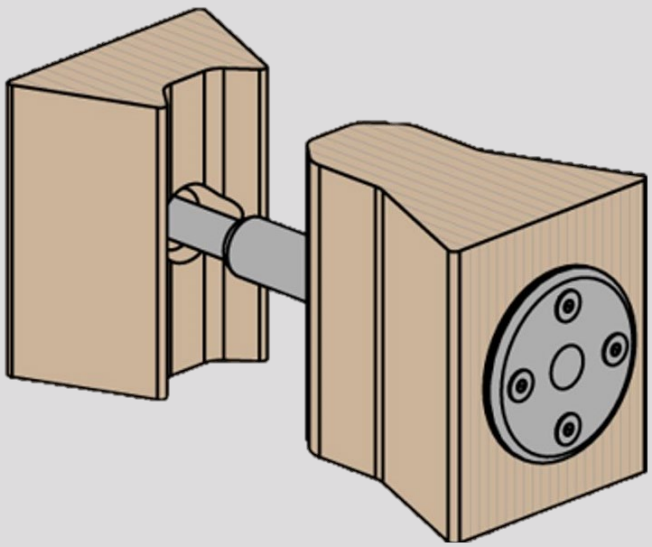
HTC-P2P Timber Panel Connector

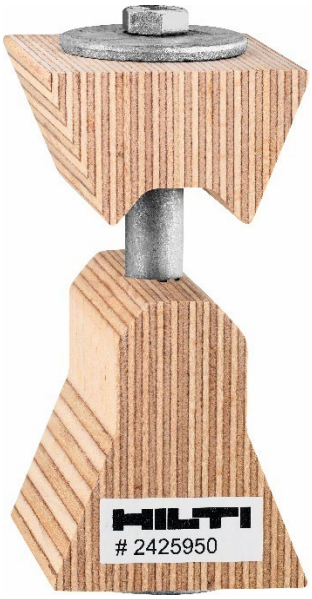
Product Technical Datasheet
CLT Panel to Panel Connector
Update: Mar 25



HTC-P2P Timber Panel Connector

High-performance timber panel-to-panel connector

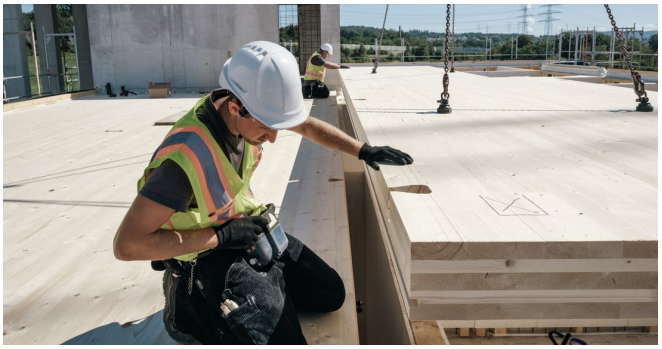
Connector version



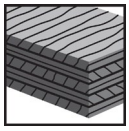
HTC-P2P
90 mm M12

Benefits

- Faster installation - saving crane time and helping you install up to 80% faster than standard methods
- Easy panel installations - quickly released, adjusted, or removed at any time, helping reduce the required installation skill and enabling temporary structure assembly
- Approvals available - static and seismic approved solution for connecting Cross-laminated timber (CLT) panels according to the ETA
- Simple to design and specify - our software module covers static, seismic, and fire designs for both shear and tensile loads
- Streamlined prefabrication - connector cutouts can be seamlessly integrated with CNC cutting during the CLT panel manufacturing process



Base material



Cross-laminated timber (CLT)

Load conditions

Static/ quasi-static

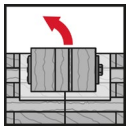
Seismic

Design in case of fire

Drilling, cleaning, setting

SIW with the Special adapter

Special adapter



Removable

Other information

Hilti design tool

Technical guide

BIM/CAD Library

Linked Approvals/Certificates and Instructions for use

Approvals/certificates

Approval no	Application / loading condition	Authority / Laboratory	Date of issue
ETA-24/1199	Static and quasi-static, Seismic	OiB, Österreichisches Institut für Bautechnik	11-02-2025

