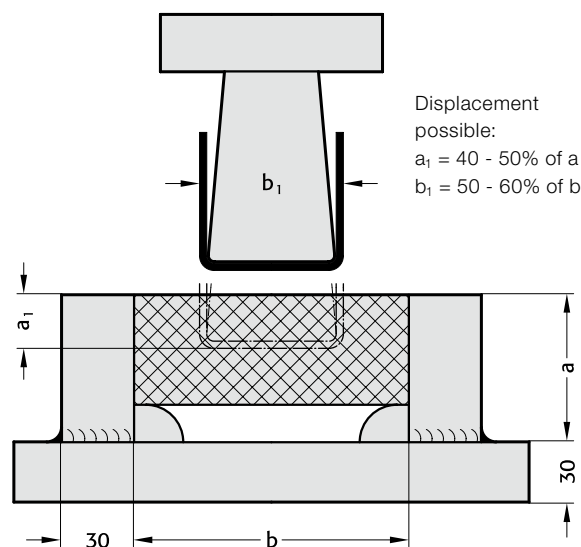
Two operational sequences are required, and a goose-necked punch configuration is essential.

Fig. 10



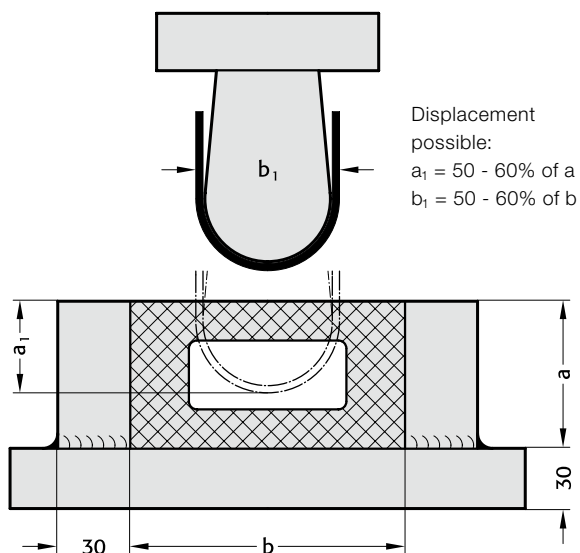
Displacement possible:
 $a_1 = 50 - 60\%$ of a
 $b_1 = 50 - 60\%$ of b

Fig. 11



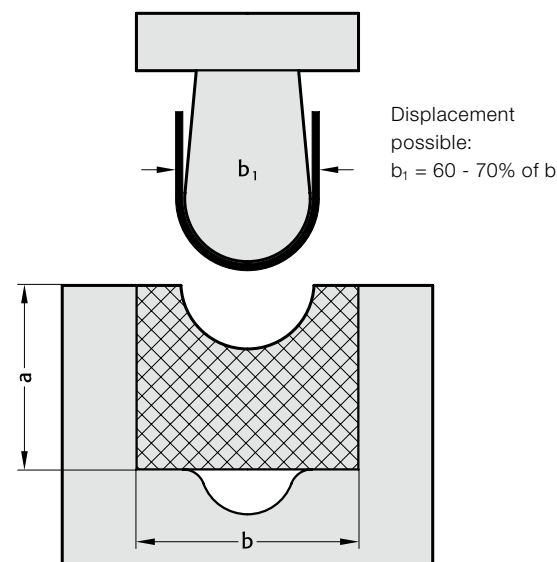
Displacement possible:
 $a_1 = 40 - 50\%$ of a
 $b_1 = 50 - 60\%$ of b

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

A collection of various metal parts and components, including pipes, flanges, valves, and fittings, arranged on a light blue background. The parts are made of different metals, including copper and stainless steel, and are shown in various sizes and shapes, demonstrating the capabilities of metal casting and machining.

BLANKING AND FORMING WITH FIBROFLEX®-ELASTOMERS

Description

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.

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.

