

3
















































































































03






ANGLE BRACKETS

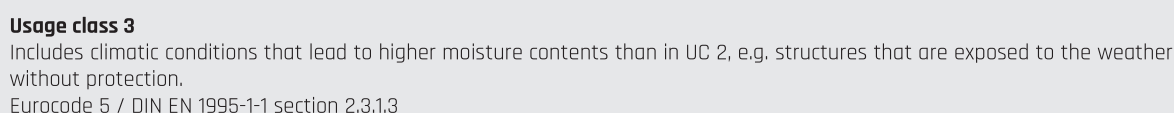
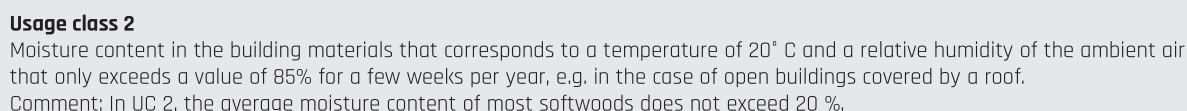
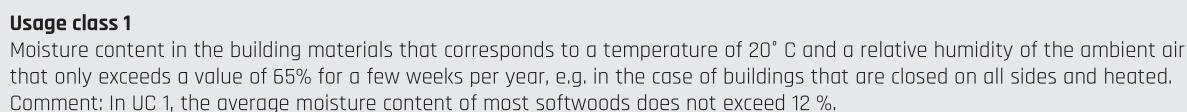
# ANGLE BRACKETS

## ASSORTMENT

						Height [mm]	Length [mm]	Width [mm]	Basics Statik & Diagramme from page	Products & Statik from page	Products Made of V4A from page
ANGLE BRACKET TOP 80/120						80-120	60	55	110	120	
ANGLE BRACKET 70X70X2.0					 	70	70	55	110	122	293
ANGLE BRACKET 70X70 GREENLINE						70	70	55	110	122	
ANGLE BRACKET TOP KR90E						95	85	65	110	124	
ANGLE BRACKET 90X90X2.5					 	90	90	65	110	128	293
ANGLE BRACKET 90X90 GREENLINE						90	90	65	110	126	
ANGLE BRACKET 100X100X3.0					 	100	100	90	110	130	293
ANGLE BRACKET 100X100 GREENLINE						105	105	90	110	130	
STRUT CONNECTOR 135 DEGREES						90-100	90-100	65-90		132	
ANGLE BRACKET TYPE 110/170L						170	110	95	110	132	
ANGLE BRACKET KR 3 MM						95-285	88	65	110	134	
ANGLE BRACKET KR 4 MM						95-285	88	65	110	134	
ANGLE BRACKET TYPE 50/80						90	50	50-80	110	138	
ANGLE BRACKET TYPE 110						90	50	110	110	138	
ANGLE BRACKET TYPE 55/80						80	60	55	110	140	
ANGLE BRACKET TYPE 60/100						100	60	60	110	140	
CONSOLE ANGLE						120-200	54	60	110	142	
ANGLE BRACKET TYPE 40/45						50-90	50-90	40-45	110	144	
ANGLE BRACKET TYPE 40/90					 	90	90	40	110	146	294
ANGLE BRACKET TYPE 40/120						120	95	40	110	146	
ANGLE BRACKET TYPE 692						65	65	90	110	146	

## ASSORTMENT

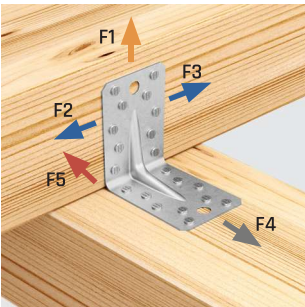
	CE symbol
	Steel with indication of the steel quality and galvanisation
	Stainless steel with material number
	Timber/timber connection
	Timber/concrete-connection



