

5

05

SHEARING ANGLES
SHEARING/TENSILE PLATES



SHEARING ANGLES

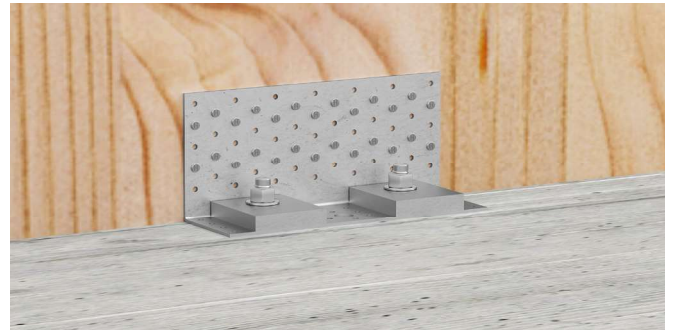
SHEARING/TENSILE

SHEARING ANGLES

The shearing angles "shearing 80" and "shearing 120" were developed to take shearing and tensile loads in timber frames and solid timber construction.

Advantages:

- Connection timber/concrete
- Efficient and quick assembly with GH threaded nails
- Expandable by modular system
- Hole pattern is optimised for board plywood and softwood
- Hole spacing is also optimised for any height compensation
- Various nail patterns are possible, including under consideration of the grain course and edge spacing
- Assembly via intermediate layer, which can and cannot move



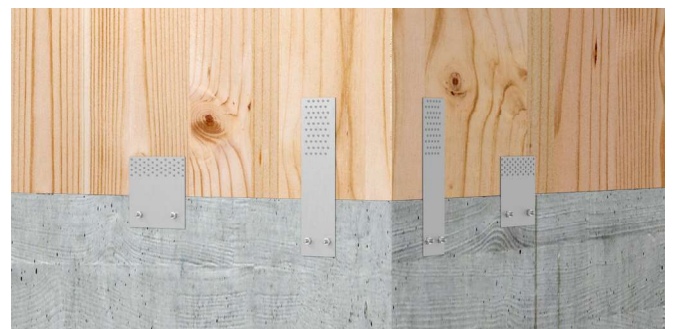
Products from page 194

SHEARING AND TENSILE PLATES

Tensile plates were developed to transfer the tensile forces from timber frames and solid timber walls into the baseplate.

Advantages:

- Connection timber/concrete
- Economic and quick assembly
- Hole pattern is optimised for board plywood and softwood
- Various nail patterns are possible, including under consideration of the grain course and edge spacing
- Assembly via intermediate layer, which can and cannot move



Basics of statics from page 196
Products & statics from page 202

SHEARING/TENSILE PLATES - SHEARING ANGLES

ASSORTMENT

						Basics Statics	Products & Statics
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SHEARING PLATES							196 202
TENSION PLATES							196 202



CE symbol



Steel with indication of the steel quality and zinc coating



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 %.



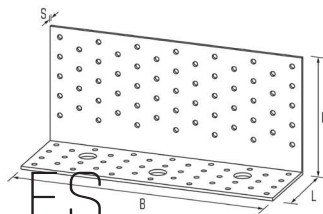
Usage class 2

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

Statics & more
Information

TOPLINE



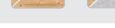
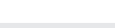
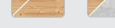
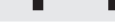
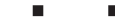
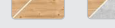
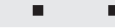
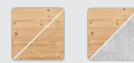
KONSTRULINE

SHEARING ANGLES

TYPE 80/ TYPE 120

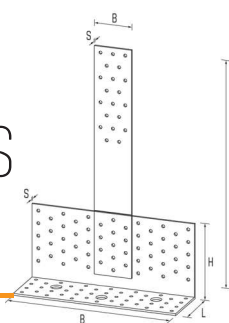


Art. No.	Dimensions [mm]							nN		EAN	Weight kg	Pallet	PU		
	H	x	L	x	W(B)	x	T(S)	Ø 5	Ø 18						
11425580	80	x	52,5	x	260	x	3,0	57	2	032824	0,728	480	10	■	■
114255120	120	x	82	x	260	x	3,0	105	3	032831	1,130	480	10	■	■



SHEARIN ANGLES & PULL TABS

IN THE MODULAR SYSTEM

Statics & more
Information

TOPLINE

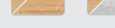
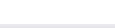
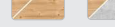
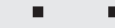
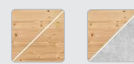


