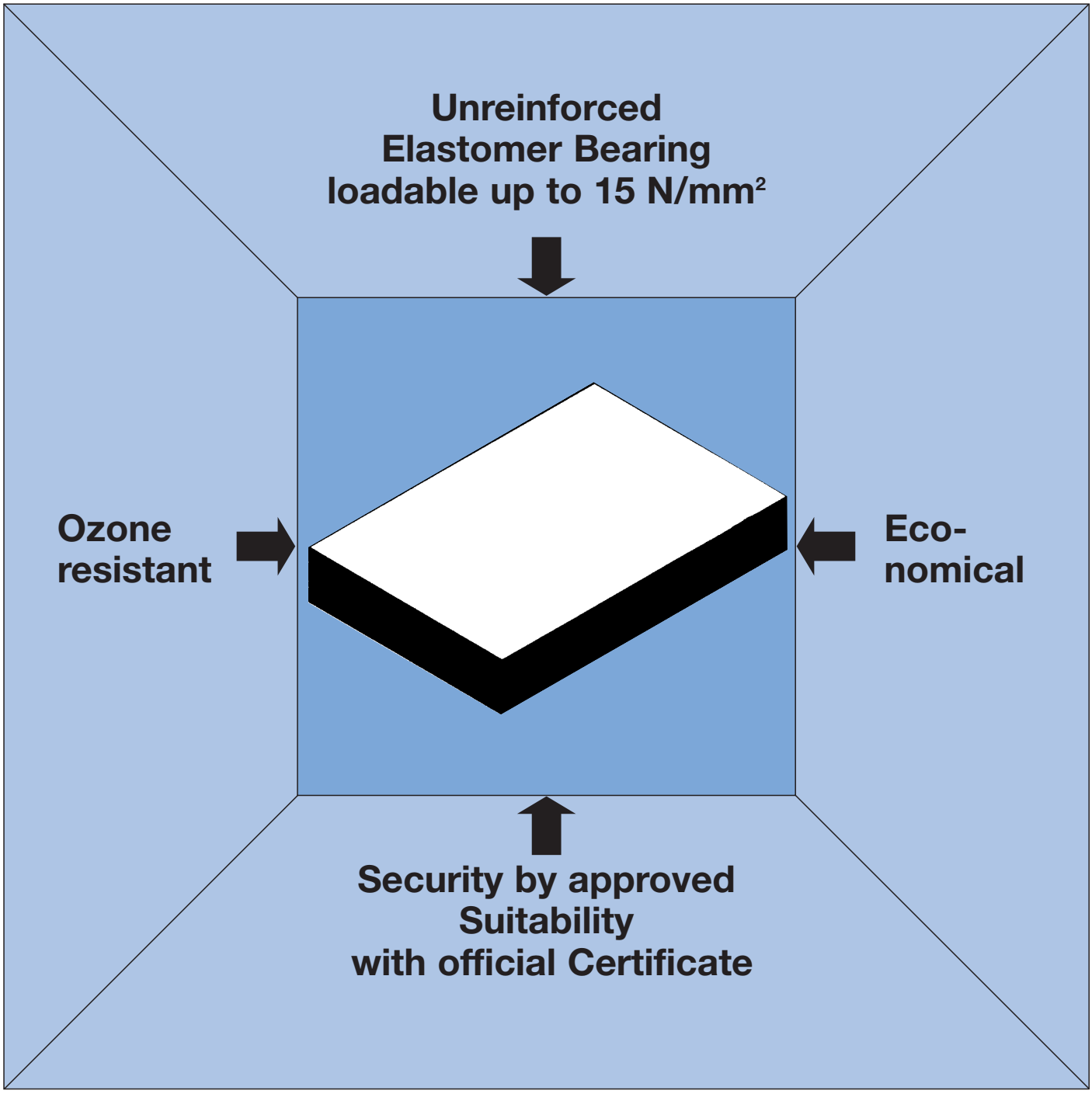
CALENBERG INGENIEURE
Planmäßig elastisch lagern

Product Information

CALENBERG
COMPACT BEARING S 70



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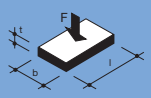
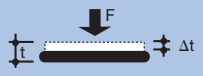
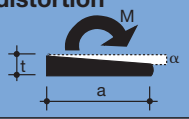
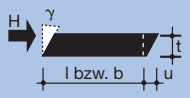
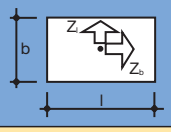
Calenberg Compact Bearing S 70

Calculation for bearing class 2 according to DIN 4141 part 3

Permissible mean load 	**perm. σ_m = (S² + S +1) / 0,85 ≤ 15 N/mm2** requirement: l ≥ b ≥ 5 x t S = shape factor (page 3) see also calculation tables page 4 and 5
Actual elastic deformation 	**act. Δt = act. σ_m · t / E_D [mm]** E_D = compression modulus (see page 6) **max. Δt** ≯ see picture 3 on page 6
Permissible angle of distortion 	**perm. α = 200 · t / a [‰];** rectangular bearing **perm. α = 226 · t / a [‰];** circular bearing see also picture 5 on page 7
Permissible horizontal shear deformation 	**perm. u = 0,6 · (t – 2) [mm]** **perm. H = C_s · u · A_E / 19000 [kN]** C_s-values and requirements see page 7
Cross tensile force 	**Z_l = 1,5 · t · l · F / A_E [kN]** (at the long side of the bearing) **Z_b = 1,5 · t · b · F / A_E [kN]** (at the short side of the bearing)

a, b, l, t, D in mm; A_E in mm²; F in kN; E_D in N/mm²; S without measuring unit

Product Description

Calenberg Compact Bearing S 70 is an unreinforced elastomer bearing with even surfaces.
The bearing consists of tough elastic, ozone resistant elastomer with a hardness of 70 ± 5 Shore A. The material has been tested according to the production guide-line of elastomer bearings, edited by the German Institute of Building Technics, which enables the classification into bearing class 2 of DIN 4141 part 3.

