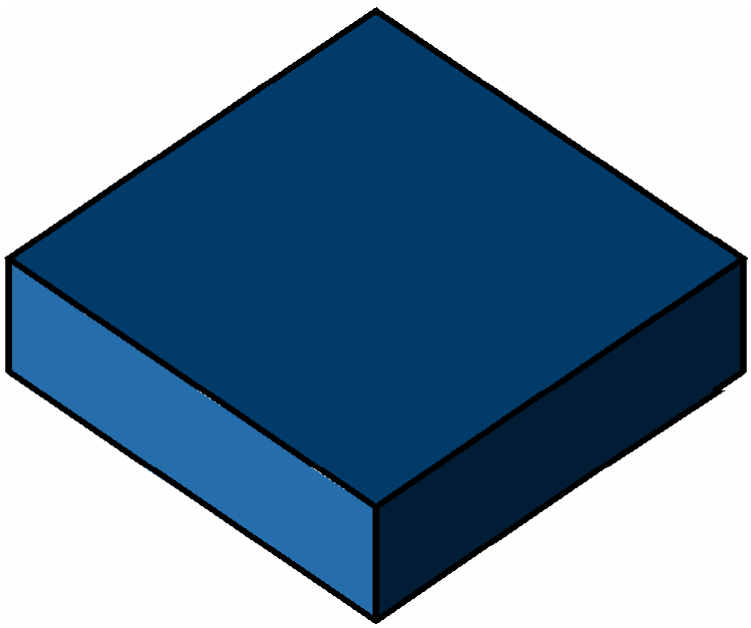
Official Certificate

No. 850.0427

Calenberg
Compact Bearing S 70

unreinforced elastomer bearing
of higher hardness



MPA HANNOVER

Extension of validity of Official Testing Certificate

Certificate No.	850.0427
Subject:	Unreinforced structural bearing **Calenberg Compact Bearing S 70**
Date of first issue:	10.07.2000
Now valid till:	30.06.2016
Intended Purpose:	Supports according to DIN 4141 part 3, Sept. 1984 Support in civil engineering Support for building construction Support class 2

This extension includes 1 page and is valid only in connection with the actual version of certificate 850.0427.
(1. issue: 10.07.2000, 1. extension: 24.09.2003, 2.extension: 26.03.2008, 1. prolongation 14.01.2010)

Garbsen, 28.06.2011

RD Dr.-Ing. Kinzel
Head of Testing Institute

Materialprüfanstalt für Werkstoffe und Produktionstechnik · MPA HANNOVER

Dipl.-Ing. Robert Witte
Deputy

Materialprüfanstalt für Werkstoffe
und Produktionstechnik
An der Universität 2
D-30823 Garbsen

Tel. +49(0)511-762 43 62
Fax +49(0)511-762 30 02
info@mpa-hannover.de
www.mpa-hannover.de

Landesbetrieb gemäß
§ 26 Nds. LHO

Vorstand:
Prof. Dr.-Ing. Bernd-Arno Behrens · Sprecher
Dr.-Ing. Andreas Kinzel · Geschäftsführer
Dr.-Ing. Hans-Joachim Seidel · Geschäftsführer

Extension of validity
of
Official Testing Certificate

Certificate No.	850.0427
Subject:	Unreinforced structural bearing **Calenberg Compact Bearing S 70**
Date of first issue:	10.07.2000
Now valid till:	31.12.2014
Intended Purpose:	Supports according to DIN 4141 part 3, Sept. 1984 Support in civil engineering Support for building construction Support class 2

This extension includes 1 page and is valid only in connection with the actual version of certificate 850.0427.
(1. issue: 10.07.2000, 1. extension: 24.09.2003, 2.extension: 26.03.2008)

Garbsen, 14.01.2010

RD Dr.-Ing. Seidel
Head of Testing Institute

Dipl.-Ing. Robert Witte
Deputy

Materialprüfanstalt für Werkstoffe
und Produktionstechnik
An der Universität 2
D-30823 Garbsen

Tel. +49(0)511-762 43 62
Fax +49(0)511-762 30 02
info@mpa-hannover.de
www.mpa-hannover.de

Landesbetrieb gemäß
§ 26 Nds. LHO

Vorstand:
Prof. Dr.-Ing. Bernd-Arno Behrens · Sprecher
Dr.-Ing. Andreas Kinzel · Geschäftsführer
Dr.-Ing. Hans-Joachim Seidel · Geschäftsführer

Official Certificate

Certificate-No.	850.0427	
Subject:	Unreinforced structural bearing **Calenberg Compact Bearing S 70** Data of manufacturer and of chemical compounds are deposited at the Material Testing Institute	
Intended Purpose:	Supports according to DIN 4141 part 3, Sept. 1984 Support in civil engineering Support for building construction bearing class 2	
Applicant:	Calenberg Ingenieure planmäßig elastisch lagern GmbH Am Knübel 2-4 D-31020 Salzhemmendorf Germany	
Date of issue:	first: prolongation: prolongation:	10.07.2000 24.09.2003 20.08.2008
Valid till:	26.03.2010	

Due to this certificate the above mentioned subject is applicable according to the state's building regulations.

This certificate includes 12 pages and 9 enclosures.

Materialprüfanstalt für Werkstoffe und Produktionstechnik
An der Universität 2
D-30823 Garbsen

Tel. +49(0)511 · 762 43 62
Fax +49(0)511 · 762 30 02
info@mpa-hannover.de
www.mpa-hannover.de

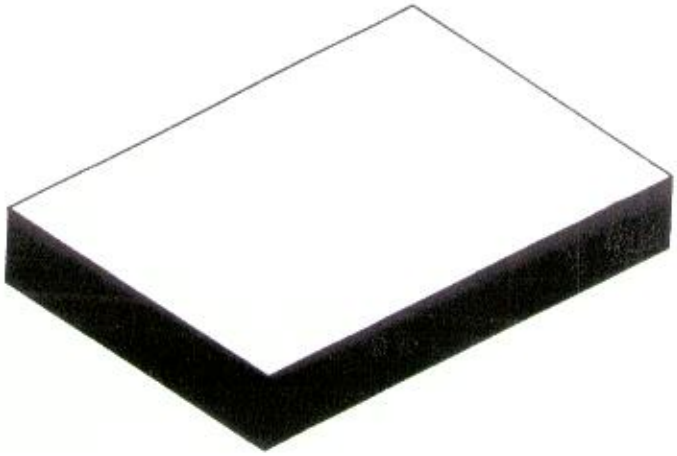
Landesbetrieb gemäß § 26 Nds. LHO

Vorstand:
Prof. Dr.-Ing. Bernd-Arno Behrens · Sprecher
Dr.-Ing. Andreas Kinzel · Geschäftsführer
Dr.-Ing. Hans-Joachim Seidel · Geschäftsführer

1. Subject and Field of Application:

1.1. Subject

The Calenberg Compact Bearing S 70 is an unreinforced non-profiled elastomer bearing.