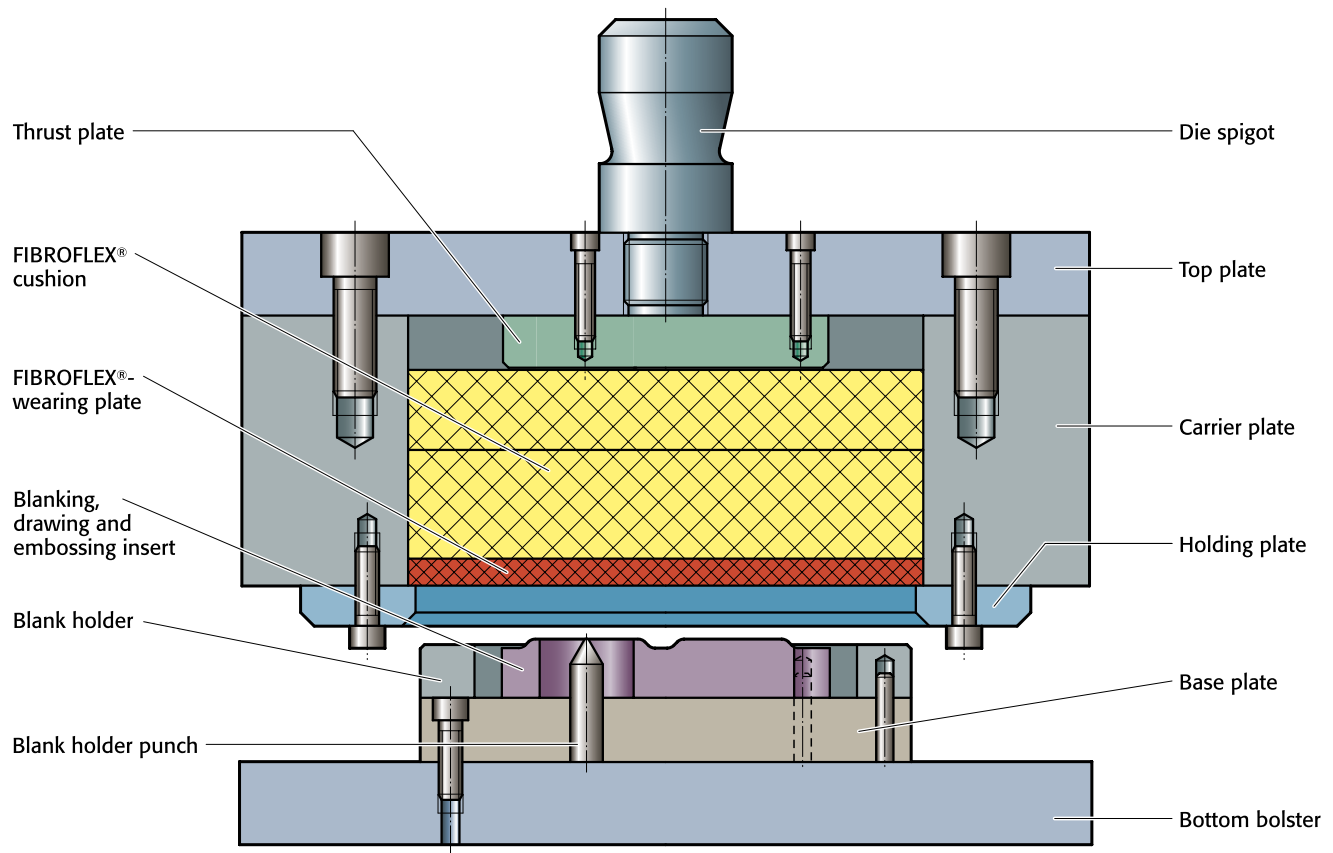
Choice of machine

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.

FIBROFLEX® FORMING TOOL: CUTTING – EMBOSSING – PUNCHING



Combined blanking – embossing – punching

The workpiece is completed at one pass.

