

CLC



TIMBER-TO-CONCRETE CONNECTOR

- CTC is the connector for timber-concrete composite floors
- Mixed timber-concrete floors are an effective solution for achieving high performance in terms of strength and stiffness on both existing and new floors
- During installation, the under head counter-thread serves as "correct installation" indicator and increases the fastener tightness inside the concrete
- Certified, self-drilling, reversible, quick, dry and non-invasive system. Ideal for slab recovery

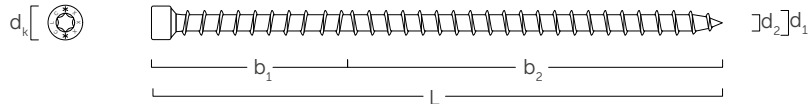


MATERIAL: carbon steel with bright zinc plated



d_1 [mm]	d_k [mm]	CODE	L [mm]	b_1 [mm]	b_2 [mm]	pcs
8 TX 40	10,50	CLC8160	160	50	110	100
		CLC8240	240	50	190	100

GEOMETRY AND MECHANICAL CHARACTERISTICS



nominal diameter	d_1	[mm]	8
head diameter	d_k	[mm]	10,50
thread diameter	d_2	[mm]	5,20
pre-drilling hole diameter	d_v	[mm]	5,00
characteristic yield moment	$M_{y,k}$	[Nm]	28,00
characteristic withdrawal-resistance parameter ⁽¹⁾	$f_{ax,k}$	[N/mm ²]	11,30
characteristic tensile strength	$f_{tens,k}$	[kN]	25,00
withdrawal-resistance characteristic - concrete	$F_{ax,concrete,Rk}$	crossed connectors at 45°	[kN] 10,00
		parallel connectors at a 45° angle, with soundproofing layer ⁽²⁾	[kN] 10,00
		parallel connectors at a 30°	[kN] 10,00
		parallel connectors at a 45° angle, without soundproofing layer	[kN] 15,00
coefficient of friction ⁽³⁾			0,25

⁽¹⁾ Associated density $\rho_a = 350 \text{ kg/m}^3$.

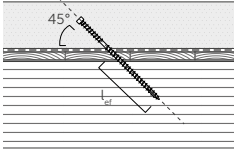
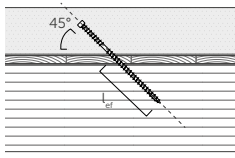
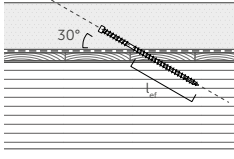
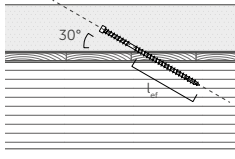
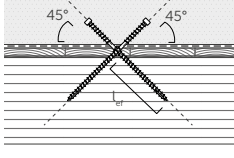
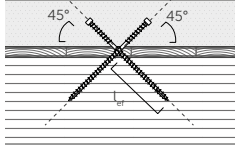
⁽²⁾ Resilient underscreed foil, in bitumen and polyester felt, like SILENT FLOOR.

⁽³⁾ The friction component μ can be considered only in arrangement with inclined screws (30° and 45°) and without the soundproofing layer.

GENERAL PRINCIPLES

- For the mechanical strength values and the geometry of the screws, reference was made to ETA-19/0244.
- 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 ($R_{tens,d}$).

SLIP MODULUS K_{SER}

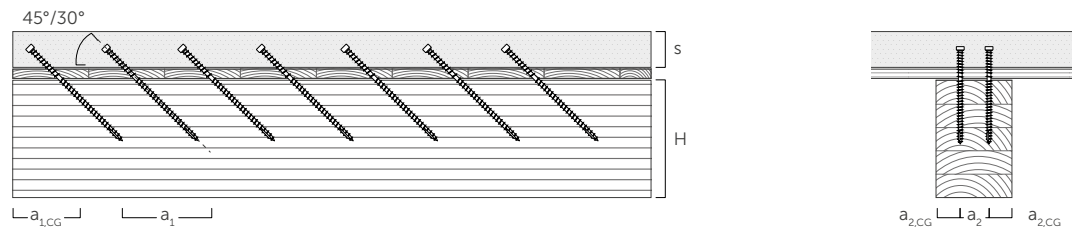
		K_{SER} [N/mm]	
connector arrangement with soundproofing layer ⁽¹⁾		connector arrangement without soundproofing layer ⁽¹⁾	
 45° parallels	$19 l_{ef}$	 48 l_{ef}	$56 l_{ef}$
 parallel at a 30°	$48 l_{ef}$	 parallel at a 30°	$80 l_{ef}$
 45° crossed	$85 l_{ef}$	 45° crossed	$85 l_{ef}$