The instructions for use can be viewed using the link in the instructions for use table or the QR code/link in the Hilti webpage table

Instructions for use (IFU)

Material	IFU
HTC-P2P	IFU HTC-P2P
Special adapter	IFU Special adapter

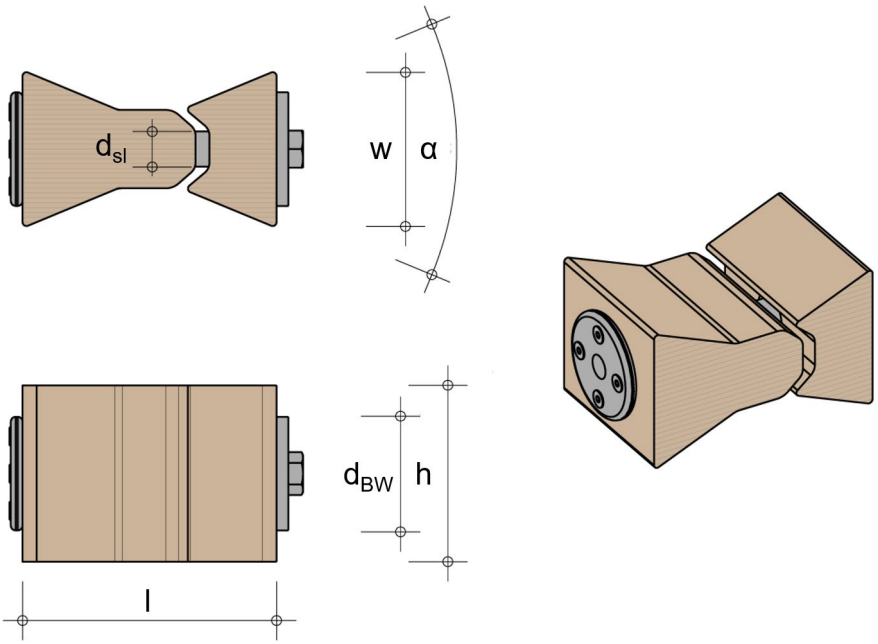
Link to Hilti Webpage

HTC-P2P	Special adapter	

Dimensions of the Connector

Parameter			HTC-P2P 90 mm M12
Assembled connector			
Length of the connector (not installed)	l	[mm]	120,0…210,0
Height of the connector	$h = d_e$	[mm]	90,0 ±1
Width of the connector	w	[mm]	78,5 ±1
Angle of inclination of wedges	α	[°]	45,0 ±1
Internally threaded sleeve			
Outer diameter of the sleeve	d_{sl}	[mm]	≥18,0
Bolt with hexagonal head			
Size			M12
Oversized flat washer			
Outer diameter	d_{BW}	[mm]	≥58,0

HTC-P2P 90 mm M12



To install the Timber Connector HTC-P2P a cutout of defined shape must be done inside the timber member, preferentially been done by CNC machining. The cutout geometry is presented in the ETA listed in the table “Approvals / Certificates”.

For more details (3d mode`ls of the cutout, etc.) please contact Hilti representative.