KONSTRULINE



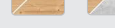
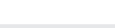
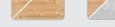
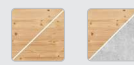
Shearing angles

Art. No.	Dimensions [mm]							nN		EAN	Weight kg	Pallet	PU		
	H	x	L	x	W(B)	x	T(S)	Ø 5	Ø 18						
11425580	80	x	52,5	x	260	x	3,0	57	2	032824	0,728	480	10	■	■
114255120	120	x	82	x	260	x	3,0	105	3	032831	1,130	480	10	■	■



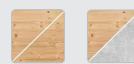
Combi angle

Art. No.	Dimensions [mm]							nN		EAN	Weight kg	Pallet	PU		
	H	x	L	x	W(B)	x	T(S)	Ø 5	Ø 18						
1144373	83	x	83	x	48	x	3,0	6	1	032848	6,360	480	10		■



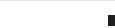
Pull tab

Art. No.	Dimensions [mm]					nN	EAN	Weight kg	Pallet	PU		
	H	x	W(B)	x	T(S)							
11460370	370	x	60	x	3,0	20/13	032855	0,475	480	10	■	



Pressure plate

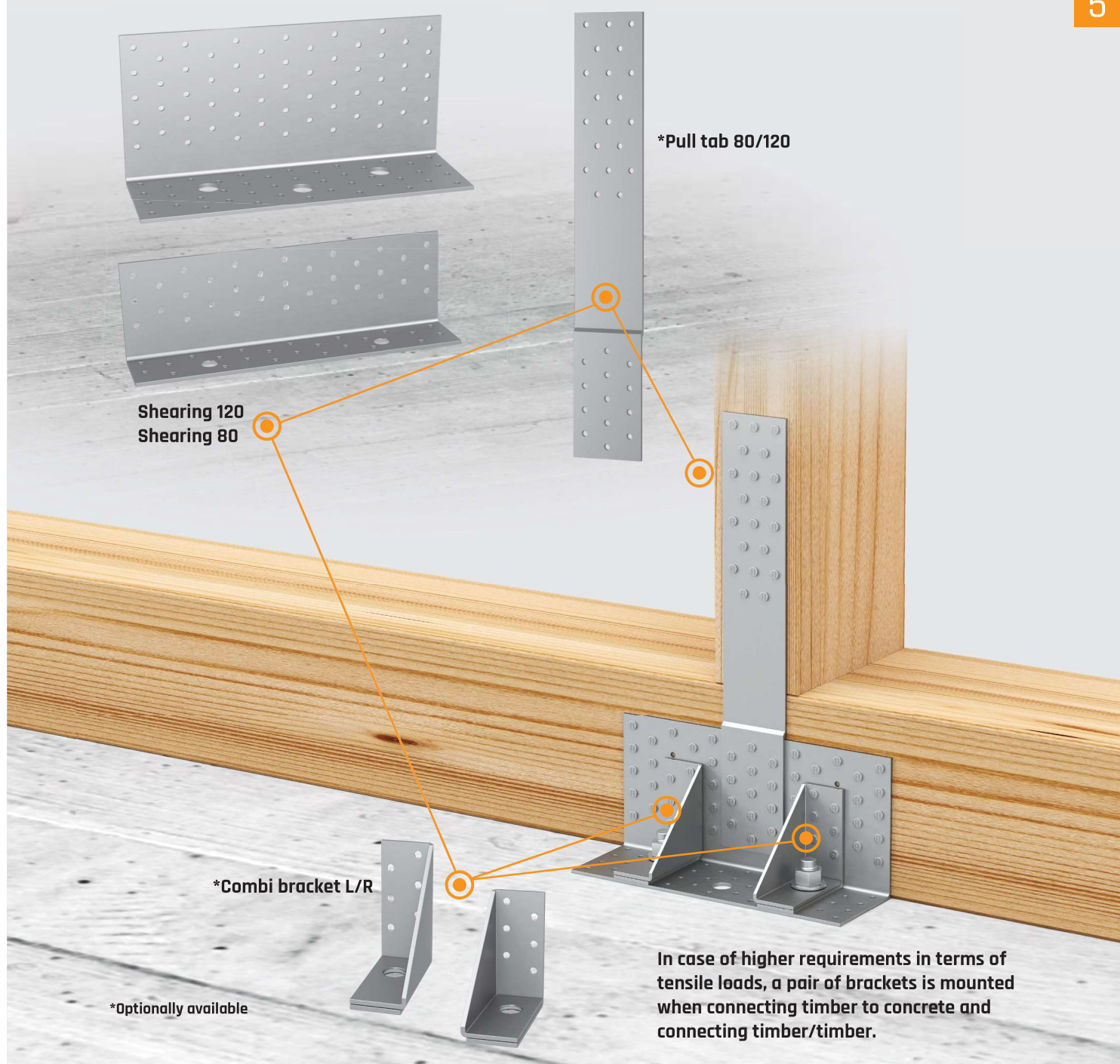
Art. No.	Dimensions [mm]					nN	EAN	Weight kg	Pallet	PU		
	L	x	W(B)	x	T(S)							
1147079	70	x	79	x	15,0	1	032862	0,628	960	20		■