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

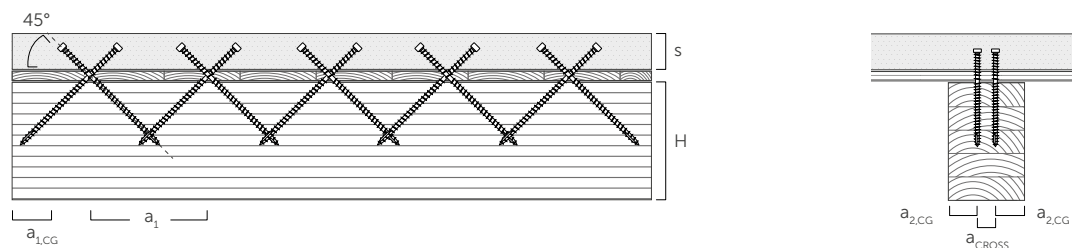
The K_{SER} slip modulus is to be considered as relating to a single inclined connector or a pair of crossed connectors subject to a parallel force at the slip surface. l_{ef} = depth of CTC connector pull-through into timber element, in millimetres.

MINIMUM DISTANCES FOR CONNECTORS STRESSED AXIALLY⁽¹⁾

PARALLEL ARRANGEMENT



CROSSED ARRANGEMENT



d_1	[mm]	8
a_1	[mm]	$130 \cdot \sin(\alpha)$
a_2	[mm]	40
$a_{1,CG}$	[mm]	85
$a_{2,CG}$	[mm]	35
a_{CROSS}	[mm]	12

NOTES

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

s thickness of concrete slab ($50 \text{ mm} \leq s \leq 0,7 H$)

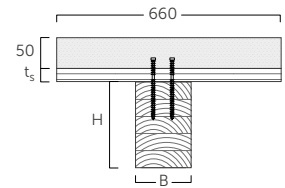
H height of timber beam ($H \geq 100 \text{ mm}$)

STRUCTURAL VALUES

CALCULATION STANDARD
NTC 2018 - UNI EN 1995:2014

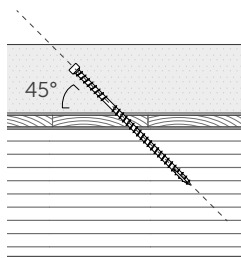
PRELIMINARY SIZING OF CLC CONNECTORS FOR TIMBER-TO-CONCRETE FLOORS

CALCULATION EXAMPLE	
Distance between joists	660 mm
Concrete slab thickness C20/25	50 mm
Arrow limit	$w_{ist} = l/400$ $w_{net,fin} = l/250$
Calculation standard	NTC 2018 - UNI EN 1995:2014



LOADS	
own weight (g_{k1})	timber beam + wooden planking + concrete slab
permanent non-structural load (g_{k2})	2 kN/m ²
variable load (q_k)	2 kN/m ²
variable load duration	medium

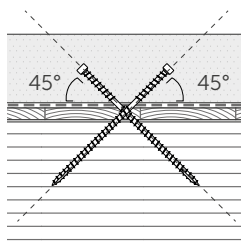
CONNECTOR CLC Ø8 x 160 - glulam GL 24h (EN 14080:2013) with continuous production control Plank thickness $t_s = 21$ mm



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. connectors per beam	8	26	44	72	-	-	-
	distance[mm]	400/400	100/200	150/250 ⁽¹⁾	120/120 ⁽¹⁾	-	-	-
	no. connectors/m ²	4,0	11,3	16,7	24,2	-	-	-
120 x 200	no. connectors per beam	-	12	28	44	68	-	-
	distance[mm]	-	300/300	100/250	150/300 ⁽¹⁾	100/250 ⁽¹⁾	-	-
	no. connectors/m ²	-	5,2	10,6	14,8	20,6	-	-
140 x 200	no. connectors per beam	-	-	26	44	64	80	-
	distance[mm]	-	-	100/300	100/100	120/240 ⁽¹⁾	100/200 ⁽¹⁾	-
	no. connectors/m ²	-	-	9,8	14,8	19,4	22,0	-
140 x 240	no. connectors per beam	-	-	-	24	42	72	84
	distance[mm]	-	-	-	180/180	100/150	150/150 ⁽¹⁾	100/250 ⁽¹⁾
	no. connectors/m ²	-	-	-	8,1	12,7	19,8	21,2