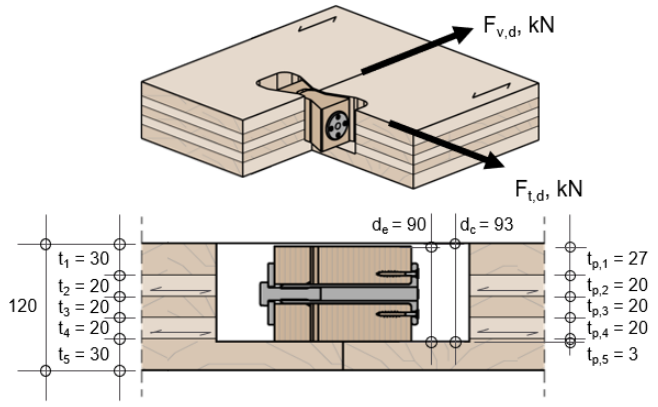
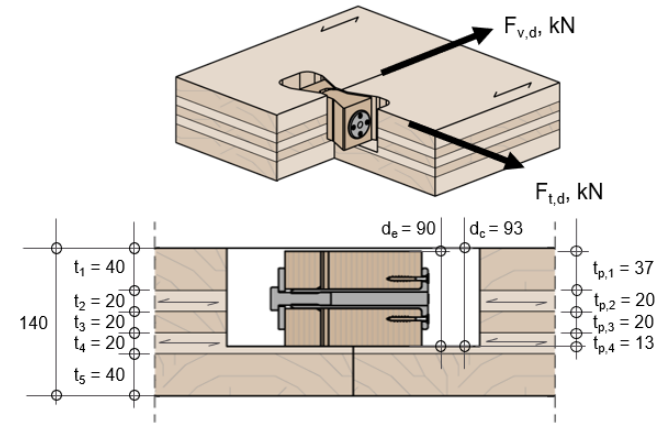
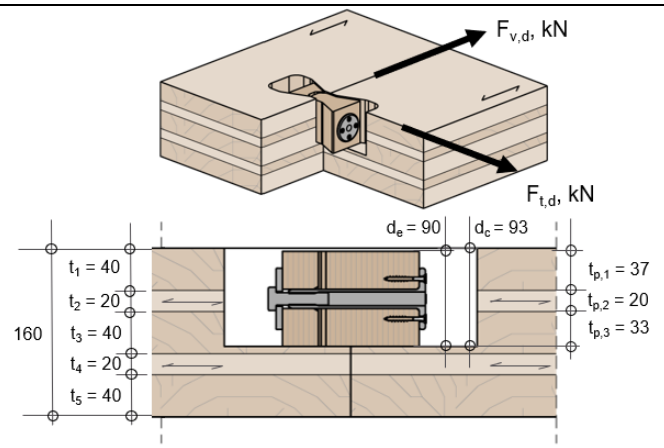
Wrong cutout geometry can negatively affect the performance of the HTC-P2P Connector!

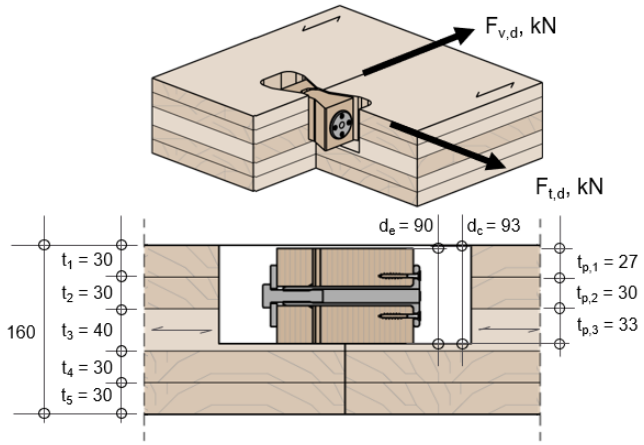
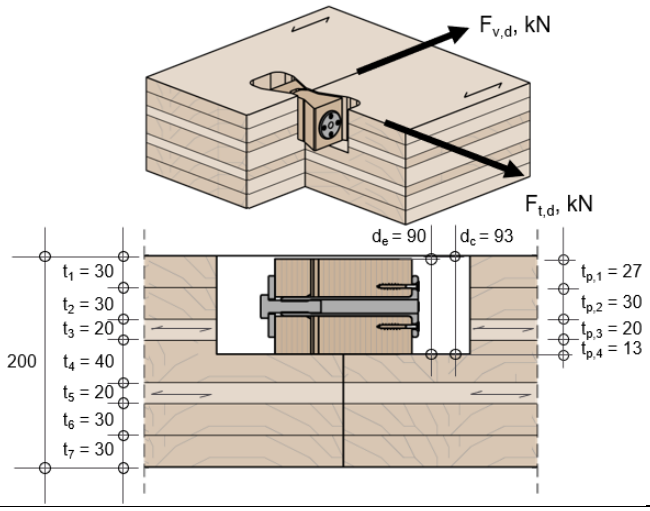
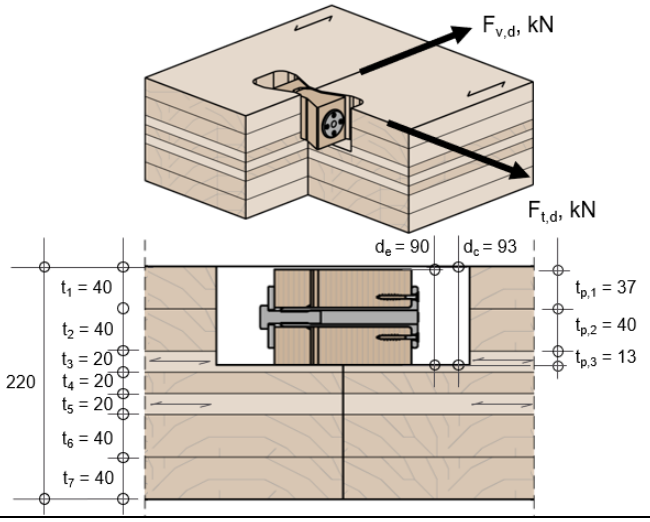
CLT Configurations covered by the current Product DataSheet

