

CONNECTOR FOR TIMBER-CONCRETE FLOORS

CERTIFICATION

Timber-to-concrete fastener with specific CE certification according to ETA 19/0244, Tested and calculated with parallel and crossed arrangement of 45° and 30° connectors, with and without wooden planking.

RAPID DRY SYSTEM

Approved system, self-drilling, reversible, fast and minimally invasive. Optimum static and noise performances, both for new projects and structural restoration.

COMPLETE RANGE

Self-perforating tip with notch and countersunk cylindrical head. Available in two diameters (7 and 9 mm) and two lengths (160 and 240 mm) to optimize the number of fasteners.

INSTALLATION INDICATOR

During installation, the under head counter-thread serves as "correct installation" indicator and increases the fastener tightness inside the concrete.

CHARACTERISTICS

FOCUS	CE marking, timber-concrete
HEAD	cylindrical, countersunk
DIAMETER	7,0 9,0 mm
LENGTH	160 240 mm



MATERIAL

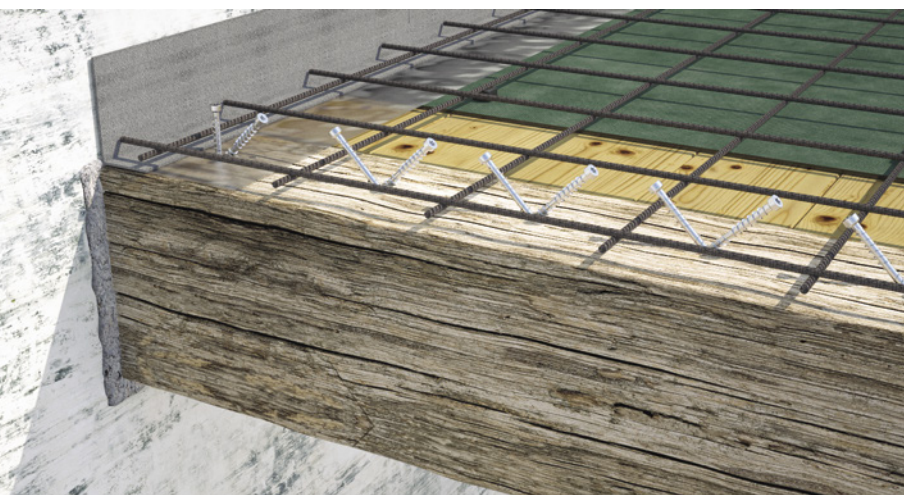
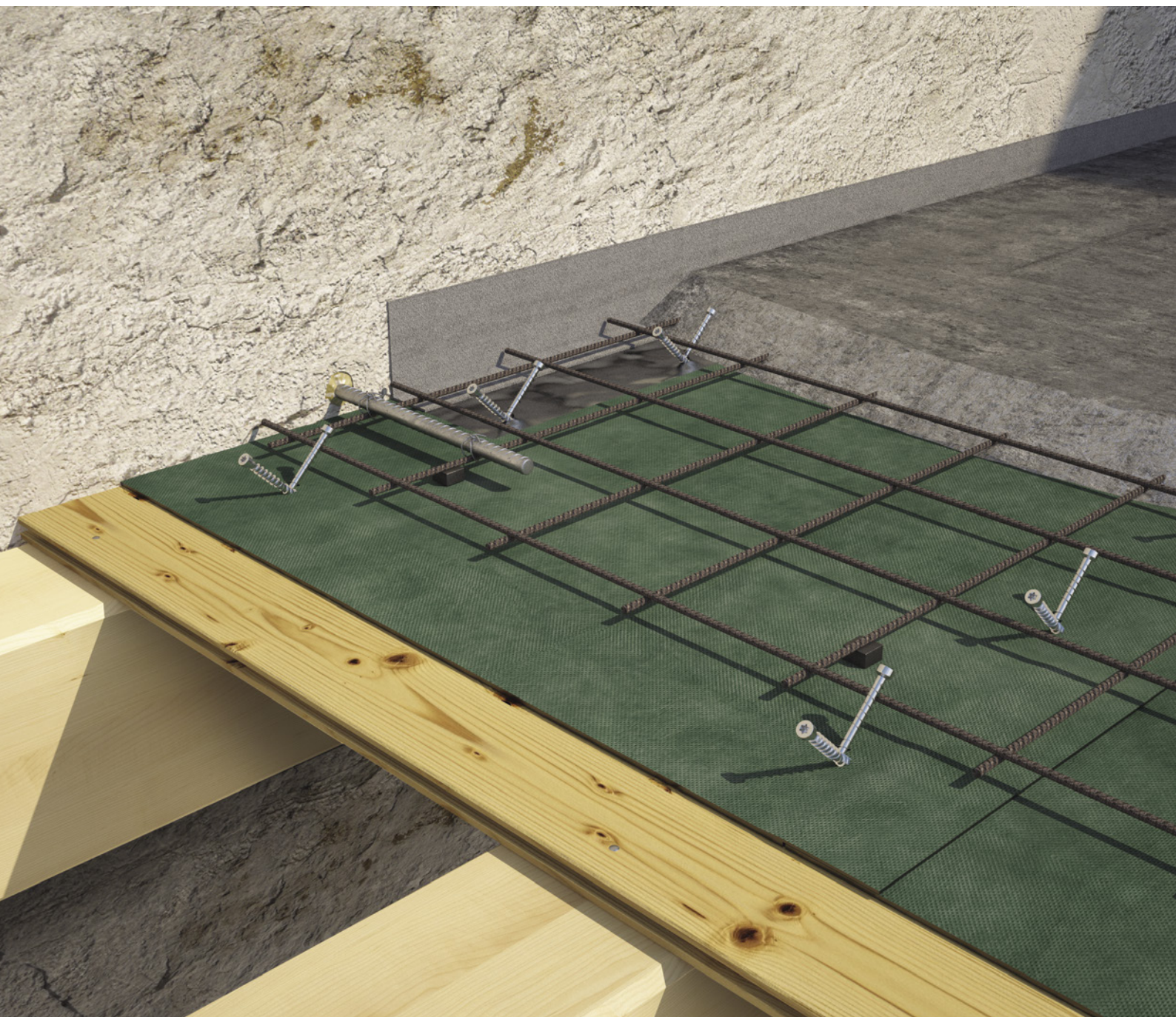
Galvanized carbon steel.

