RING

REMOVABLE CONNECTOR FOR BEAMS AND PANELS

EFFICIENT

The high strength of the connector makes it possible to reduce the number of fastenings. Simple processing of the panel is required, resulting in easy transport and installation, speeded up by operations performed only on one side of the wall. Thanks to the double inclination of the screws, the connectors can be pre-installed in the factory or inserted on site.

VERSION WITH SCREWS

The RING60T screw version is ideal for multiple timber-to-timber connections. It allows the positioning of timber components at any desired inclinations and tolerances. The routing can also be carried out on site using a BORMAX cutter.

VERSION WITH BOLT

The bolted version RING90C is ideal for creating connections to steel or concrete in hybrid structures, or for timber-to-timber connections using two connectors. No additional components required, simple bolting with M16: easy to install, easy to remove.

VIDEO

CALCULATION TOOL

CE
ETA-25/0316

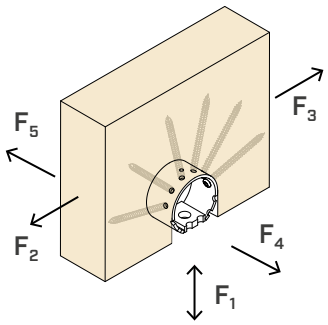
SERVICE CLASS SC1 SC2

MATERIAL

S355 Fe/Zn12c

S355 + Fe/Zn12c carbon steel

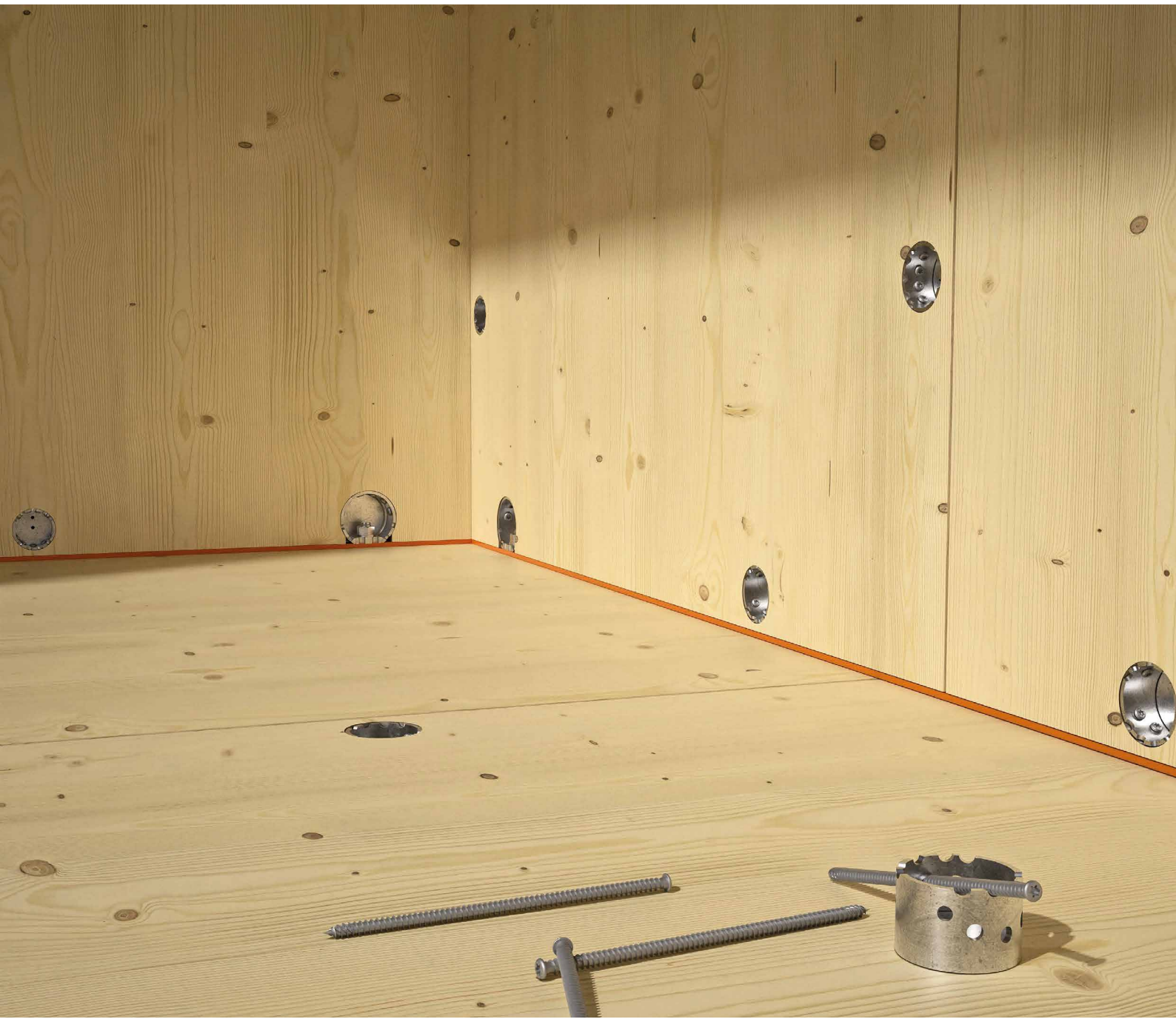
EXTERNAL LOADS



VIDEO
Scan the QR Code and watch the video on our YouTube channel

UNIVERSAL

The **RING90C** connector can also be used for timber-to-concrete connections, for example at the base of columns.

