Leistungserklärung / *Declaration of Performance*
14312_LE_08_0183_DE_2021

Eindeutiger Kenncode des Produkttyps *Unique identification code of the product type*	Winkel Typ *Bracket Type*	Dicke *Thickness*
HV2630	Lochplattenwinkel 90 ohne Rippe *Angle Bracket 90 without rib*	2,5 mm
HV2640	Lochplattenwinkel 105 ohne Rippe *Angle Bracket 105 without rib*	3 mm
HV2650	Lochplattenwinkel 90 mit Rippe *Angle Bracket 90 with rib*	2,5 mm
HV2660	Lochplattenwinkel 105 mit Rippe *Angle Bracket 105 with rib*	3 mm

- **Verwendungszweck(e)** / *Usage(s)*
  Verbinder für tragende Holzkonstruktionen, als Verbindung von Balken und Pfetten /
  Connectors for load bearing timber structures, as a connection between beams and purlins

- **Hersteller** / *Manufacturer*
  Conmetall Meister GmbH
  Hafenstraße 26
  29223 Celle Germany

- **System(e) zur Bewertung und Überprüfung der Leistungsbeständigkeit /**
  System(s) for evaluating and verifying constancy of performance
  System 2+

- **Europäisch Technische Bewertung** / *European Technical Assessment*

  Europäisches Bewertungsdokument / *European evaluation document:*
  ETAG) No.015 22.04.2013
  Europäisch technische Bewertung / *European technical evaluation:*
  ETA-08/0183 06.09.2018
  Technische Bewertungsstelle / *Technical Assessment Body:*
  ETA-Danmark A/S
  Notifizierte Stelle / *Notified body:*
  0769

- **Wesentliche Merkmale und erklärte Leistung(en) /**
  Essential features and stated performance(s)

Wesentliches Merkmal *Essential features*	Leistung *Performance*	Harmonisierte technische Spezifikation *Harmonized technical specification*
Charakteristische Tragfähigkeit *Characteristic load-carrying capacity*	Annex B	ETA-08/0183 3.1
Steifigkeit *Stiffness*	NPD	ETA-08/0183 3.1
Duktilität beim zyklischen Testen *Ductility in cyclic testing*	NPD	ETA-08/0183 3.1
Brandverhalten *reaction to fire*	A1	EN 1350-1
Hygiene, Gesundheit und Umwelt *Hygiene, health and the environment*	Keine gefährlichen Materialien *no dangerous materials*	ETA-08/0183 3.3
Nachhaltiger Gebrauch natürlicher Ressourcen *Sustainable use of natural resources*	NPD	ETA-08/0183 3.7
Allgemeine Aspekte in Bezug auf die Leistung des Produkts / *General aspects related to the performance of the product*	Nutzungsklassen 1 und 2 bei Holzkonstruktionen unter Verwendung von Holzarten gem. Eurocode 5 *Usage classes 1 and 2 for timber constructions using wood species acc. Eurocode 5*	ETA-08/0183 3.8

Tab. 1

Die Leistung des vorstehenden Produkts entspricht der erklärten Leistung/ den erklärten Leistungen. Für die Erstellung der Leistungserklärung im Einklang mit der Verordnung (EU) Nr. 305/2011 ist allein der obengenannte Hersteller verantwortlich.
Unterzeichnet für den Hersteller und im Namen des Herstellers von:

The performance of the above product is the declared performance. The above manufacturer is solely responsible for drawing up the declaration of performance in accordance with Regulation (EU) No 305/2011.
Signed for the manufacturer and on behalf of the manufacturer of:

Conmetall Meister GmbH
Celle, 12.04.2021

i. V. Andreas Schacht
Leitung Einkauf Eisenwaren /
Head of purchasing ironmongery

i. A. Christian Ehle
Leitung Qualitätsmanagement Celle /
Head of quality management Celle