FIELDS OF USE

Screw connection system for timber-to-concrete floors, approved for:

- wood based panels
- solid timber and glulam
- CLT, LVL
- high density woods

Service classes 1 and 2.

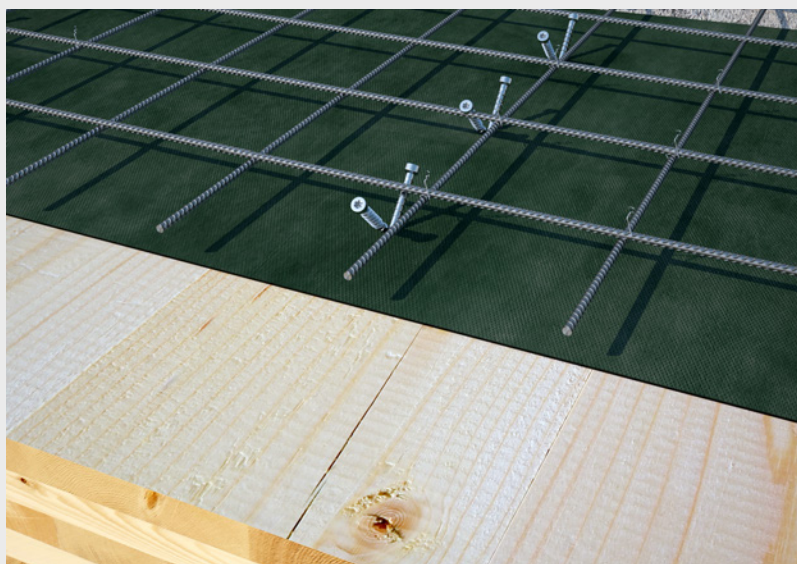


TIMBER-TO-CONCRETE

Ideal for composite floors and for renovation of existing floors. Stiffness values also calculated in the presence of vapour barrier sheet or soundproofing layer.

STRUCTURAL RESTORATION

Values also tested, certified and calculated for high density woods. Certification specific for application in timber-concrete structures.

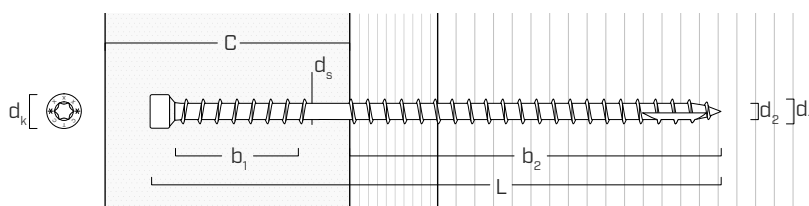


Composite timber-concrete floors on CLT panel with 45° connectors arranged in a single row.



Composite timber-concrete floors with 30° connectors arranged in a double row.

GEOMETRY AND MECHANICAL CHARACTERISTICS



Nominal diameter	d_1	[mm]	7	9
Head diameter	d_k	[mm]	9,50	11,50
Tip diameter	d_2	[mm]	4,60	5,90
Shank diameter	d_s	[mm]	5,00	6,50
Pre-drilling hole diameter	d_v	[mm]	4,0	5,0
Characteristic yield moment	$M_{y,k}$	[Nmm]	20000	38000
Characteristic withdrawal-resistance parameter	$f_{ax,k}$	[N/mm ²]	11,3	11,3
Associated density	ρ_a	[kg/m ³]	350	350
Characteristic tensile strength	$f_{tens,k}$	[kN]	20,0	30,0
Withdrawal-resistance characteristic - concrete	Crossed connectors at a 45° angle, with soundproofing layer ⁽¹⁾			
	Parallel connectors at a 45° angle, with soundproofing layer ⁽¹⁾	$F_{ax,concrete,Rk}$	[kN]	10,0
	Parallel connectors at a 30° angle, with soundproofing layer ⁽¹⁾			
	Parallel connectors at a 45° angle, without soundproofing layer	$F_{ax,concrete,Rk}$	[kN]	15,0
Coefficient of friction	μ	[-]	0,25	0,25

⁽¹⁾ Resilient underscreed foil, in bitumen and polyester felt, like SILENT FLOOR.