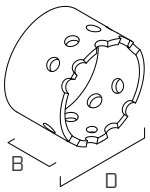


HYBRID STRUCTURES

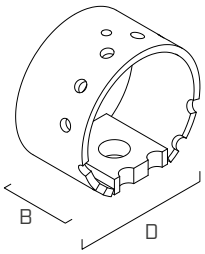
The **RING90C** model can be used for timber-to-steel connections in hybrid structures. Easy to disassemble thanks to the M16 bolt.

CODES AND DIMENSIONS

	CODE	D [mm]	B [mm]	n Ø7 [pcs]	n Ø17 [pcs]	pcs
1	**RING60T**	60	40	4 + 5	-	5
2	**RING90C**	90	50	6	1	5



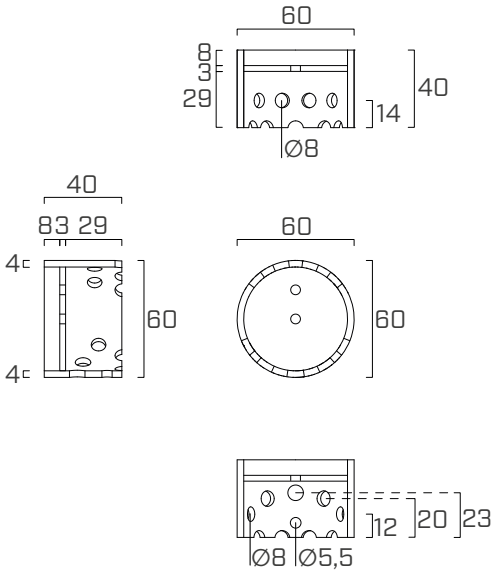
1



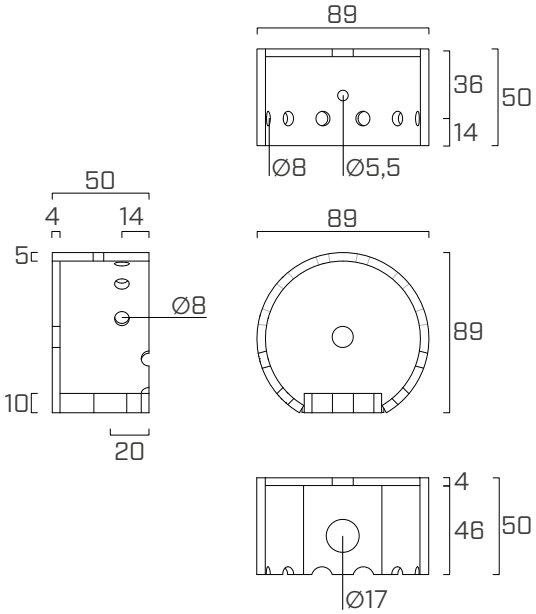
2

GEOMETRY

RING60T



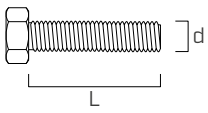
RING90C

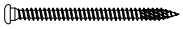


FASTENERS

hexagonal head BOLT

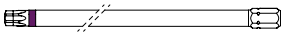
CODE	d [mm]	L [mm]	SW [mm]	pcs
EKS1650	M16	50	24	25
EKS1660	M16	60	24	25



type	description		d [mm]
LBS HARDWOOD EVO	C4 EVO round head screw on hardwoods		7
HBS	countersunk screw		5
MET	threaded rod		16
ULS 125	washer		M16
MUT	hexagonal nut		M16

For further details please see the "TIMBER SCREWS AND DECK FASTENING" catalogue.

RELATED PRODUCTS



LONG
LONG BIT

BORMAX
PRECISION CUTTER
FOR TIMBER

BEAR
TORQUE WRENCH

ROUTING GEOMETRY

ROUTING IN THE PANEL[1]

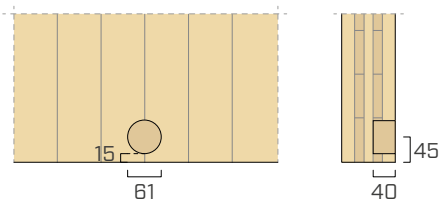
RING60T and RING90C can be installed as needed in either through or closed routing. Additionally, with RING90C, the hole position within the panel can be adjusted to allow connector placement in spaced configurations. This section presents several installation options.