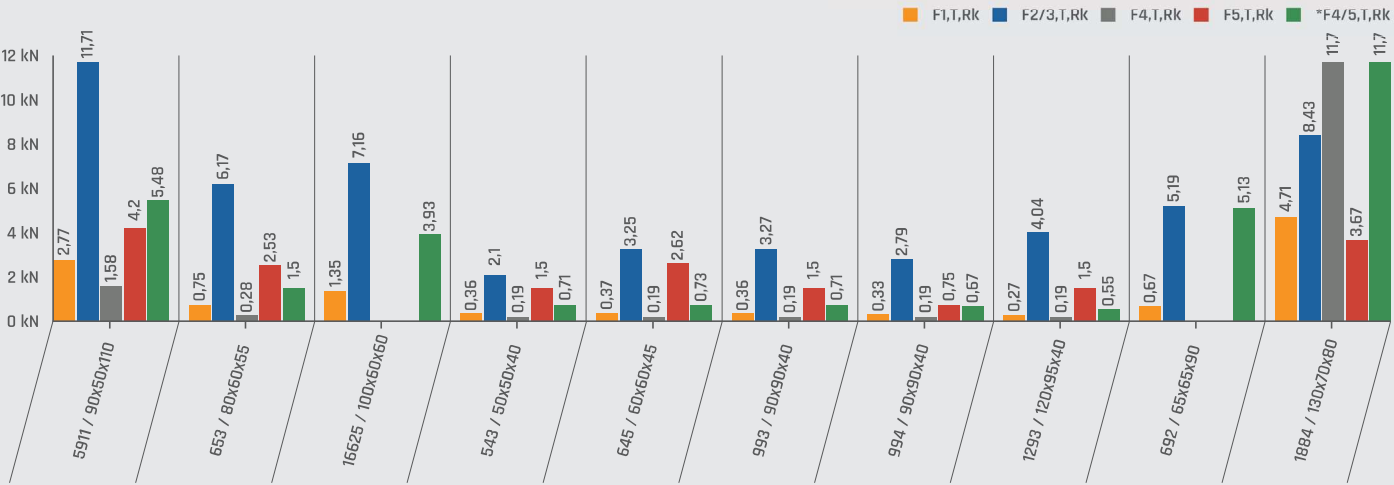
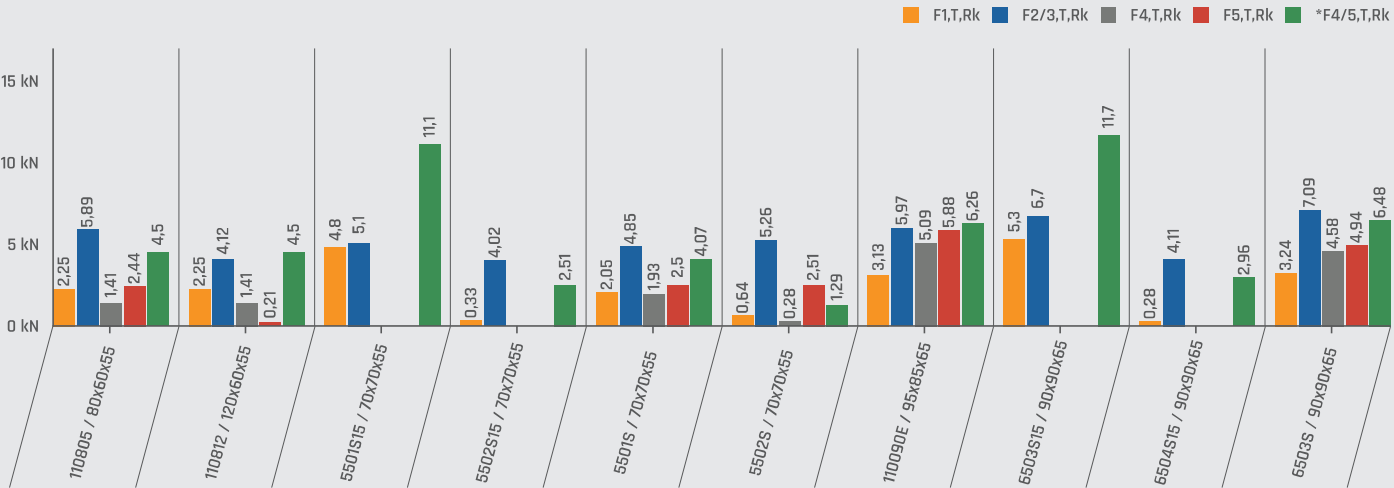


