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03

ANGLE BRACKETS

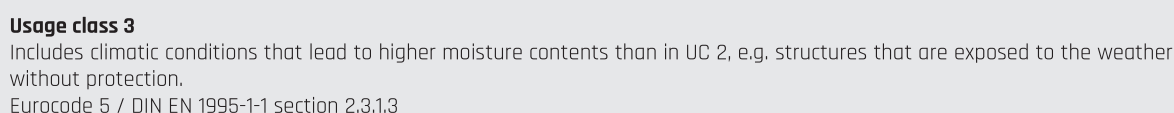
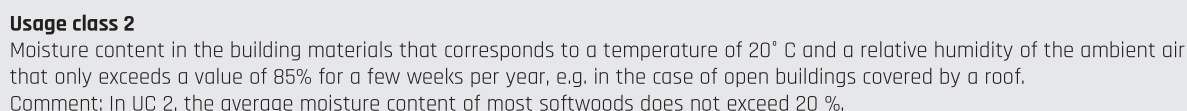
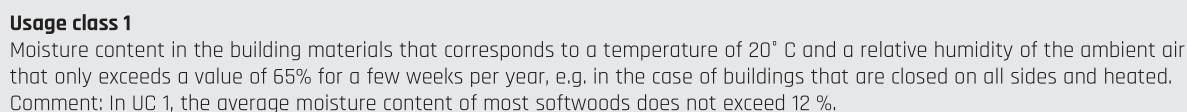
# ANGLE BRACKETS

## ASSORTMENT

|                                 |                                                                                     |                                                                                     |                                                                                     |                                                                                     | Height<br>[mm]                                                                      | Length<br>[mm]                                                                      | Width<br>[mm]                                                                       | Basics<br>Statik &<br>Diagramme<br>from page | Products &<br>Statik<br>from page | Products<br>Made of<br>V4A<br>from page |
|---------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------|-----------------------------------------|
| ANGLE BRACKET TOP 80/120        |    |    |    |    |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET 70X70X2.0         |    |    |    |    |    |    |    |                                              |                                   |                                         |
| ANGLE BRACKET 70X70 GREENLINE   |    |    |    |    |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET TOP KR90E         |    |    |    |    |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET 90X90X2.5         |    |    |    |    |    |    |    |                                              |                                   |                                         |
| ANGLE BRACKET 90X90 GREENLINE   |   |   |   |   |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET 100X100X3.0       |  |  |  |  |  |  |  |                                              |                                   |                                         |
| ANGLE BRACKET 100X100 GREENLINE |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| STRUT CONNECTOR 135 DEGREES     |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET TYPE 110/170L     |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET KR 3 MM           |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET KR 4 MM           |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET TYPE 50/80        |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET TYPE 110          |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET TYPE 55/80        |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET TYPE 60/100       |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| CONSOLE ANGLE                   |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET TYPE 40/45        |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET TYPE 40/90        |  |  |  |  |  |  |  |                                              |                                   |                                         |
| ANGLE BRACKET TYPE 40/120       |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |
| ANGLE BRACKET TYPE 692          |  |  |  |  |                                                                                     |                                                                                     |                                                                                     |                                              |                                   |                                         |

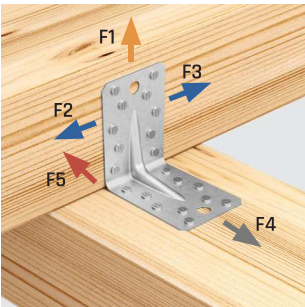
## ASSORTMENT

|                                                                                     |                                                              |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------|
|  | CE symbol                                                    |
|  | Steel with indication of the steel quality and galvanisation |
|  | Stainless steel with material number                         |
|  | Timber/timber connection                                     |
|  | Timber/concrete-connection                                   |

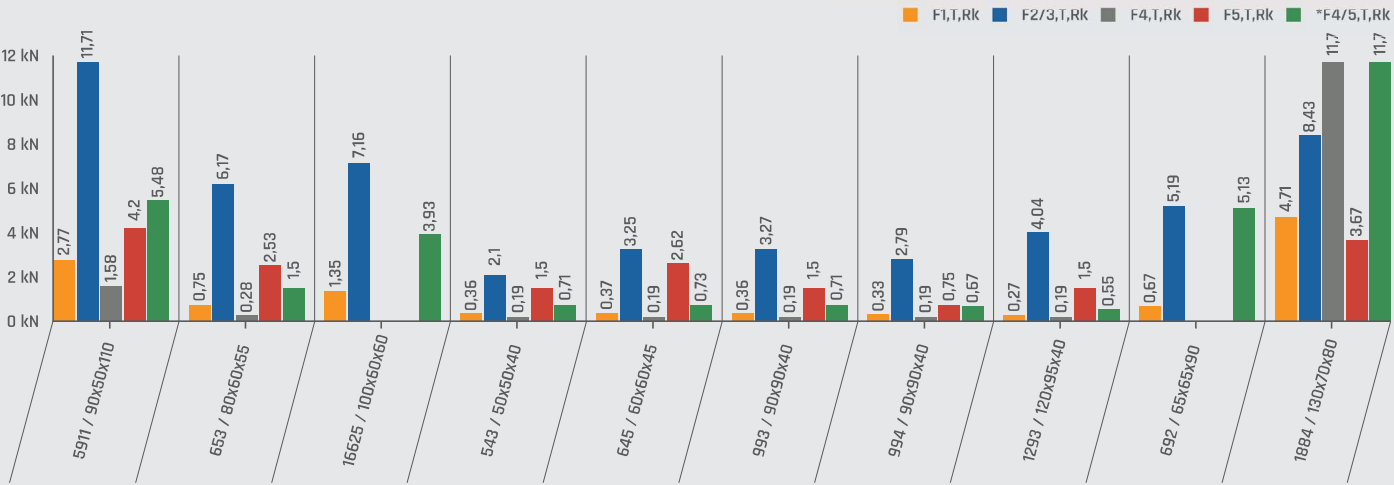
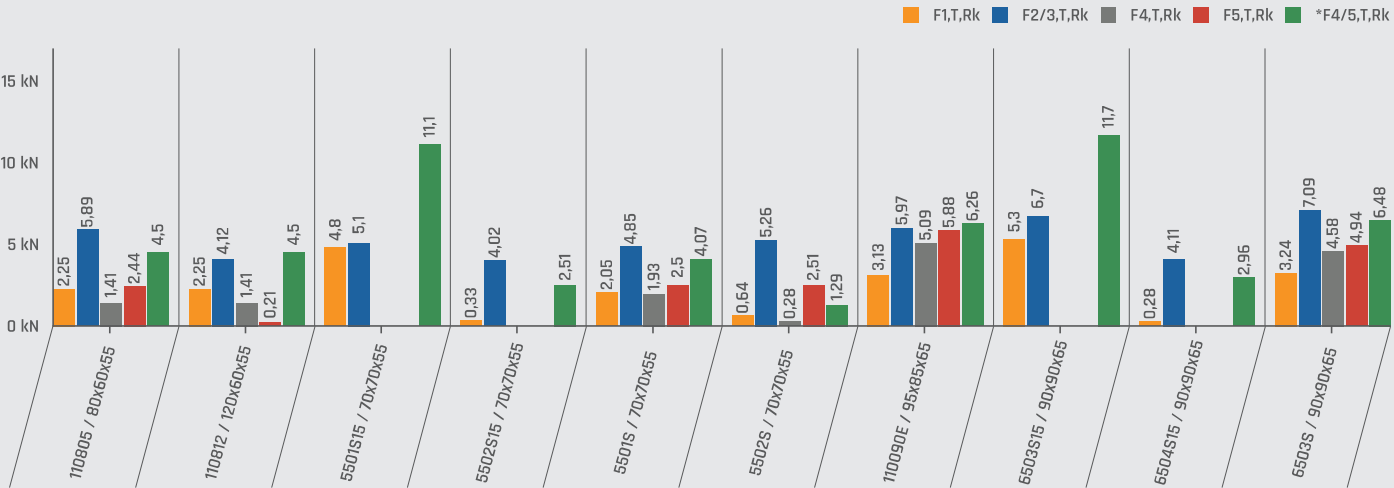