STANDARD INSTALLATION FLUSH WITH PANEL

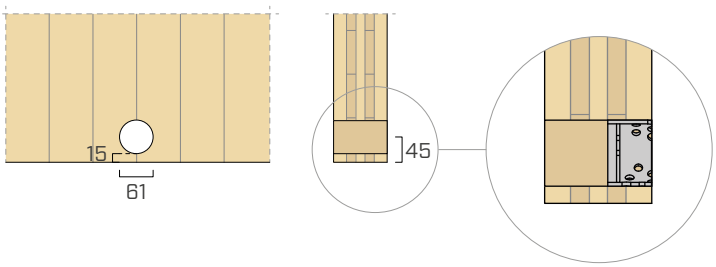
NON-THROUGH ROUTING | **THROUGH ROUTING**

RING60T

1

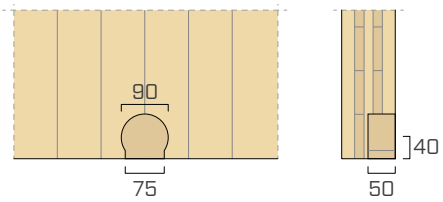


1

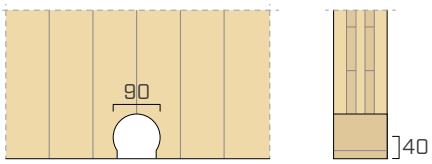


RING90C – pattern 1/2 | STANDARD INSTALLATION FLUSH WITH WALL

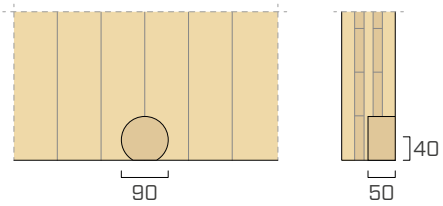
2



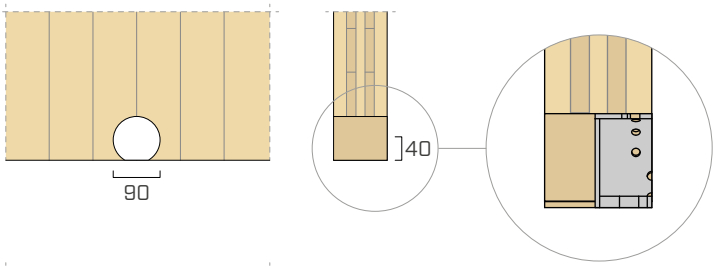
2



3



3



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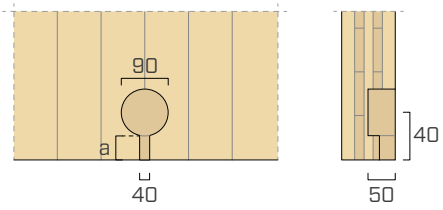
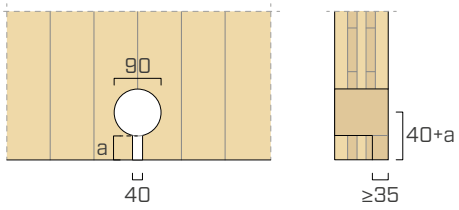
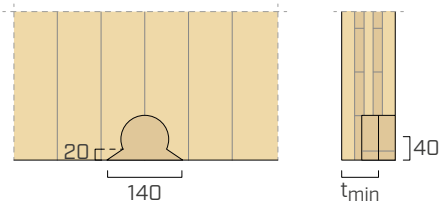


4[2]



RING90C – pattern 1 | RECESSED INSTALLATION

5[3]



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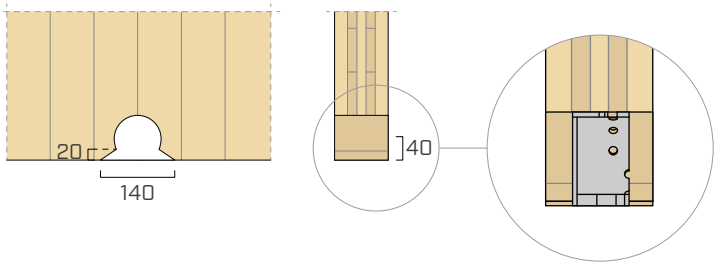


NOTES:

[1] The maximum hole/connector oversize is +1 mm (61.5 mm for RING60T – 91 mm for RING90C).

[2] Only for F_1.

[3] For recessed configuration relative to the wall surface (pattern 1 only).