How to Specify

Deliver Calenberg Compact Bearing S 70, unreinforced homogeneous elastomer bearing according to DIN 4141 part 3, bearing class 2, format dependant loadable up to a mean load of 15 N/mm², Official Certificate Nr. 849.0633.

a) In general

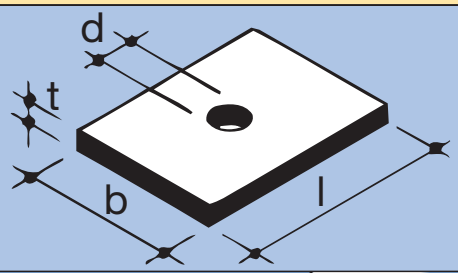
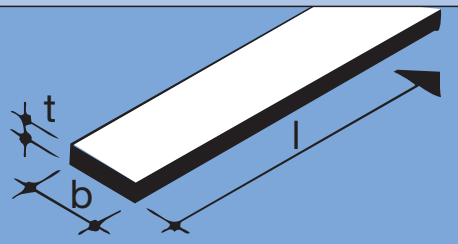
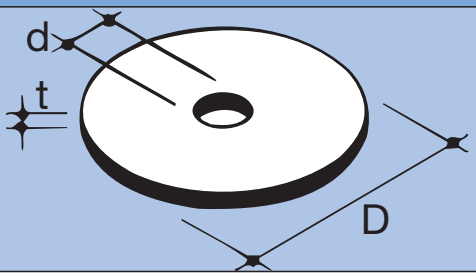
Length: ..... mm
Width: ..... mm
Thickness: ..... mm
Quantity: ..... piece
Price: ..... Euro/piece

b) Embedded in Polystyrene or Ciflamon

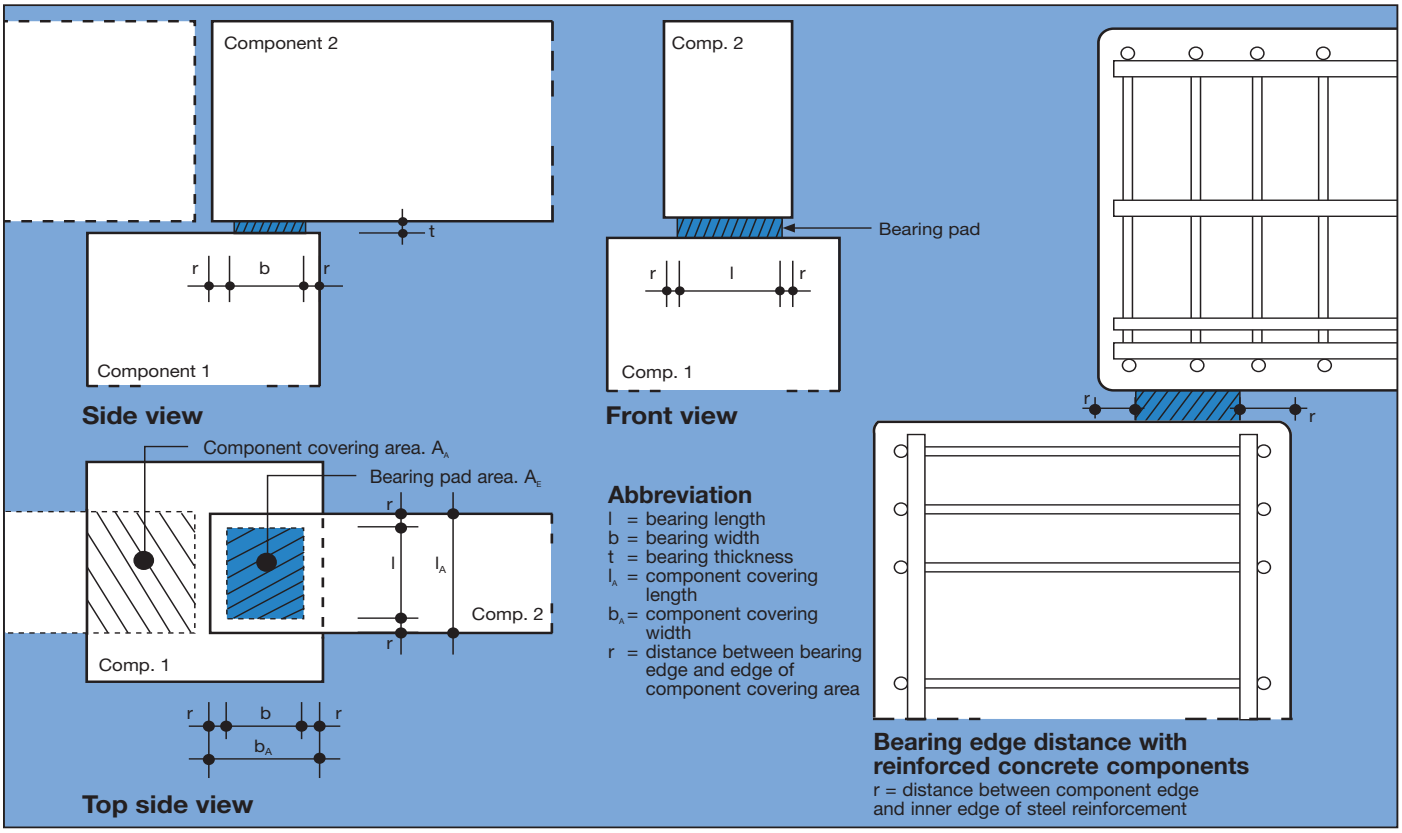
Total width: ..... mm
Width of bearing pad: ..... mm
Thickness: ..... mm
Quantity: ..... m
Price: ..... Euro/m