Picture 1: Calenberg Compact Bearing S70

The Calenberg Compact Bearing S 70 is manufactured in thickness of 5, 8, 10, 15 and 20 mm.
Length and width are variable. They conform to the particular bearing stress for the intended purpose under consideration of the below mentioned bearing reactions.

1.2 Field of Application

The Calenberg Compact Bearing S 70 can be used for supports of components and structures in building construction according to bearing class 2 of DIN 4141 part 3, Sept. 84.
Basic requirement for the application is that the adjacent components are only stressed irrelevantly by other bearing reactions. The stability of the structure must not be endangered by excessive stress of the bearing or failure of the bearing function.
This certificate is only valid if demands on sound protection have not to be met.
Due to the declaration of the applicant there was no reason to test the effects of the installed building product regarding to demands on health and environmental protection.
The bearings are shape dependant applicable up to a maximum vertical load according to table 1.

Bearing Thickness in mm	5	8	10	15	20
	Maximal permissible compression stress in N/mm²				
Bearing Area Length x width in mm²					
80 x 80	15	11.5	8	5	3,5
100 x 50	15	8.5	6.5	4	3
190 x 50	15	11	8	5	3.5
100 x 100	15	15	11.5	6.5	4.5
190 x 100	15	15	15	9.5	6.5
150 x 150	15	15	15	15	7.5
185 x 185	15	15	15	15	10

Table 1: Calenberg Compact Bearing S 70
Matrix of the maximum permissible compressive stress

Length and width are variable. They conform to the particular bearing stresses of the case of application considering the below mentioned bearing reactions.
The data of the defined bearing areas in the following chapters may be used for the interpolation of bearing reactions of bearing areas differing from these bearing areas.

2. Requirements on the Building Product

2.1 Characteristics, Characteristic Values and Composition of the Calenberg Compact Bearing S 70

2.1.1 Characteristics

2.1.1.1 Physical Characteristics

The physical characteristics of the elastomer – tested on test sheets – have to be proved according to chapter 2.1.2.5 and 2.2.1.

2.1.1.2 Bearing Reactions

The essential characteristics restricting the application are the bearing reactions on

- the transmission of vertical loads (compression spring reaction) and thus implied bearing elongation,
- shear load (determination of the shear modulus)
- unplanned bearing load beyond the defined bearing load (vertical stress overload)
- creeping of the bearing under long-term load (long-term stability)

The bearing reactions have to be proved on bearing dimensions according to table 2.

Bearing Dimensions Length x width in mm	Thickness In mm	Max. Load for the Determination of the Compression Spring Reaction in N/mm²	Load Area for the Determination of the Shear Modulus in N/mm²	Overload In N/mm²	Determination of the Bearing Elongation at max. Load	Long-term Test
80 x 80	5	15			X	
100 x 50	5	15			X	
190 X 50	5	15			X	
100 X 100	5	15			X	
190 X 100	5	15	2-8		X	
150 X 150	5	15			X	
185 X 185	5	15			X	
80 x 80	8	11.5			X	
100 x 50	8	8.5			X	
190 X 50	8	11			X	
100 X 100	8	15			X	
190 X 100	8	15	2-8		X	
185 X 185	8	15			X	
80 x 80	10	8			X	
190 X 50	10	8			X	
100 X 100	10	11.5		80	X	X
190 X 100	10	15	2-8		X	
150 X 150	10	15			X	
185 X 185	10	15			X	
80 x 80	15	5			X	
100 x 50	15	4			X	
190 X 50	15	5			X	
100 X 100	15	6.5			X	
190 X 100	15	9.5	2-8		X	
185 X 185	15	15			X	
80 x 80	20	3.5				
100 x 50	20	3				
190 X 50	20	3.5				
100 X 100	20	4.5				
190 X 100	20	6.5	2-8			
150 X 150	20	7.5				
185 X 185	20	10				

Table 2: Test Scope of Bearing Reactions

2.1.2 Characteristic Values

2.1.2.1 Bearing Reaction at Vertical Load

The compressive stress at deflection out of vertical load must correspond to the nominal values for the deflection-dependant stress in the diagrams 1 to 7 – load-deflection curves - (enclosure) with a compression stress tolerance of ± 10 % related to the particular deflection.

The nominal values of the permissible concentric bearing elongation at maximum vertical compression stress can be taken from the following table 3. The nominal values of the bearing elongation have to be in a tolerance range of ± 10 %.

	Bearing Thickness in mm									
	5		8		10		15		20	
	Maximum Test Load σ in N/mm² and Corresponding Bearing Elongation A in mm²									
Nominal Bearing Area Length x Width without Load in mm²	σ	A	σ	A	σ	A	σ	A	σ	A
80 x 80	15	95x90	11,5	92x93	8	92x92	5	92x91	3,5	90x88
100 x 50	15	108x65	8,5	107x61	-	-	4	109x59	3	108x57
190 X 50	15	196x60	11	199x62	8	198x53	5	196x61	3,5	196x59
100 X 100	15	114x115	15	117x115	11,5	117x117	6,5	115x113	4,5	114x113
190 X 100	15	199x112	15	198x115	15	205x121	9,5	204x119	6,5	205x119
150 X 150	15	157x159	-	-	15	169x169	-	-	7,5	172x169
185 X 185	15	190x191	15	193x195	15	201x202	15	207x206	10	210x210

Table 3: Calenberg Compact Bearing S 70
Bearing Elongation at Load

2.1.2.2 Bearing Reactions out of Shear Stress

The shear moduli of the bearing at horizontal shear stress and simultaneous vertical stress must correspond to the nominal values in diagram 8 of the enclosure with a tolerance of the shear modulus at the particular vertical load of ± 10 %.

2.1.2.3 Bearing Reaction at Vertical Overload

The vertical load at a value of the vertical deflection higher than the maximum vertical deflection permitted must correspond to the nominal values of the vertical compressive stress according to diagram 9 of the enclosure with a tolerance of ± 15 %.

After the stress failure test the bearing should neither show a visible abrasion nor any starting cracks or damages.

2.1.2.4 Long-Term Durability

The creep value must be below 10 %. The obvious damaged bearing surface must be below 15 % of the total surface.

2.1.2.5 Physical Characteristics

The physical characteristics of the elastomer must meet the demands of table 4.

Characteristics	Demand
Shore-A-hardness	70 ± 5 Shore-A
Tensile strength (standard specimen S2)	≥ 12 N/mm²
Tensile elongation (standard specimen S2)	≥180 %
Rebound elasticity	≥ 30 %
Crack growth resistance strip sample	≥ 2,5 N/mm
Behaviour after heat effect 7d/150°C - reduction of tensile strength - reduction of tensile elongation	 max. 25 % max 40 % (rel.)
Behaviour in cold condition – 30°C, 24 h / Speedy bending around bolt ø 2 mm, sample 2 mm thick	no break
Behaviour under ozone influence 23 °C/50pphm/72h/20 % elongation	crack degree 0
Compression set 24h/70°C	≤ 30 %
Table 4: Physical Characteristics of the Elastomer	

2.1.2.6 Limit Dimensions of the Bearing

The limit dimensions of the bearing must follow class M4 DIN 7715 part 2.