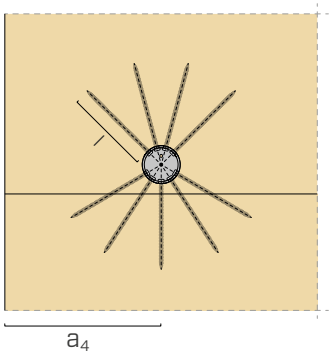
INSTALLATION

FASTENERS

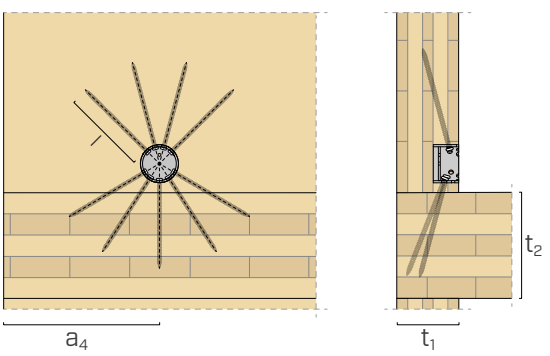
type	screws	number of screws [pcs]
RING60T	LBSHEVO Ø7	4 + 5
RING90C - pattern 1	LBSHEVO Ø7	4
RING90C - pattern 2	LBSHEVO Ø7	6

RING60T

I-JOINT

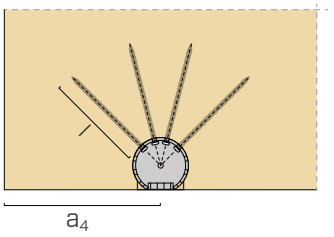


L/T-JOINT

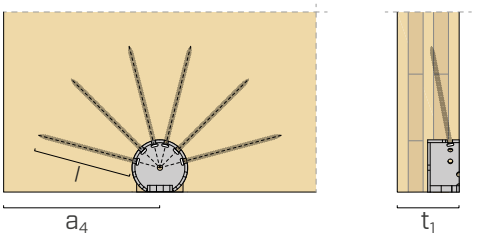


RING90C

RING90C - pattern 1



RING90C - pattern 2



MINIMUM DISTANCE FROM EDGE AND MINIMUM DIMENSIONS[1]

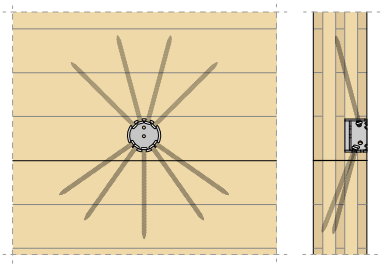
CODE	configuration	screws	l [mm]	$a_{4,min}$ [mm]	$t_{1,min}$ [mm]	$t_{2,min}$ [mm]
RING60T	**I-JOINT**	LBSHEVO Ø7	120	140	80	-
			160	175	100	-
			200	210	120	-
RING60T	**L/T-JOINT**	LBSHEVO Ø7	120	140	60	120
			160	175	80	160
			200	210	100	180
RING90C	**pattern 1**	LBSHEVO Ø7	120	130	50	-
			160	160	50	-
			200	185	60	-
RING90C	**pattern 2**	LBSHEVO Ø7	120	170	50	-
			160	205	50	-
			200	245	50	-

(1) Minimum dimensions refer to application on CLT panels. The distances of the fasteners to the ends and edges must be observed for application on glulam beams. The actions of transverse forces orthogonal to the grain that may introduce splitting phenomena must also be checked.

