ESZ type 100 | with national technical approval
General information and calculation basis

Character meanings in the formula

f_{tRd}	=	Calculated value of the internal resistance of the bearing [N/mm²]
G	=	Shear modulus [N/mm²]
a	=	shorter side of the bearing [mm]
b	=	Longer side of the bearing [mm]
t	=	Bearing thickness [mm]
α_{bd}	=	Angular rotation around the axis parallel to the bearing side b [‰]
α_{ad}	=	Angular rotation around the axis parallel to the bearing side a [‰]
c	=	Mainly loaded bearing side of a rectangular bearing [mm]
η_2	=	Aspect ratio coefficient

b/a	η_2
1	0,208
1,5	0,231
2	0,246
3	0,267
4	0,282
6	0,299
8	0,307
10	0,313
∞	0,333

Table 1:
η_2 as a function of the aspect ratio b/a as a table of values
(Intermediate values may be interpolated linearly)

$$f_{tRd} = \frac{R_{\perp d}}{\eta_2} \cdot \frac{t}{a}$$

f_{tRd} is the calculated value of the internal resistance of the bearing and is used to calculate the permissible compressive stress $\sigma_{z,Rd}$

	Shape factor range S (S, $S_{borehole}$ or S_{mod})	Function for determining the design value of the load-bearing capacity $R_{\perp d}$ [N/mm²]
Point and strip bearings	0.83 – 2.33	$R_{\perp d}$ = 5.3805 · S - 0.6536
	2.33 – 2.50	$R_{\perp d}$ = 10.635 · S - 12.89
	2.50 – 5.00	$R_{\perp d}$ = 8.4004 · S - 7.3293
	≥ 5.00	$R_{\perp d}$ = 34.7

Table 2:
$R_{\perp d}$ = Rated value of the associated load-bearing capacity of the bearing [N/mm²] perpendicular to the bearing plane as a function of the shape factor S at a compression ε = 40 %.

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Initial assumptions

$F_{z,max,d}$	=	185	kN
f_{tRd}	=	Formula	N/mm²
a	=	130	mm
b	=	150	mm
t	=	15	mm
G	=	1.2	N/mm²
$\alpha_{Statics}$	=	5.2	‰
$\alpha_{Obliqueness}$	=	10	‰
$\alpha_{Unevenness}$	=	4.8	‰
$\alpha_{bd\ total}$	=	20	‰
η_2	=	0.215	

In this calculation example, a rotation around the axis parallel to the bearing side b (α_{bd}) is calculated. The bearing has no holes.

Calculation wax

$$S = \frac{130 \cdot 150}{2 \cdot 15 \cdot (130+150)} = \mathbf{2.32}$$

$$R_{\perp d} = 5.3805 \cdot S - 0.6536 = 17.17 \cdot 2.32 - 0.6536 = \mathbf{11.83\ N/mm^2}$$

$$f_{tRd} = \frac{11.83}{0.215} \cdot \frac{15}{130} = 6.35\ \mathrm{N/mm^2}$$

$$\sigma_{z,Rd} = \left[6.35 - 0.02 \cdot \frac{1.2}{2} \cdot \left(\frac{130}{15}\right)^2 - 0 \cdot \frac{1.2}{2} \cdot \left(\frac{150}{15}\right)^2\right] \cdot \frac{130}{15} \cdot 0.215 = \mathbf{10.15\ N/mm^2}$$

$$\sigma_{z,m} = \frac{185.000}{130 \cdot 150} = \mathbf{9.49\ N/mm^2}$$

$$\sigma_{z,Rd} = \mathbf{10.14\ N/mm^2} \geq \sigma_m = \mathbf{9.49\ N/mm^2} > \textbf{Proof provided!}$$

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