GENERAL PRINCIPLES:

- The design shear strength of each crossed connector is the minimum between the timber design shear strength ($R_{ax,d}$), the concrete design shear strength ($R_{ax,concrete,d}$) and the steel design shear strength ($R_{tens,d}$):

$$R_{v,Rd} = (\cos \alpha + \mu \cdot \sin \alpha) \cdot \min \begin{cases} F_{ax,d} \\ f_{tens,d} \\ F_{ax,concrete,Rd} \end{cases}$$

The friction component μ can be considered only in arrangement with inclined screws (30° e 45°) and without the soundproofing layer.

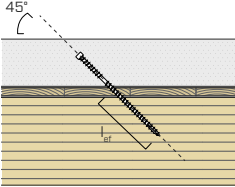
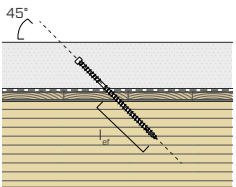
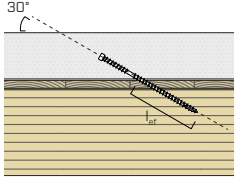
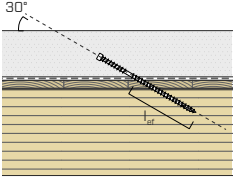
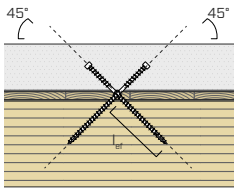
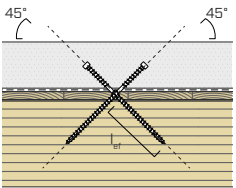
- For the mechanical strength values and the geometry of the screws, reference was made to ETA-19/0244,

CODES AND DIMENSIONS

d ₁ [mm]	CODE	L [mm]	b ₁ [mm]	b ₂ [mm]	pcs
7	CTC7160	160	40	110	100
TX 30	CTC7240	240	40	190	100

d ₁ [mm]	CODE	L [mm]	b ₁ [mm]	b ₂ [mm]	pcs
9	CTC9160	160	40	110	100
TX 40	CTC9240	240	40	190	100

SLIP MODULUS K_{ser}

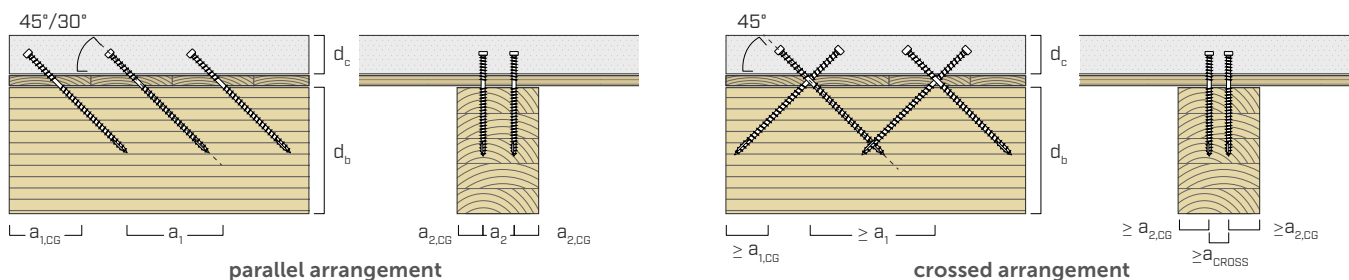
connector arrangement with soundproofing layer ⁽¹⁾	K_{ser} [N/mm]		connector arrangement without soundproofing layer ⁽¹⁾	K_{ser} [N/mm]	
	CTC Ø7	CTC Ø9		CTC Ø7	CTC Ø9
 45° parallels	16 l _{ef}	22 l _{ef}	 45° parallels	48 l _{ef}	60 l _{ef}
 30° parallels	48 l _{ef}	48 l _{ef}	 30° parallels	80 l _{ef}	80 l _{ef}
 45° crossed	70 l _{ef}	100 l _{ef}	 45° crossed	70 l _{ef}	100 l _{ef}

⁽¹⁾ Resilient underscreed foil, in bitumen and polyester felt, like SILENT FLOOR.

The K_{ser} slip modulus is to be considered as relating to a single inclined connector or a pair of crossed connectors subject to a parallel force at the slip surface.

l_{ef} = depth of CTC connector penetration into timber element, in millimetres.