The performance of the HTC-P2P Connector (Characteristic resistance, Stiffness) shall be calculated based on the effective ratio β – which is a ratio between the total thickness of layers (t_p), oriented parallel to the load direction across the embedment depth of the Connector, and the embedment depth of the Connector (d_e). The effective ratio shall be determined based on the used CLT, direction of the applied load, embedment depth of the connector and the depth of the cutout.

The pre-calculated values of effective ratios in Tension ans Shear for the selected types of CLTs that are presented in the table below are taking into account the following limitations:

- Cutout has a correct geometry (as presented in the ETA listed in the table “Approvals / Certificates”) and has a depth of d_c = 93 mm
- Cutout orientation and direction of the applied load is matching with what presented on the sketches;

Name	CLT Configuration	Effective ratio calculation			
Panels with a Single top layer					
120-5s		**Tension ($F_{t,d}$, kN)**			
		$\sum t_{p,II,t}$	[mm]	$t_{p,2} + t_{p,4}$	40
		$\beta_{II,t}$	[-]	$\sum t_{p,II,t} / d_e$	0,44
		Shear ($F_{v,d}$, kN)			
		$\sum t_{p,II,v}$	[mm]	$t_{p,1} + t_{p,3} + t_{p,5}$	50
		$\beta_{II,v}$	[-]	$\sum t_{p,II,v} / d_e$	0,56
140-5s		**Tension ($F_{t,d}$, kN)**			
		$\sum t_{p,II,t}$	[mm]	$t_{p,2} + t_{p,4}$	33
		$\beta_{II,t}$	[-]	$\sum t_{p,II,t} / d_e$	0,37
		Shear ($F_{v,d}$, kN)			
		$\sum t_{p,II,v}$	[mm]	$t_{p,1} + t_{p,3}$	57
		$\beta_{II,v}$	[-]	$\sum t_{p,II,v} / d_e$	0,63
160-5s		**Tension ($F_{t,d}$, kN)**			
		$\sum t_{p,II,t}$	[mm]	$t_{p,2}$	20
		$\beta_{II,t}$	[-]	$\sum t_{p,II,t} / d_e$	0,22
		Shear ($F_{v,d}$, kN)			
		$\sum t_{p,II,v}$	[mm]	$t_{p,1} + t_{p,3}$	70
		$\beta_{II,v}$	[-]	$\sum t_{p,II,v} / d_e$	0,78