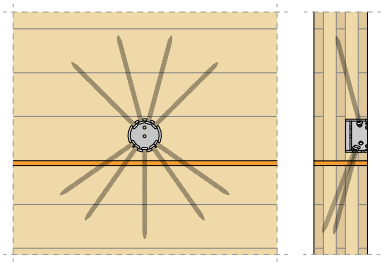
APPLICATION EXAMPLES

RING60T

I-JOINT

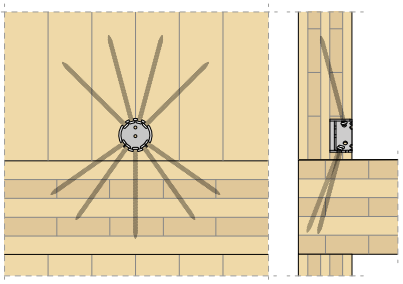


floor-to-floor | wall-to-wall



floor-to-floor | wall-to-wall
with XYLOFON

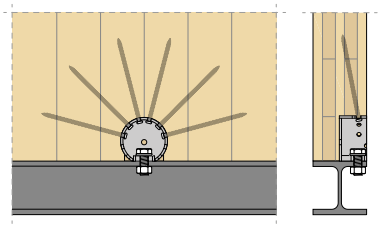
L/T-JOINT



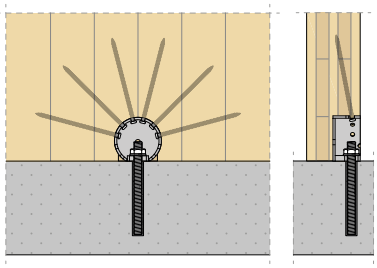
wall-floor

RING90C

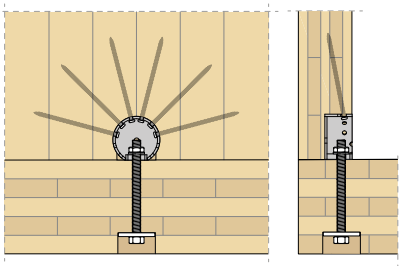
MATERIAL-CONFIGURATION MATCHING



timber-to-steel

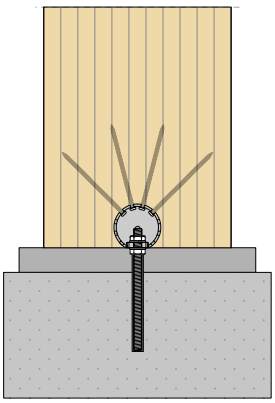


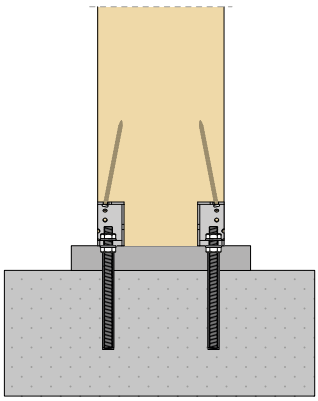
timber-to-concrete

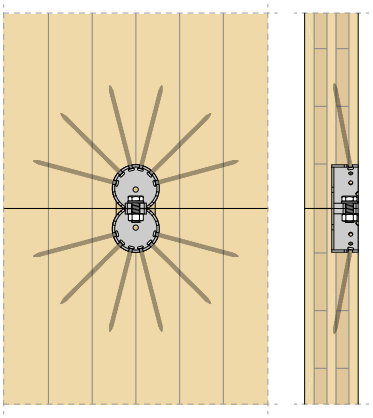


timber-to-timber

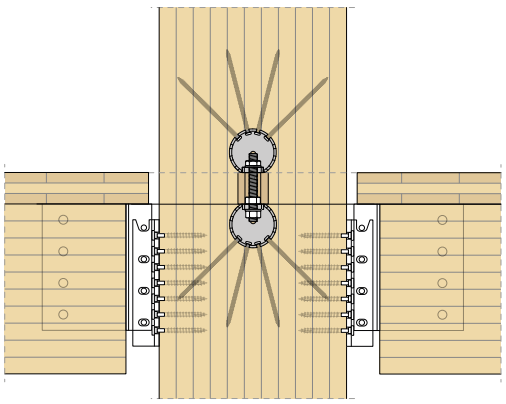
DIRECT FASTENING

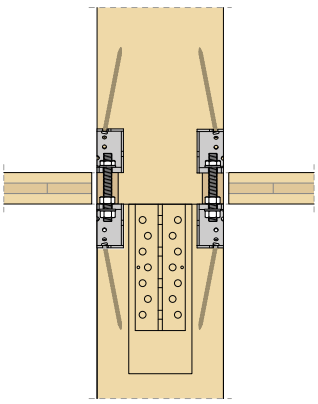


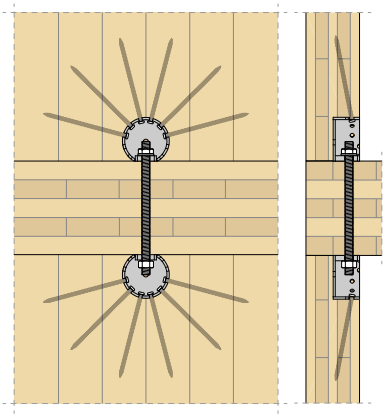




SPACED FASTENING

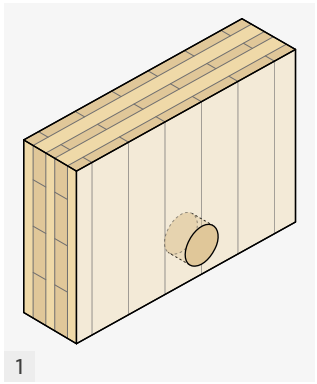