Annex A
Product details

Product details definitions

Table A.1 Materials specification

Bracket type	Thickness (mm)	Steel specification	Coating specification
70 with rib	2,5	S 250 GD + Z 275	Z 275
70 without rib	2,5	S 250 GD + Z 275	Z 275
90 with rib	2,5	S 250 GD + Z 275	Z 275
90 without rib	2,5	S 250 GD + Z 275	Z 275
105 with rib	3,0	S 250 GD + Z 275	Z 275
105 without rib	3,0	S 250 GD + Z 275	Z 275

Bracket type	Thickness (mm)	Steel specification	Coating specification
70 with rib	1,5	S 250 GD + Z 275	Z 275
90 with rib	1,5	S 250 GD + Z 275	Z 275
105 with rib	1,5	S 250 GD + Z 275	Z 275

Table A.2 Range of sizes, 2,5 mm thick

Bracket type	Height (mm)		Width (mm)	
	min	max	min	max
70 with rib	70	70	52	55
70 without rib	70	70	55	55
90 with rib	90	90	62	65
90 without rib	90	90	65	65
105 with rib	105	105	90	90
105 without rib	105	105	90	90

Table A.3 Range of sizes, 1,5 mm thick

Bracket type	Height (mm)		Width (mm)	
	min	max	min	max
70 with rib	69	71	52	55
90 with rib	89	91	62	65
105 with rib	104	106	87	90

Table A.3 Fastener specification

NAIL diameter	Length Min – max	Nail type
4.0	60 - 100	Ringed shank nails according to EN 14592

The load-carrying capacities of the angle brackets were determined based on the use of connector nails 4,0 x 60 mm in accordance with the German national approval for the nails. The characteristic withdrawal capacity of the nails has to be determined by calculation in accordance with EN 1995-1-1: 2004, paragraph 8.3.2 (head pull-through is not relevant):

$F_{ax,Rk} = f_{1,k} \times d \times t_{pen}$

Where:

$f_{1,k}$ Characteristic value of the withdrawal parameter in N/mm²
d Nail diameter in mm
t_{pen} Penetration depth of the profiled shank in mm

Based on tests by Versuchsanstalt für Stahl, Holz und Steine, University of Karlsruhe, the characteristic value of the withdrawal resistance for the threaded nails used can be calculated as:

$f_{1,k} = 50 \times 10^{-6} \times \rho_k^2$

Where:

ρ_k Characteristic density of the timber in kg/m³

The shape of the nail directly under the head shall be in the form of a truncated cone with a diameter under the nail head which exceeds the hole diameter.

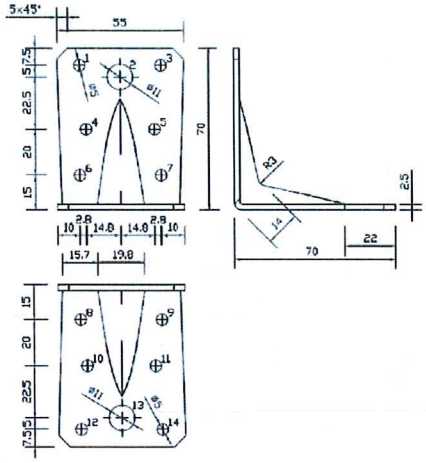
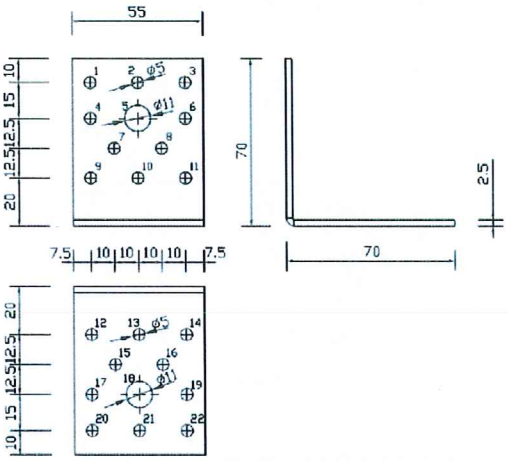