CONNECTOR CLC Ø8 x 160 - Glulam GL24h (EN 14080:2013) Plank thickness $t_s = 21$ mm



Crossed installation at a
45° angle, with or without
soundproofing layer

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. connectors per beam	16	28	52	88	-	-	-
	distance[mm]	400/400	250/250	150/150	100/100	-	-	-
	no. connectors/m ²	8,1	12,12	19,70	29,63	-	-	-
120 x 200	no. connectors per beam	-	18	32	54	74	-	-
	distance[mm]	-	400/400	250/250	120/240	100/200	-	-
	no. connectors/m ²	-	7,79	12,12	18,18	22,42	-	-
140 x 200	no. connectors per beam	-	-	26	44	66	90	-
	distance[mm]	-	-	300/300	150/300	120/200	100/150	-
	no. connectors/m ²	-	-	9,85	14,81	20,00	24,79	-
140 x 240	no. connectors per beam	-	-	-	26	50	68	118
	distance[mm]	-	-	-	350/350	200/200	120/240	100/100
	no. connectors/m ²	-	-	-	8,75	15,15	18,73	29,80

NOTES

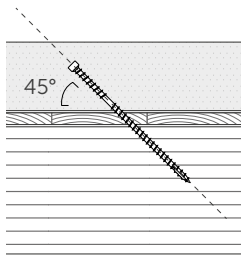
⁽¹⁾ Connectors placed in two rows.

For different calculation configurations, the CLC Calculator spreadsheet is freely available (www.holztechnik.com).

STRUCTURAL VALUES

CALCULATION STANDARD
NTC 2018 - UNI EN 1995:2014

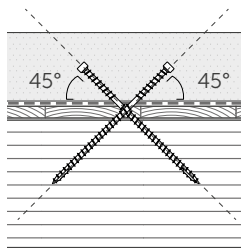
CONNECTOR CLC Ø8 x 240 - Glulam GL24h (EN 14080:2013)
Plank thickness $t_s = 21$ mm



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. connectors per beam	8	14	24	34	-	-	-
	distance[mm]	500/500	250/250	120/300	100/200	-	-	-
	no. connectors/m ²	4,0	6,1	9,1	11,4	-	-	-
120 x 200	no. connectors per beam	-	8	16	24	34	46	-
	distance[mm]	-	500/500	250/250	150/200	120/200	100/150	-
	no. connectors/m ²	-	3,5	6,1	8,1	10,3	12,7	-
140 x 200	no. connectors per beam	-	-	14	22	32	46	60
	distance[mm]	-	-	300/300	150/300	120/240	100/150	100/100
	no. connectors/m ²	-	-	5,3	7,4	9,7	12,7	15,2
140 x 240	no. connectors per beam	-	-	-	16	26	34	44
	distance[mm]	-	-	-	300/300	150/300	120/250	100/200
	no. connectors/m ²	-	-	-	5,4	7,9	9,4	11,1

CONNECTOR CLC Ø8 x 240 - Glulam GL24h (EN 14080:2013)
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Crossed installation at a 45° angle, with or without soundproofing layer

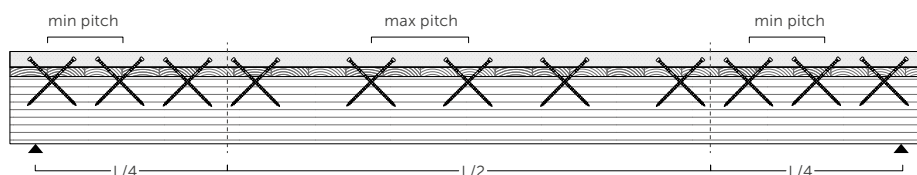
beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. connectors per beam	14	26	48	74	-	-	-
	distance[mm]	500/500	200/400	120/240	100/150	-	-	-
	no. connectors/m ²	7,1	11,3	18,2	24,9	-	-	-
120 x 200	no. connectors per beam	-	14	30	52	68	-	-
	distance[mm]	-	500/500	200/400	120/300	100/250	-	-
	no. connectors/m ²	-	6,1	11,4	17,5	20,6	-	-
140 x 200	no. connectors per beam	-	-	26	46	68	90	-
	distance[mm]	-	-	300/300	150/250	100/250	120/120	-
	no. connectors/m ²	-	-	9,8	15,5	20,6	24,8	-
140 x 240	no. connectors per beam	-	-	-	36	50	74	88
	distance[mm]	-	-	-	250/250	200/200	100/250	100/200
	no. connectors/m ²	-	-	-	12,1	15,2	20,4	22,2