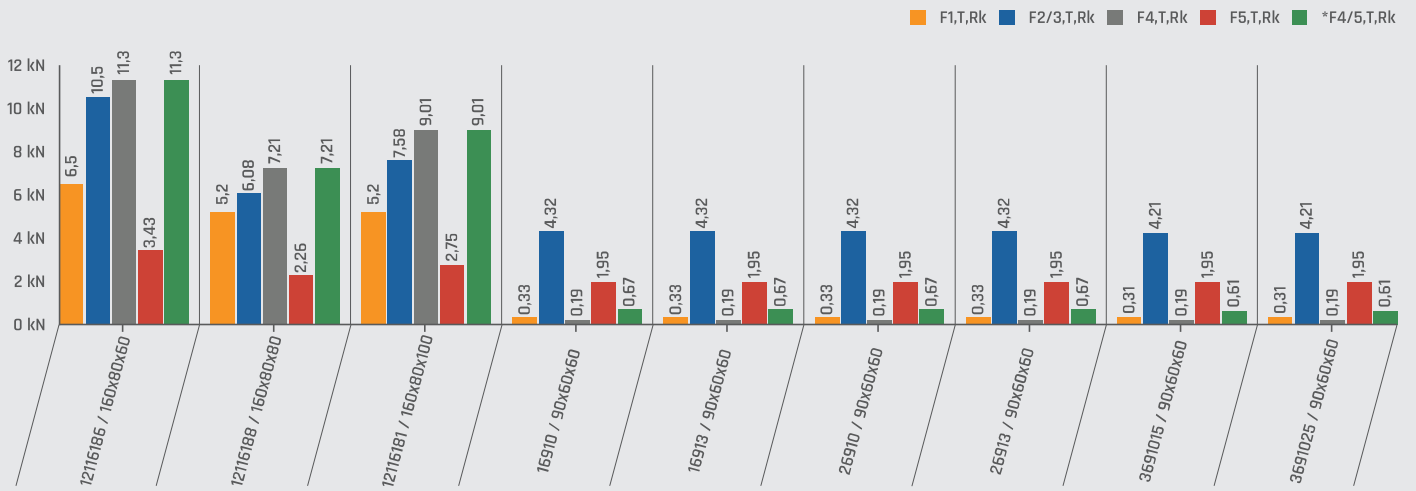
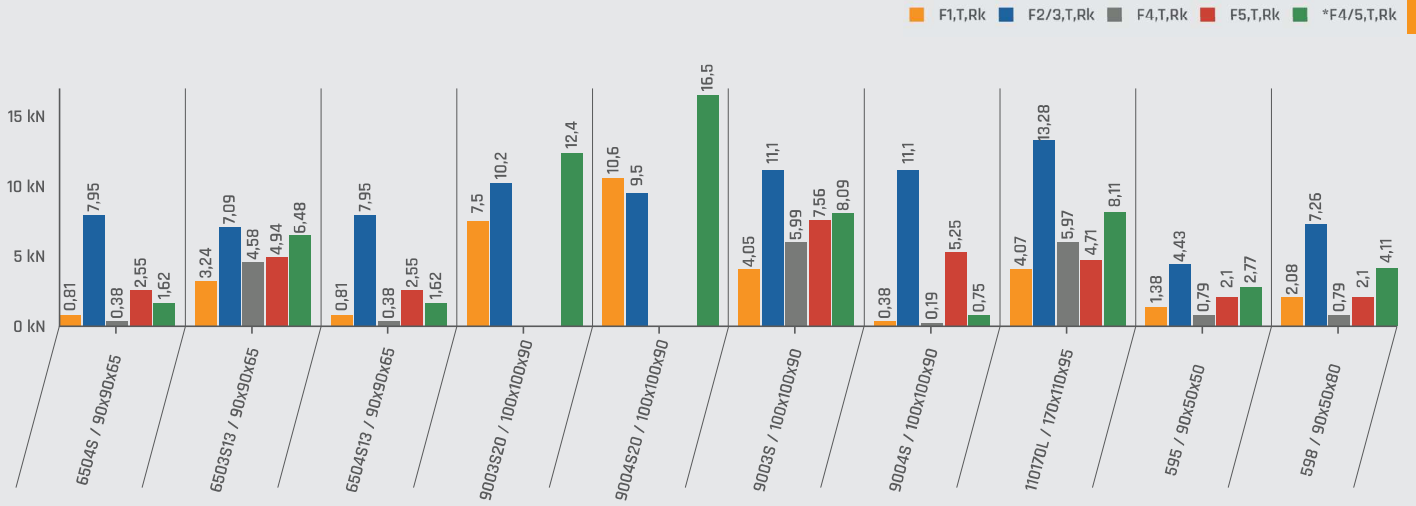
# ANGLE BRACKETS

## STATICS DIAGRAM



3





# ANGLE BRACKETS

## TECHNICAL FEATURES

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### Geometry

|   |                         |
|---|-------------------------|
| H | Height (mm)             |
| L | Length (mm)             |
| B | Width (mm)              |
| S | Material thickness (mm) |

### Tables

|         |                                       |
|---------|---------------------------------------|
| $n_a$   | Number of connecting elements         |
| NB      | Nail pattern                          |
| Full    | Maximum number of connecting elements |
| Partial | Minimum number of connecting elements |

### Timber connecting element

|                                                                                   |                                       |
|-----------------------------------------------------------------------------------|---------------------------------------|
| $\emptyset_{[mm]}$                                                                | Diameter of connecting element        |
| $L_{[mm]}$                                                                        | Length of connecting element          |
|  | Grain direction in the wood component |

### Connecting element concrete/ steel

|    |              |
|----|--------------|
| Bo | Dowels/bolts |
|----|--------------|

### Load directions

|                                                                                           |                                                              |
|-------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| $F_1$    | Force at a right angle to the connector level, lifting force |
| $F_2$    | Force in rod direction                                       |
| $F_3$    | Force in rod direction                                       |
| $F_4$  | Force in direction of the angle bracket                      |
| $F_5$  | Force away from the angle bracket                            |



CE symbol



Steel with indication of the steel quality and galvanisation



Stainless steel with material number



Timber/timber connection



Timber/concrete-connection



### Usage class 1

Moisture content in the building materials that corresponds to a temperature of 20° C and a relative humidity of the ambient air that only exceeds a value of 65% for a few weeks per year, e.g. in the case of buildings that are closed on all sides and heated. Comment: In UC 1, the average moisture content of most softwoods does not exceed 12 %.



### Usage class 2

Moisture content in the building materials that corresponds to a temperature of 20° C and a relative humidity of the ambient air that only exceeds a value of 85% for a few weeks per year, e.g. in the case of open buildings covered by a roof. Comment: In UC 2, the average moisture content of most softwoods does not exceed 20 %.



### Usage class 3

Includes climatic conditions that lead to higher moisture contents than in UC 2, e.g. structures that are exposed to the weather without protection. Eurocode 5 / DIN EN 1995-1-1 section 2.3.1.3

## Design

|                |                                                                                                                                                                                                      |
|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $F_{1,Ed}$     | Design load for load direction 1 in kN                                                                                                                                                               |
| $F_{2/3,Ed}$   | Design load for load direction 2 or 3 in kN                                                                                                                                                          |
| $F_{4,Ed}$     | Design load for load direction 4 in kN                                                                                                                                                               |
| $F_{5,Ed}$     | Design load for load direction 5 in kN                                                                                                                                                               |
| $F_{4/5,Ed}$   | Design load for load direction 4 or 5 in kN                                                                                                                                                          |
| $F_{1,Rk}$     | Characteristic value of the load capacity in load direction 1 for one or for two angle brackets in kN                                                                                                |
| $F_{2/3,Rk}$   | Characteristic value of the load capacity in load direction 2 or 3 for one or for two angle brackets in kN                                                                                           |
| $F_{4,Rk}$     | Characteristic value of the load capacity in load direction 4 for one angle bracket in kN                                                                                                            |
| $F_{5,Rk}$     | Characteristic value of the load capacity in load direction 5 for one angle bracket in kN                                                                                                            |
| $F_{4/5,Rk}$   | Characteristic value of the load capacity in load direction 4 or 5 for two angle brackets in kN                                                                                                      |
| $F_{1,Rd}$     | Design value of the load capacity in load direction 1 for one or for two angle brackets in kN                                                                                                        |
| $F_{2/3,Rd}$   | Design value of the load capacity in load direction 2 or 3 for one or for two angle brackets in kN                                                                                                   |
| $F_{4,Rd}$     | Characteristic value of the load capacity in load direction 4 for one angle bracket in kN                                                                                                            |
| $F_{5,Rd}$     | Characteristic value of the load capacity in load direction 5 for one angle bracket in kN                                                                                                            |
| $F_{4/5,Rd}$   | Characteristic value of the load capacity in load direction 4 or 5 for two angle brackets in kN                                                                                                      |
| $F_{i,Ed}$     | Design value of load capacity for one or two angle brackets for the respective load direction "i" (i = 1 to 5) in kN                                                                                 |
| $F_{i,Rk,T}$   | Characteristic value of the load-bearing capacity of the sheet steel-timber connection with GH threaded/anchor nails for the 'i' (i = 1 to 5) in kN respective load direction 'i' (i = 1 to 5) in kN |
| $F_{i,Rk,S}$   | Characteristic value for steel load capacity of the bracket (table value „S“ oder $F_{Rk,S}$ bzw. $F_{Rd,S}$ ) for the respective load direction "i" (i = 1 to 5) in kN                              |
| $k_{mod}$      | Modification factor for load impact duration and usage class                                                                                                                                         |
| $\gamma_{M,T}$ | Partial safety factor for timber (for Germany: 1.3)                                                                                                                                                  |
| $\gamma_{M,S}$ | Partial safety factor for steel for cross-section stresses (for Germany: 1.0)                                                                                                                        |

## Dowel design

|              |                                                                                                                                                                                                                                                                                                  |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $k_{t,ax}$   | Coefficient for calculating the axial load-bearing capacity per bolt, for connecting the bracket to concrete or steel components for the respective Load direction "i" (i = 1 to 5)                                                                                                              |
| $k_{t,v}$    | Coefficient for calculating the shear load-bearing capacity per bolt, for connecting the bracket to concrete or steel components for the respective Load direction "i" (i = 1 to 5)                                                                                                              |
| $F_{i,Ed}$   | Design load on one or two angle brackets for the respective load direction "i" (i = 1 to 5) in kN                                                                                                                                                                                                |
| $F_{i,Rd}$   | Design value of load capacity on one or two angle brackets for the respective load direction "i" (i = 1 to 5) in kN                                                                                                                                                                              |
| $F_{i,Ed,B}$ | Design value for one bolt or one anchor for the respective load direction "i" (i = 1 to 5) in kN                                                                                                                                                                                                 |
| $F_{i,Rd,B}$ | Design value of the load-bearing capacity of the entire connection to concrete or steel with bolts or anchors for the respective Load direction 'i' (i = 1 to 5) in kN (calculation must be carried out separately and is based on the respective approval and standard of the bolts or anchors) |

# ANGLE BRACKETS

## APPLICATIONS

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### Application:

Timber/timber; timber/concrete, steel connections

### Materials:

**350**  
**GD**  
Z275

**250**  
**GD**  
Z275

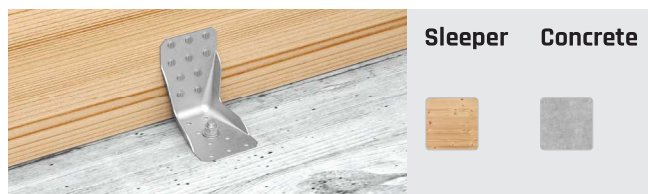
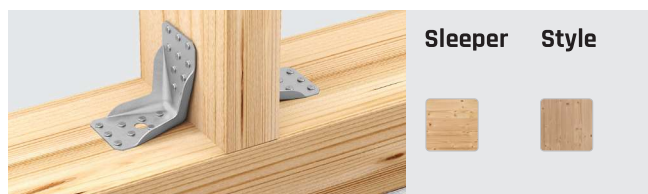
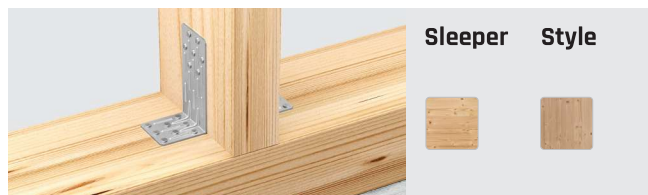
**235**  
**JR**  
feuerverzinkt

**A4**  
1.4571

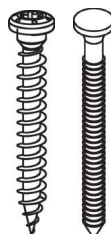
### Material thicknesses:

1.5 / 2.0 / 2.5 / 3.0 / 4.0 / 6.0 / 8.0 mm

More on request.