Figure A.1 Dimensions of Angle Bracket 70 with rib



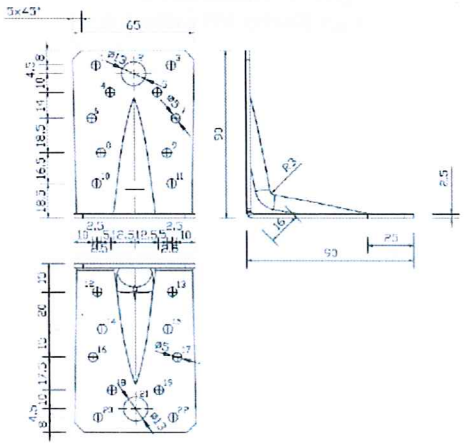


Figure A.3 Dimensions of Angle Bracket 90 with rib

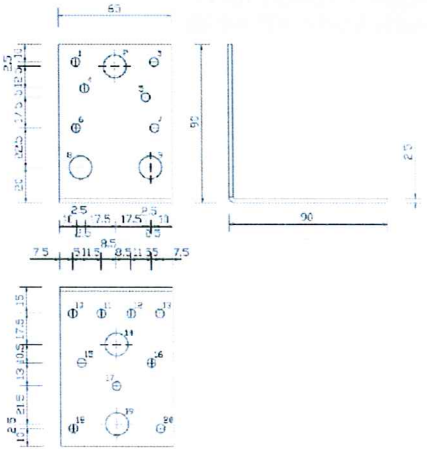


Figure A.4 Dimensions of Angle Bracket 90 without rib

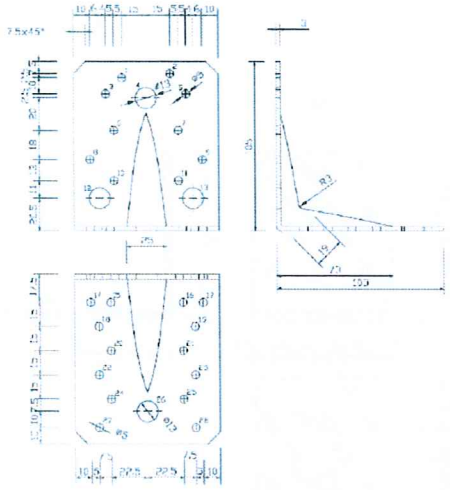


Figure A.5 Dimensions of
Angle Bracket 105 with rib

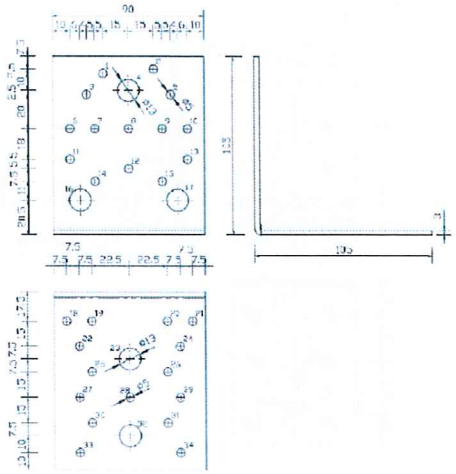


Figure A.6 Dimensions of
Angle Bracket 105 without rib

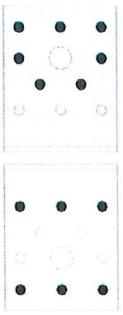
Nail Patterns – Angle Bracket 70 without rib

LC 2/3

Nails in hole number:
1,3,4,6,9,11 /
12,13,14,20,21,22

LC 4/5

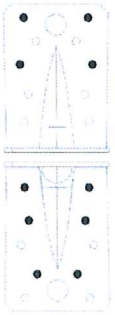
Nails in hole number:
1,2,3,4,6,7,8 /
12,13,14,20,21,22