Supplier: Calenberg Ingenieure GmbH
Am Knübel 2–4
D-31020 Salzhemmendorf
Tel. +49/5153 94 00-0
Fax +49/5153 94 00-49

Shape Factors

Bearing Format	Shape Factor
	**Rectangular bearing pad** ● without hole: $S = \frac{l \cdot b}{2 \cdot t\,(l + b)}$ ● with round hole: $S = \frac{4 \cdot l \cdot b - \pi \cdot d^2}{4 \cdot t\,(2 \cdot l + 2 \cdot b + \pi \cdot d)}$
	**Rectangular bearing strip** $S \approx \frac{b}{2 \cdot t}$
	**Circular bearing pad** ● without hole: $S = \frac{D}{4 \cdot t}$ ● with round hole: $S = \frac{D - d}{4 \cdot t}$

Picture 1: Shape factors for different formats



Picture 2: Maximum ground area of elastomer bearing pad in reinforced concrete construction (edge distance). With wood or steel components the edge distance of the bearing pad should be at least 1 cm resp. 1,5 times of the bearing thickness.

Calculation Table 1: Compact Bearing S 70, 5, 8, 10 mm thick

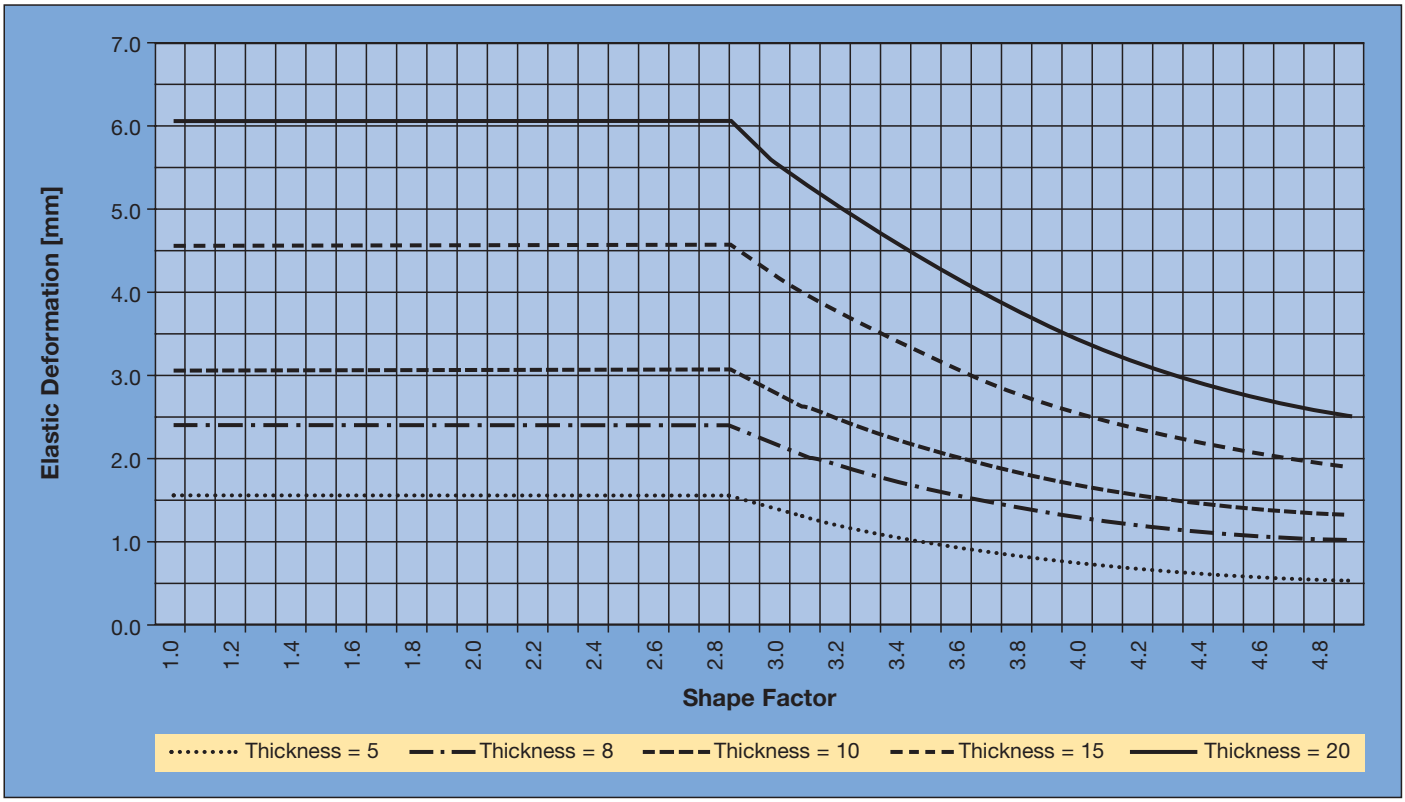
Bearing Thickness (mm)	perm. angular Distortion α (‰)	Bearing Width (mm)	Load, perm. σ_m (N/mm²) — Bearing Length l (mm)																	
			50	60	70	80	90	100	125	150	175	200	225	250	275	300	350	400	450	500
5	20.0	50	11.5	13.1	14.6															
	16.7	60	13.1																	
	14.3	70	14.6													15.0				
	12.5	80																		
8	32.0	50	5.9	6.6	7.2	7.8	8.3	8.7	9.7	10.4	11.0	11.5	11.9	12.2	12.5	12.8	13.2	13.5	13.8	14.0
	26.7	60	6.6	7.5	8.3	9.1	9.8	10.4	11.7	12.8	13.6	14.4								
	22.9	70	7.2	8.3	9.4	10.3	11.2	12.0	13.7											
	20.0	80	7.8	9.1	10.3	11.5	12.5	13.5												
	17.8	90	8.3	9.8	11.2	12.5	13.8													
	16.0	100	8.7	10.4	12.0	13.5														
	14.5	110	9.1	11.0	12.7	14.4														
	13.3	120	9.5	11.5	13.4															
	12.3	130	9.8	11.9	14.0															
	11.4	140	10.1	12.4	14.6															
	10.7	150	10.4	12.8																
	10.0	160	10.6	13.1																
	9.4	170	10.9	13.5																