### For use in usage classes



### Connecting element:

GH threaded nails 4.0 x 35 / 40 / 50 / 60 / 75 / 100 mm  
GH screws 5.0 x 25 / 35 / 40 / 50 / 60 / 70 mm

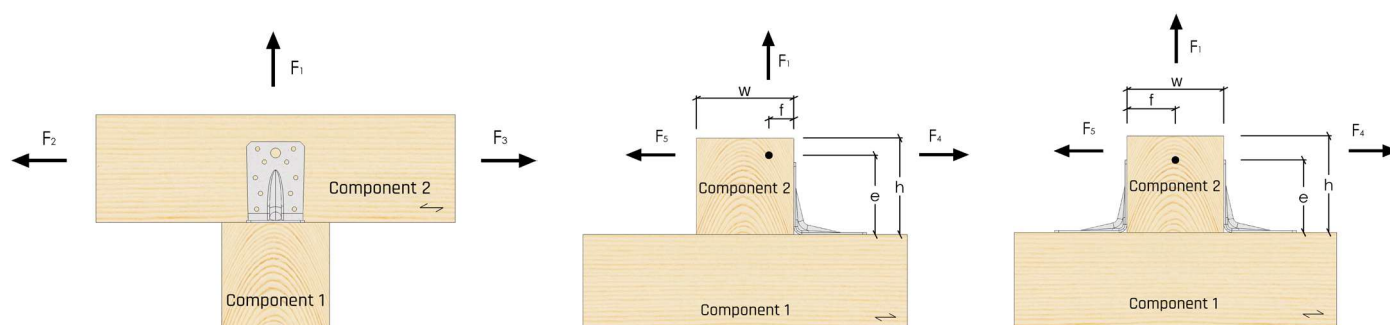
Bolt, dowel or concrete anchor M10, M12

Connecting elements from page 274

# ANGLE BRACKETS

## LOAD DIRECTIONS

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### Load $F_1$ :

For the load-bearing capacity of a bracket, the load is applied at spacing  $f$  from the contact surface between the bracket and the timber beam is applied (Figure 2). If it is assumed that the timber component is prevented from rotating or if two console angles are arranged, then the eccentricity is  $f = 0$ .

### Load $F_{2/3}$

Calculation of the load-bearing capacity of one or two angle brackets that are loaded with a force in the direction of the axis of component 2 (Fig. 1).

### Load $F_4 / F_5 / F_{4/5}$

In all three cases, the load is applied at a distance  $e$  from the contact surface between component 1 and component 2 (Figure 2). The load cases are considered as a combination of two base load cases.

The first base load case is the lateral load with forces  $n F_4$ ,  $F_5$  or  $F_{4/5}$  with  $e = 0$ .

For the arrangement with an angle bracket, the rotation of component 2 is taken into account.

For the arrangement with two angle brackets, the rotation of component 2 is prevented and the load on the beam due to the moment is calculated as the lifting force  $F_1 = F_{4/5} \times e/w$ ,  $w$  is thereby the width of component 2

### Nail patterns

Partial and full nail fitting or partial and full screw fitting  
See nail pattern for the product

### Connection over intermediate layers

The characteristic load capacities for the connection with angle brackets indicated in the tables also apply to an intermediate layer between the angle bracket and timber component. The following conditions must be met:

- The intermediate layer must be connected to the timber component without being able to be moved.
- The insert depth of the profiled area of the nail or the thread length of the screw in the timber component must be the same or greater.
- For this, a correspondingly long connecting element must be used.
- The characteristic perforation strength  $f_{h,k}$  of the connecting element in the intermediate layer must be the same or greater.

### Determination of load capacity

The load capacity of connections with angle brackets  $F_{i,Rd}$  for the respective load direction "i" ( $i = 1$  to 5) corresponds to the smallest value of:

- The load capacity of the steel sheet-timber connection with GH threaded/anchor nails  $F_{i,Rd,T}$
- Steel load capacity of the bracket  $F_{i,Rd,S}'$
- Load-bearing capacity of the connection to concrete or steel with bolts or anchors under consideration of the coefficient  $k_{t,ax}$  or  $k_{t,v}$ , see section 4.

$$F_{i,Rd} = \min \left\{ \frac{k_{mod} \cdot F_{i,Rk,T}}{\gamma_{M,T}}; \frac{F_{i,Rk,S}}{\gamma_{M,S}}; F_{i,Rd,B} \right\}$$

The increased load capacity values of the GH threaded/anchor nails according to ETA-13/0523 apply.  
The values of EN14592 apply to angle brackets made of stainless steel.

### Connection timber- concrete/ steel

The design load of the respective load direction "i" (i = 1 to 5)  $F_{i,Ed,B}$  for one bolt or for one anchor is calculated as follows:

$$F_{i,Ed,B} = k_{i,t,ax} \times F_{i,Ed} \quad \text{for axial stress on the bolt or anchor}$$

$$F_{i,Ed,B} = k_{i,t,v} \times F_{i,Ed} \quad \text{for lateral stress on the bolt or anchor}$$

#### Load in one direction

In case of sole impact of load components  $F_1$ ,  $F_{2/3}$ ,  $F_4$  or  $F_5$  or  $F_{4/5}$  the proof of interaction must be provided in the following form:

$$\frac{F_{i,Ed}}{F_{i,Rd}} \leq 1$$

#### Load in several directions

In case of simultaneous impact of load components  $F_1$ ,  $F_{2/3}$ ,  $F_4$  or  $F_5$  and  $F_{4/5}$  the proof of interaction must be provided as follows:  
For a bracket, the loads  $F_4$  and  $F_5$  never take effect at the same time.

For one bracket:

$$\left(\frac{F_{1,Ed}}{F_{1,Rd}}\right)^2 + \left(\frac{F_{2/3,Ed}}{F_{2/3,Rd}}\right)^2 + \left(\frac{F_{4,Ed}}{F_{4,Rd}}\right)^2 + \left(\frac{F_{5,Ed}}{F_{5,Rd}}\right)^2 \leq 1$$

For two brackets:

$$\left(\frac{F_{1,Ed}}{F_{1,Rd}}\right)^2 + \left(\frac{F_{2/3,Ed}}{F_{2/3,Rd}}\right)^2 + \left(\frac{F_{4/5,Ed}}{F_{4/5,Rd}}\right)^2 \leq 1$$

#### General information

The load capacities apply to timbers with a characteristic raw density of 350 kg/m<sup>3</sup>.

Curvatures of the timber components and joist edges in the area of the angle brackets are not permitted - the wood must be sharp-edged in the area of the bracket.

There must be proof that no gaps occur in the timber component for all load directions according to EN 1995 or an equivalent national standard.

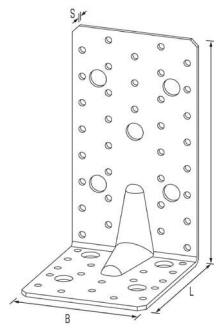
#### Minimum spacing according to EN 1995-1-1

| [mm]             |                                    | Force parallel to the grain | Force at a right angle to the grain | Force under the bracket a to the grain |
|------------------|------------------------------------|-----------------------------|-------------------------------------|----------------------------------------|
|                  |                                    | (a = 0°)                    | (a = 90°)                           | (a any)                                |
| a <sub>1</sub>   | in grain direction                 | 28                          | 14                                  | (14+14 x cos a)                        |
| a <sub>2</sub>   | Right angle to the grain direction | 14                          | 14                                  | 14                                     |
| a <sub>3,t</sub> | End grain with stress              | 60                          | 40                                  | (40 + 20 x cos a)                      |
| a <sub>3,e</sub> | End grain without stress           | 40                          | 40                                  | 40                                     |
| a <sub>4,t</sub> | Loaded edge                        | 20                          | 28                                  | (20 + 8 x sin a)                       |
| a <sub>4,e</sub> | Unloaded edge                      | 20                          | 20                                  | 20                                     |

Nails Ø 4 mm, without pilot drilling, in nail plates, p<sub>k</sub> ≤ 420 kg/m<sup>3</sup>

# ANGLE BRACKETS

## TYPE 110/170L



| Art. No. | Dimensions [mm] |   |     |   |      |   |      | nN  | nBo  | EAN     | Weight | Pallet | PU |   |   |
|----------|-----------------|---|-----|---|------|---|------|-----|------|---------|--------|--------|----|---|---|
|          | H               | x | L   | x | W(B) | x | T(S) | Ø 5 | Ø 13 | 4019346 | kg     |        |    |   |   |
| 110170L  | 170             | x | 110 | x | 95   | x | 3,0  | 53  | 9    | 215593  | 0.557  | 1500   | 25 | ■ | ■ |

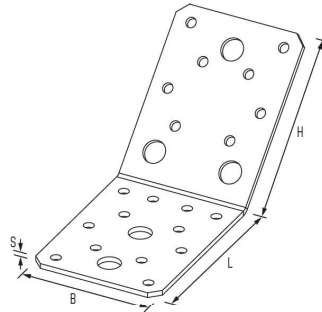
The unequal-legged 3 mm thick angle bracket 110/170 S with its 9 x Ø 13 mm holes can be used very universally for higher loads, e.g. for securing high sleepers. The bracket is also perfect for taking loads  $F_2$  and  $F_3$ . Standard connections such as pole/column, wall bar/column, sleeper/concrete, etc.