MINIMUM DISTANCES FOR AXIAL STRESSES ⁽¹⁾



	7	9
a ₁ [mm]	130 · sin(a)	130 · sin(a)
a ₂ [mm]	35	45
a _{1,CG} [mm]	85	85
a _{2,CG} [mm]	32	37
a _{CROSS} [mm]	11	14

d_c = thickness of concrete slab (50 mm ≤ d_c ≤ 0,7 d_b)

d_b = height of wooden beam (d_b ≥ 100 mm)

NOTES:

⁽¹⁾ The minimum distances for connectors stressed axially are compliant with ETA-19/0244,

PRELIMINARY SIZING OF VB CONNECTORS FOR TIMBER- CONCRETE FLOORS

CALCULATION EXAMPLE

distance between joists = 660 mm

concrete slab thickness C20/25 = 50 mm

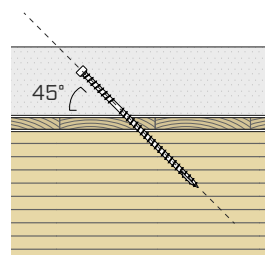
strain limit $w_{ist} = l/400$
 $w_{net,fin} = l/250$

LOADS

own weight (g_{k1}) = timber beam + wooden planking + concrete slab

permanent non-structural load (g_{k2}) = 2 kN/m²

variable overload (q_k) = 2 kN/m²

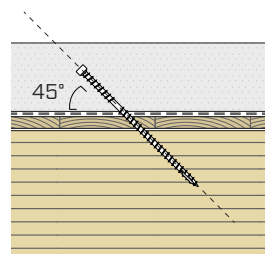


Installation at a 45° angle, without soundproofing layer.

CONNECTOR CTC Ø7 - Glulam GL 24h (EN 14080:2013)

Plank thickness $t_s = 21$ mm

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. pairs per beam	8	10	20	30			
	CTC	7x160	7x240	7x240	7x240	-	-	-
	pitch [mm]	500/500	250/500	160/400	220/440			
120 x 200	no. pairs per beam		10	12	20	30		
	CTC	-	7x160	7x240	7x240	7x240	-	-
	pitch [mm]	-	300/500	250/500	160/320	130/260		
140 x 200	no. pairs per beam			10	20	30	34	
	CTC	-	-	7x240	7x240	7x240	7x240	-
	pitch [mm]	-	-	300/500	180/360	130/260	110/220	
140 x 240	no. pairs per beam				12	20	30	36
	CTC	-	-	-	7x240	7x240	7x240	7x240
	pitch [mm]	-	-	-	300/500	200/400	150/300	120/240
					4,0	6,1	8,3	9,1



Installation at a 45° angle, with soundproofing layer.

CONNECTOR CTC Ø7 - Glulam GL 24h (EN 14080:2013)

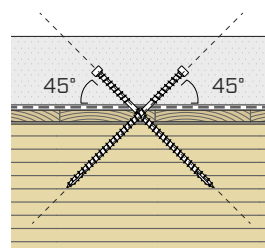
Plank thickness $t_s = 21$ mm

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. pairs per beam	10	14	38	30			
	CTC	7x160	7x240	7x240	7x240	-	-	-
	pitch [mm]	300/500	180/500	100/100	220/440			
120 x 200	no. pairs per beam		8	12	24	56		
	CTC	-	7x160	7x240	7x240	7x240	-	-
	pitch [mm]	-	500/500	250/500	120/240	160/160 ⁽¹⁾		
140 x 200	no. pairs per beam			10	22	54	90	
	CTC	-	-	7x240	7x240	7x240	7x240	-
	pitch [mm]	-	-	300/500	200/200	150/200 ⁽¹⁾	150/200 ⁽²⁾	
140 x 240	no. pairs per beam				8	16	34	64
	CTC	-	-	-	7x240	7x240	7x240	7x240
	pitch [mm]	-	-	-	500/500	300/500	140/200	150/200 ⁽¹⁾
					2,7	4,8	9,4	16,2

CONNECTOR CTC Ø7 - Glulam GL 24h (EN 14080:2013)

Plank thickness $t_s = 21$ mm

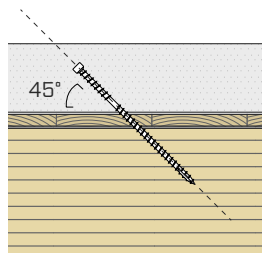
beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. pairs per beam	16	20	40	48			
	CTC	7x160	7x240	7x240	7x240	-	-	-
	pitch [mm]	500/500	250/500	160/320	120/400			
120 x 200	no. pairs per beam		16	24	40	48	60	
	CTC	-	7x240	7x240	7x240	7x240	7x240	-
	pitch [mm]	-	400/500	250/500	180/400	150/400	120/400	
140 x 200	no. pairs per beam			20	28	48	60	88
	CTC	-	-	7x240	7x240	7x240	7x240	7x240
	pitch [mm]	-	-	280/500	200/500	150/400	120/400	100/200
140 x 240	no. pairs per beam				24	40	52	64
	CTC	-	-	-	7x240	7x240	7x240	7x240
	pitch [mm]	-	-	-	300/500	200/500	150/400	120/400
					8,1	12,1	14,3	16,2



Crossed installation at a 45° angle, with soundproofing layer.