GH SHEARING ANGLES IN THE MODULAR SYSTEM

By fitting additional pressure plates or combi angles L/R, the shearing angles are also suitable for absorbing higher tensile loads F_t . In timber construction, with the additional assembly of the pull tab 370, tensile loads can be absorbed directly from the pole. The modular system can replace the former additional assembly of connectors for tensile and push forces.

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SHEARING AND TENSILE PLATES

TECHNICAL FEATURES

Geometry

H	Height (mm)
L	Length (mm)
W(B)	Width (mm)
T(S)	Material thickness (mm)
Ø [mm]	Diameter

Tables

$F_{z,rk}$	Max. load capacity in load direction [kN]
n	Number of holes Ø5,0
n_{Bo}	Number of holes for dowels/bolts with Ø 17,0[mm]
n_{erf}	Necessary number of nails/screws
$F_{Stahl,Rk}$	Characteristic steel load capacity [kN]
NH	Softwood C24
BSP	Board plywood VH 24
	Grain course

Timber connecting element

GH threaded holes ETA-13/0523 Ø4,0xL [mm]
GH wood connector screw ETA-13/0523 Ø5 [mm]
Dowels/bolts

Load directions

$F_{z,rk}$ 	Tensile PL 440 + PL 540; lifting load, load direction F1
$F_{z,rk}$ 	Shearing PL140; PL220; PL 260 shearing load, load direction $F_{2/3}$

Design

$F_{timber,Rk}$	Characteristic value of load capacity "timber"
$F_{steel,Rk}$	Characteristic value of load capacity "Steel"
k_{mod}	Modification coefficient according to EN 1995-1-1
γ_M	Partial safety factor for connections in wood construction (DE: $\gamma_M=1.3$)
γ_{M2}	Partial safety factor for stress of structural steel connections on perforated soffit (DE: $\gamma_{M2}=1.25$)

Axis/edge spacing

$a_{4,t}$	Minimum spacing from stressed edge, vertical
$a_{3,t}$	to the grain direction
e_{Bo}	Minimum spacing from stressed end grain, parallel
a_{Bo}	to the grain direction
ΔH	Possible height compensation between the lower edge of the timber and Concrete top edge



Steel with indication of the steel quality and zinc coating



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 %.



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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

SHEARING AND TENSILE

APPLICATIONS

Application:

GH shearing plates for the introduction of shear forces of timber frame and solid wood walls.
GH tension plates for the introduction of tensile forces of timber frame and solid wood walls