### Connection methods

- Timber/timber
- Timber/concrete, masonry
- Timber/steel
- Timber/Halfen rail

# STRUT CONNECTORS

## 135 DEGREE



| Art. No. | Dimensions [mm] |   |     |   |      |   |      | nN  | nN  | nBo  | nBo  | EAN     | Weight | Pallet | PU  |   |   |
|----------|-----------------|---|-----|---|------|---|------|-----|-----|------|------|---------|--------|--------|-----|---|---|
|          | H               | x | L   | x | W(B) | x | T(S) | Ø 5 | Ø 7 | Ø 11 | Ø 13 | 4019346 | kg     |        |     |   |   |
| 1867     | 90              | x | 90  | x | 65   | x | 2,5  | 20  | 8   | 2    | -    | 130124  | 0.190  | 4500   | 100 | ■ | ■ |
| 2197     | 100             | x | 100 | x | 90   | x | 3,0  | 28  | -   | 6    | 2    | 130131  | 0.352  | 2400   | 40  | ■ | ■ |



Strut connectors have an angle of 135° and are used to connect timber constructions.

# TYPE 110/170L

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| Timber / Timber |     |     |      |      |                |         |        |                     |                     |                       |                     |                     |                     |                     |                        |                        |
|-----------------|-----|-----|------|------|----------------|---------|--------|---------------------|---------------------|-----------------------|---------------------|---------------------|---------------------|---------------------|------------------------|------------------------|
| Art. No.        | H   | L   | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,S,Rk</sub> | F <sub>2/3,T,Rk</sub> | F <sub>4,T,Rk</sub> | F <sub>4,S,Rk</sub> | F <sub>5,T,Rk</sub> | F <sub>5,S,Rk</sub> | *F <sub>4/5,T,Rk</sub> | *F <sub>4/5,S,Rk</sub> |
| 110170L         | 170 | 110 | 95   | 3,0  | 35             | Full    | 4,0x40 | 2,44                | 5,89                | 10,36                 | 3,59                | 8,71                | 2,83                | 9,06                | 4,87                   | 11,77                  |
|                 |     |     |      |      |                |         | 4,0x60 | 4,07                | 5,89                | 13,28                 | 5,97                | 8,71                | 4,71                | 9,06                | 8,11                   | 11,77                  |
|                 |     |     |      |      | 22             | Partial | 4,0x40 | 1,84                | 6,01                | 5,87                  | 2,70                | 8,90                | 0,16                | 0,66                | 3,67                   | 12,02                  |
|                 |     |     |      |      |                |         | 4,0x60 | 3,07                | 6,01                | 7,71                  | 4,48                | 8,90                | 0,27                | 0,66                | 6,10                   | 12,02                  |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail,  $\rho_k = 350 \text{ kg/m}^3$ ,  $f = 0 \text{ mm}$ ,  $e = 40 \text{ mm}$ ,  $b = 80 \text{ mm}$ , unit of length in mm, unit for force in kN.

For 2 angle brackets opposite each other, the values  $F_{1,T,Rk}$ ,  $F_{1,S,Rk}$ ,  $F_{2/3,T,Rk}$  can be doubled.

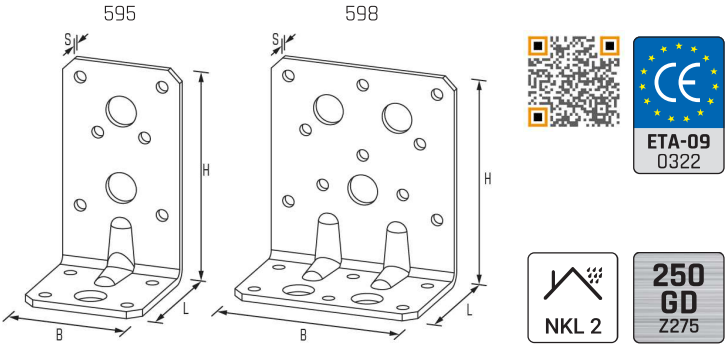
| Timber   |     |     |    |     |                |         |        |                     |                     |                     |                       |                      | Concrete            |                     |                    |                     |                     |                     |                    |                     |                        |                        |                      |                       |
|----------|-----|-----|----|-----|----------------|---------|--------|---------------------|---------------------|---------------------|-----------------------|----------------------|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|--------------------|---------------------|------------------------|------------------------|----------------------|-----------------------|
| Art. No. | H   | L   | B  | S   | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,S,Rk</sub> | k <sub>1,t,ax</sub> | F <sub>2/3,T,Rk</sub> | k <sub>2/3,t,v</sub> | F <sub>4,T,Rk</sub> | F <sub>4,S,Rk</sub> | k <sub>4,t,v</sub> | k <sub>4,t,ax</sub> | F <sub>5,T,Rk</sub> | F <sub>5,S,Rk</sub> | k <sub>5,t,v</sub> | k <sub>5,t,ax</sub> | *F <sub>4/5,T,Rk</sub> | *F <sub>4/5,S,Rk</sub> | k <sub>4/5,t,v</sub> | k <sub>4/5,t,ax</sub> |
| 110170L  | 170 | 110 | 95 | 3,0 | 17             | Full    | 4.0x40 | 32,13               | 14,55               | 0,77                | 7,04                  | 0,25                 | -                   | 11,83               | 0,25               | 0,52                | 2,83                | 9,06                | 0,25               | 0,20                | 27,63                  | 29,09                  | 0,25                 | 0,39                  |
|          |     |     |    |     |                |         | 4.0x60 | 40,19               | 14,55               | 0,77                | 9,61                  | 0,25                 | -                   | 11,83               | 0,25               | 0,52                | 4,71                | 9,06                | 0,25               | 0,20                | 51,00                  | 29,09                  | 0,25                 | 0,39                  |
|          |     |     |    |     | 11             | Partial | 4.0x40 | 20,79               | 14,55               | 0,77                | 4,45                  | 0,50                 | -                   | 11,83               | 0,50               | 0,52                | 0,16                | 0,66                | 0,50               | 0,20                | 17,88                  | 29,09                  | 0,50                 | 0,39                  |
|          |     |     |    |     |                |         | 4.0x60 | 26,00               | 14,55               | 0,77                | 5,64                  | 0,50                 | -                   | 11,83               | 0,50               | 0,52                | 0,27                | 0,66                | 0,50               | 0,20                | 27,86                  | 29,09                  | 0,50                 | 0,39                  |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail,  $\rho_k = 350 \text{ kg/m}^3$ ,  $f = 0 \text{ mm}$ ,  $e = 40 \text{ mm}$ ,  $b = 80 \text{ mm}$ , unit of length in mm, unit for force in kN.

For 2 angle brackets opposite each other, the values  $F_{1,T,Rk}$ ,  $F_{1,S,Rk}$ ,  $F_{2/3,T,Rk}$  can be doubled and the values  $F_{1,k}$ ,  $F_{1,0,k}$ ,  $F_{2/3,k}$  halved.

# ANGLE BRACKETS

## TYPE 50/80

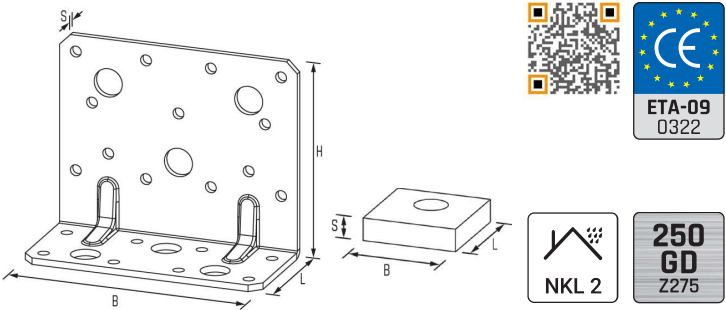


| Art. No. | Dimensions [mm] |   |    |   |      |   |      | nN  | nBo  | EAN     | Weight | Pallet | PU  |   |   |
|----------|-----------------|---|----|---|------|---|------|-----|------|---------|--------|--------|-----|---|---|
|          | H               | x | L  | x | W(B) | x | T(S) | Ø 5 | Ø 13 | 4019346 | kg     |        |     |   |   |
| 595      | 90              | x | 50 | x | 50   | x | 3,0  | 10  | 3    | 110096  | 0,144  | 6000   | 100 | ■ | ■ |
| 598      | 90              | x | 50 | x | 80   | x | 3,0  | 16  | 5    | 110300  | 0,231  | 3000   | 100 | ■ | ■ |

Angle brackets type 50 and type 80 are strong unequal-legged brackets and are suitable for timber/timber connections or for fastening timber constructions to concrete/steel or masonry.

# ANGLE BRACKETS

## TYPE 110



| Art. No. | Dimensions [mm] |   |    |   |     |   |      | nN  | nBo   | EAN     | Weight | Pallet | PU |   |   |
|----------|-----------------|---|----|---|-----|---|------|-----|-------|---------|--------|--------|----|---|---|
|          | H               | x | L  | x | B   | x | S    | Ø 5 | Ø 13  | 4019346 | kg     |        |    |   |   |
| 5911     | 90              | x | 50 | x | 110 | x | 3,0  | 21  | 6     | 110317  | 0,317  | 1500   | 50 | ■ | ■ |
| 59114    | -               | x | 40 | x | 43  | x | 10,0 | -   | 1xØ14 | 217740  | 0,107  | 5000   | 50 | ■ | ■ |

Angle bracket type 110 is a strong unequal-legged bracket and suitable for timber/timber connections or for fastening timber constructions to concrete/steel or masonry.  
With an additional pressure plate, even higher load absorptions are possible.