	8.9	180	11.1	13.8												15.0				
	8.4	190	11.3	14.1																
	8.0	200	11.5	14.4																
10	40.0	50	4.5	5.0	5.4	5.8	6.1	6.4	7.0	7.5	7.9	8.2	8.5	8.7	8.9	9.1	9.4	9.6	9.8	9.9
	33.3	60	5.0	5.6	6.1	6.7	7.1	7.5	8.4	9.1	9.7	10.2	10.6	10.9	11.2	11.5	11.9	12.3	12.5	12.8
	28.6	70	5.4	6.1	6.8	7.5	8.1	8.6	9.7	10.7	11.5	12.1	12.7	13.2	13.6	14.0	14.6			
	25.0	80	5.8	6.7	7.5	8.2	8.9	9.6	11.0	12.3	13.3	14.1	14.9							
	22.2	90	6.1	7.1	8.1	8.9	9.8	10.6	12.3	13.8										
	20.0	100	6.4	7.5	8.6	9.6	10.6	11.5	13.5											
	18.2	110	6.7	7.9	9.1	10.2	11.3	12.3	14.7											
	16.7	120	6.9	8.2	9.5	10.8	12.0	13.1												
	15.4	130	7.1	8.5	9.9	11.3	12.6	13.9												
	14.3	140	7.3	8.8	10.3	11.8	13.2	14.6												
	13.3	150	7.5	9.1	10.7	12.3	13.8													
	12.5	160	7.7	9.3	11.0	12.7	14.3													
	11.8	170	7.8	9.6	11.3	13.1	14.8													
	11.1	180	8.0	9.8	11.6	13.5														
	10.5	190	8.1	10.0	11.9	13.8														
	10.0	200	8.2	10.2	12.1	14.1														
	9.5	210	8.3	10.3	12.4	14.5														
	9.1	220	8.5	10.5	12.6	14.8														
	8.7	230	8.6	10.6	12.8															
	8.3	240	8.6	10.8	13.0															
	8.0	250	8.7	10.9	13.2															
	7.7	260	8.8	11.0	13.4															
	7.4	270	8.9	11.2	13.5															
	7.1	280	9.0	11.3	13.7															
	6.9	290	9.0	11.4	13.8															
	6.7	300	9.1	11.5	14.0															
	6.5	310	9.2	11.6	14.1															
	6.3	320	9.2	11.7	14.3															
	6.1	330	9.3	11.7	14.4															
	5.9	340	9.3	11.8	14.5															
	5.7	350	9.4	11.9	14.6															
	5.6	360	9.4	12.0	14.7									15.0						
	5.4	370	9.5	12.1	14.8															
	5.3	380	9.5	12.1	14.9															
	5.1	390	9.6	12.2																
	5.0	400	9.6	12.3																
	4.9	410	9.6	12.3																
	4.8	420	9.7	12.4																
	4.7	430	9.7	12.4																