2.1.3 Compound

The elastomer material consists of an EPDM based vulcanizate. The data of the chemical compound are deposited at the Material Testing Institute Hannover.

The components according to table 5 have to be proved.

Component
Caoutchouc content and proof
Soot content
Auxiliary material
Glow residue (mineral components)
Table 5: Proof of Chemical Compound

2.2 Applied Test Methods

2.2.1 Physical Characteristics of the Elastomer

Test with Test Sheets

Characteristics	Test according to:
Shore-A-hardness	DIN 4141 part 140/01.91, chapter 4.1.6
Tensile strength (standard specimen S2)	DIN 4141 part 140/01.91, chapter 4.1.7
Tensile elongation (standard specimen S2)	DIN 4141 part 140/01.91, chapter 4.1.7
Compression set DVR 24h/70°C	DIN 4141 part 140/01.91, chapter 4.1.9
Crack growth resistance strip sample	DIN 4141 part 140/01.91, chapter 4.1.8
Behaviour under heat effect 7d/150°C - reduction of tensile strength - reduction of tensile elongation	DIN 4141 part 140/01.91, chapter 4.1.11 chapter 4.1.7 chapter 4.1.7 (deviating temperature raised to 150°C)
Behaviour under ozone influence 23 °C/50pphm/72h/20 % elongation	DIN 53509
Table 6: Procedure for the Proof of Physical Characteristics	

2.2.2 Compound

Component	Test Procedure, Test with Bearing
Caoutchouc content and proof	NMR-spectronomy or alternative procedure
Glow residue	Glowing at 550°C or alternative procedure
Auxiliary material	DIN 53553 or alternative procedure
Soot content	Difference of a.m. components or alternative procedure
Table 7: Procedure for the Proof of Chemical Compound	

2.2.3 Bearing Reactions

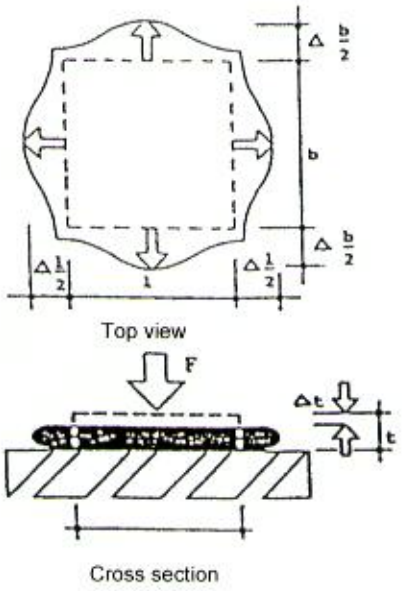
2.2.3.1 Determination of Bearing Reaction out of Vertical Load

The static load deflection graphs will be determined between shuttered concrete areas according to DIN 4141, part 150.

Three load and relief graphs a time will be completed. The test speed is 10 mm/min. The third compression loading will be registered as graph.

At maximum load during the third loading the bearing elongation will be measured. The size of the test is according to the specification in table 2, column 3 and 6.

The bearing elongation will be determined as shown in picture 2.



l	=	length of elastomer sheet
b	=	width of elastomer sheet
t	=	thickness of elastomer sheet

Δl	=	max. transverse deformation in bearing length
Δb	=	max. transverse deformation in bearing width
Δt	=	vertical deflection of the elastomer sheet

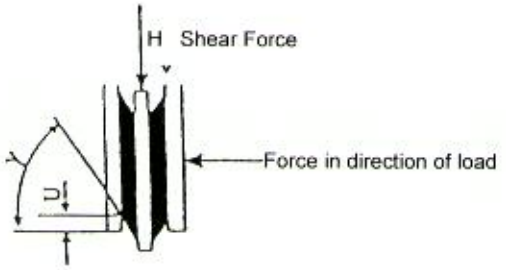
Picture 2:
Measurement of the area deformation of a concentric loaded Calenberg Compact Bearing S 70 between load transmitting areas of the adjacent components (concrete according to DIN 4141 part 150) with thus partly hindered transverse elongation.

2.2.3.2 Shear Deformation Test

The shear deformation graphs will be determined according to picture 3 following DIN 4141 part 150 between corundum-covered steel plates with a deformation speed of 1.5 mm/s.

On this occasion bearings with three different preloads according to the beginning, the middle and the end of the complete load area of table 2, column 4, will be tested.

The third loading will be registered and analysed regarding the shear deformation modulus according to picture 3



$$G = \frac{\Delta\tau}{\Delta \tan\gamma} \qquad \tau = \frac{H}{A} \qquad \tan\gamma = \frac{U}{t_0}$$

$$\tan\gamma_1 = 0.2 \rightarrow U_{0.2} = 0.2 \times t_0$$

$$\tan\gamma_2 = 0.9 \rightarrow U_{0.9} = 0.9 \times t_0$$

$$G = \frac{H_2 - H_1}{2A\left(\frac{U_2}{t_0} - \frac{U_1}{t_0}\right)} = \frac{H_2 - H_1}{2F \times 0.7} \qquad 2A = 2(L \times B)$$

A = ground area of the bearing
U = shear deformation
H = shear force
t_0= bearing thickness

Picture 3: Scheme of the Shear Modulus Test

2.2.3.3 Compression Failure Test

A bearing with dimension of 100 x 100 x 10 mm³ will be loaded up to a top force of 800 kN. The test speed is 10 mm/min.

The bearing will be loaded once.

The compression failure test happens between rough rolled steel plates.

Through evaluation of the force deformation diagram as well as an optic examination of the free side areas and the surfaces the bearing will be examined regarding eventual occurring failure features (cracks, scaling).

2.2.3.4 Durability Test

Two bearings with dimension of 100 x 100 x 10 mm³ will be tested according to DIN 4141 part 150, chapter 4.1.10, considering a different raised load of 60 N/mm² and a reduced load period of 14 days.

2.3 Design and Calculation

For design and calculation of the Calenberg Compact Bearing S 70 DIN 4141 is decisive in its actual valid edition under the extended consideration of the area load according to table 1 of this certificate.
In this connection the above mentioned bearing reactions

- load deformation reaction
- shear reaction
- creep

and the bearing characteristics

- physical properties
- creep tendency
- ageing behaviour

have to be considered in regard to its proof scope, -kind and –magnitude.
For the execution the following standards, including their hints indicating other rules and documents have to be considered additionally in their respective valid edition regarding this certificate's date of issue.

- DIN 1045 Concrete and steel reinforced concrete construction, design and execution
- DIN 1055 Design load for Structures
- German committee for steel reinforced concrete, issue 339, column joints in precast steel reinforced concrete structures with unreinforced elastomer bearings
- DIN 18800 Steel construction
- DIN 1052 Timber construction
- DIN 1053 Brick construction (masonry)

The Calenberg Compact Bearing S 70 is manufactured in thickness of 5, 8, 10, 15 and 20 mm. Length und width are variable. They conform to the particular bearing stress due to the intended purpose under consideration of the bearing reactions.
The data about characteristics and nominal values of Calenberg Compact Bearing S 70 in the above mentioned chapters for defined bearing areas can be used for the interpolation of bearing reactions of differing bearing areas to those shown above.