## TYPE 50/80

3

| Timber / Timber |    |    |      |      |                |         |        |                     |                     |                       |                     |                     |                     |                     |                        |                        |
|-----------------|----|----|------|------|----------------|---------|--------|---------------------|---------------------|-----------------------|---------------------|---------------------|---------------------|---------------------|------------------------|------------------------|
| Art. No.        | H  | L  | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,S,Rk</sub> | F <sub>2/3,T,Rk</sub> | F <sub>4,T,Rk</sub> | F <sub>4,S,Rk</sub> | F <sub>5,T,Rk</sub> | F <sub>5,S,Rk</sub> | *F <sub>4/5,T,Rk</sub> | *F <sub>4/5,S,Rk</sub> |
| 595             | 90 | 50 | 50   | 3,0  | 10             | Full    | 4,0x40 | 0,83                | 1,29                | 3,49                  | 0,47                | 0,37                | 1,26                | 0,98                | 1,65                   | 2,59                   |
|                 |    |    |      |      |                |         | 4,0x60 | 1,38                | 1,29                | 4,43                  | 0,79                | 0,37                | 2,10                | 0,98                | 2,77                   | 2,59                   |
|                 |    |    |      |      | 8              | Partial | 4,0x40 | 0,83                | 1,29                | 3,24                  | 0,47                | 0,37                | 1,26                | 0,98                | 1,65                   | 2,59                   |
|                 |    |    |      |      |                |         | 4,0x60 | 1,38                | 1,29                | 4,14                  | 0,79                | 0,37                | 2,10                | 0,98                | 2,77                   | 2,59                   |
| 598             | 90 | 50 | 80   | 3,0  | 14             | Full    | 4,0x40 | 1,25                | 2,21                | 5,64                  | 0,47                | 0,63                | 1,26                | 1,68                | 2,48                   | 4,42                   |
|                 |    |    |      |      |                |         | 4,0x60 | 2,08                | 2,21                | 7,26                  | 0,79                | 0,63                | 2,10                | 1,67                | 4,11                   | 4,42                   |
|                 |    |    |      |      | 8              | Partial | 4,0x40 | 1,25                | 2,21                | 4,07                  | 0,47                | 0,63                | 1,26                | 1,68                | 2,46                   | 4,42                   |
|                 |    |    |      |      |                |         | 4,0x60 | 2,08                | 2,21                | 5,22                  | 0,79                | 0,63                | 2,10                | 1,67                | 4,06                   | 4,42                   |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail  $p_k = 350 \text{ kg/m}^3$ ,  $f = 0 \text{ mm}$ ,  $e = 40 \text{ mm}$ ,  $b = 80 \text{ mm}$ , unit of length in mm, unit for force in kN. For 2 opposite  
For angle brackets, the values  $F_{1,T,Rk}$ ,  $F_{1,S,Rk}$ ,  $F_{2/3,T,Rk}$  can be doubled.

| Timber   |    |    |      |      |                |         |        |                     |                     |                     |                       |                      | Concrete            |                     |                    |                     |                     |                     |                    |                     |                        |                        |                      |                       |
|----------|----|----|------|------|----------------|---------|--------|---------------------|---------------------|---------------------|-----------------------|----------------------|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|--------------------|---------------------|------------------------|------------------------|----------------------|-----------------------|
| Art. No. | H  | L  | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,S,Rk</sub> | k <sub>1,t,αx</sub> | F <sub>2/3,T,RK</sub> | k <sub>2/3,t,v</sub> | F <sub>4,T,Rk</sub> | F <sub>4,S,Rk</sub> | k <sub>4,t,v</sub> | k <sub>4,t,αx</sub> | F <sub>5,T,Rk</sub> | F <sub>5,S,Rk</sub> | k <sub>5,t,v</sub> | k <sub>5,t,αx</sub> | *F <sub>4/5,T,Rk</sub> | *F <sub>4/5,S,Rk</sub> | k <sub>4/5,t,v</sub> | k <sub>4/5,t,αx</sub> |
| 595      | 90 | 50 | 50   | 3,0  | 6              | Full    | 4.0x40 | 11,34               | 0,15                | 6,77                | 1,84                  | 1,00                 | 0,47                | 0,17                | 1,00               | 6,15                | 1,26                | 0,98                | 1,00               | 0,34                | 10,8                   | 0,31                   | 1,00                 | 3,38                  |
|          |    |    |      |      |                |         | 4.0x60 | 14,18               | 0,15                | 6,77                | 2,74                  | 1,00                 | 0,79                | 0,17                | 1,00               | 6,15                | 2,10                | 0,98                | 1,00               | 0,34                | 18,00                  | 0,31                   | 1,00                 | 3,38                  |
|          |    |    |      |      | 4              | Partial | 4.0x40 | 7,56                | 0,15                | 6,77                | 1,45                  | 1,00                 | 0,47                | 0,17                | 1,00               | 6,15                | 1,26                | 0,98                | 1,00               | 0,34                | 7,20                   | 0,31                   | 1,00                 | 3,38                  |
|          |    |    |      |      |                |         | 4.0x60 | 9,46                | 0,15                | 6,77                | 2,21                  | 1,00                 | 0,79                | 0,17                | 1,00               | 6,15                | 2,10                | 0,98                | 1,00               | 0,34                | 12,00                  | 0,31                   | 1,00                 | 3,38                  |
| 598      | 90 | 50 | 80   | 3,0  | 8              | Full    | 4.0x40 | 15,12               | 0,26                | 3,38                | 3,51                  | 0,50                 | 0,47                | 0,29                | 0,50               | 3,08                | 1,26                | 1,68                | 0,50               | 0,17                | 14,40                  | 0,53                   | 0,50                 | 1,69                  |
|          |    |    |      |      |                |         | 4.0x60 | 18,91               | 0,26                | 3,38                | 4,92                  | 0,50                 | 0,79                | 0,29                | 0,50               | 3,08                | 2,10                | 1,67                | 0,50               | 0,17                | 24,00                  | 0,53                   | 0,50                 | 1,69                  |
|          |    |    |      |      | 4              | Partial | 4.0x40 | 7,56                | 0,26                | 3,38                | 2,36                  | 0,50                 | 0,47                | 0,29                | 0,50               | 3,08                | 1,25                | 1,68                | 0,50               | 0,17                | 7,20                   | 0,53                   | 0,50                 | 1,69                  |
|          |    |    |      |      |                |         | 4.0x60 | 9,46                | 0,26                | 3,38                | 3,41                  | 0,50                 | 0,79                | 0,29                | 0,50               | 3,08                | 2,10                | 1,67                | 0,50               | 0,17                | 12,00                  | 0,53                   | 0,50                 | 1,69                  |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail,  $p_k = 350 \text{ kg/m}^3$ ,  $f = 0 \text{ mm}$ ,  $e = 40 \text{ mm}$ ,  $b = 80 \text{ mm}$ , unit of length in mm, unit for force in kN.  
For 2 angle brackets opposite each other, the values  $F_{1,T,Rk}$ ,  $F_{1,S,Rk}$ ,  $F_{2/3,T,Rk}$  can be doubled and the values  $F_{1,v,k}$ ,  $F_{1,αx,k}$ ,  $F_{2/3,v,k}$  halved.

## TYPE 110

| Timber / Timber |    |    |      |      |                |         |        |                     |                     |                       |                     |                     |                     |                     |                        |                        |
|-----------------|----|----|------|------|----------------|---------|--------|---------------------|---------------------|-----------------------|---------------------|---------------------|---------------------|---------------------|------------------------|------------------------|
| Art. No.        | H  | L  | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,S,Rk</sub> | F <sub>2/3,T,Rk</sub> | F <sub>4,T,Rk</sub> | F <sub>4,S,Rk</sub> | F <sub>5,T,Rk</sub> | F <sub>5,S,Rk</sub> | *F <sub>4/5,T,Rk</sub> | *F <sub>4/5,S,Rk</sub> |
| 5911            | 90 | 50 | 110  | 3,0  | 19             | Full    | 4,0x40 | 1,66                | 2,77                | 9,28                  | 0,95                | 0,79                | 4,20                | 2,10                | 3,30                   | 5,54                   |
|                 |    |    |      |      |                |         | 4,0x60 | 2,77                | 2,77                | 11,71                 | 1,58                | 0,79                | 2,52                | 2,10                | 5,48                   | 5,54                   |
|                 |    |    |      |      | 12             | Partial | 4,0x40 | 1,66                | 2,77                | 6,93                  | 0,95                | 0,79                | 4,20                | 2,10                | 3,29                   | 5,54                   |
|                 |    |    |      |      |                |         | 4,0x60 | 2,77                | 2,77                | 8,99                  | 1,58                | 0,79                | 2,10                | 2,10                | 5,44                   | 5,54                   |

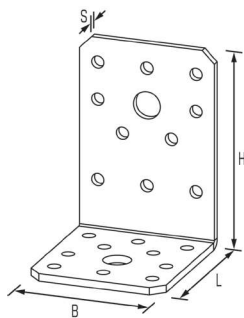
Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail,  $p_k = 350 \text{ kg/m}^3$ ,  $f = 0 \text{ mm}$ ,  $e = 40 \text{ mm}$ ,  $b = 80 \text{ mm}$ , unit of length in mm, unit for force in kN.  
For 2 angle brackets opposite each other, the values  $F_{1,T,Rk}$ ,  $F_{1,S,Rk}$ ,  $F_{2/3,T,Rk}$  can be doubled.