Nail Patterns – Angle Bracket 90 with rib

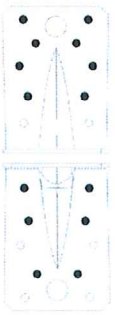
LC 1 – column

Nails in hole number:
1,3,6,7/
12,13,14,15,18,19

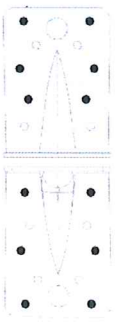


LC 1 – purlin

Nails in hole number:
1,3,4,5,6,7,8,9 /
12,13,14,15,18,19



LC 2/3
Nails in hole number:
1,3,6,7,8,9 /
12,13,16,17,20,22



LC 4/5
Nails in hole number:
1,3,4,5,6,7,8,9 /
12,13,14,15,18,19

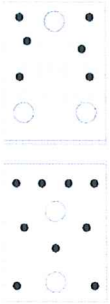
Nail Patterns – Angle Bracket 90 without rib

LC 1 – column

Nails in hole number:
1,3,5/
10,11,12,13,15,16
17,18,20

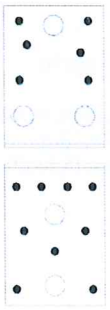
LC 1 – purlin

Nails in hole number:
1,3,4,5,6,7/
10,11,12,13,,15,16
17,18,20



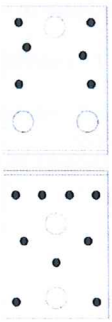
LC 2/3

Nails in hole number:
1,3,6,7,8,9 /
12,13,16,17,20,22



LC 4/5

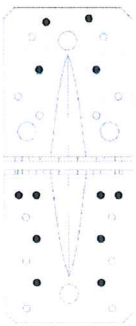
Nails in hole number:
1,3,4,5,6,7,8,9 /
12,13,14,15,18,19



Nail Patterns – Angle Bracket 105 with rib

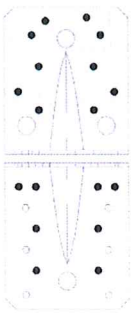
LC 1 – column

Nails in hole number:
1,2,6,7 /
14,15,16,17,20,21,24,25



LC 1 – purlin

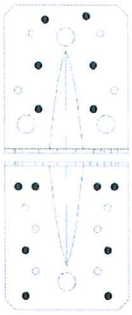
Nails in hole number:
1,2,3,5,6,7,8,9,10,11 /
14,15,16,17,20,21,24,25



Nail Patterns – Angle Bracket 105 with rib

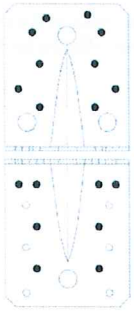
LC 2/3

Nails in hole number:
1,2,6,7,10,11 /
14,15,16,17,22,23,27,28



LC 4/5

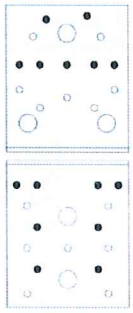
Nails in hole number:
1,2,3,5,6,7,8,9,10,11 /
14,15,16,17,20,21,24,25



