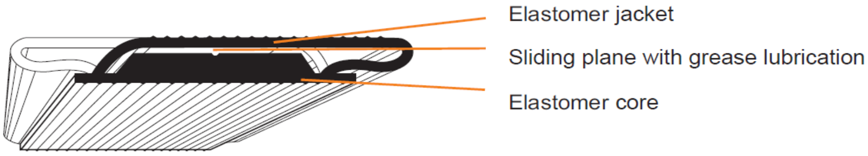


ESZ
WILFRIED BECKER GMBH
Elastomer Service Zentrale

Weilerhöfe 1
41564 Kaarst-Büttgen

Telefon (0 21 31) 75 81 00
Telefax (0 21 31) 75 81 11

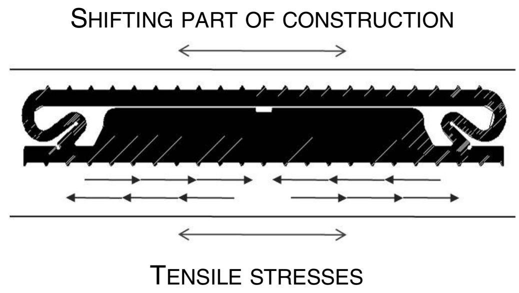
E-Mail: info@esz-becker.de
Internet: www.esz-becker.de

ESZ linear rubber sliding bearing GLS^{DBP}

Unreinforced elastomer linear rubber sliding bearing
with general supervisory approval

Load perpendicular to the plane of the bearing:
INFORMATION ABOUT TRANSVERSE TENSILE FORCES IN THE BEARING JOINT

The ESZ linear rubber sliding bearing GLS^{DBP} is practically incompressible.
Hence, it follows that the ESZ linear rubber sliding bearing GLS^{DBP} expands transversely to the compressive load while the volume remains constant. The bearing is hindered in this transverse expansion to a greater or lesser degree by the adjacent structural elements. (Surface friction). If the adjacent surfaces now prevent the lateral expansion of the elastomer, this must inevitably result in shear stresses in the joint, which leads to tensile stresses in the adjacent material and to compressive stresses in the rubber.
These so-called adhesive tensile stresses in the adjacent material are unwanted. They become larger with increasing elastomer thickness and must not be confused with splitting tensile stresses, which only take effect at a certain depth and occur with all forms of partial area loading. The reinforcement for the transverse tensile forces in reinforced concrete elements is to be arranged as close as possible to the bearing. Attention must still be paid to concrete coverage, however.



CALCULATION OF THE TRANSVERSE TENSILE FORCES IN THE BEARING JOINT

Bearing class 2 according to DIN 4141-3:

For simplicity's sake we assume here that the supporting force is transmitted into the adjacent structural elements distributed to a 0.3xa deep strip at the exterior edge of the bearing. The transverse tensile force resulting from the lateral expansion of the elastomer may be calculated as follows:

$$Zq = 1{,}5 \times F \times t \times a \times 10^{-5}$$

with a and t in [mm]
[DIN 4141-15 5.3 (2)].

The transversely-directed tensile forces Z_q thus determined must be verified in the adjacent structural elements: e.g. through appropriate reinforcement in the case of reinforced concrete.

Design example:
The determination is as follows for an ESZ linear rubber sliding bearing GLS^{DBP} with dimensions of 500x60x10 mm and with an applied load of 7,5 N/mm²:
Transverse direction:
F= 150 kN
a= 40 mm (width of elastomer core)
b= 500 mm
t= 10 mm