CONNECTOR CTC Ø9 - Glulam GL 24h (EN 14080:2013)

Plank thickness $t_s = 21$ mm

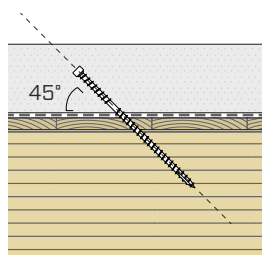


Installation at a 45° angle,
without soundproofing
layer.

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. pairs per beam	8	10	16	24			
	CTC	9x160	9x240	9x240	9x240	-	-	-
	pitch [mm]	450/500	250/500	150/500	120/300			
120 x 200	no. pairs per beam		8	12	20	24	34	
	CTC	-	9x240	9x240	9x240	9x240	9x240	-
	pitch [mm]		450/500	250/500	180/400	140/400	110/250	
140 x 200	no. pairs per beam			10	14	22	34	46
	CTC	-	-	9x240	9x240	9x240	9x240	9x240
	pitch [mm]			300/500	200/500	160/500	120/300	180/350
140 x 240	no. pairs per beam				12	20	24	32
	CTC	-	-	-	9x240	9x240	9x240	9x240
	pitch [mm]				300/500	200/500	160/500	120/400
					4,0	6,1	6,6	8,1

CONNECTOR CTC Ø9 - Glulam GL 24h (EN 14080:2013)

Plank thickness $t_s = 21$ mm

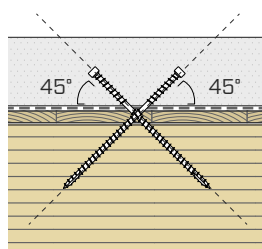


Installation at a 45° angle,
with soundproofing layer.

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. pairs per beam	8	10	30				
	CTC	9x160	9x240	9x240	-	-	-	-
	pitch [mm]	500/500	250/500	100/200				
120 x 200	no. pairs per beam		8	10	24	60		
	CTC	-	9x240	9x240	9x240	9x240	-	-
	pitch [mm]		400/500	280/500	130/300	140/160		
140 x 200	no. pairs per beam			10	40	52	66	
	CTC	-	-	9x240	9x240	9x240	9x240	-
	pitch [mm]			300/500	200/200	160/200	200/300	
140 x 240	no. pairs per beam				12	22	36	68
	CTC	-	-	-	9x240	9x240	9x240	9x240
	pitch [mm]				300/500	180/400	210/420	140/200
					4,0	6,7	9,9	17,2

CONNECTOR CTC Ø9 - Glulam GL 24h (EN 14080:2013)

Plank thickness $t_s = 21$ mm



Crossed installation
at a 45° angle, with
soundproofing layer.

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. pairs per beam	16	24	40				
	CTC	9x160	9x160	9x160	-	-	-	-
	pitch [mm]	500/500	250/500	150/300				
120 x 200	no. pairs per beam		16	24	40	52		
	CTC	-	9x160	9x160	9x160	9x240	-	-
	pitch [mm]		400/400	250/500	180/360	130/300		
140 x 200	no. pairs per beam			24	40	60	68	
	CTC	-	-	9x160	9x160	9x240	9x240	-
	pitch [mm]			250/500	180/360	130/260	120/240	
140 x 240	no. pairs per beam				32	48	60	72
	CTC	-	-	-	9x160	9x240	9x240	9x240
	pitch [mm]				300/500	150/300	140/280	120/240
					10,8	14,5	16,5	18,2

NOTES:

⁽¹⁾ Connectors placed in two rows.

⁽²⁾ Connectors placed in three rows.

For different calculation configurations, the MyProject software is available
(www.rothoblaas.com).

PRELIMINARY SIZING OF VB CONNECTORS FOR TIMBER- CONCRETE FLOORS

CALCULATION EXAMPLE

distance between joists = 660 mm

concrete slab thickness C20/25 = 50 mm

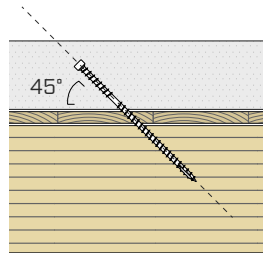
strain limit $w_{ist} = l/400$
 $w_{net,fin} = l/250$

LOADS

own weight (g_{k1}) = timber beam + wooden planking + concrete slab

permanent non-structural load (g_{k2}) = 2 kN/m²

variable overload (q_k) = 2 kN/m²

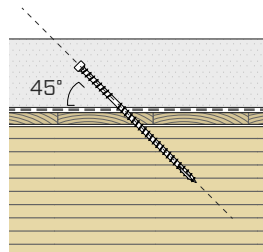


Installation at a 45° angle,
without soundproofing
layer.