Calculation Table 2: Compact Bearing S 70, **15, 20 mm** thick

Bearing Thickness (mm)	perm. angular Distortion α (‰)	Bearing Width (mm)	Load, perm. σ_m (N/mm²) Bearing Length l (mm) 50	60	70	80	90	100	125	150	175	200	225	250	275	300	350	400	450	500
15	37.5	80	3.6	4.1	4.5	4.8	5.2	5.5	6.2	6.8	7.3	7.7	8.0	8.4	8.6	8.9	9.3	9.6	9.9	10.1
	33.3	90	3.8	4.3	4.7	5.2	5.6	6.0	6.8	7.5	8.1	8.6	9.1	9.5	9.8	10.2	10.7	11.1	11.5	11.8
	30.0	100	3.9	4.5	5.0	5.5	6.0	6.4	7.4	8.2	9.0	9.6	10.2	10.6	11.1	11.5	12.1	12.7	13.1	13.5
	27.3	110	4.1	4.7	5.2	5.8	6.3	6.8	7.9	8.9	9.8	10.5	11.2	11.8	12.3	12.8	13.6	14.3	14.9	
	25.0	120	4.2	4.8	5.5	6.1	6.7	7.2	8.5	9.6	10.6	11.5	12.3	12.9	13.6	14.1				
	23.1	130	4.3	5.0	5.7	6.3	7.0	7.6	9.0	10.2	11.4	12.4	13.3	14.1	14.8					
	21.4	140	4.4	5.1	5.9	6.6	7.2	7.9	9.5	10.9	12.1	13.3	14.3							
	20.0	150	4.5	5.3	6.0	6.8	7.5	8.2	9.9	11.5	12.9	14.1								
	18.8	160	4.6	5.4	6.2	7.0	7.8	8.5	10.4	12.0	13.6									
	17.6	170	4.6	5.5	6.3	7.2	8.0	8.8	10.8	12.6	14.3									
	16.7	180	4.7	5.6	6.5	7.4	8.2	9.1	11.2	13.1	14.9									
	15.8	190	4.8	5.7	6.6	7.5	8.4	9.4	11.6	13.6										
	15.0	200	4.8	5.8	6.7	7.7	8.6	9.6	11.9	14.1										
	14.3	210	4.9	5.9	6.8	7.8	8.8	9.8	12.3	14.6										
	13.6	220	4.9	5.9	6.9	8.0	9.0	10.1	12.6											
	13.0	230	5.0	6.0	7.0	8.1	9.2	10.3	12.9											
	12.5	240	5.0	6.1	7.1	8.2	9.3	10.5	13.2											
	12.0	250	5.1	6.1	7.2	8.4	9.5	10.6	13.5											
	11.5	260	5.1	6.2	7.3	8.5	9.6	10.8	13.8											
	11.1	270	5.2	6.3	7.4	8.6	9.8	11.0	14.1											
	10.7	280	5.2	6.3	7.5	8.7	9.9	11.2	14.3											
	10.3	290	5.2	6.4	7.5	8.8	10.0	11.3	14.6											
	10.0	300	5.3	6.4	7.6	8.9	10.2	11.5	14.8											
	9.4	320	5.3	6.5	7.7	9.0	10.4	11.8												
	8.8	340	5.4	6.6	7.9	9.2	10.6	12.0												
	8.6	350	5.4	6.6	7.9	9.3	10.7	12.1												
	8.3	360	5.4	6.7	8.0	9.3	10.8	12.3												
	7.9	380	5.5	6.7	8.1	9.5	11.0	12.5												
	7.5	400	5.5	6.8	8.2	9.6	11.1	12.7												
20	50.0	80	2.8	3.0	3.3	3.5	3.7	3.9	4.4	4.7	5.0	5.3	5.5	5.7	5.8	6.0	6.2	6.4	6.6	6.7
	44.4	90	2.9	3.2	3.5	3.7	4.0	4.2	4.7	5.2	5.5	5.8	6.1	6.3	6.6	6.7	7.1	7.3	7.5	7.7
	40.0	100	3.0	3.3	3.6	3.9	4.2	4.5	5.1	5.6	6.0	6.4	6.7	7.0	7.3	7.5	7.9	8.2	8.5	8.7
	36.4	110	3.1	3.4	3.8	4.1	4.4	4.7	5.4	6.0	6.5	7.0	7.4	7.7	8.0	8.3	8.8	9.2	9.5	9.8
	33.3	120	3.1	3.5	3.9	4.3	4.6	5.0	5.7	6.4	7.0	7.5	8.0	8.4	8.8	9.1	9.7	10.2	10.6	10.9
	30.8	130	3.2	3.6	4.0	4.4	4.8	5.2	6.0	6.8	7.5	8.1	8.6	9.1	9.5	9.9	10.6	11.1	11.6	12.0
	28.6	140	3.3	3.7	4.2	4.6	5.0	5.4	6.3	7.2	7.9	8.6	9.2	9.7	10.2	10.7	11.5	12.1	12.7	13.2
	26.7	150	3.3	3.8	4.3	4.7	5.2	5.6	6.6	7.5	8.3	9.1	9.8	10.4	11.0	11.5	12.4	13.1	13.8	14.4
	25.0	160	3.4	3.9	4.4	4.8	5.3	5.8	6.9	7.9	8.8	9.6	10.4	11.0	11.7	12.3	13.3	14.1	14.9	
	23.5	170	3.4	3.9	4.4	5.0	5.5	5.9	7.1	8.2	9.2	10.1	10.9	11.7	12.4	13.0	14.2			
	22.2	180	3.5	4.0	4.5	5.1	5.6	6.1	7.3	8.5	9.6	10.6	11.5	12.3	13.1	13.8				
	21.1	190	3.5	4.0	4.6	5.2	5.7	6.3	7.6	8.8	10.0	11.0	12.0	12.9	13.8	14.5				
	20.0	200	3.5	4.1	4.7	5.3	5.8	6.4	7.8	9.1	10.3	11.5	12.5	13.5	14.4					
	19.0	210	3.6	4.2	4.7	5.3	5.9	6.5	8.0	9.4	10.7	11.9	13.0	14.1						
	18.2	220	3.6	4.2	4.8	5.4	6.1	6.7	8.2	9.6	11.0	12.3	13.5	14.7						
	17.4	230	3.6	4.2	4.9	5.5	6.2	6.8	8.4	9.9	11.4	12.7	14.0							
	16.7	240	3.7	4.3	4.9	5.6	6.3	6.9	8.6	10.2	11.7	13.1	14.5							
	16.0	250	3.7	4.3	5.0	5.7	6.3	7.0	8.7	10.4	12.0	13.5								
	15.4	260	3.7	4.4	5.0	5.7	6.4	7.1	8.9	10.6	12.3	13.9								
	14.8	270	3.7	4.4	5.1	5.8	6.5	7.2	9.1	10.8	12.6	14.3								
	14.3	280	3.7	4.4	5.1	5.9	6.6	7.3	9.2	11.1	12.9	14.6								
	13.8	290	3.8	4.5	5.2	5.9	6.7	7.4	9.4	11.3	13.1									
	13.3	300	3.8	4.5	5.2	6.0	6.7	7.5	9.5	11.5	13.4									
	12.5	320	3.8	4.5	5.3	6.1	6.9	7.7	9.8	11.8	13.9									
	11.8	340	3.9	4.6	5.4	6.2	7.0	7.8	10.0	12.2	14.4									
	11.4	350	3.9	4.6	5.4	6.2	7.1	7.9	10.1	12.4	14.6									
	11.1	360	3.9	4.6	5.4	6.3	7.1	8.0	10.2	12.5	14.8									
	10.5	380	3.9	4.7	5.5	6.3	7.2	8.1	10.4	12.8										
	10.0	400	3.9	4.7	5.5	6.4	7.3	8.2	10.6	13.1										
	8.9	450	4.0	4.8	5.7	6.6	7.5	8.5	11.1	13.8										