Nail Patterns – Angle Bracket 105 without rib

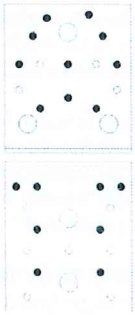
LC 1 – column

Nails in hole number:
1,2,6,7,8,9,10
18,19,20,21,25,26,30,31



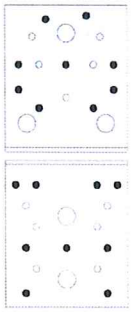
LC 1 – purlin

Nails in hole number:
1,2,3,5,6,8,10,12,14,15 /
18,19,20,21,25,26,30,31



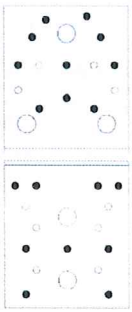
LC 2/3

Nails in hole number:
1,2,6,8,10,11,13,14,15 /
18,19,20,21,27,28,29,33,34



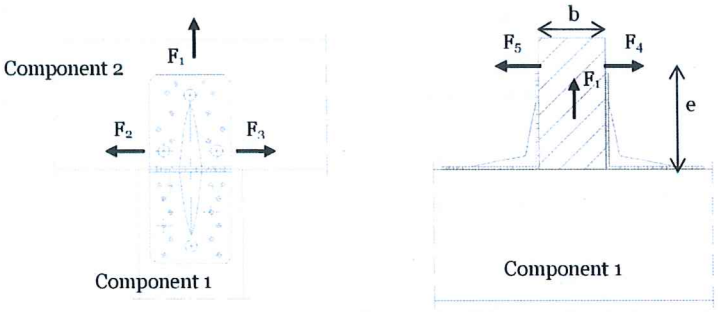
LC 4/5

Nails in hole number:
1,2,3,5,6,8,10,12,14,15 /
18,19,20,21,27,28,29,33,34



Annex B
Characteristic load-carrying capacities – brackets 2,5 mm thickness

Definitions of forces, their directions and eccentricity
Forces - Beam to beam connection



Fastener specification
Holes are marked with numbers referring to the nailing pattern in Annex A.
The holes which have to be nailed are given in Annex A for the different forces. If a connection is subjected to combined loading the following ail patterns have to be used:

Angle Bracket 70 without rib:	F_1 with F_2/F_3 or F_2/F_3 with F_4/F_5:	Nail Patterns F_2/F_3
Angle Bracket 90 with rib:	F_1 with F_2/F_3 or F_2/F_3 with F_4/F_5:	Nail Patterns F_1
Angle Bracket 105 with rib:	F_1 with F_2/F_3 or F_2/F_3 with F_4/F_5:	Nail Patterns F_1
Angle Bracket 105 without rib:	F_1 with F_2/F_3:	Nail Patterns F_2/F_3
Angle Bracket 105 without rib:	F_1 with F_4/F_5:	Nail Patterns F_4/F_5

Double angle brackets per connection
The angle brackets must be placed at each side opposite each other, symmetric to the component axis.

Acting forces

F_1	Lifting force acting along the central axis of the joint.
F_2 and F_3	Lateral force acting in the joint between the component 2 and component 1 in the component 2 direction
F_4 and F_5	Lateral force acting in the component 1 direction along the central axis of the joint. If the load is applied with an eccentricity e, a design for combined loading is required.

Single angle bracket per connection
Acting forces

F_1	Lifting force acting in the central axis of the angle bracket. The component 2 shall be prevented from rotation. If the component 2 is prevented from rotation the load-carrying capacity will be half of a connection with double angle brackets.
F_2 and F_3	Lateral force acting in the joint between the component 2 and the component 1 in the component 2 direction. The component 2 shall be prevented from rotation. If the component 2 is prevented from rotation the load-carrying capacity will be half of a connection with double angle brackets.
F_4 and F_5	Lateral force acting in the component 1 direction in the height of the top edge of component 2. F_4 is the lateral force towards the angle bracket; F_5 is the lateral force away from the angle bracket. Only the characteristic load-carrying capacities for angle brackets with ribs are given.

Wane
Wane is not allowed, the timber has to be sharp-edged in the area of the angle brackets.

Timber splitting
For the lifting force F_1 it must be checked in accordance with Eurocode 5 or a similar national Timber Code that splitting will not occur.

Combined forces

If the forces F_1 and F_2/F_3 or F_4/F_5 act at the same time, the following inequality shall be fulfilled:

$$\left(\frac{F_{1,d}}{F_{Rd,1}}\right)^2+\left(\frac{F_{2,d}}{F_{Rd,2}}\right)^2+\left(\frac{F_{3,d}}{F_{Rd,3}}\right)^2+\left(\frac{F_{4,d}}{F_{Rd,4}}\right)^2+\left(\frac{F_{5,d}}{F_{Rd,5}}\right)^2 \le 1$$

The forces F_2 and F_3 or F_4 and F_5 are forces with opposite direction. Therefore only one force F_2 or F_3, respectively, and F_4 or F_5, respectively, is able to act simultaneously with F_1, while the other shall be set to zero.

