

09

NAIL PLATE STRIPS NAIL PLATES



NAIL PLATE STRIPS / NAIL PLATES

SORTIMENT

						Length [mm]	Width [mm]	Basics Statics	Products & Statics
								from page	from page
NAIL PLATE STRIPS 2.0							1200 40-400	252	256
NAIL PLATE STRIPS 2.5							1200 40-400	252	257
NAIL PLATE BOARDS							2500 1200		256
NAIL PLATES 2.0								120-500 40-200	252 258
NAIL PLATES 1.5 GREENLINE							120-500 40-200	252	259

9



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

NAIL PLATES / NAIL PLATE STRIPS

TECHNICAL FEATURES

Geometry

L	Length [mm]
W(B)	Width (mm)
T(S)	Material thickness (mm)

Tables

n _o	Number of connecting elements in timber
----------------	---

Design

R _k	Characteristic value of a load capacity [kN]
R _d	Design value of load capacity [kN]
R _{90,d}	Design value of load capacity vertical to the grain
n _{ef}	Effective number of connecting elements
Y _M	Partial safety factor
k _{mod}	Modification coefficient for load impact duration

9



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

Connection to timber

A connection should always consist of two opposite nail sheets. The width of the connected timbers must be the same. Only holes with their centre of gravity at least 6 mm from the nail plate edge may be used.

Design example

Load capacities in kN

Characteristic raw density of timber: $\rho_k = 350 \text{ kg/m}^3$ (C24)

Characteristic value $R_{v,k}$

Design value $R_{z,Rd}$ for KLED "short"

The following proof must be kept for the design of the connection:

Connecting element load capacity

$$R_d = n_{ef} \times k_{mod} / 1,3 \times R_{v,k}$$

Nail plate load capacity in the net cross-section

$$R_d = 0,9 \times A_{net} \times f_u / y_{M2} \quad \text{with } A_{net} = 0,75 \times b \times t, \quad y_{M2} = 1,25$$

according to EN 1993-1-1 6.2.3

$$R_{90,d} = 14 \times b \times \sqrt{\frac{h_e}{1 - h_e/h}} \times \frac{k_{mod}}{1,3}$$

Cross-tensile proof in the strap according to EN 1995-1-1 8.1.4

Strap Softwood C24 100 [mm] x 160 [mm]

Tensile rod Softwood C24 100 [mm] x 160 [mm]

Nail plates 2 x 80 x 240 x 1.5 steel sheet S 250 with tensile strength $f_u = 330 \text{ [N/mm}^2\text{]}$

Threaded nails 4 x 50 according to ETA-13/0523 - 2 x 5 threaded nails in the strap and 2 x 6 threaded nails in the tensile rod

Usage class 2, class of load impact duration "short" $\rightarrow k_{mod} = 0,9$

Load capacity of nails in the strap

Shearing load capacity of a threaded nail 4x50 according to ETA-13/0523: $R_{v,k} = 2,21 \text{ [kN]}$

$$R_d = 2 \times 5 \times 0,9 / 1,3 \times 2,21 = 15,3 \text{ [kN]}$$

Load capacity of nails in the pull rod

Determination of n_{ef} according to EN 1995-1-1 8.3.1.1 (8): $n_{ef} = n^{0,85} = 2 \times 3 \times 2^{0,85} = 10,8$

$$R_d = 10,8 \times 0,9 / 1,3 \times 2,21 = 16,5 \text{ [kN]}$$

Load capacity of nail plates

Net cross-section surface: $A_{net} = 0,75 \times w \times d = 0,75 \times 80 \times 1,5 = 90 \text{ [mm}^2\text{]}$