Name	CLT Configuration	Effective ratio calculation			
Panels with a Double top layer					
160-5ss		**Tension ($F_{t,d}$, kN)**			
		$\sum t_{p,II,t}$	[mm]	$t_{p,3}$	33
		$\beta_{II,t}$	[-]	$\sum t_{p,II,t} / d_e$	0,37
		Shear ($F_{v,d}$, kN)			
		$\sum t_{p,II,v}$	[mm]	$t_{p,1} + t_{p,2}$	57
		$\beta_{II,v}$	[-]	$\sum t_{p,II,v} / d_e$	0,63
200-7ss		**Tension ($F_{t,d}$, kN)**			
		$\sum t_{p,II,t}$	[mm]	$t_{p,3}$	20
		$\beta_{II,t}$	[-]	$\sum t_{p,II,t} / d_e$	0,22
		Shear ($F_{v,d}$, kN)			
		$\sum t_{p,II,v}$	[mm]	$t_{p,1} + t_{p,2} + t_{p,4}$	70
		$\beta_{II,v}$	[-]	$\sum t_{p,II,v} / d_e$	0,78
220-7ss		**Tension ($F_{t,d}$, kN)**			
		$\sum t_{p,II,t}$	[mm]	$t_{p,3}$	13
		$\beta_{II,t}$	[-]	$\sum t_{p,II,t} / d_e$	0,14
		Shear ($F_{v,d}$, kN)			
		$\sum t_{p,II,v}$	[mm]	$t_{p,1} + t_{p,2}$	67
		$\beta_{II,v}$	[-]	$\sum t_{p,II,v} / d_e$	0,86

Note:

$\sum t_{p,II,t}$, $\sum t_{p,II,v}$ – total thickness of the layers, oriented parallel to the load direction across the embedment depth of the Connector, in direction of Tension ($F_{t,d}$) or Shear ($F_{v,d}$) load

CLTs that are compatible with the HTC-P2P Connector are presented in the ETA-24/1199 that is referenced in the table “Approvals / Certificates”. For specific design cases and for additional information on the Product’s performance – please refer to the HTC-P2P Technical Guide, ETA-24/1199 or Hilti design tool

Static and quasi-static loading based on ETA-24/1199. Design according to EOTA TR 085

All data in this section applies to:

- Correct setting (See Instruction for use)
- Service class 1 or 2 acc.to EN 1995-1-1
- The moisture level of the connector should be less than %18 as mentioned in the IFU
- Values are valid for a single connector
- No edge distance and spacing influence (see the section “Setting information”)
- CLT panels with:
  - Minimum strength class of lamellas is C16, average strength class of lamellas is C24 according to EN 338
  - Cutout has a correct geometry (as presented in the ETA referenced in the table “Approvals / Certificates”) and has a depth of d_c = 93 mm
  - Cutout orientation and direction of the applied load is matching with what presented on the sketches in the Section above
  - Effective ratio, as specified in the tables of this section

Calculations are done with:

- Modification factor k_{mod} = 0,9 (Short-term actions acc.to Table 3.1 EN 1995-1-1);
- Partial safety factor for the material property γ_M = 1,3 (Connections, acc. to Table 2.3 EN 1995-1-1);

For specific design cases (including other CLT configurations and thickness) and for additional information on the Product’s performance – please refer to the HTC-P2P Technical Guide, ETA-24/1199 or Hilti design tool

Design resistance

Connector type			**HTC-P2P 90 mm M12**					
CLT configuration (number of top layers, name)			Single top layer			Double top layer		
			120-5S	140-5S	160-5S	160-5SS	200-7SS	220-7SS
Tension								
Effective ratio in Tension	$\beta_{II,t}$	[-]	0,44	0,37	0,22	0,37	0,22	0,14
Design resistance	$R_{t,d}$	[kN]	27,2	27,2	27,2	18,8	17,1	16,2
Slip modulus	$k_{ser,t}$	[kN/mm]	6,7	6,8	7,0	6,9	7,6	8,0
Shear								
Effective ratio in Shear	$\beta_{II,v}$	[-]	0,56	0,63	0,78	0,63	0,78	0,86
Design resistance	$R_{v,d}$	[kN]	28,9	30,4	33,6	28,3	31,6	33,3
Slip modulus	$k_{ser,v}$	[kN/mm]	8,4	8,8	9,6	9,7	11,2	12,0