If the load F_4/F_5 is applied with an eccentricity e, a design for combined loading **for connections with double angle brackets** is required. Here, an additional force ΔF_1 has to be added to the existing force F_1.

$$\Delta F_{1,d} = F_{4,d} / F_{5,d} \cdot \frac{e}{B}$$

B is the width of component 2.

Characteristic load-carrying capacities 2 angle brackets per connection

Table B.1: Characteristic load-carrying capacities Load F_1 – 2 angle brackets / connection

Angle Bracket	Nail number n_V	Nail number n_h	Timber $R_{Rk,H}$	Steel $R_{Rk,S}$
70 without rib	1,2,3	12,13,14,20,21,22	3,05 kN	1,56 kN
90 without rib	1,3,5	10,11,12,13,15,16,17,18,20	8,07 kN	2,34 kN
105 without rib	1,2,6,7,8,9,10	18,19,20,21,25,26,30,31	8,09 kN	4,50 kN
70 with rib	1,3	8,9,10,11,12,14	3,16 kN	4,57 kN
90 with rib	1,3,6,7	12,13,14,15,18,19	6,46 kN	8,59 kN
105 with rib	1,2,6,7	14,15,16,17,20,21,24,25	11,8 kN	14,0 kN
Angle bracket 70 with and without rib are connected with nails ø4,0x40				
Angle bracket 90 and 105 with and without rib are connected with nails ø4,0x60				

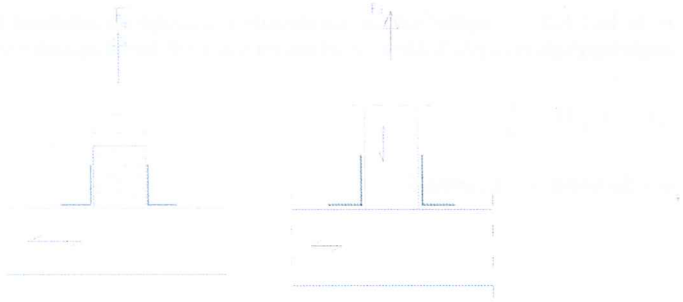


Table B.2: Characteristic load-carrying capacities Load $F_{2/3}$, 2 angle brackets / connection

Angle Bracket	Nail number n_V	Nail number n_h	Timber $R_{Rk,H}$
70 without rib	1,3,4,6,9,11	12,13,14,20,21,22	7,57 kN
90 without rib	1,3,4,5,6,7	10,11,12,13,15,16,17,18,20	9,55 kN
105 without rib	1,2,6,8,10,11,13, 14,15	18,19,20,21,27,28,29,33,34	12,8 kN
70 with rib	1,3,4,5	8,9,10,11,12,14	5,49 kN
90 with rib	1,3,6,7,8,9	12,13,16,17,20,22	8,39 kN
105 with rib	1,2,6,7,10,11	14,15,16,17,22,23,27,28	9,60 kN
Angle bracket 70 with and without rib are connected with nails ø4,0x40			
Angle bracket 90 and 105 with and without rib are connected with nails ø4,0x60			

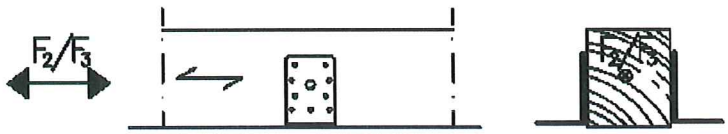
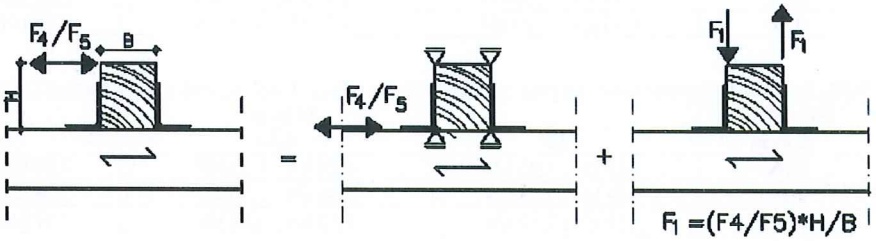