15.0

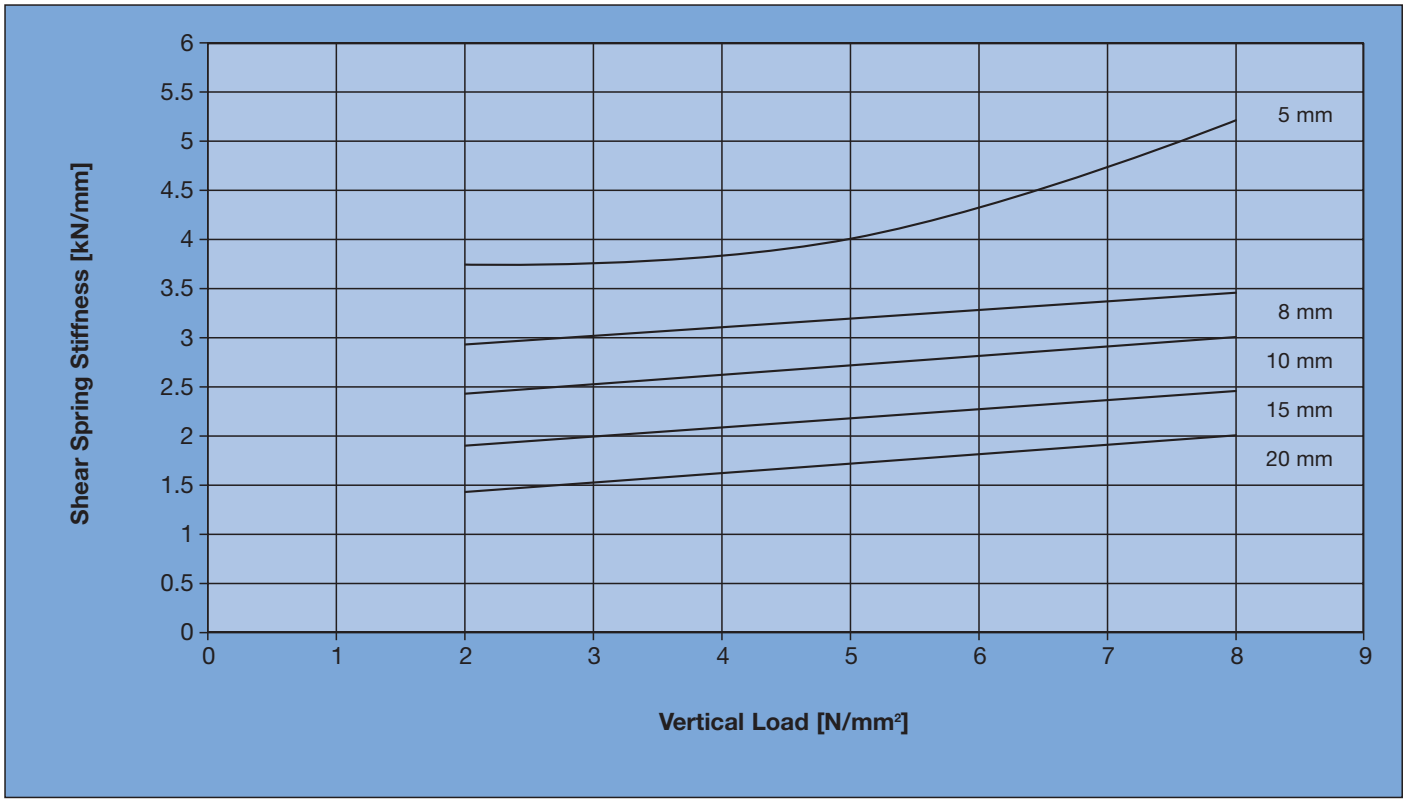
15.0



Picture 3: Elastic bearing deformation with perm. load depending on bearing thickness and shape factor