$$R_d = 0,9 \times 2 \times 90 \times 330 / 1,25 = 42,8 \text{ [kN]}$$

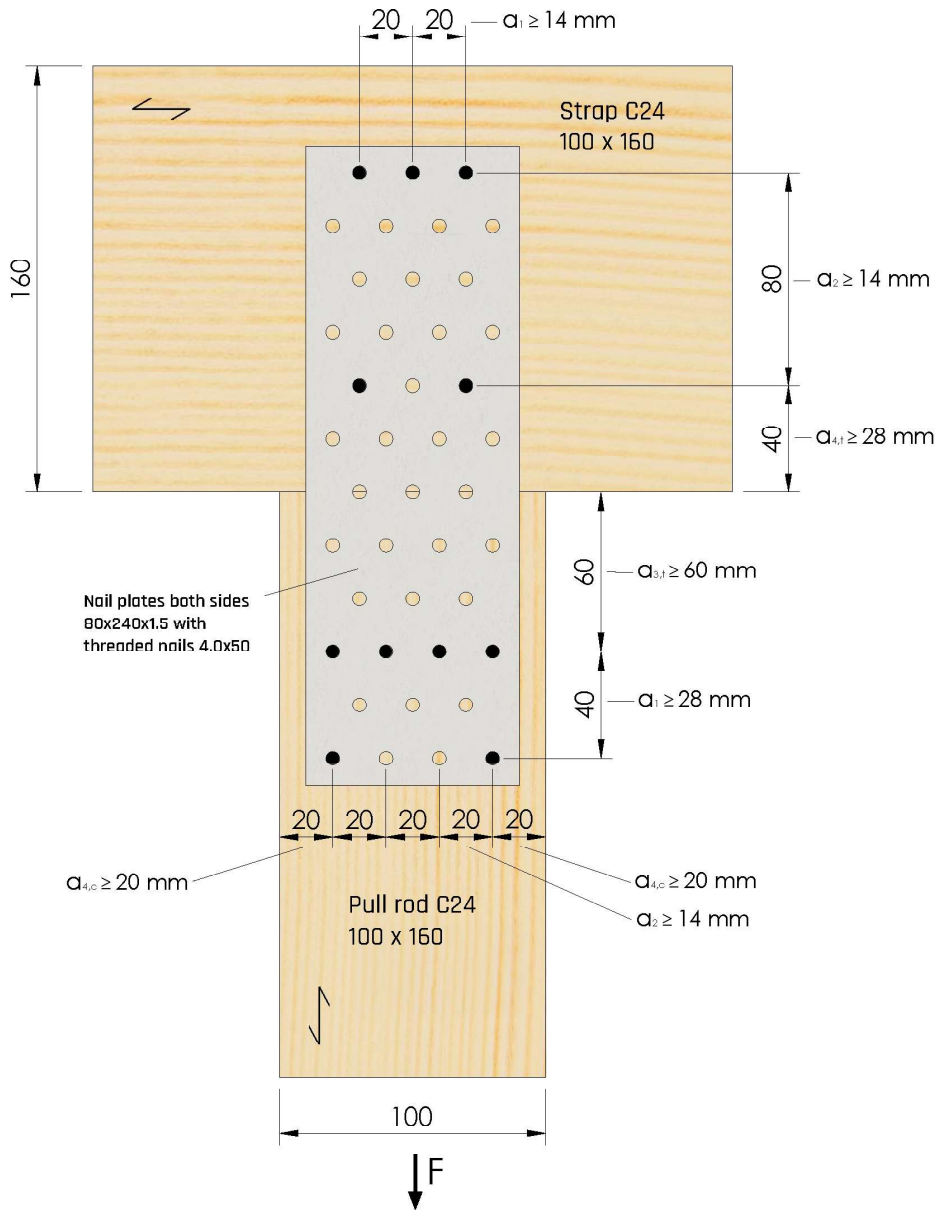
The off-centre load of the nail plates is not taken into account.

Load capacity of transverse connection

Spacing of the outer connecting element row from the stressed edge: $h_e = 120 \text{ [mm]}$

$$R_{90,d} = 14 \times 100 \times \sqrt{\frac{120}{1 - 120/160}} \times \frac{0,9}{1,3} = \mathbf{21,2 \text{ [kN]}}$$

Load capacity of connection: $R_d = \min (15,3; 16,5; 42,8; 21,2) = 15,3 \text{ [kN]}$



Minimum and edge spacing

The regulations according to EN1995-1-1 apply for edge spacing parallel and vertical to the grain. In accordance with DIN 1052:2008-12 it is recommended that the clear distance between the outer connecting element groups of two joist hangers corresponds to 2 times the main beam height. If this is not achieved, the load capacity should be reduced.

		Force parallel to the grain	Force at a right angle to the grain
a_1	in grain direction	28 mm	14 mm
a_2	Right angle to the grain direction	14 mm	14 mm
$a_{3,t}$	End grain with stress	60 mm	40 mm
$a_{3,c}$	End grain without stress	40 mm	40 mm
$a_{4,t}$	Loaded edge	20 mm	28 mm
$a_{4,c}$	Unloaded edge	20 mm	20 mm

See EN 1995-1-1 Tab.8.2 for other brackets than those specified between force and grain

Minimum spacing according to EN 1995-1-1, for threaded nails $\varnothing 4 \text{ mm}$ in nail sheets, $\rho_k \leq 420 \text{ kg/m}^3$