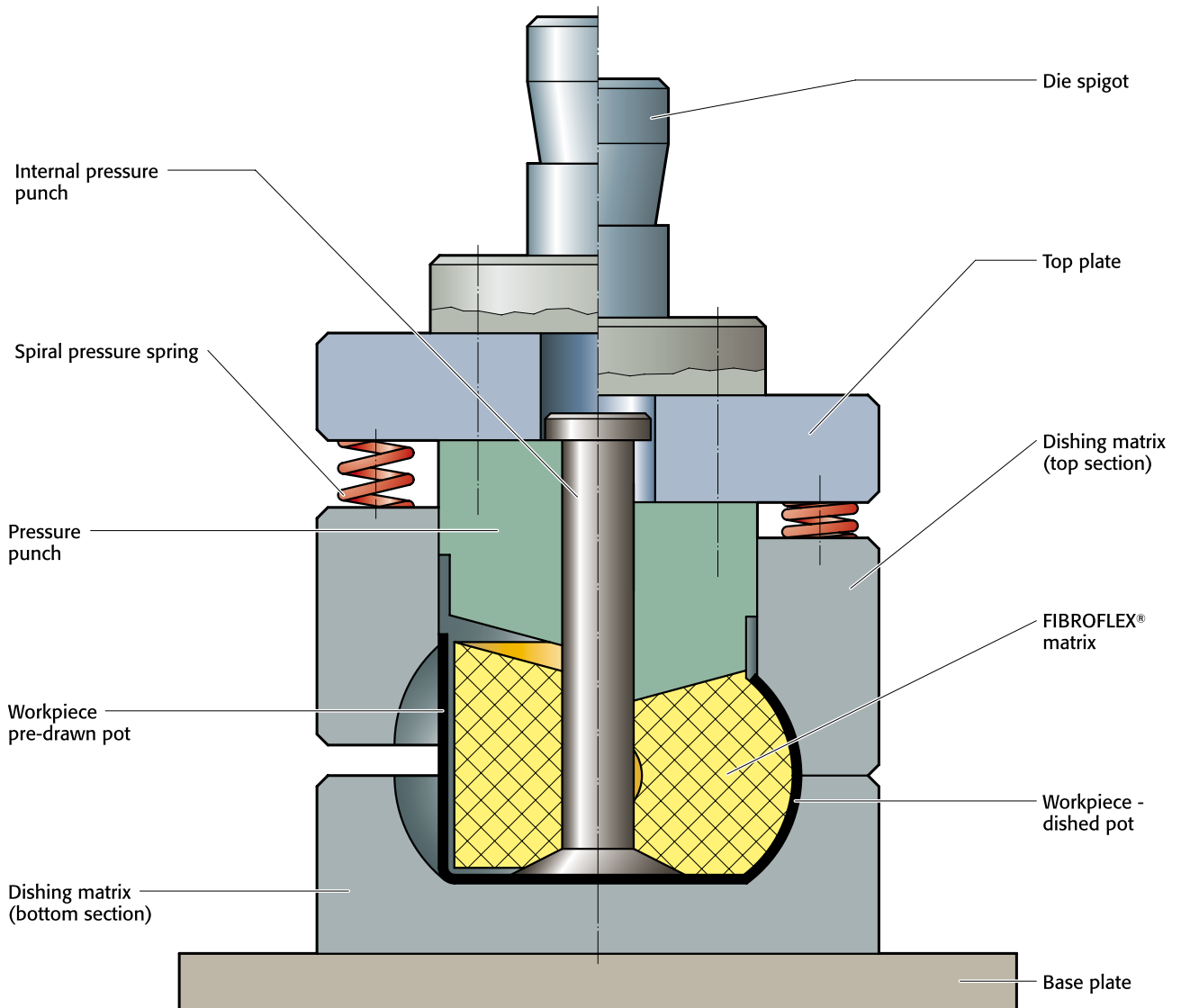
The shape is determined by the combined blanking, hole cutting and embossing matrix blank holder punch, without a reverse shape mould on the cushion side.