NOTES

(1) Connectors placed in two rows.
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GENERAL PRINCIPLES

- Pitch means the minimum and maximum spacing values at which the connectors are positioned, respectively at the sides (L/4 - minimum spacing) and in the central part of the beam (L/2 - maximum spacing)

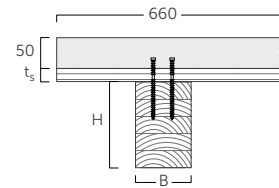


STRUCTURAL VALUES

CALCULATION STANDARD
EN 1995:2014

PRELIMINARY SIZING OF CLC CONNECTORS FOR TIMBER-TO-CONCRETE FLOORS

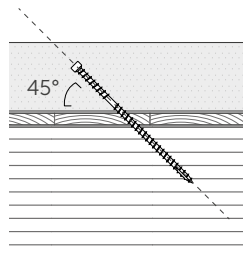
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Calculation standard	EN 1995:2014



LOADS	
own weight (g_{k1})	timber beam + wooden planking + concrete slab
permanent non-structural load (g_{k2})	2 kN/m ²
variable load (q_k)	2 kN/m ²
variable load duration	medium

CONNECTOR CLC Ø8 x 160 - Glulam GL24h (EN 14080:2013)

Plank thickness $t_s = 21$ mm

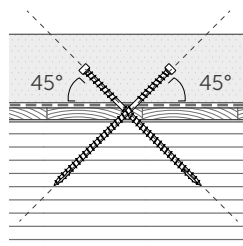


Installation at a 45° angle, without soundproofing layer

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. connectors per beam	8	20	40	60	-	-	-
	distance[mm]	400/400	150/250	100/100	150/150 ⁽¹⁾	-	-	-
	no. connectors/m ²	4,0	8,7	15,2	20,2	-	-	-
120 x 200	no. connectors per beam	-	8	20	38	68	-	-
	distance[mm]	-	500/500	150/300	100/150	150/150 ⁽¹⁾	-	-
	no. connectors/m ²	-	3,5	7,6	12,8	20,6	-	-
140 x 200	no. connectors per beam	-	-	16	34	52	92	-
	distance[mm]	-	-	250/250	100/200	150/300 ⁽¹⁾	120/120 ⁽¹⁾	-
	no. connectors/m ²	-	-	6,1	11,4	15,8	25,3	-
140 x 240	no. connectors per beam	-	-	-	18	34	54	80
	distance[mm]	-	-	-	250/250	120/200	100/100	150/150 ⁽¹⁾
	no. connectors/m ²	-	-	-	6,1	10,3	14,9	20,2

CONNECTOR CLC Ø8 x 160 - Glulam GL24h (EN 14080:2013)

Plank thickness $t_s = 21$ mm



Crossed installation at a 45° angle, with or without soundproofing layer

beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. connectors per beam	16	26	42	72	-	-	-
	distance[mm]	400/400	200/400	150/250	120/120	-	-	-
	no. connectors/m ²	8,1	11,3	15,9	24,2	-	-	-
120 x 200	no. connectors per beam	-	16	24	44	68	90	-
	distance[mm]	-	400/400	300/400	200/200	100/250	100/150	-
	no. connectors/m ²	-	6,9	9,1	14,8	20,6	24,8	-
140 x 200	no. connectors per beam	-	-	20	38	66	80	-
	distance[mm]	-	-	400/400	200/300	150/150	100/200	-
	no. connectors/m ²	-	-	7,6	12,8	20,0	22,0	-
140 x 240	no. connectors per beam	-	-	-	20	40	58	82
	distance[mm]	-	-	-	450/450	250/250	150/250	100/250
	no. connectors/m ²	-	-	-	6,7	12,1	16,0	20,7