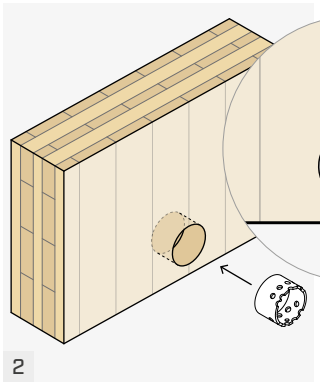


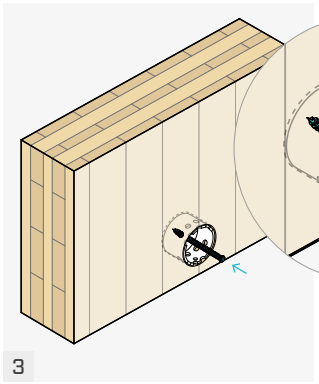


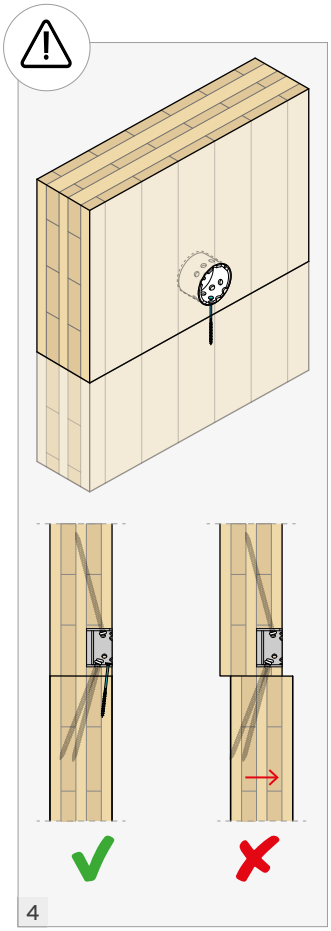
ASSEMBLING RING60T

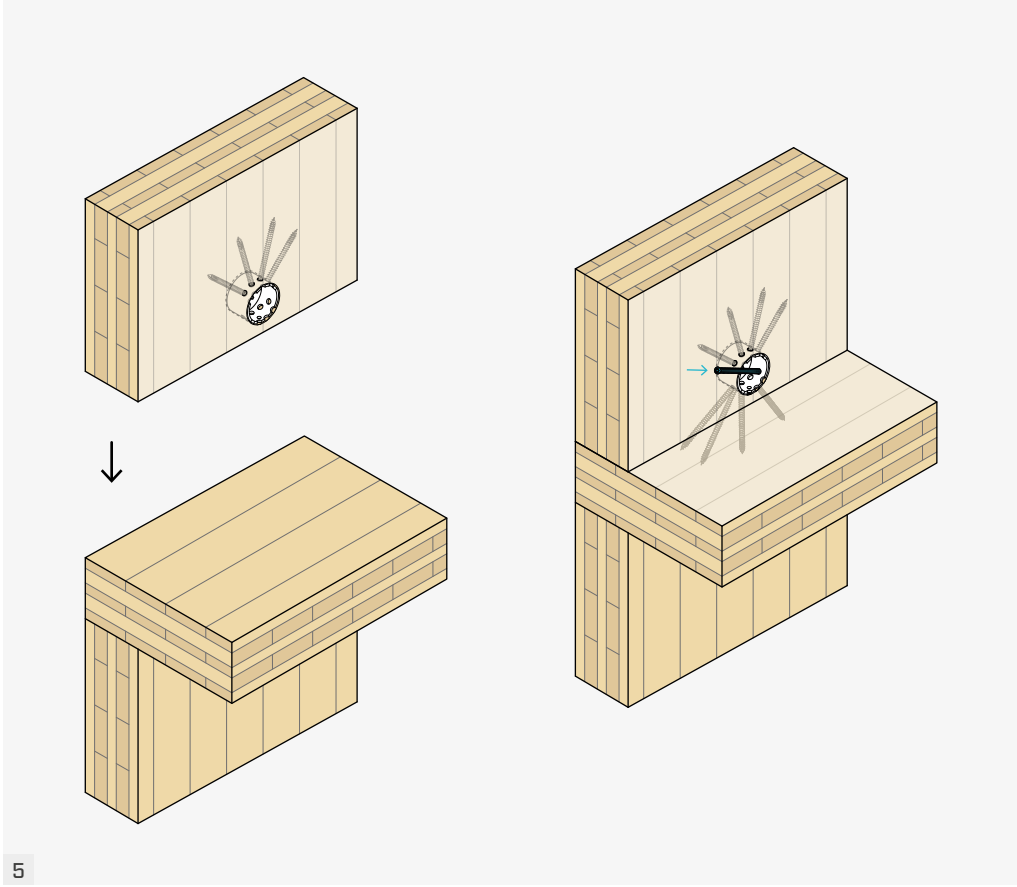
The fastening of the RING60T connector involves installing 4 screws in the element where the connector is installed, and 5 in the second connected element. The special geometry of the connector ensures that the screws are inserted correctly by means of specific seats on the outer edge. Operationally, each screw insertion point corresponds to a reference mark on the outer ring, which ensures the correct insertion angle in both directions (see figure 3).
An additional screw (HBS Ø5) can be used to align the second timber panel during assembly, prior to inserting the 5 screws that complete the joint.



