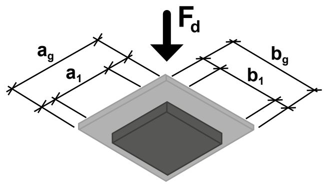
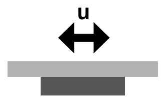
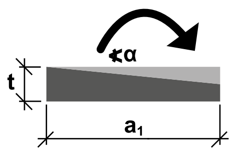
Ciparall sliding bearing type ST

Elastomer deformation sliding bearing for static component bearings

Dimensioning with design values

The bearings are dimensioned in accordance with the general building authority approval up to compressive stress of $\sigma_{R,d} = 28\,N/mm^2$. The drill holes, cut-outs and the required edge clearances must be taken into consideration in accordance with DIN EN 1992.

LOAD TYPE

Design value of the load capacity	Displacement	Bearing design	Perm. angle of rotation
			
EQUATION			
$\sigma_{R,d} \leq 28$ [N/mm²] Approval no. 16.22-534 $A_E = a_1 \times b_1$ [mm²] Verification: $\sigma_{E,d} \leq \sigma_{R,d}$	u = variable Friction coefficient 0.047 with 20 N/mm² after an accumulated sliding distance of 198 m. Other values can be found in the approval.	Thickness t = 11 mm t_1 = 2.6 mm t_2 = 8.4 mm Thickness t = 20 mm t_1 = 4.8 mm t_2 = 15.2 mm Thickness t = 30 mm t_1 = 4.8 mm t_2 = 25.2 mm Thickness t = 40 mm t_1 = 4.8 mm t_2 = 35.2 mm For elastic deformation, see page 2	Thickness t t = 11 mm: perm. $\alpha = 2000/a_1 \leq 40‰$ t = 20 mm: perm. $\alpha = 3000/a_1 \leq 40‰$ t = 30 mm: perm. $\alpha = 5100/a_1 \leq 40‰$ t = 40 mm: perm. $\alpha = 7300/a_1 \leq 40‰$ (Rectangular bearing) To be taken into account according to the approval: • 10 ‰ from obliqueness • $\frac{625}{a_1}$ from unevenness see also booklet 600, DAfStb

KEY TO EQUATION SYMBOLS

F_d	Vertical force
A_E	Bearing area
a_1	Length of the bearing body
b_1	Width of the bearing body
a_g	Length of the sliding plate
b_g	Width of the sliding plate
$\sigma_{R,d}$	Design value of the load capacity
$\sigma_{E,d}$	Design compressive stress from impact
α	Distortion of bearing
u	Displacement distance
t	Bearing thickness
t_1	Sliding plate
t_2	Elastomeric body

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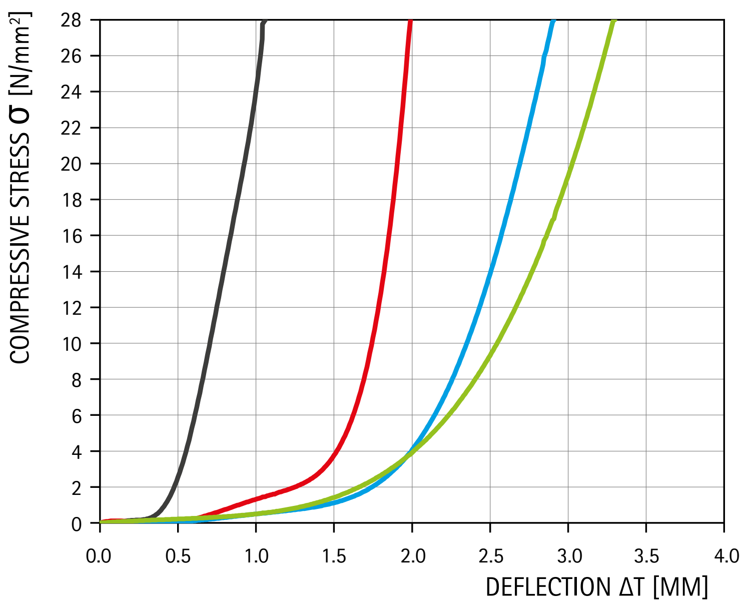
The tables below show the design value of the load capacity and the permissible angle of rotation in relation to the bearing dimensions. Intermediate values may be interpolated.