2.4 Execution

The above mentioned bearing reactions and bearing characteristics regarding their proof scope have to be considered.

For the execution the following standards, including their hints indicating other rules and documents have to be considered additionally in their respective valid edition regarding this certificate's date of issue.

- DIN 4141 Structural Bearings
- DIN 1045 Concrete and steel reinforced concrete construction, design and execution
- DIN 1055 Design load for Structures
- German committee for steel reinforced concrete, issue 339, column joints in precast steel reinforced concrete structures with unreinforced elastomer bearings
- DIN 18800 Steel construction
- DIN 1052 Timber construction
- DIN 1053 Brick construction (masonry)

2.5 Use, Maintenance

For use and maintenance the instructions of the standards listed in chapter 2.4 – so far described as necessary – have to be considered additionally in their respective valid edition regarding this certificate's date of issue.
In this connection the above mentioned bearing reactions and bearing characteristics have to be considered regarding their proof scope –kind and –magnitude.

3 Conformity Procedure

According to the A-list of building rules, part 2 the procedure of the conformity proof follows the ÜH" regulations – conformity declaration of the manufacturer - based an a "P"-proof of use – official certificate 850.0427, dated 10.07.2000 of the Testing Institute for Mechanical Engineering Materials and Plastics.
The manufacturer has to supervise the production as described in table 8.

Kind of Test	Specification	Frequency
Chemical compound	chapter 2.2.2 table 7	each mixture charge
Physical properties	chapter 2.2.1 table 6	each mixture charge
Load deflection graph	chapter 2.2.3.1 bearing size 100x100xthickness	each thickness once a year
Shear modulus	chapter 2.2.3.2	each thickness once a year
Table 8:		
Scope of Works Internal Production Control		

4. Conformity Mark

The building product Calenberg Compact Bearing S 70 has to be marked by the manufacturer with the conformity mark (Ü-mark) according to the conformity mark regulations of the federal states. The Ü-mark has to be attached with the prescribed data to the building product "Calenberg Compact Bearing S 70" or on its packing (a packing insert is equivalent) or if this is not possible on the delivery note.

5. Legal Basis

This official certificate is granted based on §§ 25 of the bylaws of the land Niedersachsen in connection with the A-list of building rules, part 2.

6. Instructions on Rights of Appeal

Against this official certificate can be contradicted within one month after publication. The contradiction has to be lodged by letter or writing down at the Testing Institute for Mechanical Engineering Materials and Plastics.

7. Common Hints

7.1 The official certificate does not replace the legally prescribed approvals, agreements and certifications concerning building activities.

7.2 The official certificate is granted without prejudice to the rights of thirds, especially private protective rights.

7.3 The contractor has to have ready the official certificate on the building site.

7.4 The official certificate is only to be duplicated completely. A publication in extracts needs the agreement of the Testing Institute for Mechanical Engineering Materials and Plastics. Sketches of advertising brochures are not allowed to contradict to the official certificate. Translations of the official certificate must include the hint: "Translation of the original German issue not examined by the Testing Institute for Mechanical Engineering Materials and Plastics ".