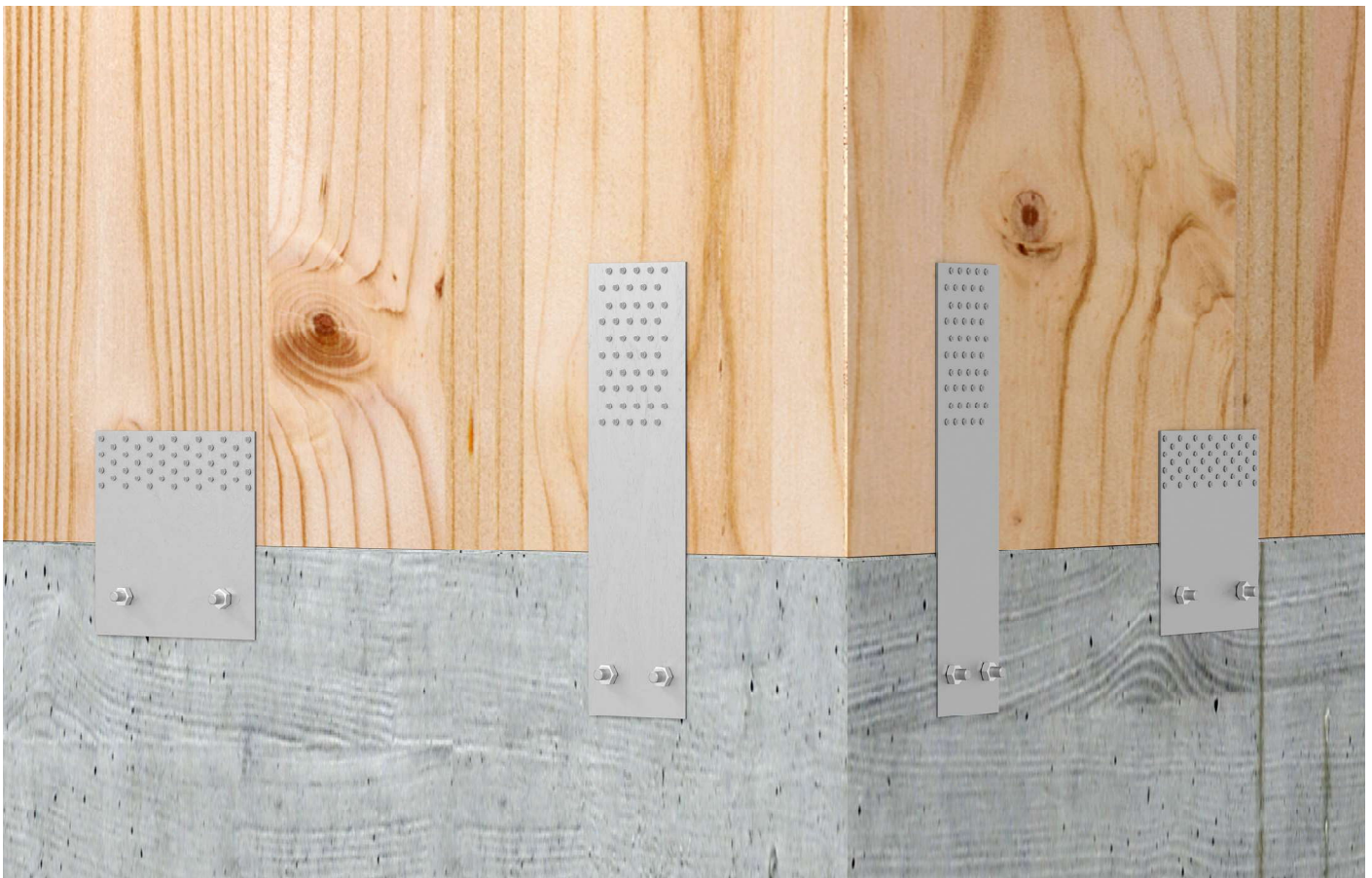
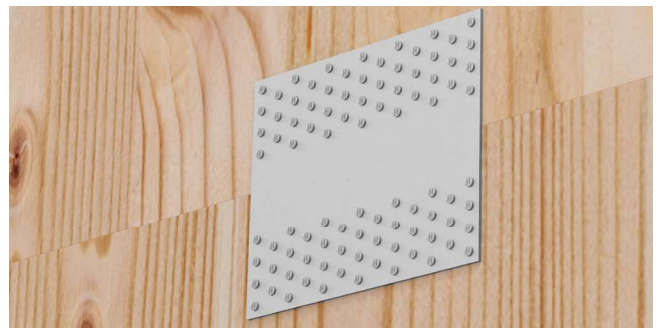
Materials:

250
GD
Z275

Material thickness:

3.0 mm

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Connecting element

GH threaded nails 4.0 x 35 / 40 / 50 / 60 / 75 / 100 mm

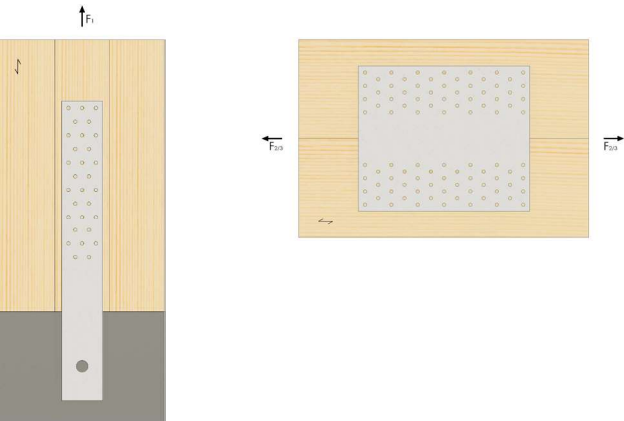
GH screws 5.0 x 25 / 35 / 40 / 50 / 60 / 70 mm

Bolt, dowel or concrete anchor M16

Connecting elements from page 274

SHEARING AND TENSILE PLATES

LOAD DIRECTIONS



Minimum and edge spacing

			GH threaded nails Ø 4.0 x L [mm]	
[mm]		Reduktion*	min. for NH / BSP	Selected NH / BSP
a ₁	10d / 12d	0,7	28	40
a ₂	5d	0,7	14	20
			min. for HN	selected for HN
a _{3,t}	15d	-	60	60
a _{4,t}	7d / 10d	-	28	30
			min. for BSP	Selected for BSP
a _{3,t}	12d	-	48	50

* Reduction of the connecting element spacing according to EN 1995-1-1:2010, section 8.3.1.4 (1)

Connection to timber

Partial nail fitting or partial screw fitting
 Full nail fitting or full screw fitting
 Nail patterns for NH = softwood C24 and BSP= board plywoodz VH 24

Load capacities of individual connecting elements

In addition to the listed load-bearing capacity of the individual fastening elements in shearing, a possible block shear failure was taken into account in the load-bearing capacities, see DIN EN 1995-1-1, Annex A.

Connection over intermediate layers

The specified load-bearing capacities also apply to intermediate layers if the following requirements are met:
 Intermediate layer:

- OSB boards type OSB/3 and OSB/4 according to EN 13986 (EN 300) or approval
- Synthetic resin-bonded chipboard in accordance with EN 13986 (EN 312) or approval
- Solid wood panels according to EN 13986 (EN 13353) or approval
- Plywood according to EN 13986 (EN 636) or approval
- Plasterboards according to approval
- Fibreboards according to EN 13986 (EN 622-2 and 622-3) minimum raw density 650 kg/m³

The value of the characteristic bearing strength of the intermediate layer must at least fulfil the value for solid softwood of strength class C24.
 The compressive strength of the intermediate layer when loaded at right angles to the connecting surface (for wood-based panels, compressive strength perpendicular to the board plane) must be at least equal to the value of the compressive strength perpendicular to the grain for solid softwood of strength class C24.

Connection of the intermediate layer

The intermediate layer must be force-fit to the timber component (non-moving intermediate layer).

In other cases and generally in the case of movable intermediate layers, the load-bearing capacity of the connecting element should be determined individually for the respective connection.

Connecting element for intermediate layers

The length must be selected so that the profiled length (insert depth) behind the intermediate layer corresponds at least to the length specified in the statics tables.

Connection to concrete

The load-bearing capacity for fixing in concrete must be verified separately in accordance with the requirements of the selected anchor, bolt, screw with Ø16mm.

Edge spacing in the concrete component must be selected and verified in accordance with the selected connecting elements in the concrete and the associated approval/ETA.

Design / proof

5

Combined stress

For GH screws under combined stress of pulling out and shearing, the following condition must be met:

$$\left(\frac{F_{ax,Ed}}{F_{ax,Rd}}\right)^2 + \left(\frac{F_{v,Ed}}{F_{v,Rd}}\right)^2 \leq 1$$

Load capacities of steel sheet

In the statics tables, the following proof of load capacity has been considered for the steel plate:

Tensile and shearing load capacity of steel, perforated soffit

Design values

To determine the design value of the respective connector, the decisive design value from the connection is determined.