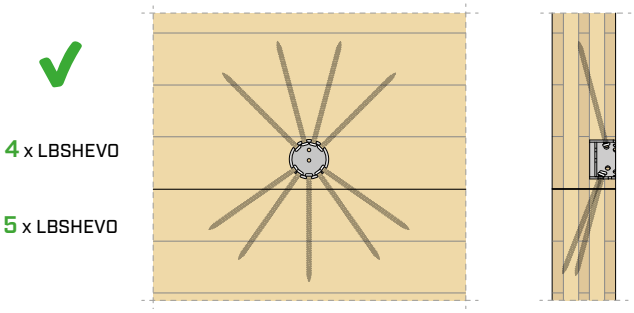




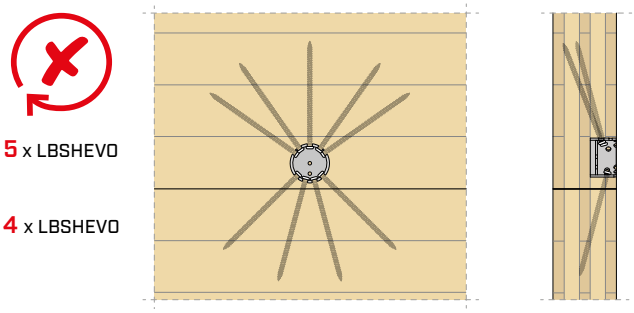




CORRECT INSTALLATION

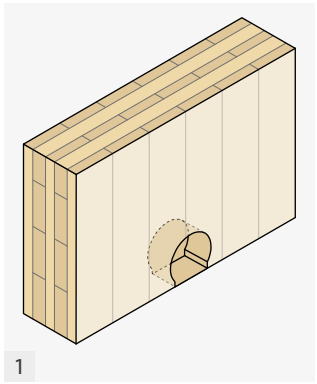


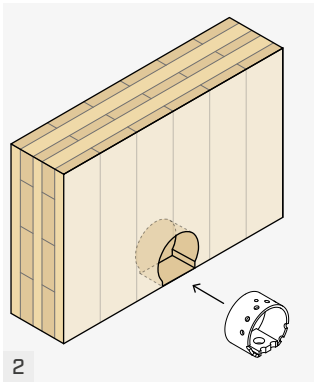
INCORRECT INSTALLATION

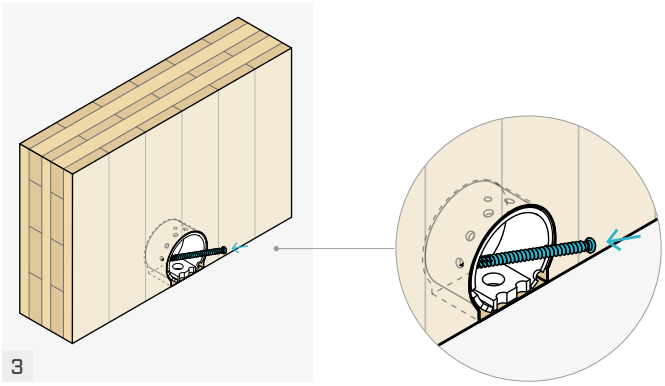


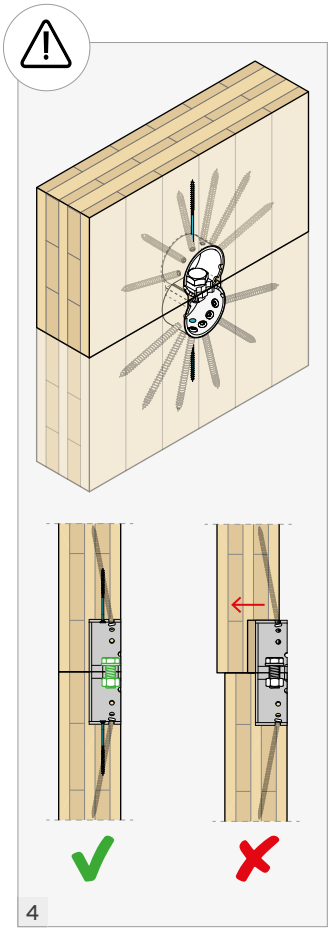
ASSEMBLING RING90C

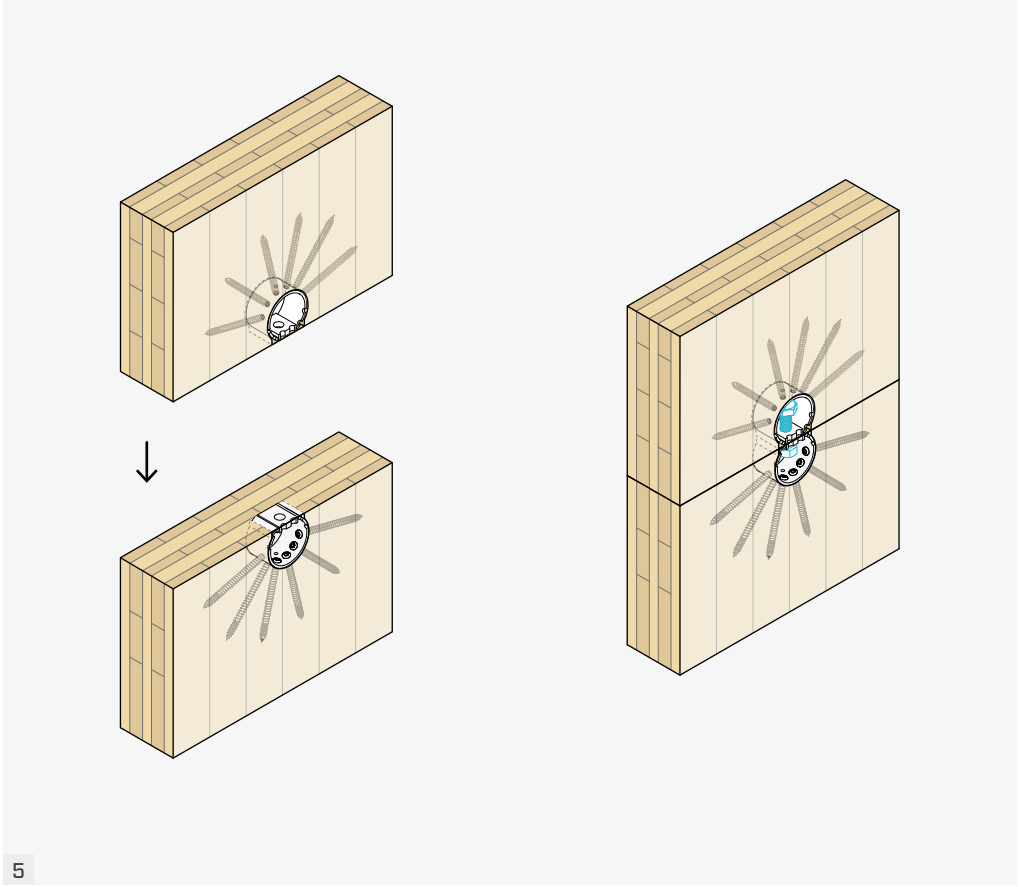
The RING90C connector is fastened using 4 or 6 screws. Also in this case, the special geometry of the connector allows the screws to be inserted correctly by means of specific seats on the outer edge. Operationally, each screw insertion point corresponds to a reference mark on the outer ring, which ensures the correct insertion angle in both directions (see figure 3).
In the case of direct panel-to-panel connection using two RING90C connectors, it is recommended to use the assembly screw, inserted through the hole in the base flange, to prevent misalignment of the two connectors on the two opposite panels.