NOTES

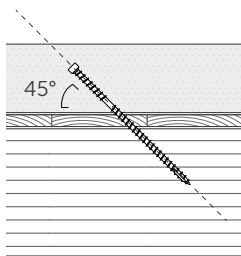
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STRUCTURAL VALUES

CALCULATION STANDARD
EN 1995:2014

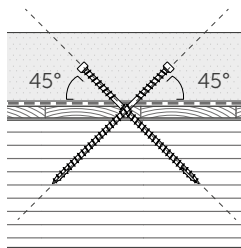
CLC CONNECTOR Ø8 x 240 - glulam GL 24h (EN 14080:2013) with continuous production control
Plank thickness $t_s = 21$ mm



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. connectors per beam	8	12	20	32	-	-	-
	distance[mm]	500/500	300/300	150/300	100/250	-	-	-
	no. connectors/m ²	4,0	5,2	7,6	10,8	-	-	-
120 x 200	no. connectors per beam	-	8	14	22	34	40	-
	distance[mm]	-	500/500	300/300	150/300	150/150	100/200	-
	no. connectors/m ²	-	3,5	5,3	7,4	10,3	11,0	-
140 x 200	no. connectors per beam	-	-	10	20	26	38	60
	distance[mm]	-	-	400/400	200/300	150/250	100/250	100/100
	no. connectors/m ²	-	-	3,8	6,7	7,9	10,5	15,2
140 x 240	no. connectors per beam	-	-	-	12	20	30	40
	distance[mm]	-	-	-	400/400	250/250	150/250	150/150
	no. connectors/m ²	-	-	-	4,0	6,1	8,3	10,1

CONNECTOR CLC Ø8 x 240 - Glulam GL24h (EN 14080:2013)
Plank thickness $t_s = 21$ mm



Crossed installation at a 45° angle, with or without soundproofing layer

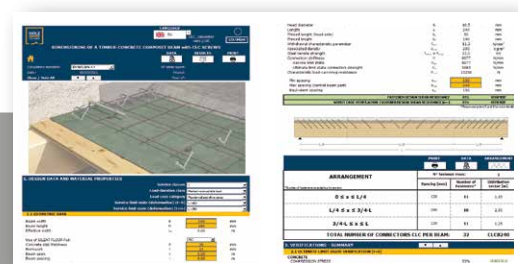
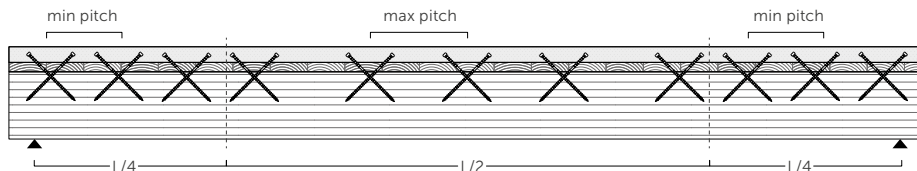
beam section BxH [mm]		span [m]						
		3	3,5	4	4,5	5	5,5	6
120 x 160	no. connectors per beam	16	28	42	62	82	-	-
	distance[mm]	400/400	200/300	150/250	100/250	100/150	-	-
	no. connectors/m ²	8,1	12,1	15,9	20,9	24,8	-	-
120 x 200	no. connectors per beam	-	18	30	44	66	-	-
	distance[mm]	-	400/400	200/400	150/300	150/150	-	-
	no. connectors/m ²	-	7,8	11,4	14,8	20,0	-	-
140 x 200	no. connectors per beam	-	-	26	42	58	74	90
	distance[mm]	-	-	250/400	150/350	120/300	100/250	100/180
	no. connectors/m ²	-	-	9,8	14,1	17,6	20,4	22,7
140 x 240	no. connectors per beam	-	-	-	30	44	58	82
	distance[mm]	-	-	-	250/400	200/250	150/250	100/250
	no. connectors/m ²	-	-	-	10,1	13,3	16,0	20,7

NOTES

(1) Connectors placed in two rows.
For different calculation configurations, the CLC Calculator spreadsheet is freely available (www.holztechnic.com).

GENERAL PRINCIPLES

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SPREADSHEET
"CLC CALCULATOR"
Download "CLC calculator"
from www.holztechnic.com