ESZ type 150 | with national technical approval
General information and calculation basis

Calculation of transverse tensile forces according to "old" DIN 4141 part 15

$Z_a = 1,5 \cdot F_{z,max,d} \cdot t \cdot b \cdot 10^{-5}$ $\quad$ $Z_b = 1,5 \cdot F_{z,max,d} \cdot t \cdot a \cdot 10^{-5}$

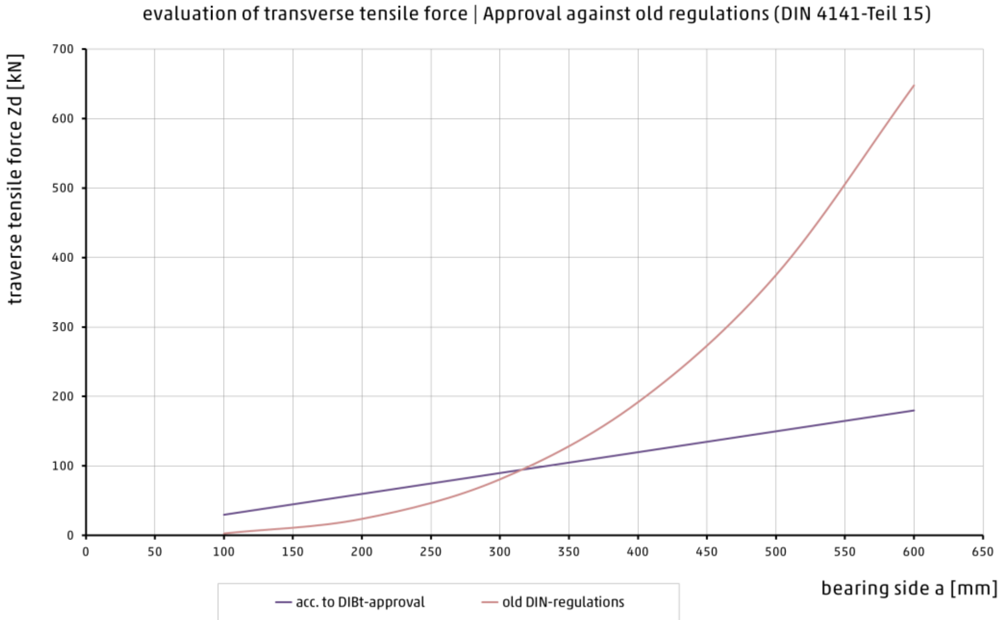
Calculation of transverse tensile forces according to DIBt approval

$Z_a = 1,5 \cdot E_{\perp d} \cdot a \cdot t \cdot 10^{-3}$ $\quad$ $Z_b = 1,5 \cdot E_{\perp d} \cdot b \cdot t \cdot 10^{-3}$

Calculation of transverse tensile forces according to ESZ

$Z_a = \max(1,5 \cdot E_{\perp d} \cdot a \cdot t \cdot 10^{-3}; 1,5/mm^2 \cdot F_{z,max,d} \cdot t \cdot b \cdot 10^{-5})$

$Z_b = \max(1,5 \cdot E_{\perp d} \cdot b \cdot t \cdot 10^{-3}; 1,5/mm^2 \cdot F_{z,max,d} \cdot t \cdot a \cdot 10^{-5})$



Calculation example of the transverse tensile forces in the bearing joint with centric loading

Z_b	=	Transverse tensile force perpendicular to the longer side b of the bearing [kN]
$E_{\perp d}$	=	Load on the bearing perpendicular to the bearing plane [N/mm²]
$Fz_{,max,d}$	=	Design value of the maximum support force in the z-direction [N/mm²]
a	=	shorter bearing side [mm]
t	=	Bearing thickness [mm]

a = 100 mm
b = 200 mm
t = 15 mm

$F_{z,max,d}$ = 300 kN
$E_{\perp d}$ = 15 N/mm²

$Z_a = \max(1,5 \cdot 15 \cdot 100 \cdot 15 \cdot 10^{-3}; 1,5/mm^2 \cdot 300 \cdot 15 \cdot 200 \cdot 10^{-5})$

$Z_a = 33,8\ kN$

$Z_b = \max(1,5 \cdot 15 \cdot 200 \cdot 15 \cdot 10^{-3}; 1,5/mm^2 \cdot 300 \cdot 15 \cdot 100 \cdot 10^{-5})$

$Z_b = 67,5\ kN$

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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	0.88 – 5.00	$R_{\perp d}$ = 7.22 · S – 3.39
	5.00 – 7.00	$R_{\perp d}$ = 8.95 · S – 12.02
	7.00 – 10.00	$R_{\perp d}$ = 1.96 · S + 36.86
	≥ 10.00	$R_{\perp d}$ = 56.50

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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