| Timber   |    |    |      |      |                |         |        |                     |                     |                     |                       |                      | Concrete            |                     |                    |                     |                     |                     |                    |                     |                        |                        |                      |                      |
|----------|----|----|------|------|----------------|---------|--------|---------------------|---------------------|---------------------|-----------------------|----------------------|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|--------------------|---------------------|------------------------|------------------------|----------------------|----------------------|
| Art. No. | H  | L  | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,S,Rk</sub> | k <sub>1,t,αx</sub> | F <sub>2/3,T,Rk</sub> | k <sub>2/3,t,v</sub> | F <sub>4,T,Rk</sub> | F <sub>4,S,Rk</sub> | k <sub>4,t,v</sub> | k <sub>4,t,αx</sub> | F <sub>5,T,Rk</sub> | F <sub>5,S,Rk</sub> | k <sub>5,t,v</sub> | k <sub>5,t,αx</sub> | *F <sub>4/5,T,Rk</sub> | *F <sub>4/5,S,Rk</sub> | k <sub>4/5,t,v</sub> | k <sub>4/5,t,α</sub> |
| 5911     | 90 | 50 | 110  | 3,0  | 11             | Full    | 4.0x40 | 20,79               | 1,44                | 3,25                | 7,81                  | 1,00                 | 0,95                | 0,79                | 1,00               | 5,00                | 2,52                | 2,10                | 1,00               | 0,41                | 19,80                  | 2,87                   | 1,00                 | 1,62                 |
|          |    |    |      |      |                |         | 4.0x60 | 26,00               | 1,44                | 3,25                | 10,14                 | 1,00                 | 1,58                | 0,79                | 1,00               | 5,00                | 4,20                | 2,10                | 1,00               | 0,41                | 33,00                  | 2,87                   | 1,00                 | 1,62                 |
|          |    |    |      |      | 6              | Partial | 4.0x40 | 11,34               | 1,44                | 3,25                | 5,12                  | 1,00                 | 0,95                | 0,79                | 1,00               | 5,00                | 2,52                | 2,10                | 1,00               | 0,41                | 10,80                  | 2,87                   | 1,00                 | 1,62                 |
|          |    |    |      |      |                |         | 4.0x60 | 14,18               | 1,44                | 3,25                | 6,67                  | 1,00                 | 1,58                | 0,79                | 1,00               | 5,00                | 4,20                | 2,10                | 1,00               | 0,41                | 18,00                  | 2,87                   | 1,00                 | 1,62                 |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail,  $p_k = 350 \text{ kg/m}^3$ ,  $f = 0 \text{ mm}$ ,  $e = 40 \text{ mm}$ ,  $b = 80 \text{ mm}$ , unit of length in mm, unit for force in kN.  
For 2 angle brackets opposite each other, the values  $F_{1,T,Rk}$ ,  $F_{1,S,Rk}$ ,  $F_{2/3,T,Rk}$  can be doubled and the values  $F_{1,v,k}$ ,  $F_{1,αx,k}$ ,  $F_{2/3,v,k}$  halved.

# ANGLE BRACKETS

## TYPE 55/80

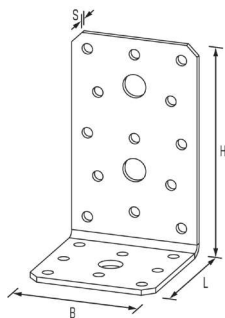


| Art. No. | Dimensions [mm] |   |    |   |      |   |      | nN  | nBo  | EAN     | Weight | Pallet | PU  |   |   |
|----------|-----------------|---|----|---|------|---|------|-----|------|---------|--------|--------|-----|---|---|
|          | H               | x | L  | x | W(B) | x | T(S) | Ø 5 | Ø 11 | 4019346 | kg     |        |     |   |   |
| 653      | 80              | x | 60 | x | 55   | x | 3,0  | 20  | 2    | 110249  | 0,159  | 4800   | 100 | ■ | ■ |

The type 55/80 angle bracket is an unequal-leg bracket with a wide range of applications and is suitable for timber/timber, timber/concrete, timber/masonry and timber/steel connections.

# ANGLE BRACKETS

## TYPE 60/100



| Art. No. | Dimensions [mm] |   |    |   |      |   |      | nN  | nBo  | EAN     | Weight | Pallet | PU  |   |   |
|----------|-----------------|---|----|---|------|---|------|-----|------|---------|--------|--------|-----|---|---|
|          | H               | x | L  | x | W(B) | x | T(S) | Ø 5 | Ø 11 | 4019346 | kg     |        |     |   |   |
| 16625    | 100             | x | 60 | x | 60   | x | 2,5  | 21  | 3    | 101780  | 0,163  | 2400   | 100 | ■ | ■ |

The type 60/100 angle bracket is an unequal-leg bracket and is suitable for timber/timber, timber/concrete, timber/masonry and timber/steel connections.

TYPE 55/80

| Timber   |    |    |      |      |                |         |        | Timber              |                     |                       |                     |                     |                     |                     |                        |                        |   |
|----------|----|----|------|------|----------------|---------|--------|---------------------|---------------------|-----------------------|---------------------|---------------------|---------------------|---------------------|------------------------|------------------------|---|
| Art. No. | H  | L  | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,S,Rk</sub> | F <sub>2/3,T,Rk</sub> | F <sub>4,T,Rk</sub> | F <sub>4,S,Rk</sub> | F <sub>5,T,Rk</sub> | F <sub>5,S,Rk</sub> | *F <sub>4/5,T,Rk</sub> | *F <sub>4/5,S,Rk</sub> |   |
| 653      | 80 | 60 | 55   | 3,0  | 14             | Full    | 4.0x40 | 0,45                | 0,39                | 4,93                  | 0,17                | 0,15                | 1,52                | 0,73                | 0,90                   | 0,78                   |   |
|          |    |    |      |      |                |         | 4.0x60 | 0,75                | 0,39                | 6,17                  | 0,28                | 0,15                | 2,53                | 0,73                | 1,50                   | 0,78                   |   |
|          |    |    |      |      | -              | Partial | 4.0x40 | -                   | -                   | -                     | -                   | -                   | -                   | -                   | -                      | -                      | - |
|          |    |    |      |      |                |         | 4.0x60 | -                   | -                   | -                     | -                   | -                   | -                   | -                   | -                      | -                      | - |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail, pk = 350 kg/m³, f = 0 mm, e = 40 mm, b = 80 mm, unit of length in mm, unit for force in kN.  
For 2 angle brackets opposite each other, the values F<sub>1,T,Rk</sub> F<sub>1,S,Rk</sub> F<sub>2/3,T,Rk</sub> can be doubled.

| Timber   |    |    |    |     |                |         |        |                     |                     |                     |                       |                      | Concrete            |                     |                    |                     |                     |                     |                    |                     |                        |                        |                      |                       |   |   |
|----------|----|----|----|-----|----------------|---------|--------|---------------------|---------------------|---------------------|-----------------------|----------------------|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|--------------------|---------------------|------------------------|------------------------|----------------------|-----------------------|---|---|
| Art. No. | H  | L  | B  | S   | n <sub>g</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,S,Rk</sub> | k <sub>1,t,ax</sub> | F <sub>2/3,T,Rk</sub> | k <sub>2/3,t,v</sub> | F <sub>4,T,Rk</sub> | F <sub>4,S,Rk</sub> | k <sub>4,t,v</sub> | k <sub>4,t,ax</sub> | F <sub>5,T,Rk</sub> | F <sub>5,S,Rk</sub> | k <sub>5,t,v</sub> | k <sub>5,t,ax</sub> | *F <sub>4/5,T,Rk</sub> | *F <sub>4/5,S,Rk</sub> | k <sub>4/5,t,v</sub> | k <sub>4/5,t,ax</sub> |   |   |
|          |    |    |    |     |                |         |        |                     |                     |                     |                       |                      |                     |                     |                    |                     |                     |                     |                    |                     |                        |                        |                      |                       |   |   |
| 653      | 80 | 60 | 55 | 3,0 | 8              | Full    | 4.0x40 | 15,12               | 0,11                | 7,36                | 2,69                  | 1,00                 | 0,45                | 0,11                | 1,00               | 7,27                | 1,52                | 0,73                | 1,00               | 0,35                | 14,40                  | 0,23                   | 1,00                 | 3,68                  |   |   |
|          |    |    |    |     |                |         | 4.0x60 | 18,91               | 0,11                | 7,36                | 4,05                  | 1,00                 | 0,75                | 0,11                | 1,00               | 7,27                | 2,53                | 0,73                | 1,00               | 0,35                | 24,00                  | 0,23                   | 1,00                 | 3,68                  |   |   |
|          |    |    |    |     | -              | Partial | 4.0x40 | -                   | -                   | -                   | -                     | -                    | -                   | -                   | -                  | -                   | -                   | -                   | -                  | -                   | -                      | -                      | -                    | -                     | - | - |
|          |    |    |    |     |                |         | 4.0x60 | -                   | -                   | -                   | -                     | -                    | -                   | -                   | -                  | -                   | -                   | -                   | -                  | -                   | -                      | -                      | -                    | -                     | - | - |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail, pk = 350 kg/m³, f = 0 mm, e = 40 mm, b = 80 mm, unit of length in mm, unit for force in kN.  
For 2 angle brackets opposite each other, the values F<sub>1,T,Rk</sub> F<sub>1,S,Rk</sub> F<sub>2/3,T,Rk</sub> can be doubled and the values F<sub>1,t,ax</sub> F<sub>1,ax,t</sub> F<sub>2/3,t,v</sub> halved.