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

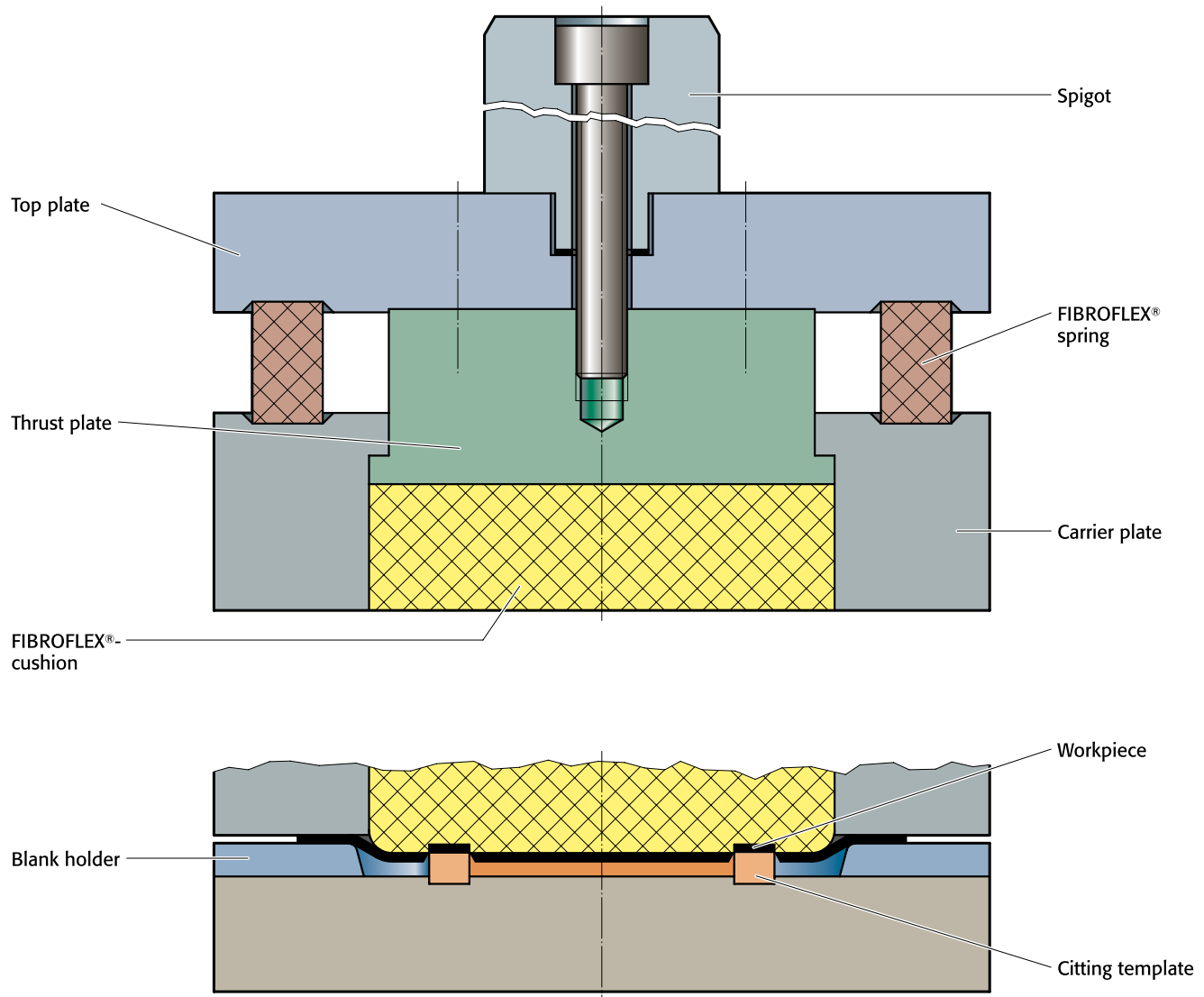
For flaring and bulging operations we recommend the use of FIBROFLEX® concave profiles wherever possible.