Garbsen, 26.03.2008

Head of Testing Institute

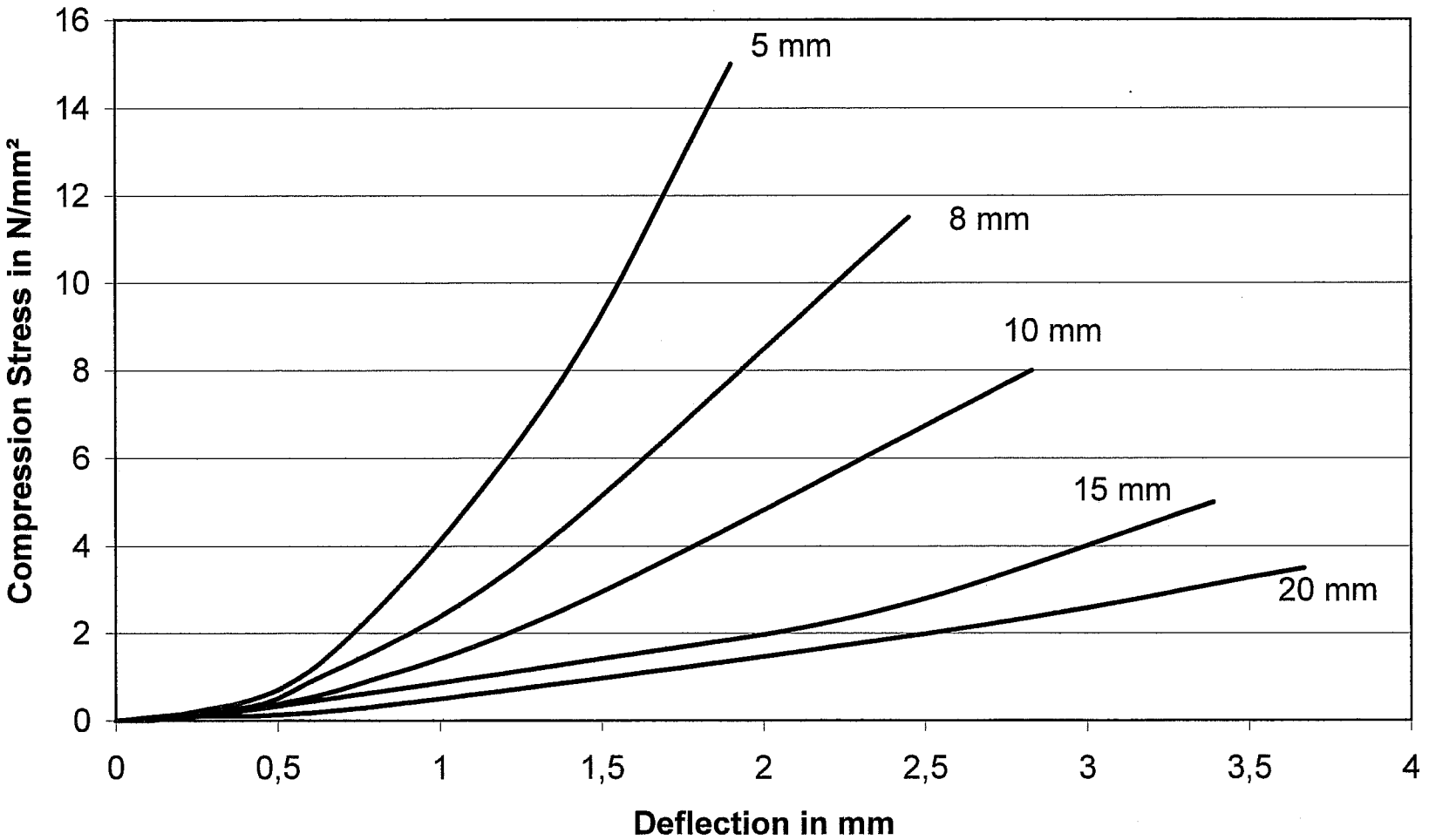
RD DR.-Ing. Kinzel

Deputy

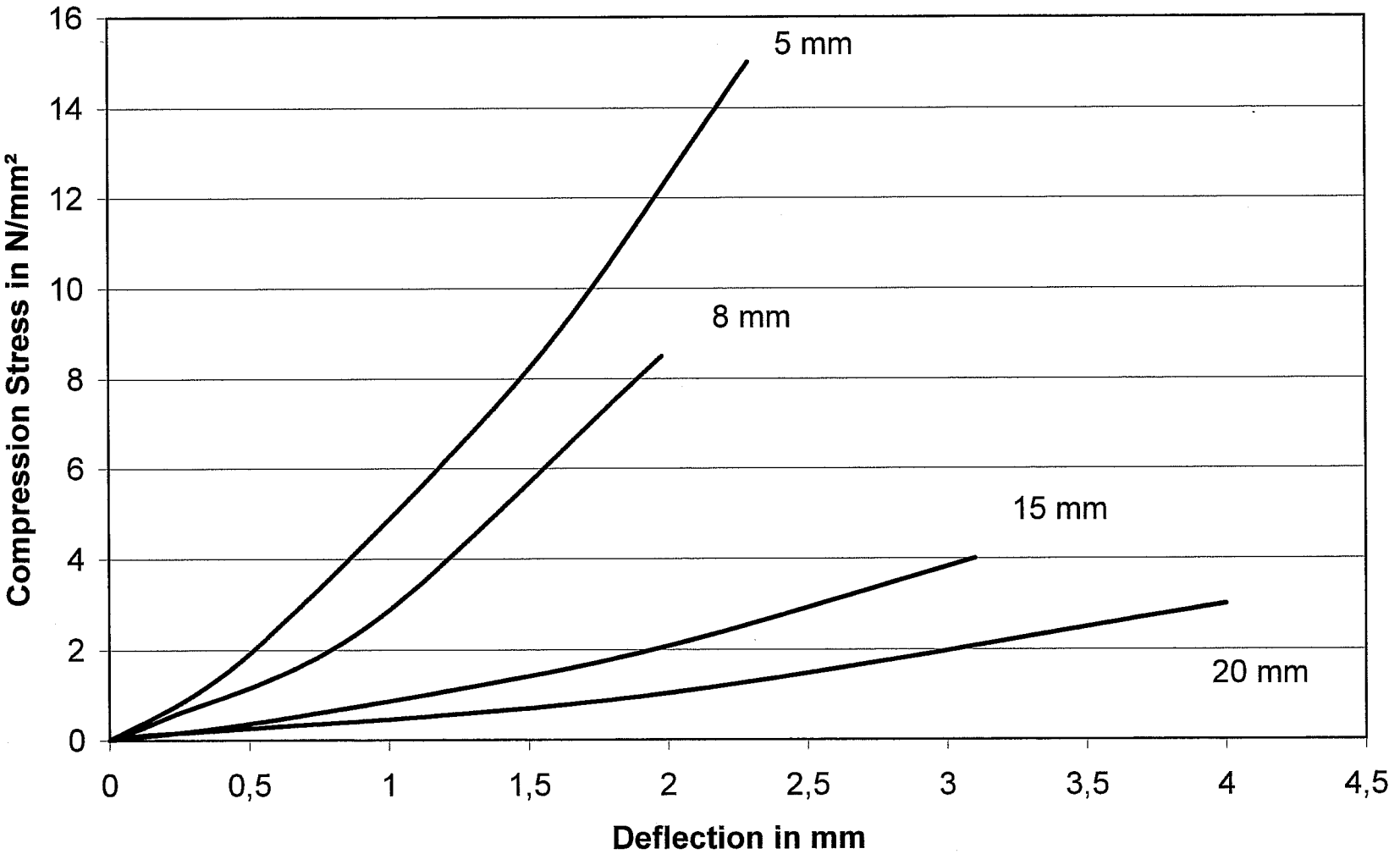
Dipl.-Ing. Witte

9 enclosures diagrams

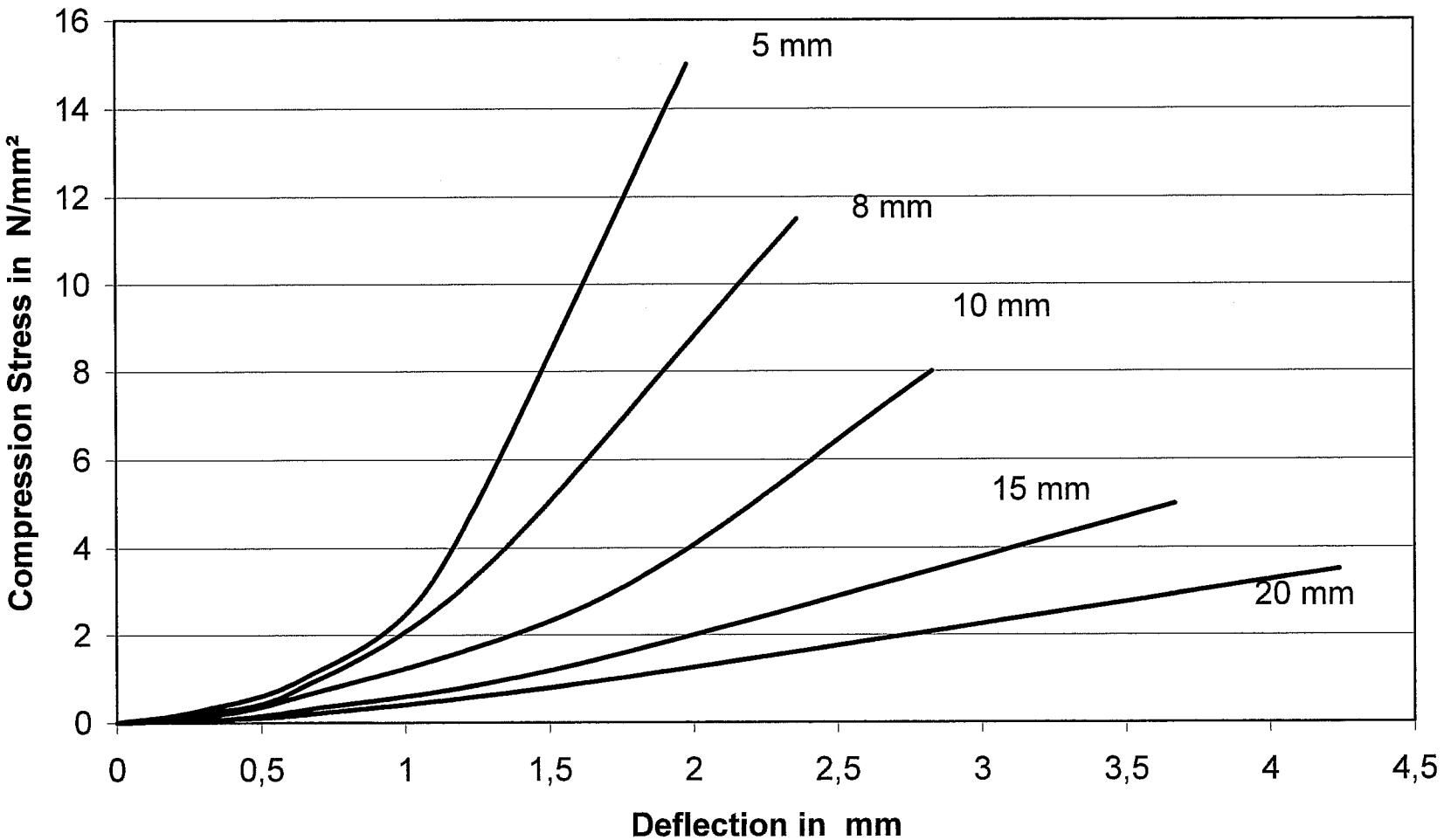
850.0427, Load Deflection Curve
Calenberg Compact Bearing S70, 80 x 80 mm²