Design value of "timber" failure

$$F_{Holz,Rd} = k_{mod} \cdot \frac{F_{Holz,Rk}}{\gamma_M}$$

Design value of "steel" failure

$$F_{Stahl,Rd} = \frac{F_{Stahl,Rk}}{\gamma_{M2}}$$

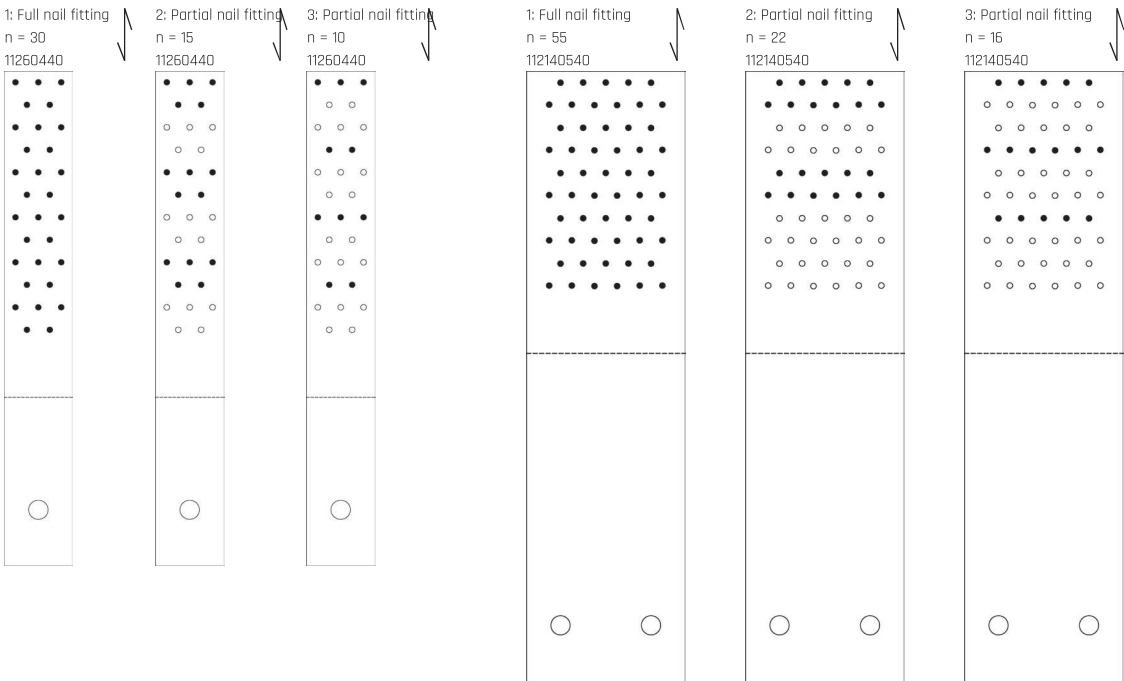
Design tablen

Load capacities in timber in kN

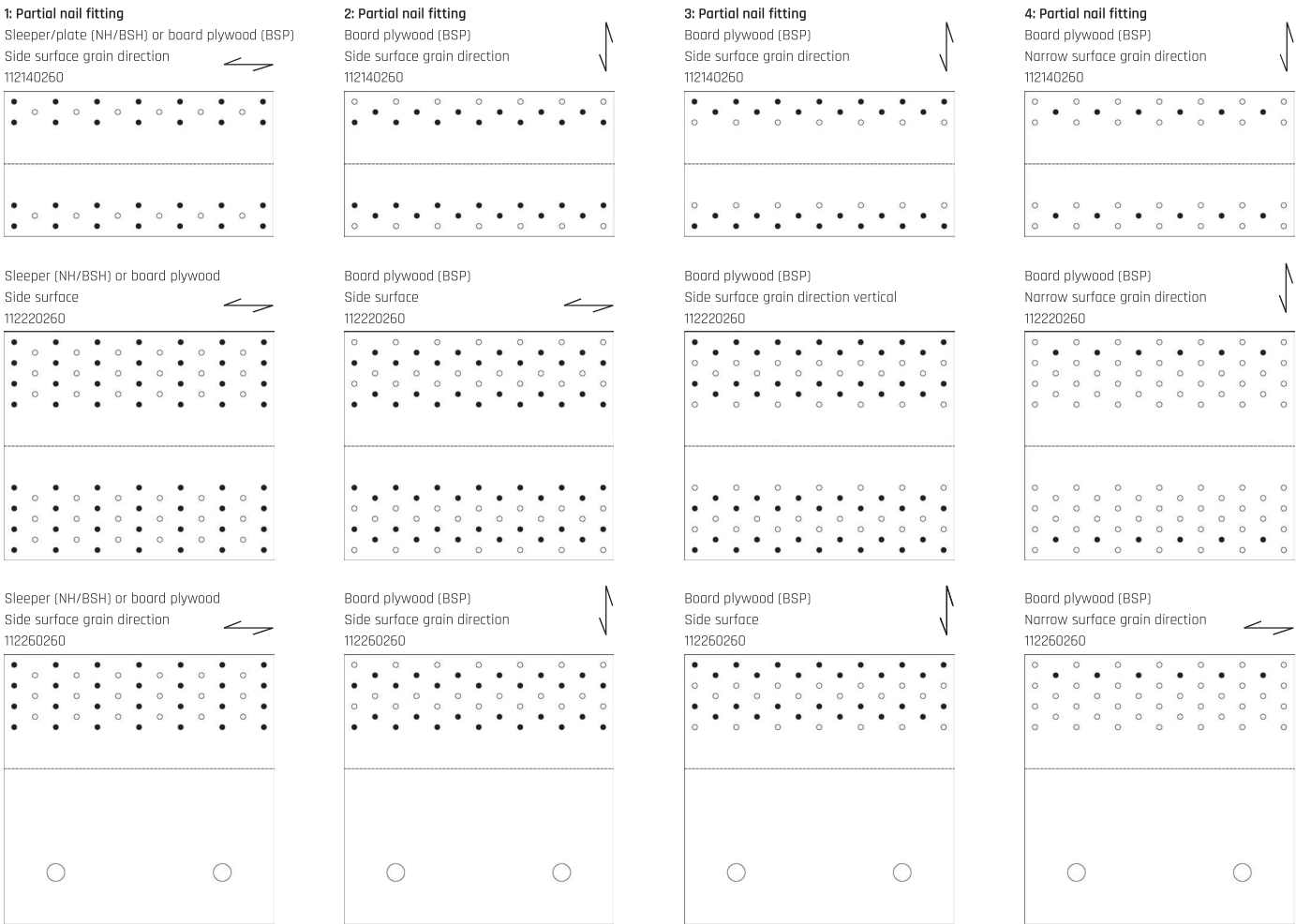
For the connections, the assumption is made that the interconnected components are held against twisting and that eccentric load situations are therefore excluded.