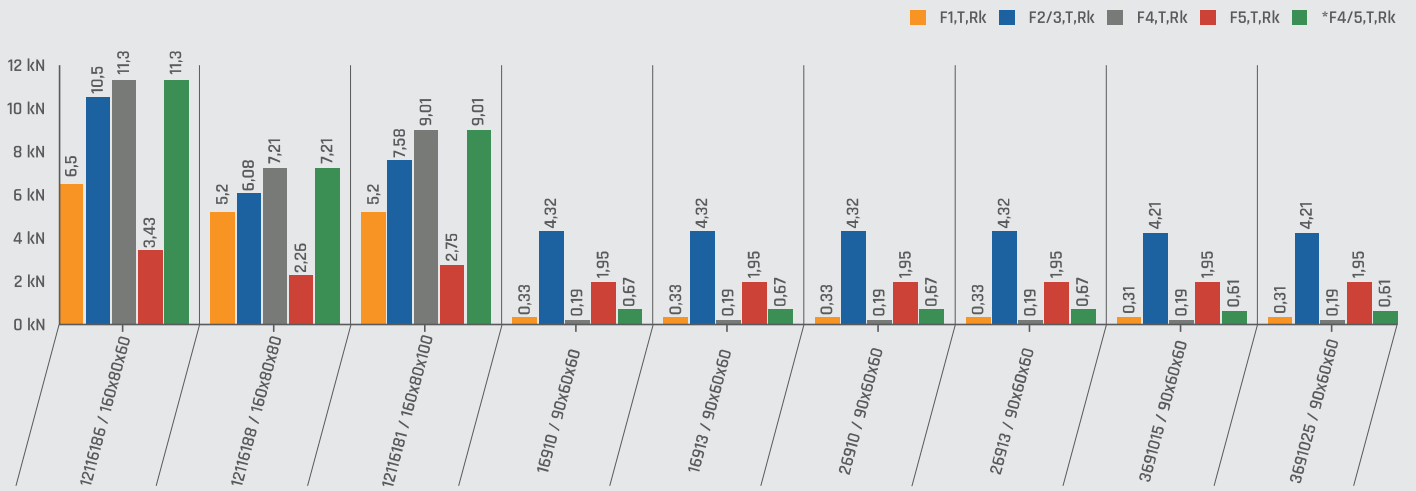
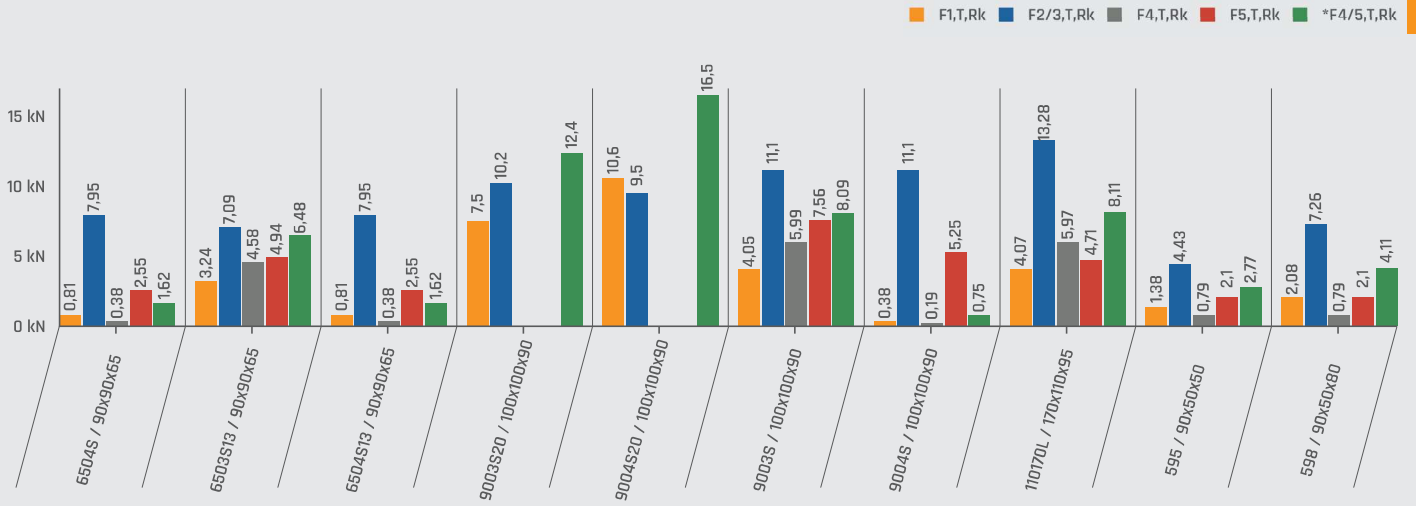
# ANGLE BRACKETS

## STATICS DIAGRAM



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# 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

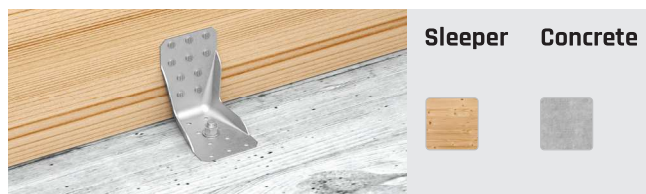
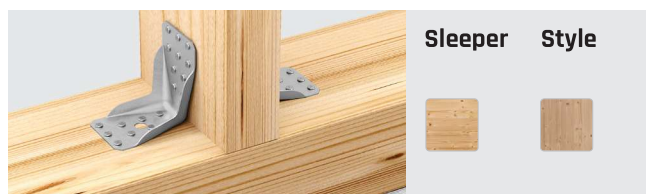
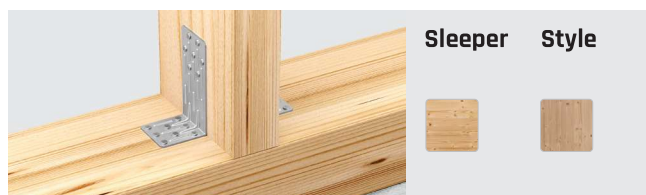
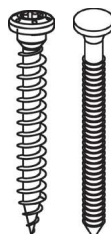
**235**  
**JR**  
 feuerverzinkt