<table>
<tr><th colspan="6">CIPARALL SLIDING BEARING TYPE ST</th></tr>
<tr><td colspan="2">Total bearing thickness t [mm]</td><td>11</td><td>20</td><td>30</td><td>40</td></tr>
<tr><td>Bearing width
a [mm]</td><td>Compressive stress
$\sigma_{R,d}$ [N/mm²]</td><td colspan="4">Angle of rotation
max. α [‰]</td></tr>
<tr><td>120</td><td rowspan="20">28.0</td><td>16.7</td><td>16.7</td><td>40.0</td><td rowspan="7">40.0</td></tr>
<tr><td>130</td><td>15.4</td><td>15.4</td><td>39.2</td></tr>
<tr><td>140</td><td>14.3</td><td>14.3</td><td>36.4</td></tr>
<tr><td>150</td><td>13.3</td><td>13.3</td><td>34.0</td></tr>
<tr><td>160</td><td>12.5</td><td>12.5</td><td>31.9</td></tr>
<tr><td>170</td><td>11.8</td><td>11.8</td><td>30.0</td></tr>
<tr><td>180</td><td>11.1</td><td>11.1</td><td>28.3</td></tr>
<tr><td>190</td><td>10.5</td><td>10.5</td><td>26.8</td><td>38.4</td></tr>
<tr><td>200</td><td>10.0</td><td>10.0</td><td>25.5</td><td>36.5</td></tr>
<tr><td>220</td><td>9.1</td><td>9.1</td><td>23.2</td><td>33.2</td></tr>
<tr><td>240</td><td>8.3</td><td>8.3</td><td>21.3</td><td>30.4</td></tr>
<tr><td>260</td><td>7.7</td><td>7.7</td><td>19.6</td><td>28.1</td></tr>
<tr><td>280</td><td>7.1</td><td>7.1</td><td>18.2</td><td>26.1</td></tr>
<tr><td>300</td><td>6.7</td><td>6.7</td><td>17.0</td><td>24.3</td></tr>
<tr><td>350</td><td>5.7</td><td>5.7</td><td>14.6</td><td>20.9</td></tr>
<tr><td>400</td><td>5.0</td><td>5.0</td><td>12.8</td><td>18.3</td></tr>
<tr><td>450</td><td>4.4</td><td>4.4</td><td>11.3</td><td>16.2</td></tr>
<tr><td>500</td><td>4.0</td><td>4.0</td><td>10.2</td><td>14.6</td></tr>
<tr><td>550</td><td>3.6</td><td>3.6</td><td>9.3</td><td>13.3</td></tr>
<tr><td>600</td><td>3.3</td><td>3.3</td><td>8.5</td><td>12.2</td></tr>
<tr><td colspan="6">Use in in-situ concrete: Embedding in polystyrene
Use in fire resistance class F90/F120: If necessary, embedding in Ciflamon fire protection board</td></tr>
</table>

Load deflection curve

The diagram shows the compression behaviour for different formats when used between concrete surfaces (precast elements).



DIMENSIONS OF THE BEARING BODY

- 180 mm x 180 mm x 11 mm
- 180 mm x 180 mm x 20 mm
- 180 mm x 180 mm x 30 mm
- 180 mm x 180 mm x 40 mm

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Dimensioning example

Given: $F_{E,d} = 570$ kN, bearing distortion $\alpha = 3.6$ ‰, horizontal displacement ± 30 mm parallel to the shorter side of the bearing body a_1

Selected bearing body dimensions: $a_1 = 120$ mm, $b_1 = 180$ mm, t = 20 mm

Load capacity:

$\sigma_{R,d} = 28.0$ N/mm²

$F_{R,d} = \sigma_{R,d} \times A_E = 28.0$ N/mm² x 120 mm x 180 mm = 604.8 kN

$F_{R,d} \geq F_{E,d}$ → Load capacity of bearing is sufficient

Bearing rotation from component deformation: $\alpha = 3.6$ ‰

Additional distortion from obliqueness: 10 ‰

Additional distortion from unevenness: 625 (mm*‰) / a (mm) = 625 / 120 = 5.21 ‰

Total distortion to be absorbed:

$\alpha = 3.6$ ‰ + 10 ‰ + 5.21 ‰ = 18.81 ‰

max. α = 3000 ‰ x mm / a = 3000 ‰ x mm/ 120 mm = 25 ‰

max. α ≥ α → maximum distortion angle of the bearing is sufficient

Horizontal displacement: ± 30 mm → required sliding distance = a_1 + 2 x 30 mm = 180 mm

The sliding plate should be 10 mm bigger all round than is specified by the anticipated sliding distances and bearing body dimensions.

→ a_g = 180 mm + 20 mm = 200 mm
b_g = 180 mm + 20 mm = 200 mm

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