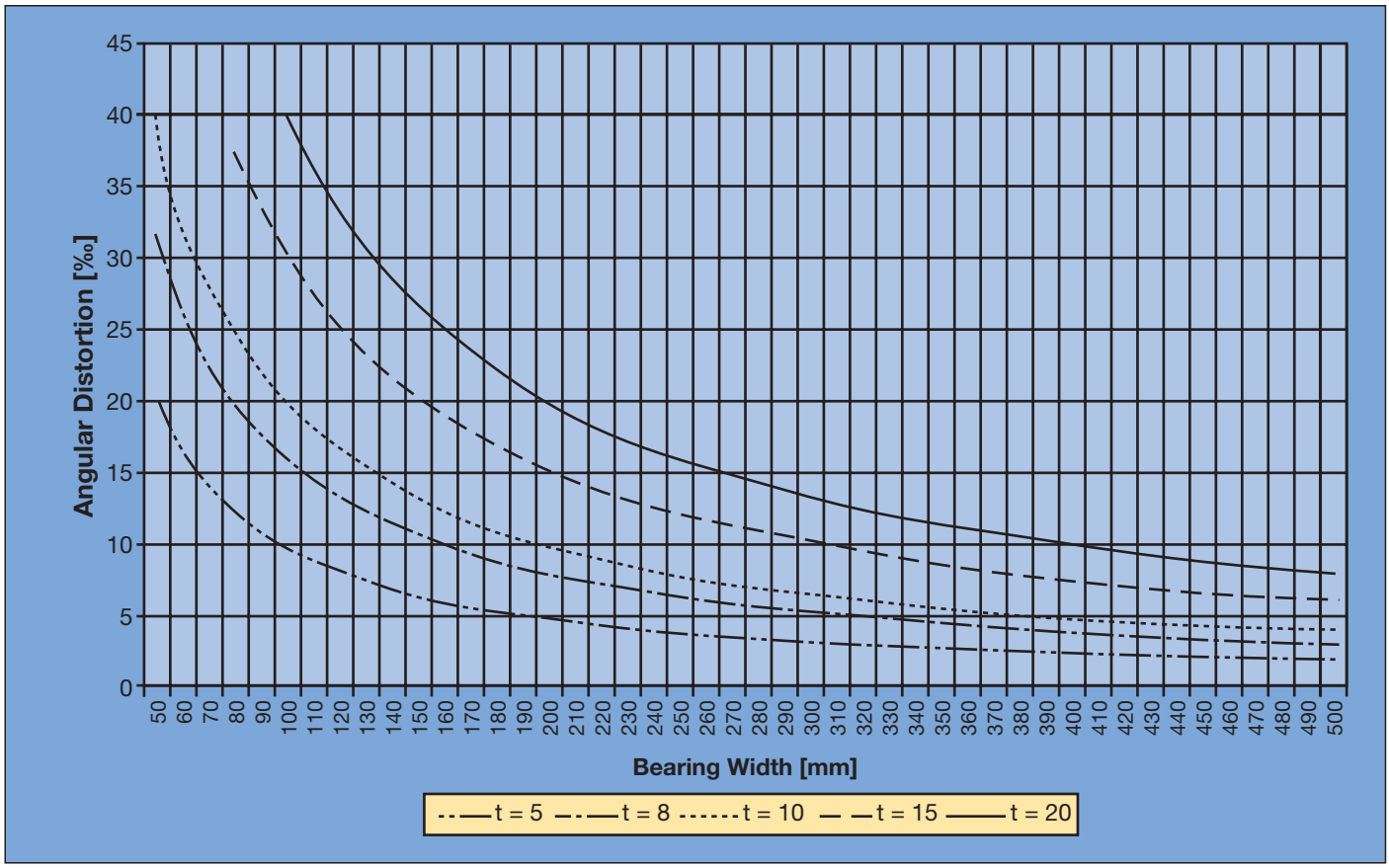
Shape Factor	Compression Modulus	Shape Factor	Compression Modulus	Shape Factor	Compression Modulus	Shape Factor	Compression Modulus
1.0	11.7	**3.6**	68.5	**6.2**	178.0	**8.8**	340.2
1.1	12.9	**3.7**	71.7	**6.3**	183.3	**8.9**	347.5
1.2	14.2	**3.8**	75.0	**6.4**	188.6	**9.0**	354.9
1.3	15.6	**3.9**	78.4	**6.5**	194.0	**9.1**	362.3
1.4	17.0	**4.0**	81.9	**6.6**	199.5	**9.2**	369.9
1.5	18.5	**4.1**	85.4	**6.7**	205.1	**9.3**	377.5
1.6	20.1	**4.2**	89.1	**6.8**	210.8	**9.4**	385.2
1.7	21.8	**4.3**	92.8	**6.9**	216.5	**9.5**	392.9
1.8	23.6	**4.4**	96.6	**7.0**	222.3	**9.6**	400.8
1.9	25.4	**4.5**	100.4	**7.1**	228.2	**9.7**	408.7
2.0	27.3	**4.6**	104.4	**7.2**	234.2	**9.8**	416.7
2.1	29.3	**4.7**	108.4	**7.3**	240.2	**9.9**	424.7
2.2	31.4	**4.8**	112.5	**7.4**	246.3	**10.0**	432.9
2.3	33.5	**4.9**	116.6	**7.5**	252.2	**10.1**	441.1
2.4	35.7	**5.0**	120.9	**7.6**	258.8	**10.2**	449.4
2.5	38.0	**5.1**	125.2	**7.7**	265.2	**10.3**	457.8
2.6	40.4	**5.2**	129.6	**7.8**	271.6	**10.4**	466.3
2.7	42.9	**5.3**	134.1	**7.9**	278.1	**10.5**	474.8
2.8	45.4	**5.4**	138.7	**8.0**	284.7	**10.6**	483.4
2.9	48.0	**5.5**	143.3	**8.1**	291.4	**10.7**	492.1
3.0	50.7	**5.6**	148.0	**8.2**	298.1	**10.8**	500.9
3.1	53.5	**5.7**	152.8	**8.3**	304.9	**10.9**	509.8
3.2	56.3	**5.8**	157.7	**8.4**	311.8	**11.0**	518.7
3.3	59.2	**5.9**	162.7	**8.5**	318.8	**11.1**	527.7
3.4	62.2	**6.0**	167.7	**8.6**	325.9	**11.2**	536.8
3.5	65.3	**6.1**	172.8	**8.7**	333.0	**11.3**	546.0