**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

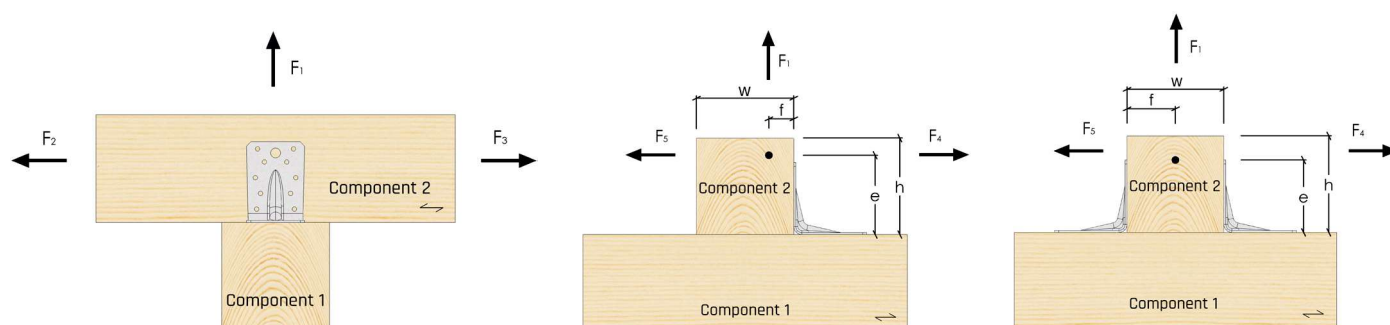
**Connecting elements from page 274**



# 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>.

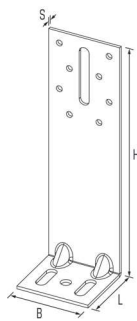
Curvatures of the timber components and joist edges in the area of the angle brackets are not permitted - the wood must be sharp-edged in the area of the bracket.

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>



# CONSOLE ANGLE

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Art. No.	Dimensions [mm]							nN	nBo	EAN	Weight	Pallet	PU		
	H	x	L	x	W(B)	x	T(S)	Ø 5	Ø 8,5	4019346	kg				
1205460	120	x	54	x	60	x	2,5	8	1	004104	0.198	3000	100	■	■
1405460	140	x	54	x	60	x	2,5	8	1	004111	0.221	3000	100	■	■
1605460	160	x	54	x	60	x	2,5	8	1	004128	0.244	3000	100	■	■
1805460	180	x	54	x	60	x	2,5	8	1	004135	0.268	3000	100	■	■
2005460	200	x	54	x	60	x	2,5	8	1	004142	0.291	3000	100	■	■



Console angles are used for façades placed in front of timber sub-structures. The necessary bracket size must be chosen in relation to the insulation thickness. The short leg is for fastening to the façade. The long leg is for fixing the frame left (substructure) with screws or nails (under compliance with the necessary minimum edge spacing).

The slotted holes in both legs enable precise and perpendicular alignment.

Other areas of use are, for example, substructures where subsequent alignment is an advantage.

# CONSOLE ANGLES

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>
1205460	120	54	60	2,5	8	Full	4.0x40	-	-	2,30	2,30
							4.0x60	-	-	3,30	3,30
					6	Partial	4.0x40	0,40	1,20	-	-
							4.0x60	0,40	1,20	-	-
1405460	140	54	60	2,5	8	Full	4.0x40	0,40	1,20	2,10	2,10
							4.0x60	0,40	1,20	2,90	2,90
					-	Partial	4.0x40	-	-	-	-
							4.0x60	-	-	-	-
1605460	160	54	60	2,5	8	Full	4.0x40	0,40	1,20	1,90	1,90
							4.0x60	0,40	1,20	2,60	2,60
					-	Partial	4.0x40	-	-	-	-
							4.0x60	-	-	-	-
1805460	180	54	60	2,5	8	Full	4.0x40	0,40	1,20	1,70	1,70
							4.0x60	0,40	1,20	2,30	2,30
					-	Partial	4.0x40	-	-	-	-
							4.0x60	-	-	-	-
2005460	200	54	60	2,5	8	Full	4.0x40	0,40	1,20	1,60	1,60
							4.0x60	0,40	1,20	2,10	2,10
					-	Partial	4.0x40	-	-	-	-
							4.0x60	-	-	-	-

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  $F_{1,T,Rk}$ ,  $F_{1,Bo,ax,rk}$ ,  $F_{2/3,T,Rk}$  can be doubled and the values  $F_{1,Bo,sx,rk}$ ,  $F_{2/3,Bo,sx,rk}$  halved.