The number of nails must be used under consideration of the specified nail/screw patterns.

Nail/screw patterns for pull tabs

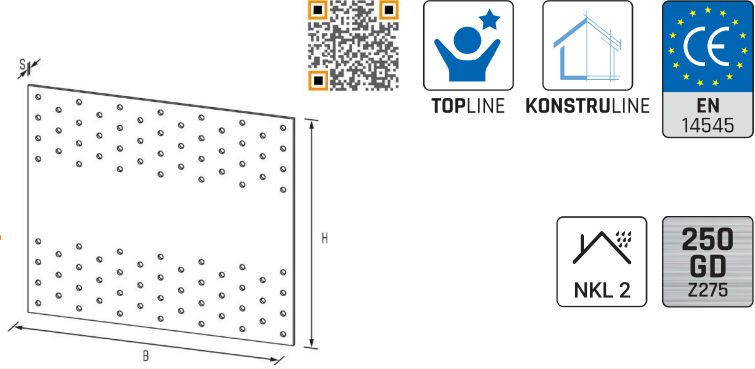


Nail/screw patterns for shearing plates



SHEARING PLATES

TYPE PL

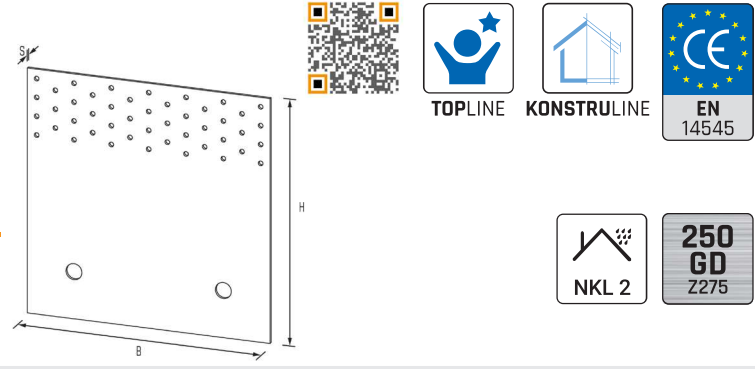


Art. No.	Dimensions [mm]					nN	nBo	EAN	Weight	Pallet	PU		
	H	x	W(B)	x	T(S)	Ø 5	Ø 17	4019346	kg				
112140260	140	x	260	x	3,0	40	-	032879	0.804	480	10	■	
112220260	220	x	260	x	3,0	96	-	032886	1.263	480	10	■	