Seismic loading based on ETA-24/1199. Design according to EOTA TR 085

All data in this section applies to:

- Correct setting (See Instruction for use)
- Service class 1 or 2 acc.to EN 1995-1-1
- The moisture level of the connector should be less than %18 as mentioned in the IFU
- Values are valid for a single connector
- No edge distance and spacing influence (see the section “Setting information”)
- CLT panels with:
  - Minimum strength class of lamellas is C16, average strength class of lamellas is C24 according to EN 338
  - Cutout has a correct geometry (as presented in the ETA referenced in the table “Approvals / Certificates”) and has a depth of d_c = 93 mm
  - Cutout orientation and direction of the applied load is matching with what presented on the sketches in the Section above
  - Effective ratio, as specified in the tables of this section

Calculations are done with:

- Modification factor k_{mod} = 1,1 (Instantaneous actions acc.to Table 3.1 EN 1995-1-1);
- Reduction factor α_{seis} = 1,0 (acc.to ETA-24/1199);
- Partial safety factor for the material property:
  - γ_M = 1,3 for the DCL (low ductility) class in case of Tension load
  - γ_M = 1,0 for the DCM (medium ductility) class in case of Shear load

For specific design cases (including other CLT configurations and thickness) and for additional information on the Product’s performance – please refer to the HTC-P2P Technical Guide, ETA-24/1199 or Hilti design tool

Design resistance

Connector type			**HTC-P2P 90 mm M12**					
CLT configuration (number of top layers,name)			Single top layer			Double top layer		
			120-5S	140-5S	160-5S	160-5SS	200-7SS	220-7SS
Tension								
Effective ratio in Tension	$\beta_{II,t}$	[-]	0,44	0,37	0,22	0,37	0,22	0,14
Design resistance	$R_{t,Ed}$	[kN]	33,3	33,3	33,3	23,0	20,9	19,8
Shear								
Effective ratio in Shear	$\beta_{II,v}$	[-]	0,56	0,63	0,78	0,63	0,78	0,86
Design resistance	$R_{v,Ed}$	[kN]	46,0	48,3	53,4	45,0	50,2	53,0

Fire resistance based on ETA-24/1199. Design according to EOTA TR 085

All data in this section applies to:

- Correct setting (See Instruction for use)
- Service class 1 or 2 acc.to EN 1995-1-1
- The moisture level of the connector should be less than %18 as mentioned in the IFU
- Values are valid for a single connector
- No edge distance and spacing influence (see the section “Setting information”)
- Charring of the CLT occurs only in the area ≥20 mm below the Connector
- CLT panels with:
  - Minimum strength class of lamellas is C16, average strength class of lamellas is C24 according to EN 338
  - Cutout has a correct geometry (as presented in the ETA referenced in the table “Approvals / Certificates”) and has a depth of d_c = 93 mm
  - Cutout orientation and direction of the applied load is matching with what presented on the sketches in the Section above
  - Effective ratio, as specified in the tables of this section

Calculations are done with:

- Temperature-dependent reduction factor k_θ = 1,0;
- Modification factor $k_{mod,fi}$ = 1,0;
- Modification factor for the strength property k_{fi} = 1,1;
- Partial safety factor for the material property $\gamma_{M,fi}$ = 1,0 (Accidental combinations, acc. to Table 2.3 EN 1995-1-1);

The current section doesn’t cover the calculations that are needed to ensure:

- The load-bearing function of the CLT panels (criterion R);
- Separating function of the CLT: Integrity (criterion E), and, when requested, Insulation (criterion I) related to the shape of the joint and width of the gap;
- Required time of fire exposure

For specific design cases (including other CLT configurations and thickness) and for additional information on the Product’s performance – please refer to the HTC-P2P Technical Guide, ETA-24/1199 or Hilti design tool.