Table 1: Compression Modulus E_D [N/mm²] of Compact Bearing S 70 depending on shape factor

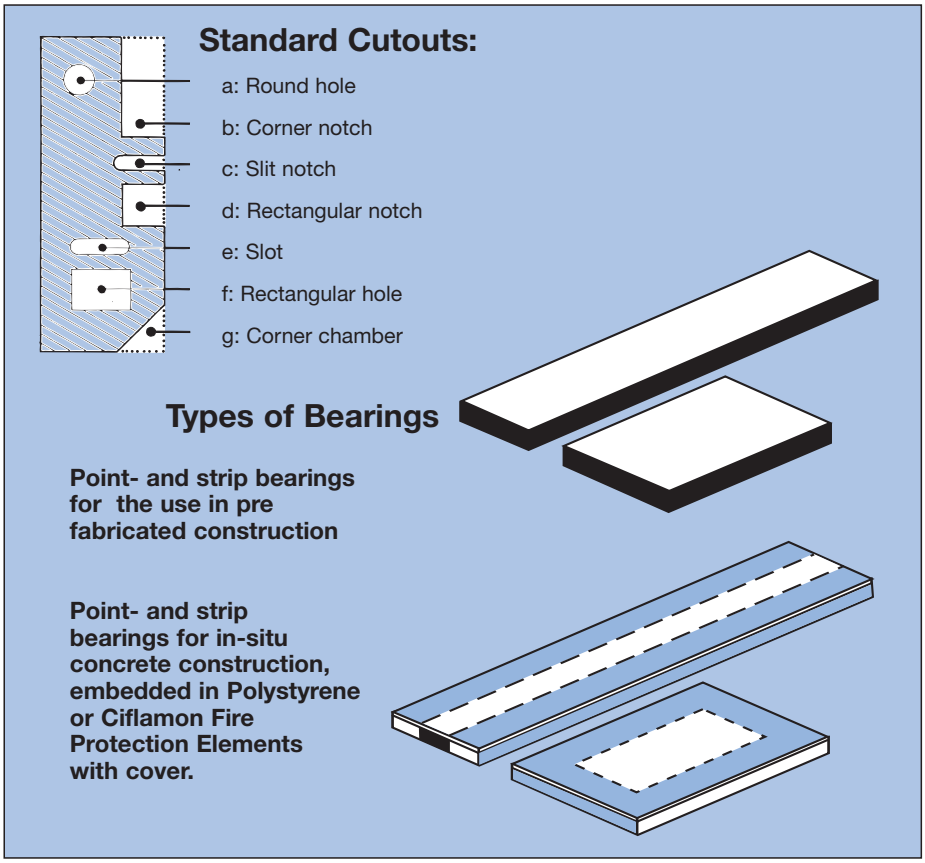


Picture 4: Shear spring stiffness C_s [kN/mm] depending on vertical load

Horizontal shear deformation caused by **unique** horizontal forces has not to be proven, because unique minor sliding does not lead to any harmful changes of the support. If a “pure” shear deformation is required, a vertical load of **2.2 N/mm²** is necessary.



Picture 5: Permissible angle of distortion depending on bearing thickness and -width



Picture 6: Calenberg Compact Bearing S 70, standard cutouts and types of bearings

Dimensions and Format

Calenberg Compact Bearings S 70 are available cut to size as requested (picture 6).
In the case that bolts have to be put through a bearing, it can be provided with holes, cutouts, slots etc..
For the use in pre fabricated construction Compact Bearings S 70 are available embedded in Polystyrene- or Ciflamon Fire Resistance Elements, so the support joint will not be affected by penetrating fresh concrete. This is important to ensure the necessary elastic bearing deformation without any resistance.

Measurements:
- Bearing thickness: 5, 8, 10, 15, 20 mm
- Maximum ground area: 1200 mm x 1200 mm

Application, Where to Use

Calenberg Compact Bearings S 70 are used in all areas of construction as permanent elastic and flexible joint elements.
The bearing pads are used in building construction as elastic rectangular, circular or strip bearings to support girders, beams, wall-boards etc..

Fire Resistance Properties

The minimum bearing dimensions required for classification into Fire Resistance Class F 90 and F 120 are listed in the “Fire Protection Table” (Brandschutztechnische Beurteilung) No. 3799/7357-AR. For bearings with smaller dimensions a jacketing with a 30 mm wide Ciflamon Fire Protection Strip is necessary to meet the conditions of the F 120 – classification.

Directions for Bearing Installation

In precast construction Compact Bearings S 70 are to be placed in the centre of the support area. With reinforced concrete components the distance between bearing edge and component edge must be at least 2,5 cm, so that the steel reinforcement encloses the bearing pad area. Chamfered component edges have to be taken into consideration.

In-situ concrete construction requires a covering of gaps and joints around the bearing pad, so the support joint will not be affected by penetrating fresh concrete. A rigid connection must be avoided. The springing effect of the elastomer bearing has to be ensured in any case.

Certificate, Approval of Suitability

- Certificate No. 849.0633, basic research into classification of Compact Bearings S 70 according to DIN 4141 part 3, Testing Institute for Machine Material and Plastic,Technical University of Hannover, 1999
- Fire Resistance Judgement No. 3799 / 7357–AR; Judgement of Calenberg elastomer bearings regarding to a classification into fire resistance class F 90 resp. F 120 according to DIN 4102 part 2 (edition 9/1977), Official Material Testing Institute of Civil Constructions, TU Braunschweig, November 1997

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