Table B.3: Characteristic load-carrying capacities Load $F_{4/5}$, 2 angle brackets / connection

Angle Bracket	Nail number n_v	Nail number n_h	Timber $R_{Rk,H}$	Steel $R_{Rk,S}$
70 without rib	1,2,3,4,6,7,8,	12,13,14,20,21,22	6,10 kN	3,63 kN
90 without rib	1,3,4,5,6,7	10,11,12,13,15,16,17,18,20	9,67 kN	3,99 kN
105 without rib	1,2,3,5,6,8,10,12,14,15	18,19,20,21,27,28,29,33,34	10,6 kN	7,98 kN
70 with rib	1,3,4,5	8,9,10,11,12,14	5,65 kN	4,12 kN
90 with rib	1,3,4,5,6,78,9	12,13,14,15,18,19	8,91 kN	6,55 kN
105 with rib	1,2,3,5,6,7,8,9,10,11	14,15,16,17,20,21,24,25	11,9 kN	11,8 kN
Angle bracket 70 with and without rib are connected with nails ø4,0x40				
Angle bracket 90 and 105 with and without rib are connected with nails ø4,0x60				



Characteristic load-carrying capacities with one angle bracket per connection

The force F_4, respectively F_5, is applied on the upper beam edge.

Table B.4: Characteristic load-carrying capacities ($R_{Rk,H}$ / $R_{Rk,S}$) Load F_4 (Force towards the angle bracket)

	H in m					
	0,08	**0,10**	**0,12**	**0,14**	**0,16**	**0,20**
70 with rib	0,82 kN/0,38 kN	0,66 kN/0,28 kN	-	0,47 kN/0,21 kN	-	-
90 with rib	-	-	1,11 kN/0,46 kN	0,95 kN/0,40 kN	0,84 kN/0,35 kN	-
105 with rib	-	-	2,42 kN/1,02 kN	-	1,82 kN/0,69 kN	1,37 kN/0,52 kN

Table B.5: Characteristic load-carrying capacities ($R_{Rk,H}$ / $R_{Rk,S}$) Load F_5 (Force off the angle bracket)

70 with rib	**H in m**		
B in m	**0,08**	**0,10**	**0,14**
0,06	1,58 kN ; 0,93 kN	1,73 kN ; 1,12 kN	2,45 kN ; 1,06 kN
0,10	1,44 kN ; 1,30 kN	1,58 kN ; 1,19 kN	1,56 kN ; 1,26 kN
0,14	1,45 kN ; 1,29 kN	1,47 kN ; 1,28 kN	1,48 kN ; 1,26 kN

Table B.6: Characteristic load-carrying capacities ($R_{Rk,H}$ / $R_{Rk,S}$) Load F_5 (Force off the angle bracket)

90 with rib	**H in m**		
B in m	**0,12**	**0,14**	**0,16**
0,08	3,85 kN ; 1,83 kN	4,24 kN ; 1,72 kN	4,89 kN ; 1,62 kN
0,10	3,49 kN ; 1,98 kN	3,65 kN ; 1,90 kN	3,88 kN ; 1,82 kN
0,14	3,23 kN ; 2,12 kN	3,30 kN ; 2,08 kN	3,37 kN ; 2,03 kN

Table B.7: Characteristic load-carrying capacities ($R_{Rk,H}$ / $R_{Rk,S}$) Load F_5 (Force off the angle bracket)

105 with rib	**H in m**		
B in m	**0,12**	**0,16**	**0,20**
0,08	5,94 kN ; 3,14 kN	5,45 kN ; 2,67 kN	4,68 kN ; 2,30 kN
0,10	5,24 kN ; 3,55 kN	6,09 kN ; 3,13 kN	5,27 kN ; 2,80 kN
0,14	4,68 kN ; 3,99 kN	5,00 kN ; 3,72 kN	5,35 kN ; 3,47 kN