TYPE 60/100

| Timber   |     |    |      |      |                |         |        | Timber              |                       |                        |
|----------|-----|----|------|------|----------------|---------|--------|---------------------|-----------------------|------------------------|
| Art. No. | H   | L  | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>2/3,T,Rk</sub> | *F <sub>4/5,T,Rk</sub> |
| 16625    | 100 | 60 | 60   | 2,5  | 19             | Full    | 4.0x40 | 1,35                | 5,56                  | 3,78                   |
|          |     |    |      |      |                |         | 4.0x60 | 1,35                | 7,16                  | 3,93                   |
|          |     |    |      |      | -              | Partial | 4.0x40 | -                   | -                     | -                      |
|          |     |    |      |      |                |         | 4.0x60 | -                   | -                     | -                      |

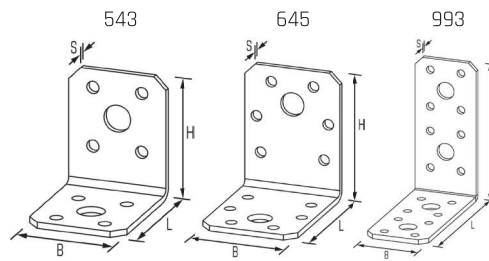
Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail, pk = 350 kg/m³, f = 0 mm, e = 40 mm, b = 80 mm, unit of length in mm, unit for force in kN.  
For 2 angle brackets opposite each other, the values F<sub>1,T,Rk</sub> F<sub>1,S,Rk</sub> F<sub>2/3,T,Rk</sub> can be doubled.

| Timber   |     |    |      |      |                |         |        |                     | Concrete                |                       |                           |                        |                           |                           |
|----------|-----|----|------|------|----------------|---------|--------|---------------------|-------------------------|-----------------------|---------------------------|------------------------|---------------------------|---------------------------|
| Art. No. | H   | L  | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,Bo,ax,rk</sub> | F <sub>2/3,T,RK</sub> | F <sub>2/3,Bo,sx,rk</sub> | *F <sub>4/5,T,Rk</sub> | F <sub>4/5,Bo,ax,rk</sub> | F <sub>4/5,Bo,sx,rk</sub> |
| 16625    | 100 | 60 | 60   | 2,5  | 10             | Full    | 4.0x40 | -                   | -                       | 3,22                  | 3,22                      | 3,35                   | 0,57                      | 2,55                      |
|          |     |    |      |      |                |         | 4.0x60 | -                   | -                       | 4,62                  | 4,62                      | 3,47                   | 0,62                      | 2,53                      |
|          |     |    |      |      | 5              | Partial | 4.0x40 | 0,54                | 0,70                    | -                     | -                         | -                      | -                         | -                         |
|          |     |    |      |      |                |         | 4.0x60 | 0,54                | 0,70                    | -                     | -                         | -                      | -                         | -                         |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail, pk = 350 kg/m³, f = 0 mm, e = 40 mm, b = 80 mm, unit of length in mm, unit for force in kN.  
For 2 angle brackets opposite each other, the values F<sub>1,T,Rk</sub> F<sub>1,S,Rk</sub> F<sub>2/3,T,Rk</sub> can be doubled and the values F<sub>1,t,ax</sub> F<sub>1,ax,t</sub> F<sub>2/3,t,v</sub> halved.

# ANGLE BRACKETS

## TYPE 40/45



3

| Art. No. | Dimensions [mm] |   |    |   |      |   |      | nN<br>Ø 5 | nBo<br>Ø 11 | EAN<br>4019346 | Weight<br>kg | Pallet | PU  |  |  |
|----------|-----------------|---|----|---|------|---|------|-----------|-------------|----------------|--------------|--------|-----|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|          | H               | x | L  | x | W(B) | x | T(S) |           |             |                |              |        |     |                                                                                     |                                                                                     |
| 543      | 50              | x | 50 | x | 40   | x | 2,5  | 8         | 2           | 110058         | 0.069        | 10800  | 150 | ■                                                                                   | ■                                                                                   |
| 645      | 60              | x | 60 | x | 45   | x | 2,5  | 12        | 2           | 110232         | 0.093        | 3600   | 50  | ■                                                                                   | ■                                                                                   |
| 993      | 90              | x | 90 | x | 40   | x | 3,0  | 16        | 4           | 110065         | 0.148        | 5100   | 100 | ■                                                                                   | ■                                                                                   |



Angle brackets type 40 and type 45 are equal-legged brackets and are suitable for timber/timber connections or for fastening timber constructions to concrete/steel or masonry.

## TYPE 40/45

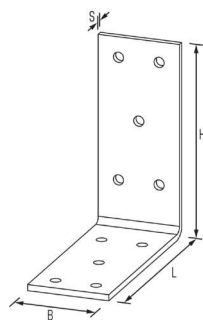
3

| Timber / Timber |    |    |      |      |                |         |        |                     |                     |                       |                     |                     |                     |                     |                        |                        |
|-----------------|----|----|------|------|----------------|---------|--------|---------------------|---------------------|-----------------------|---------------------|---------------------|---------------------|---------------------|------------------------|------------------------|
| Art. No.        | H  | L  | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,S,Rk</sub> | F <sub>2/3,T,Rk</sub> | F <sub>4,T,Rk</sub> | F <sub>4,S,Rk</sub> | F <sub>5,T,Rk</sub> | F <sub>5,S,Rk</sub> | *F <sub>4/5,T,Rk</sub> | *F <sub>4/5,S,Rk</sub> |
| 543             | 50 | 50 | 40   | 2,5  | 6              | Full    | 4.0x40 | 0,21                | 0,09                | 1,51                  | 0,11                | 0,05                | 0,90                | 0,17                | 0,43                   | 0,19                   |
|                 |    |    |      |      |                |         | 4.0x60 | 0,36                | 0,09                | 2,10                  | 0,19                | 0,05                | 1,50                | 0,17                | 0,71                   | 0,19                   |
|                 |    |    |      |      | -              | Partial | 4.0x40 | -                   | -                   | -                     | -                   | -                   | -                   | -                   | -                      | -                      |
|                 |    |    |      |      |                |         | 4.0x60 | -                   | -                   | -                     | -                   | -                   | -                   | -                   | -                      | -                      |
| 645             | 60 | 60 | 45   | 2,5  | 8              | Full    | 4.0x40 | 0,22                | 0,11                | 2,51                  | 0,11                | 0,06                | 1,58                | 0,41                | 0,44                   | 0,22                   |
|                 |    |    |      |      |                |         | 4.0x60 | 0,37                | 0,11                | 3,25                  | 0,19                | 0,06                | 2,62                | 0,41                | 0,73                   | 0,22                   |
|                 |    |    |      |      | -              | Partial | 4.0x40 | -                   | -                   | -                     | -                   | -                   | -                   | -                   | -                      | -                      |
|                 |    |    |      |      |                |         | 4.0x60 | -                   | -                   | -                     | -                   | -                   | -                   | -                   | -                      | -                      |
| 993             | 90 | 90 | 40   | 3,0  | 10             | Full    | 4.0x40 | 0,21                | 0,14                | 2,48                  | 0,11                | 0,07                | 0,90                | 0,25                | 0,43                   | 0,27                   |
|                 |    |    |      |      |                |         | 4.0x60 | 0,36                | 0,14                | 3,27                  | 0,19                | 0,07                | 1,50                | 0,25                | 0,71                   | 0,27                   |
|                 |    |    |      |      | -              | Partial | 4.0x40 | -                   | -                   | -                     | -                   | -                   | -                   | -                   | -                      | -                      |
|                 |    |    |      |      |                |         |        | -                   | -                   | -                     | -                   | -                   | -                   | -                   | -                      | -                      |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail,  $\rho_k = 350 \text{ kg/m}^3$ ,  $f = 0 \text{ mm}$ ,  $e = 40 \text{ mm}$ ,  $b = 80 \text{ mm}$ , unit of length in mm, unit for force in kN.  
For 2 angle brackets opposite each other, the values  $F_{1,T,Rk}$ ,  $F_{1,S,Rk}$ ,  $F_{2/3,T,Rk}$  can be doubled.

| Timber   |    |    |      |      |                |         |        |                     |                     |                     |                       |                      | Concrete            |                     |                    |                     |                     |                     |                    |                     |                        |                        |                      |                       |   |
|----------|----|----|------|------|----------------|---------|--------|---------------------|---------------------|---------------------|-----------------------|----------------------|---------------------|---------------------|--------------------|---------------------|---------------------|---------------------|--------------------|---------------------|------------------------|------------------------|----------------------|-----------------------|---|
| Art. No. | H  | L  | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,S,Rk</sub> | k <sub>1,t,ox</sub> | F <sub>2/3,T,RK</sub> | k <sub>2/3,t,v</sub> | F <sub>4,T,Rk</sub> | F <sub>4,S,Rk</sub> | k <sub>4,t,v</sub> | k <sub>4,t,ox</sub> | F <sub>5,T,Rk</sub> | F <sub>5,S,Rk</sub> | k <sub>5,t,v</sub> | k <sub>5,t,ox</sub> | *F <sub>4/5,T,Rk</sub> | *F <sub>4/5,S,Rk</sub> | k <sub>4/5,t,v</sub> | k <sub>4/5,t,ox</sub> |   |
| 543      | 50 | 50 | 40   | 2,5  | 2              | Full    | 4,0x40 | 3,78                | 0,07                | 6,64                | 0,48                  | 1,00                 | -                   | 0,07                | 1,00               | 7,27                | 0,90                | 0,17                | 1,00               | 0,36                | 3,60                   | 0,14                   | 1,00                 | 3,32                  |   |
|          |    |    |      |      |                |         | 4,0x60 | 4,73                | 0,07                | 6,64                | 0,72                  | 1,00                 | -                   | 0,07                | 1,00               | 7,27                | 1,50                | 0,17                | 1,00               | 0,36                | 6,00                   | 0,14                   | 1,00                 | 3,32                  |   |
|          |    |    |      |      | -              | Partial | 4,0x40 | -                   | -                   | -                   | -                     | -                    | -                   | -                   | -                  | -                   | -                   | -                   | -                  | -                   | -                      | -                      | -                    | -                     | - |
|          |    |    |      |      |                |         | 4,0x60 | -                   | -                   | -                   | -                     | -                    | -                   | -                   | -                  | -                   | -                   | -                   | -                  | -                   | -                      | -                      | -                    | -                     | - |
| 645      | 60 | 60 | 45   | 2,5  | 4              | Full    | 4,0x40 | 7,56                | 0,04                | 8,82                | 1,05                  | 1,00                 | 1,80                | 0,05                | 1,00               | 7,27                | 1,58                | 0,41                | 1,00               | 0,33                | 7,20                   | 0,09                   | 1,00                 | 4,41                  |   |
|          |    |    |      |      |                |         | 4,0x60 | 9,46                | 0,04                | 8,82                | 1,60                  | 1,00                 | 3,00                | 0,05                | 1,00               | 7,27                | 2,62                | 0,41                | 1,00               | 0,33                | 12,00                  | 0,09                   | 1,00                 | 4,41                  |   |
|          |    |    |      |      | -              | Partial | 4,0x40 | -                   | -                   | -                   | -                     | -                    | -                   | -                   | -                  | -                   | -                   | -                   | -                  | -                   | -                      | -                      | -                    | -                     | - |
|          |    |    |      |      |                |         | 4,0x60 | -                   | -                   | -                   | -                     | -                    | -                   | -                   | -                  | -                   | -                   | -                   | -                  | -                   | -                      | -                      | -                    | -                     | - |
| 993      | 90 | 90 | 40   | 3,0  | 4              | Full    | 4,0x40 | 7,56                | 0,11                | 6,45                | 1,03                  | 1,00                 | -                   | 0,10                | 1,00               | 7,27                | 0,90                | 0,25                | 1,00               | 0,36                | 7,20                   | 0,22                   | 1,00                 | 3,23                  |   |
|          |    |    |      |      |                |         | 4,0x60 | 9,46                | 0,11                | 6,45                | 1,57                  | 1,00                 | -                   | 0,10                | 1,00               | 7,27                | 1,50                | 0,25                | 1,00               | 0,36                | 12,00                  | 0,22                   | 1,00                 | 3,23                  |   |
|          |    |    |      |      | -              | Partial | 4,0x40 | -                   | -                   | -                   | -                     | -                    | -                   | -                   | -                  | -                   | -                   | -                   | -                  | -                   | -                      | -                      | -                    | -                     | - |
|          |    |    |      |      |                |         | 4,0x60 | -                   | -                   | -                   | -                     | -                    | -                   | -                   | -                  | -                   | -                   | -                   | -                  | -                   | -                      | -                      | -                    | -                     | - |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail,  $\rho_k = 350 \text{ kg/m}^3$ ,  $f = 0 \text{ mm}$ ,  $e = 40 \text{ mm}$ ,  $b = 80 \text{ mm}$ , unit of length in mm, unit for force in kN.  
For 2 angle brackets opposite each other, the values  $F_{1,T,Rk}$ ,  $F_{1,S,Rk}$ ,  $F_{2/3,T,Rk}$  can be doubled and the values  $F_{1,v,k}$ ,  $F_{1,ox,k}$ ,  $F_{2/3,v,k}$  halved.