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SHEARING PLATES

TYPE PL 260



Art. No.	Dimensions [mm]					nN	nBo	EAN	Weight	Pallet	PU		
	H	x	W(B)	x	T(S)	Ø 5	Ø 17	4019346	kg				
112260260	260	x	260	x	3,0	46	2	032893	1.493	480	10		■

TENSILE PLATES

TYPE PL



Art. No.	Dimensions [mm]					nN	nBo	EAN	Weight	Pallet	PU		
	H	x	W(B)	x	T(S)	Ø 5	Ø 17	4019346	kg				
11260440	440	x	60	x	3,0	30	1	032787	0.519	540	10		■
112140540	540	x	140	x	3,0	55	2	032794	1.740	160	10		■

SHEARING PLATES TYPE PL

Timber							Timber									
Art. No.	Load case $F_{2/3}$					Nail pattern	1		2		3		4*		5**	
	H	W(B)	T(S)	Ø5	Ø17		$F_{z,rk}$	$n_{erf.}$	$F_{z,rk}$	$n_{erf.}$	$F_{z,rk}$	$n_{erf.}$	$F_{z,rk}$	$n_{erf.}$	$F_{z,rk}$	$n_{erf.}$
112140260	140	260	3	40	-	4.0x50	21,90	28	20,50	26	18,90	26	9,10	12(14)	12,50	12
						4.0x60	23,30	28	21,80	26	20,20	26	9,70	12(14)	13,30	12
						4.0x75	24,80	28	32,20	26	21,50	26	10,30	12(14)	14,10	12
112220260	220	260	3	96	-	4.0x50	30,40	56	31,90	48	30,00	52	6,10	24(28)*	13,30	24
						4.0x60	32,40	56	34,10	48	32,10	52	6,50	24(28)*	14,20	24
						4.0x75	34,40	56	36,20	48	34,00	52	6,90	24(28)*	15,10	24

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SHEARING PLATES TYPE PL 260

Timber							Concrete									
Art. No.	Load case $F_{2/3}$					Nail pattern	1		2		3		4*			
	H	W(B)	T(S)	Ø5	Ø17		$F_{z,rk}$	$n_{erf.}$	$F_{z,rk}$	$n_{erf.}$	$F_{z,rk}$	$n_{erf.}$	$F_{z,rk}$	$n_{erf.}$		
112260260	260	260	3	46	2	4.0x50	30,40	28	31,90	26	30,00	26	6,10	6-7		
						4.0x60	32,40	14	34,10	13	32,10	13	6,50	6-7		
						4.0x75	34,40	14	36,20	13	34,00	13	6,90	6-7		

* The connecting elements must be arranged in the narrow face of the cross laminated timber in such a way that they are not located in the end grain.

** Connections with differing connection patterns, for combinations of connection pattern 4 with one of the connection patterns 1 to 3 – e.g. narrow surface BSP (nail pattern 4) with side surface PSB (nail pattern 1-3).

TENSILE PLATES TYPE PL

Timber							Concrete									
Art. No.	Load case F_t					Nail pattern	1		2		3					
	H	W(B)	T(S)	Ø5	Ø17		$F_{z,rk}$	$n_{erf.}$	$F_{z,rk}$	$n_{erf.}$	$F_{z,rk}$	$n_{erf.}$				
11260440	440	60	3	30	1	4.0x50	31,60	30	31,60	15	22,10	10			35,30	
						4.0x60	38,30	30	35,50	15	23,60	10			35,30	
						4.0x75	48,40	30	37,70	15	25,10	10			35,30	
112140540	540	140	3	55	2	4.0x50	63,20	55	48,70	22	35,40	16			70,60	
						4.0x60	76,60	55	52,00	22	37,80	16			70,60	
						4.0x75	96,80	55	55,30	22	40,20	16			70,60	