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.

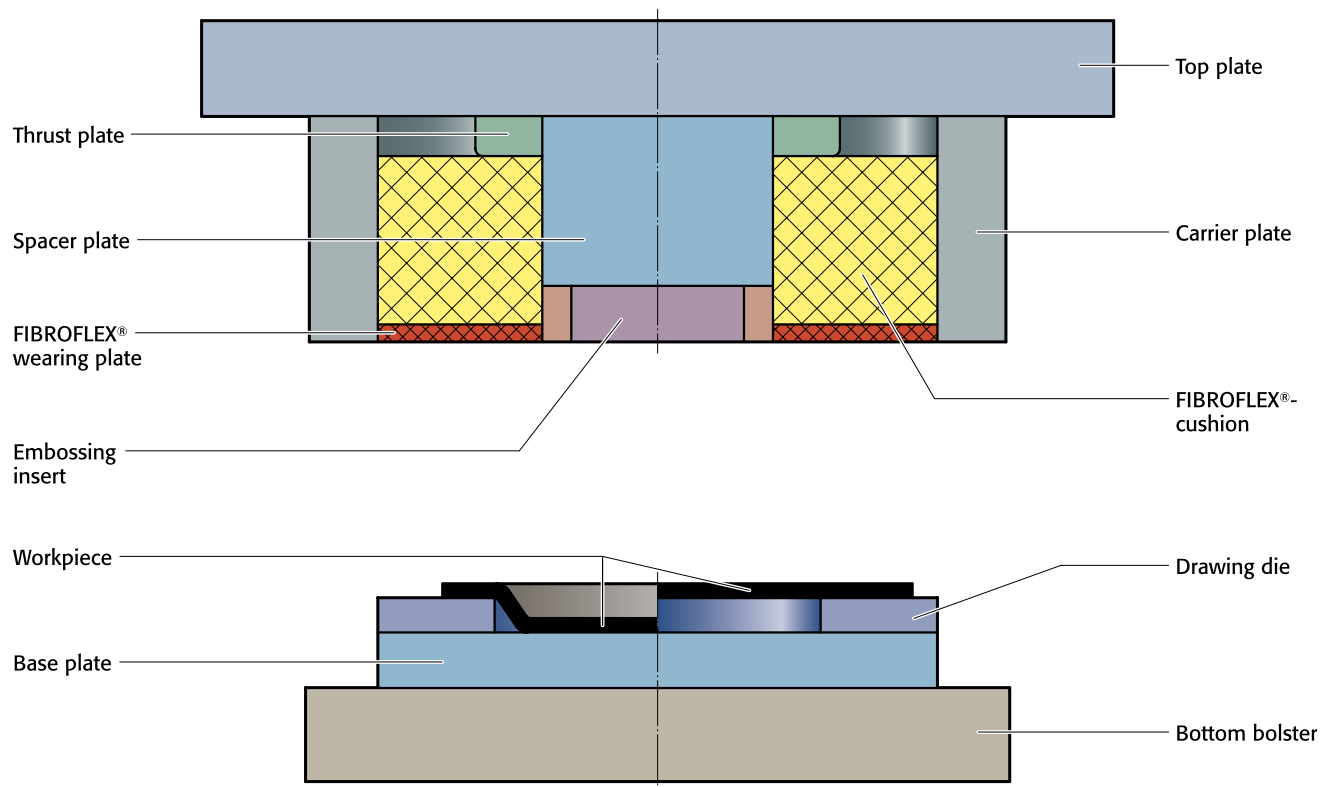
The even clamping pressure which is excellent for pressing also means that parts with intricate contours can be manufactured.