CONNECTOR CTC Ø7 - Glulam GL 24h (EN 14080:2013)

Plank thickness $t_s = 21$ mm

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. pairs per beam	8	10	18	24			
	CTC	7x160	7x240	7x240	7x240	-	-	-
	pitch [mm]	500/500	250/500	200/400	120/240			
120 x 200	no. connectors/m ²	4,0	4,3	6,8	8,1			
	no. pairs per beam		8	10	18	24		
	CTC		7x160	7x240	7x240	7x240		
140 x 200	pitch [mm]		500/500	300/500	200/400	140/280		
	no. connectors/m ²		3,5	3,8	6,1	7,3		
	no. pairs per beam			10	12	22	32	
140 x 240	CTC			7x240	7x240	7x240	7x240	
	pitch [mm]			400/500	250/500	180/360	130/260	
	no. connectors/m ²			3,8	4,0	6,7	8,8	
140 x 240	no. pairs per beam				10	16	22	30
	CTC				7x240	7x240	7x240	7x240
	pitch [mm]				400/500	300/500	200/400	150/300
140 x 240	no. connectors/m ²				3,4	4,8	6,1	7,6



Installation at a 45° angle,
with soundproofing layer.

CONNECTOR CTC Ø7 - Glulam GL 24h (EN 14080:2013)

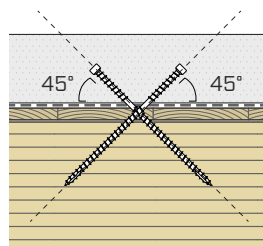
Plank thickness $t_s = 21$ mm

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. pairs per beam	8	10	38				
	CTC	7x160	7x240	7x240	-	-	-	-
	pitch [mm]	500/500	250/500	100/100				
120 x 200	no. connectors/m ²	4,0	4,3	14,4				
	no. pairs per beam		8	10	24	54		
	CTC		7x160	7x240	7x240	7x240		
140 x 200	pitch [mm]		500/500	300/500	120/240	150/200 ⁽¹⁾		
	no. connectors/m ²		3,5	3,8	8,1	16,4		
	no. pairs per beam			8	22	46	90	
140 x 240	CTC			7x240	7x240	7x240	7x240	
	pitch [mm]			500/500	150/300	150/300 ⁽¹⁾	150/200 ⁽²⁾	
	no. connectors/m ²			3,0	7,4	13,9	24,8	
140 x 240	no. pairs per beam				8	14	34	60
	CTC				7x240	7x240	7x240	7x240
	pitch [mm]				500/500	400/500	140/200	150/250 ⁽¹⁾
140 x 240	no. connectors/m ²				2,7	4,2	9,4	15,2

CONNECTOR CTC Ø7 - Glulam GL 24h (EN 14080:2013)

Plank thickness $t_s = 21$ mm

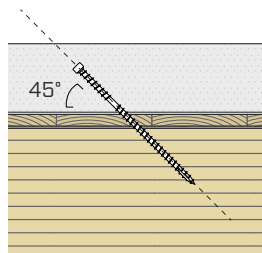
beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. pairs per beam	16	20	36	44			
	CTC	7x160	7x240	7x240	7x240	-	-	-
	pitch [mm]	500/500	250/500	200/400	150/300			
120 x 200	no. connectors/m ²	8,1	8,7	13,6	14,8			
	no. pairs per beam		16	20	36	48	52	
	CTC		7x240	7x240	7x240	7x240	7x240	
140 x 200	pitch [mm]		500/500	300/500	200/400	150/300	150/350	
	no. connectors/m ²		6,9	7,6	12,1	14,5	14,3	
	no. pairs per beam			20	24	44	52	84
140 x 240	CTC			7x240	7x240	7x240	7x240	7x240
	pitch [mm]			280/500	250/500	180/360	150/400	110/200
	no. connectors/m ²			7,6	8,1	13,3	14,3	21,2
140 x 240	no. pairs per beam				20	36	44	60
	CTC				7x240	7x240	7x240	7x240
	pitch [mm]				400/500	250/500	200/400	150/300
140 x 240	no. connectors/m ²				6,7	10,9	12,1	15,2



Crossed installation
at a 45° angle, with
soundproofing layer.

CONNECTOR CTC Ø9 - Glulam GL 24h (EN 14080:2013)

Plank thickness $t_s = 21$ mm

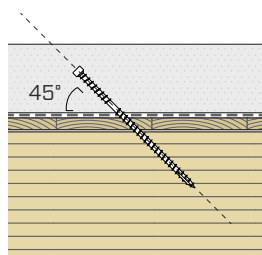


Installation at a 45° angle,
without soundproofing
layer.