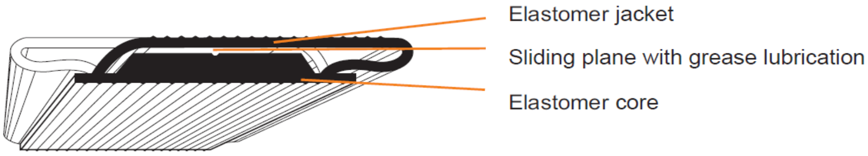
$$Zq = 1{,}5 \times 150kN \times 10mm \times 40 \times 10^{-5}$$

$$Zq = \ 0{,}9\ kN$$

Longitudinal direction:

$$Zq = 1{,}5 \times 150kN \times 10mm \times 500 \times 10^{-5}$$

$$Zq = \ 11{,}25\ kN$$



ESZ linear rubber sliding bearing GLS^{DBP}

Unreinforced elastomer linear rubber sliding bearing with general supervisory approval

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CALCULATION OF THE TRANSVERSE TENSILE FORCES IN THE BEARING JOINT

Bearing class 1 according to DIN 4141-3:

When using the ESZ linear rubber sliding bearing GLS^{DBP} as an elastomer bearing for bearing class 1, the transverse tensile force may be determined with the help of the data in issue 339 of the DAfStB in accordance with DIN 4141-15 5.3. In deviation from the calculation of the transverse tensile forces in the case of bearing class 2, the forces here are strongly dependent on the bearing thickness t, the form factor S_o and the bearing tilt a. The values determined through tests produced the following curves.

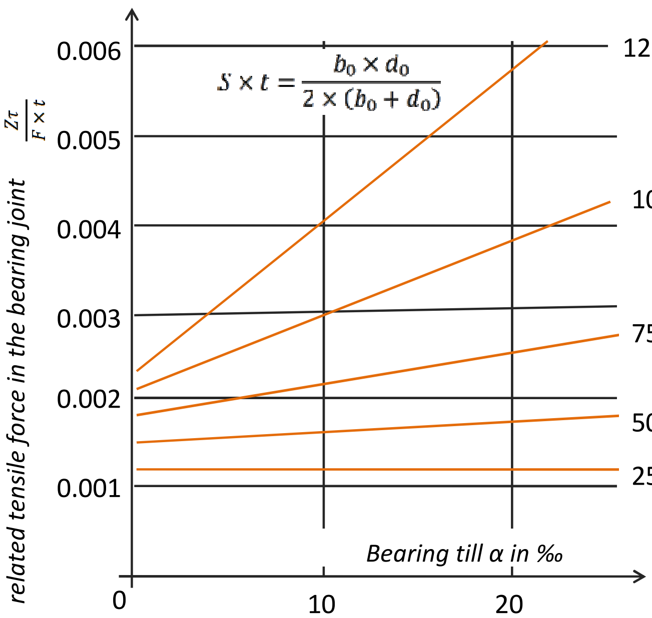

FIG. 38: [ISSUE 339 DAFSTB] DEPENDENCE OF THE RELATED TENSILE FORCE IN THE BEARING JOINT ON THE BEARING TILT α, THE FORM FACTOR S AND THE BEARING THICKNESS t.

Since the tests resulted in a linear dependence on the bearing thickness t, the transverse tensile force was related to F **and** t.

<u>Design example:</u>

The determination is as follows for an ESZ linear rubber sliding bearing GLS^{DBP} with dimensions of 500x60x10 mm, an applied load of 7,5 N/mm² and a twist of 15 ‰:

F= 150 kN

a= 60mm-20mm= 40 mm = b_0
b= 500 mm = d_0
t_b= 10 mm
a= 15‰

Coefficient according to issue 339 DAfStB:

$$S \times t = \frac{b_0 \times d_0}{2 \times (b_0 + d_0)}$$

$$S \times t = \frac{40 \times 500}{2 \times (40 + 500)} = \mathbf{18,52}$$

FIG. 38: where α= 10 ‰ and 18,52

$$\frac{Z\tau}{F \times t} = 0{,}00125 \frac{1}{mm}$$

The transverse tensile stress in the bearing joint thus equates to:

$$Z\tau = F \times t \times \frac{Z\tau}{F \times t}$$

$$Z\tau = F \times t \times \frac{Z\tau}{F \times t} = 150kN \times 10mm \times 0{,}00125 \frac{1}{mm}$$

$$Z\tau = 1{,}875\ kN$$