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

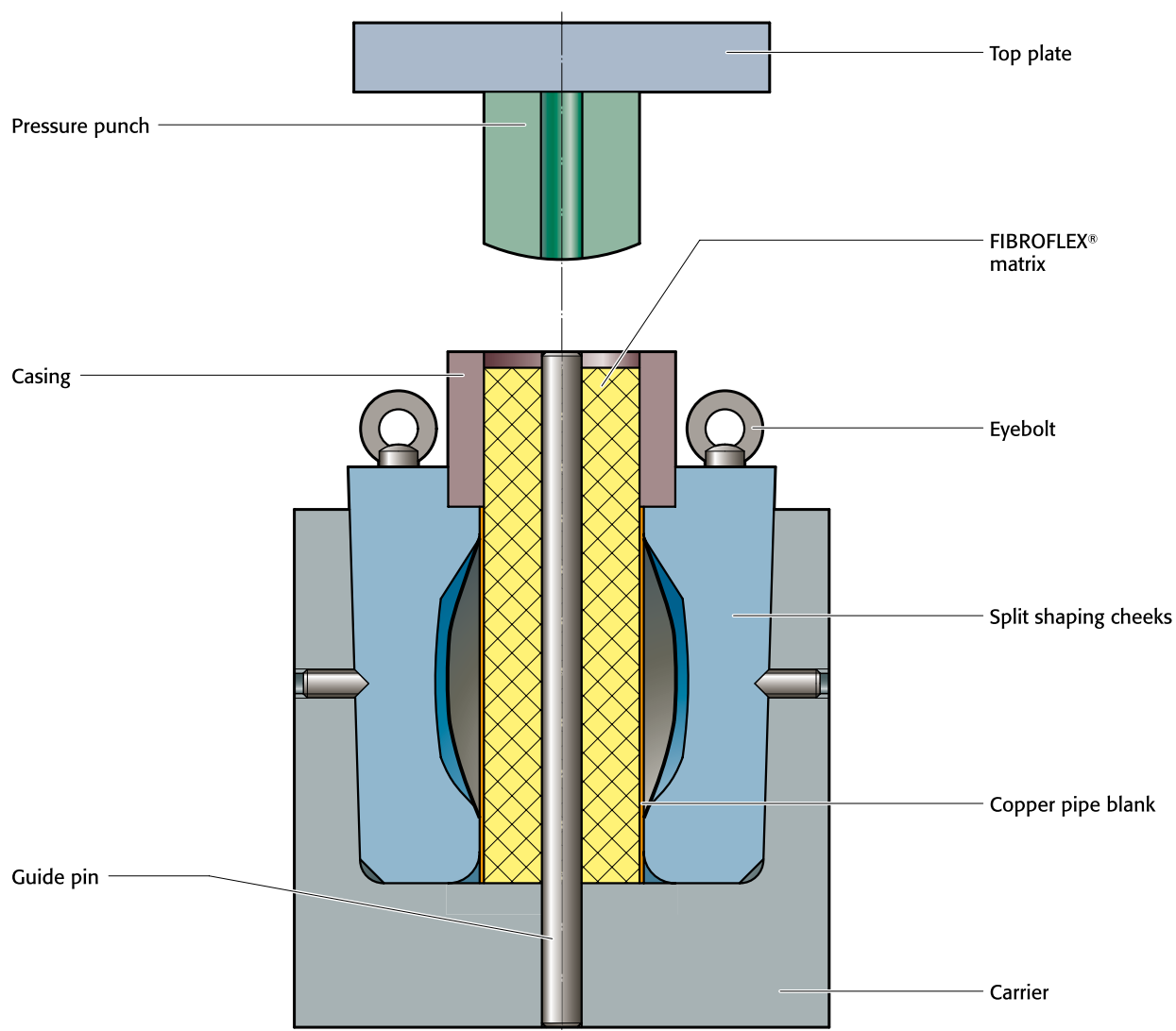
The limits for flaring and bulging depend on the workpiece material, its thickness and hardness and also the height of the FIBROFLEX® cushion. Maximum permissible deformation of the FIBROFLEX® cushion:

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.