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. pairs per beam	8	10	14	22			
	CTC	9x160	9x240	9x240	9x240	-	-	-
	pitch [mm]	500/500	250/500	200/500	150/300			
120 x 200	no. pairs per beam		8	10	18	22	30	
	CTC	-	9x240	9x240	9x240	9x240	9x240	-
	pitch [mm]		500/500	300/500	200/400	160/400	130/300	
140 x 200	no. pairs per beam			10	12	22	30	46
	CTC	-	-	9x240	9x240	9x240	9x240	9x240
	pitch [mm]			400/500	250/500	180/400	150/300	180/350 ⁽²⁾
140 x 240	no. pairs per beam				10	16	22	30
	CTC	-	-	-	9x240	9x240	9x240	9x240
	pitch [mm]				400/500	300/500	200/400	150/300
					3,4	4,8	6,1	7,6

CONNECTOR CTC Ø9 - Glulam GL 24h (EN 14080:2013)

Plank thickness $t_s = 21$ mm

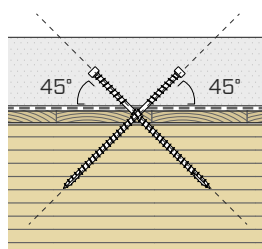


Installation at a 45° angle,
with soundproofing layer.

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. pairs per beam	8	10	26				
	CTC	9x160	9x240	9x240	-	-	-	-
	pitch [mm]	500/500	300/500	120/200				
120 x 200	no. pairs per beam		8	10	22	38		
	CTC	-	9x240	9x240	9x240	9x240	-	-
	pitch [mm]		500/500	300/500	150/300	100/140		
140 x 200	no. pairs per beam			10	18	34	64	
	CTC	-	-	9x240	9x240	9x240	9x240	-
	pitch [mm]			300/500	200/400	200/400 ⁽²⁾	210/300 ⁽²⁾	
140 x 240	no. pairs per beam				8	20	30	48
	CTC	-	-	-	9x240	9x240	9x240	9x240
	pitch [mm]				500/500	200/400	150/300	100/150
					2,7	6,1	8,3	12,1

CONNECTOR CTC Ø9 - Glulam GL 24h (EN 14080:2013)

Plank thickness $t_s = 21$ mm



Crossed installation
at a 45° angle, with
soundproofing layer.

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. pairs per beam	16	24	36				
	CTC	9x160	9x160	9x160	-	-	-	-
	pitch [mm]	500/500	250/500	200/300				
120 x 200	no. pairs per beam		16	20	36	48		
	CTC	-	9x160	9x160	9x160	9x160	-	-
	pitch [mm]		500/500	300/500	250/500	150/500		
140 x 200	no. pairs per beam			20	36	48	60	
	CTC	-	-	9x160	9x240	9x240	9x240	-
	pitch [mm]			300/500	200/400	150/300	140/300	
140 x 240	no. pairs per beam				24	40	52	60
	CTC	-	-	-	9x240	9x240	9x240	9x240
	pitch [mm]				500/500	200/400	150/400	150/300
					8,1	12,1	14,3	15,2

NOTES:

⁽¹⁾ Connectors placed in two rows.

⁽²⁾ Connectors placed in three rows.

For different calculation configurations, the MyProject software is available
(www.rothoblaas.com).

PROJECT DATA

BEAMS

B = 120 mm
H = 160 mm
i = 650 mm
L = 4,0 m
Wood GL24h (EN 14081:2013)

COMPOSITE FLOOR

s = 50 mm
Concrete C25/30

INTERMEDIATE LAYER

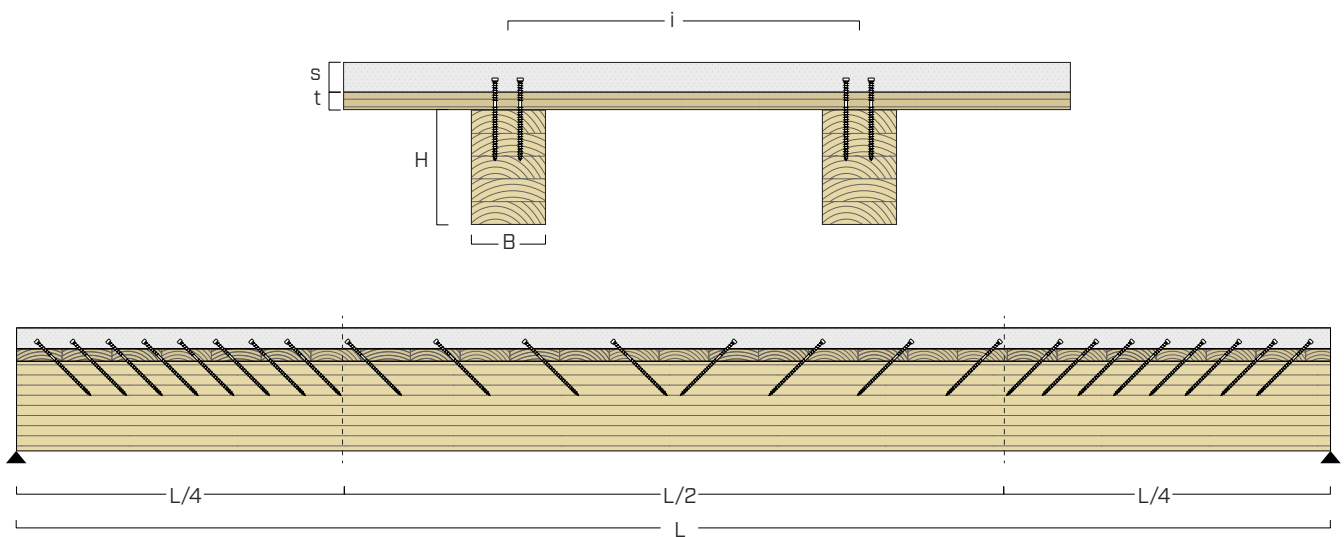
t = 21 mm
C20 Plank (EN 14081:2013)