850.0427, Load Deflection Curve
Calenberg Compact Bearing S70, 50 x 100 mm²

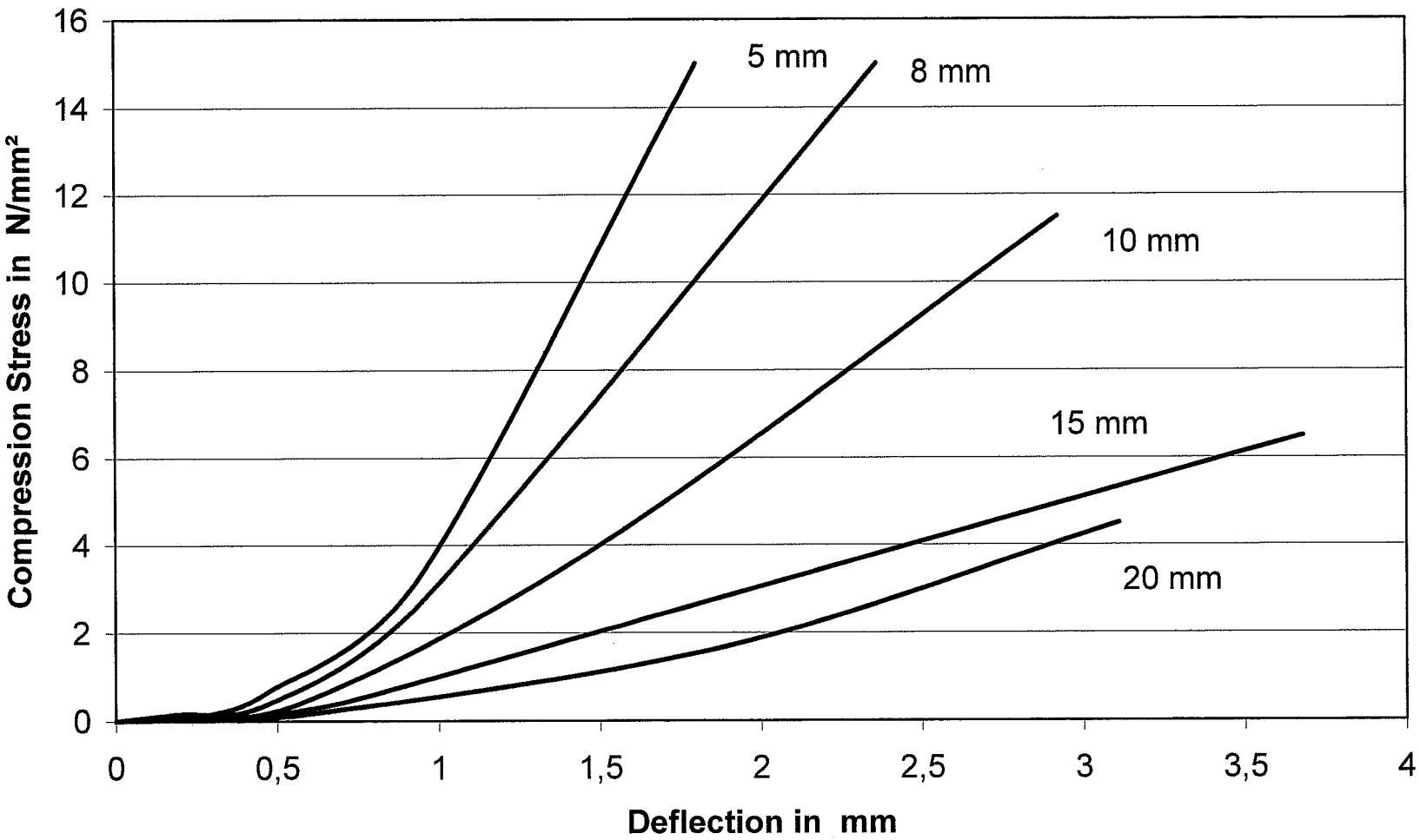


850.0427, Load Deflection Curve
Calenberg Compact Bearing S70, 190 x 50 mm²



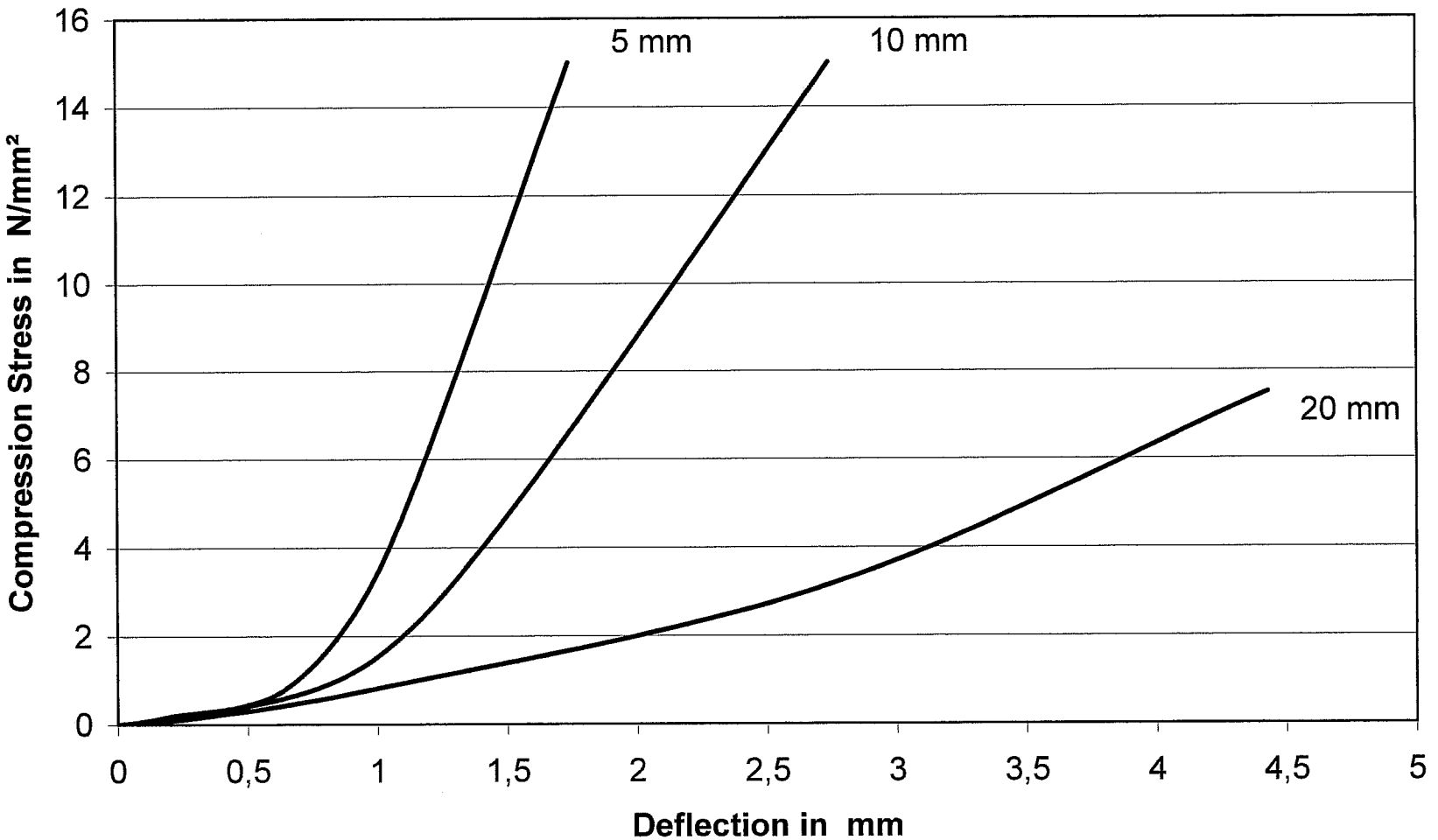
Hannover

850.0427, Load Deflection Curve
Calenberg Compact Bearing S70, 100 x 100 mm²