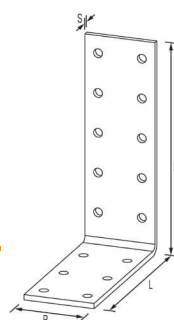


# ANGLE BRACKETS

## TYPE 40/90

| Art. No. | Dimensions [mm] |   |    |   |      |   |      | nN  | EAN     | Weight | Pallet | PU  |   |  |
|----------|-----------------|---|----|---|------|---|------|-----|---------|--------|--------|-----|---|--|
|          | H               | x | L  | x | W(B) | x | T(S) | Ø 5 | 4019346 | kg     |        |     |   |  |
| 994      | 90              | x | 90 | x | 40   | x | 3,0  | 10  | 110102  | 0,179  | 5100   | 100 | ■ |  |

The angle bracket type 40/90 is a 3.0 mm thick equal-legged bracket.  
Applications include purlins on laminated timber beams, wall bars on columns, etc.

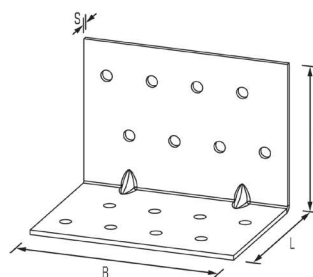


# ANGLE BRACKETS

## TYPE 40/120

| Art. No. | Dimensions [mm] |   |    |   |      |   |      | nN  | EAN     | Weight | Pallet | PU  |   |  |
|----------|-----------------|---|----|---|------|---|------|-----|---------|--------|--------|-----|---|--|
|          | H               | x | L  | x | W(B) | x | T(S) | Ø 5 | 4019346 | kg     |        |     |   |  |
| 1293     | 120             | x | 95 | x | 40   | x | 3,0  | 16  | 110331  | 0,177  | 5100   | 100 | ■ |  |

The angle bracket type 40/120 is a 3.0 mm thick unequal-legged bracket.  
Applications include purlins on laminated timber beams, in timber constructions,  
Pole connections on the sleeper, etc.



# ANGLE BRACKETS

## TYPE 692

| Art. No. | Dimensions [mm] |   |    |   |      |   |      | nN  | EAN     | Weight | Pallet | PU  |   |  |
|----------|-----------------|---|----|---|------|---|------|-----|---------|--------|--------|-----|---|--|
|          | H               | x | L  | x | W(B) | x | T(S) | Ø 5 | 4019346 | kg     |        |     |   |  |
| 692      | 65              | x | 65 | x | 90   | x | 2,0  | 16  | 110348  | 0,161  | 4000   | 100 | ■ |  |

The angle bracket type 692 is a versatile bracket.  
It is particularly suited to loads in the  $F_{2/3}$  and  $F_{4/5}$  direction due to the ribs.

## TYPE 40/90

3

| Timber / Timber |    |    |      |      |                |         |        |                     |                     |                       |                     |                     |                     |                     |                        |                        |
|-----------------|----|----|------|------|----------------|---------|--------|---------------------|---------------------|-----------------------|---------------------|---------------------|---------------------|---------------------|------------------------|------------------------|
| Art. No.        | H  | L  | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,S,Rk</sub> | F <sub>2/3,T,Rk</sub> | F <sub>4,T,Rk</sub> | F <sub>4,S,Rk</sub> | F <sub>5,T,Rk</sub> | F <sub>5,S,Rk</sub> | *F <sub>4/5,T,Rk</sub> | *F <sub>4/5,S,Rk</sub> |
| 994             | 90 | 90 | 40   | 3,0  | 8              | Full    | 4,0x40 | 0,20                | 0,12                | 2,12                  | 0,11                | 0,07                | 0,45                | 0,53                | 0,40                   | 0,23                   |
|                 |    |    |      |      |                |         | 4,0x60 | 0,33                | 0,12                | 2,79                  | 0,19                | 0,07                | 0,75                | 0,53                | 0,67                   | 0,23                   |
|                 |    |    |      |      | -              | Partial | 4,0x40 | -                   | -                   | -                     | -                   | -                   | -                   | -                   | -                      | -                      |
|                 |    |    |      |      |                |         | 4,0x60 | -                   | -                   | -                     | -                   | -                   | -                   | -                   | -                      | -                      |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail, pk = 350 kg/m<sup>3</sup>, f = 0 mm, e = 40 mm, b = 80 mm, unit of length in mm, unit for force in kN.  
For 2 angle brackets opposite each other, the values F<sub>1,T,Rk</sub>, F<sub>1,S,Rk</sub>, F<sub>2/3,T,Rk</sub> can be doubled.

## TYPE 40/120

| Timber / Timber |     |    |      |      |                |         |        |                     |                     |                       |                     |                     |                     |                     |                        |                        |
|-----------------|-----|----|------|------|----------------|---------|--------|---------------------|---------------------|-----------------------|---------------------|---------------------|---------------------|---------------------|------------------------|------------------------|
| Art. No.        | H   | L  | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>1,S,Rk</sub> | F <sub>2/3,T,Rk</sub> | F <sub>4,T,Rk</sub> | F <sub>4,S,Rk</sub> | F <sub>5,T,Rk</sub> | F <sub>5,S,Rk</sub> | *F <sub>4/5,T,Rk</sub> | *F <sub>4/5,S,Rk</sub> |
| 1293            | 120 | 95 | 40   | 3,0  | 12             | Full    | 4,0x40 | 0,16                | 0,08                | 3,18                  | 0,11                | 0,05                | 0,90                | 0,25                | 0,33                   | 0,15                   |
|                 |     |    |      |      |                |         | 4,0x60 | 0,27                | 0,08                | 4,04                  | 0,19                | 0,05                | 1,50                | 0,25                | 0,55                   | 0,15                   |
|                 |     |    |      |      | -              | Partial | 4,0x40 | -                   | -                   | -                     | -                   | -                   | -                   | -                   | -                      | -                      |
|                 |     |    |      |      |                |         | 4,0x60 | -                   | -                   | -                     | -                   | -                   | -                   | -                   | -                      | -                      |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail, pk = 350 kg/m<sup>3</sup>, f = 0 mm, e = 40 mm, b = 80 mm, unit of length in mm, unit for force in kN.  
For 2 angle brackets opposite each other, the values F<sub>1,T,Rk</sub>, F<sub>1,S,Rk</sub>, F<sub>2/3,T,Rk</sub> can be doubled.

## TYPE 692

| Timber / Timber |    |    |      |      |                |         |        |                     |                       |                        |
|-----------------|----|----|------|------|----------------|---------|--------|---------------------|-----------------------|------------------------|
| Art. No.        | H  | L  | W(B) | T(S) | n <sub>a</sub> | NB      | VM     | F <sub>1,T,Rk</sub> | F <sub>2/3,T,Rk</sub> | *F <sub>4/5,T,Rk</sub> |
| 692             | 65 | 65 | 90   | 2,0  | 12             | Full    | 4.0x40 | 0,67                | 3,82                  | 5,01                   |
|                 |    |    |      |      |                |         | 4.0x60 | 0,67                | 5,19                  | 5,13                   |
|                 |    |    |      |      | -              | Partial | 4.0x40 | -                   | -                     | -                      |
|                 |    |    |      |      |                |         | 4.0x60 | -                   | -                     | -                      |

Values are valid for 1 angle bracket (\* 2 angle brackets opposite each other), GH nail, pk = 350 kg/m<sup>3</sup>, f = 0 mm, e = 40 mm, b = 80 mm, unit of length in mm, unit for force in kN.  
For 2 angle brackets opposite each other, the values F<sub>1,T,Rk</sub>, F<sub>1,S,Rk</sub>, F<sub>2/3,T,Rk</sub> can be doubled.