CONNECTORS - CTC Ø9 x 240

Diameter	9 mm
Length	240 mm
Connector arrangement	inclined at 45°
Distribution	L/4-L/2

LOAD CONDITIONS

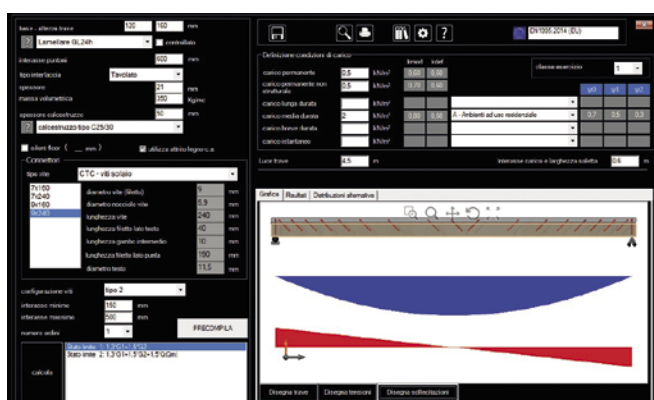
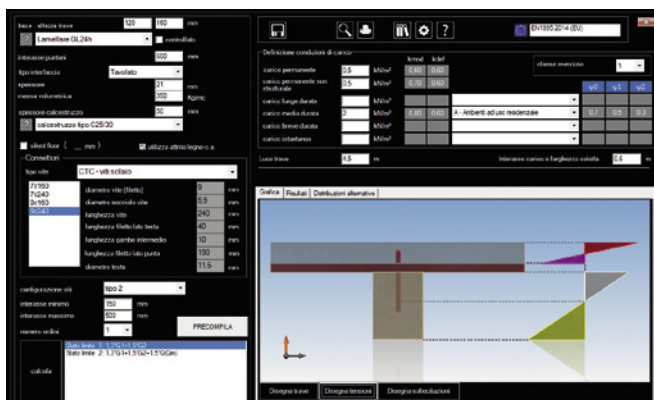
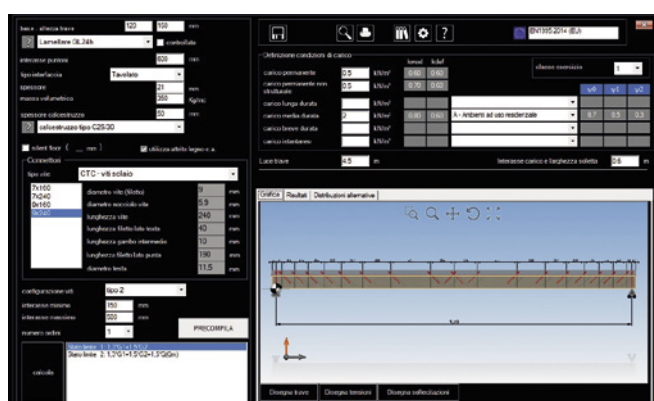
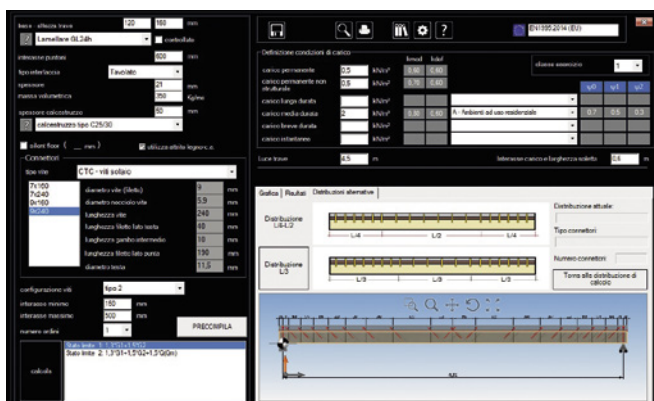
Permanent structural load (G_1)	1,50 kN/m ²
Permanent non-structural load (G_2)	2,50 kN/m ²
Variable load (Q)	2,00 kN/m ²
Category A: residential environment	
Variable load duration	medium



CALCULATION WITH MYPROJECT SOFTWARE [EN 1995:2014 and ETA-19/0244]

RESULTS

Number of connectors	22 CTC Ø9x240	Min spacing (L/4)	180 mm
Incidence of connectors	8 connectors/m ²	Max spacing (L/2)	370 mm



For different calculation configurations, the MyProject software is available (www.rothoblaas.com).

CALCULATION REPORT