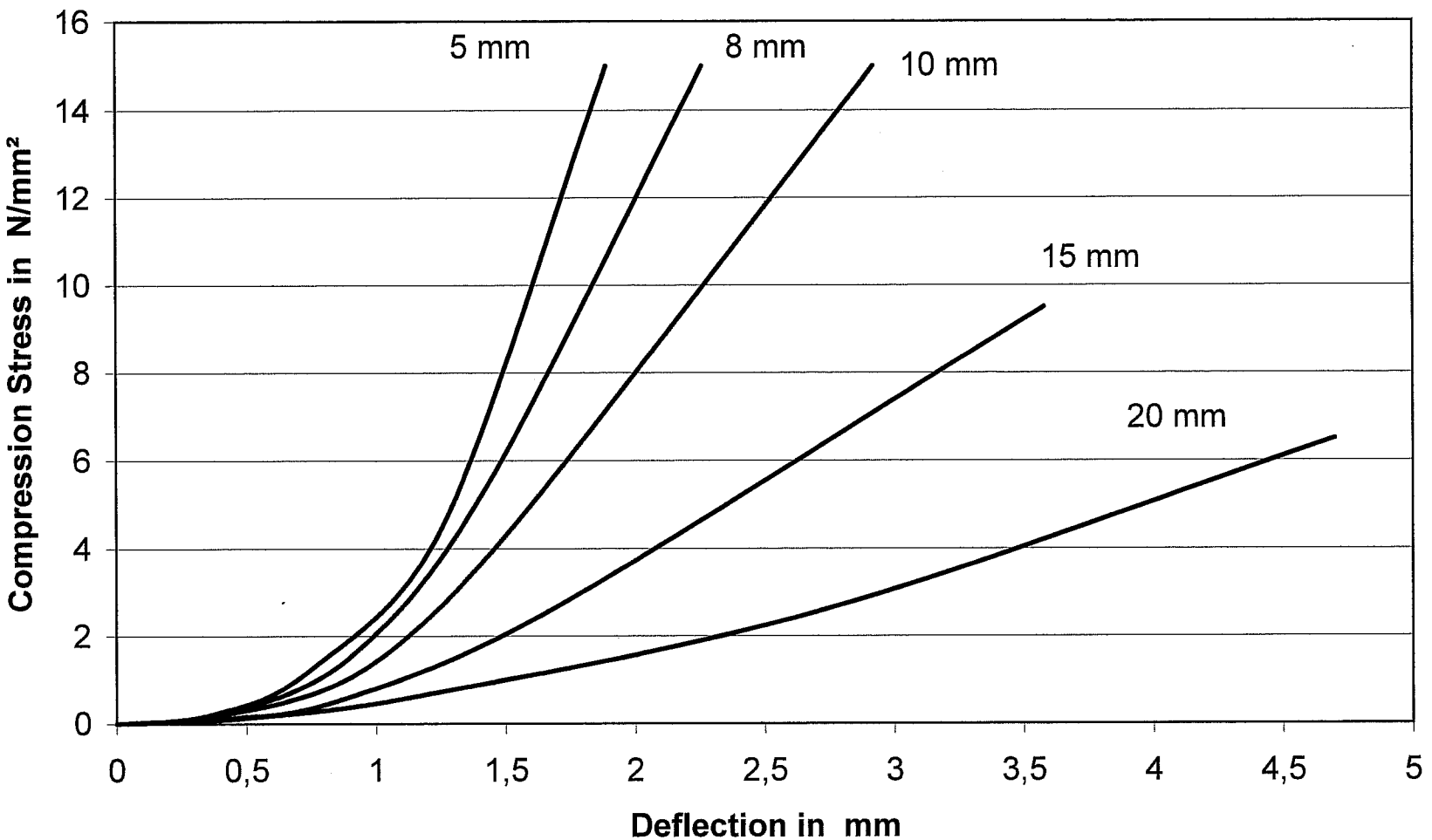


Hannover

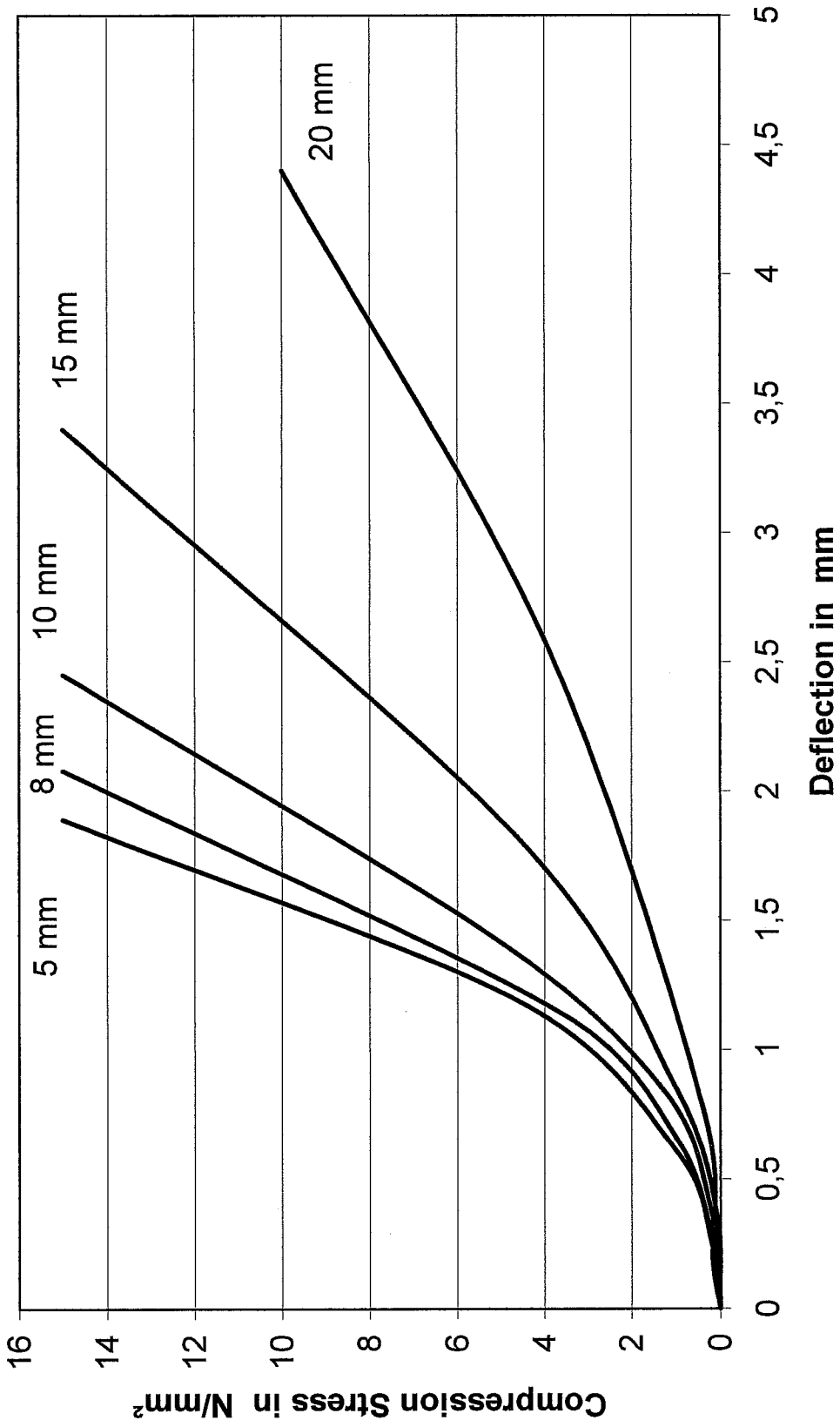
850.0427, Load Deflection Curve
Calenberg Compact Bearing S70, 150 x 150 mm²

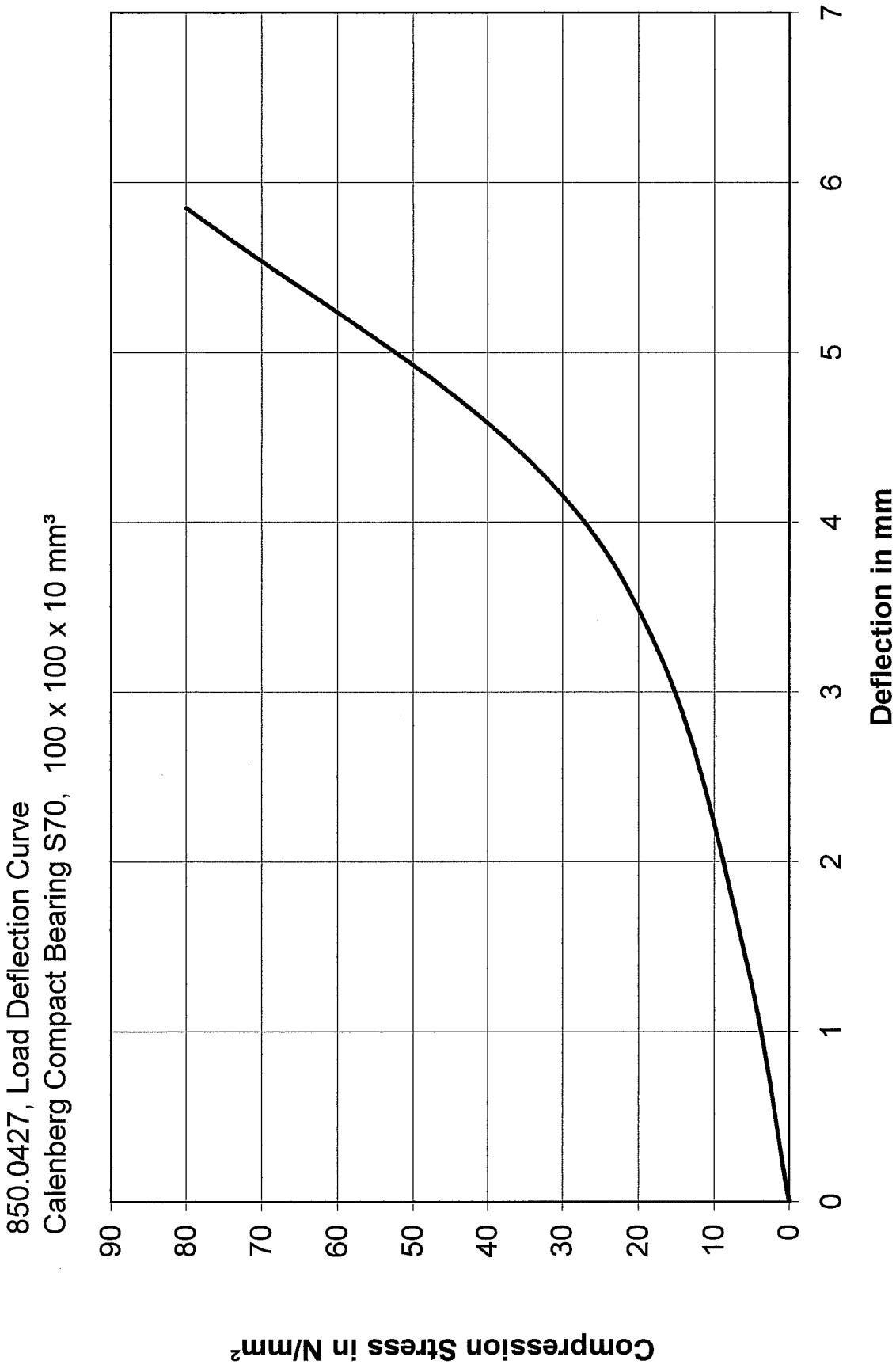


850.0427, Load Deflection Curve
Calenberg Compact Bearing S70, 190 x 100 mm²



850.0427, Load Deflection Curve
Calenberg Compact Bearing S70, 185 x 185 mm²




850.0427, Load Deflection Curve
Calenberg Compact Bearing S70, 100 x 100 x 10 mm³
Compression Stress in N/mm²
0
10
20
30
40
50
60
70
80
90
0
1
2
3
4
5
6
7
Deflection in mm

850.0427, Shear Modules
Calenberg Compact Bearing S70, 190 x 100 mm²