Design resistance

Connector type			**HTC-P2P 90 mm M12**					
CLT configuration (number of top layers, name)			Single top layer			Double top layer		
			120-5S	140-5S	160-5S	160-5SS	200-7SS	220-7SS
Tension								
Effective ratio in Tension	$\beta_{II,t}$	[-]	0,44	0,37	0,22	0,37	0,22	0,14
Design resistance	$R_{t,d,fi}$	[-]	43,2	43,2	43,2	29,9	27,2	25,7
Shear								
Effective ratio in Shear	$\beta_{II,v}$	[-]	0,56	0,63	0,78	0,63	0,78	0,86
Design resistance	$R_{v,d,fi}$	[-]	46,0	48,3	53,4	45,0	50,2	53,0

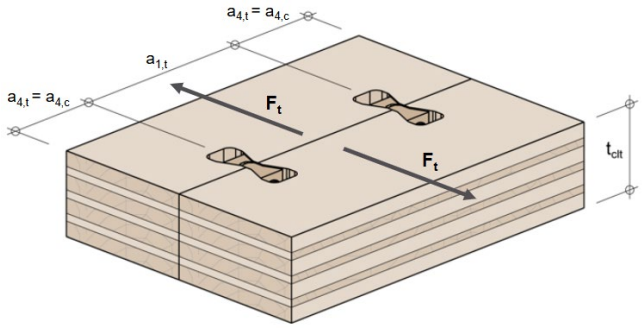
Setting information

Connector type			HTC-P2P 90 mm M12
Tension loads			
Minimum edge distance Minimum end distance [1)]	$a_{4,t} = a_{4,c}$	[mm]	250
Minimum spacing [1)]	$a_{1,t}$	[mm]	500
Shear loads			
Minimum edge distance Minimum end distance [1)]	$a_{3,t} = a_{3,c}$	[mm]	300
Minimum spacing [1)]	$a_{1,v}$	[mm]	300
Tension and Shear loads			
Cutout depth [2)]	d_c	[mm]	93…105
Embedment depth of the Connector	d_e	[mm]	90
Minimum base material thickness	t_{clt}	[mm]	120

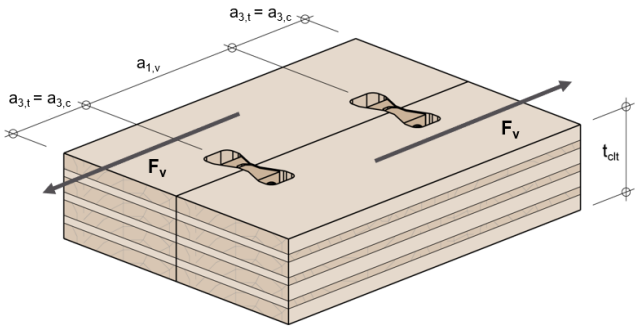
1) Minimum edge, end distances and spacing must be ensured in order to reach the capacity of the Connector (Resistance, Stiffness) as presented in the sections above;
2) Maximum cutout depth is limited by the length of the installation tool

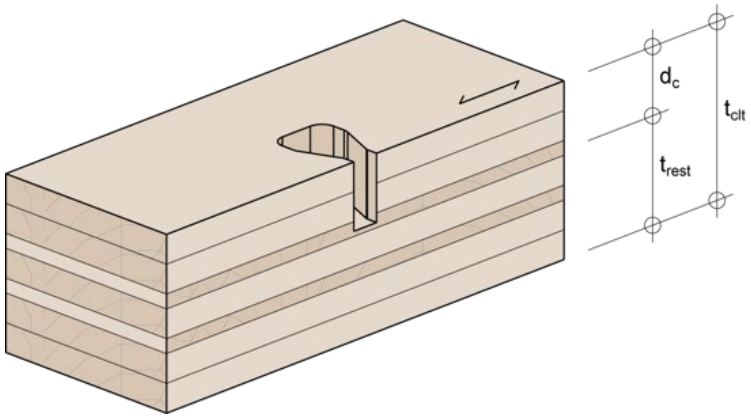
Installation parameters

a) In case of Tension loads:



b) In case of Shear loads:





Drilling and Installation equipment

For detailed setting information on installation see instructions for use given with the product.

Other tools		Torque Impact wrench - SIW 6AT-A22
		Torque Impact wrench - SIW 22T-A
		Adapter M12 SW19 offset