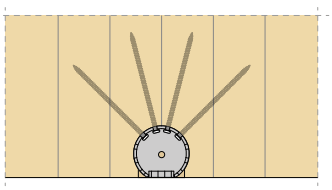






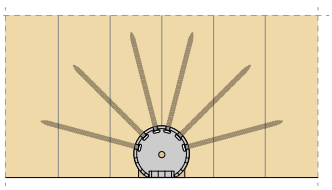
RING90C - pattern 1

4 x LBSHEVO



RING90C - pattern 2

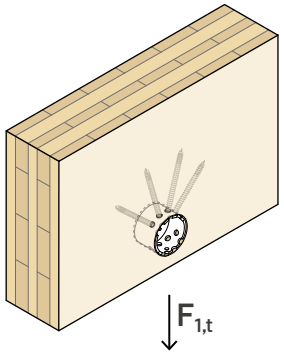
6 x LBSHEVO



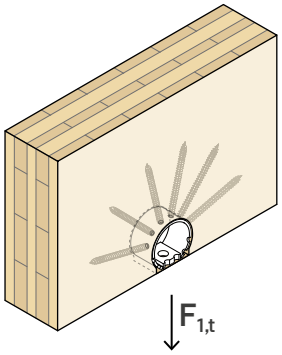
STRUCTURAL VALUES | F_1

TENSION JOINTS[1]

RING60T



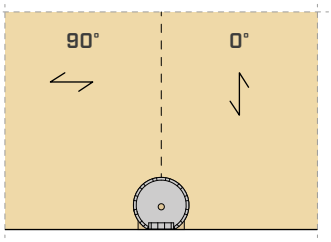
RING90C

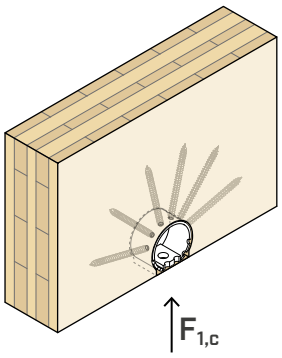


CODE	configuration	LBSHEVO Ø x L [mm]	LBSHEVO n_V [pcs]	LBSHEVO n_H [pcs]	$R_{1,t\,k}$ GL24h [kN]	$R_{1,t\,k}$ CLT [kN]	$K_{1,t\,ser}$ GL24h [N/mm]	$K_{1,t\,ser}$ CLT [N/mm]
RING60T	-	Ø7 x 120	4	5	27,5	25,7	2750	2570
		Ø7 x 160			39,2	36,6	3916	3660
		Ø7 x 200			50,5	47,2	5050	4720
RING60T	**with XYLOFON**	Ø7 x 120	4	5	25,1	23,4	2510	2340
		Ø7 x 160			36,9	34,4	3690	3440
		Ø7 x 200			48,3	45,0	4830	4500
RING90C	**pattern 1**	Ø7 x 120	4	-	34,0	31,7	13100	12200
		Ø7 x 160			44,5	41,4	17133	15933
		Ø7 x 200			54,7	50,9	21067	19600
RING90C	**pattern 2**	Ø7 x 120	6	-	39,3	36,6	11333	10567
		Ø7 x 160			51,4	47,8	14833	13800
		Ø7 x 200			63,2	58,8	18233	16967

[1] The M16 bolt and any additional connection elements must be checked separately.
For RING90C, in the case of non-through routing, the strength can be increased by 4.3%.

COMPRESSION JOINT[1]



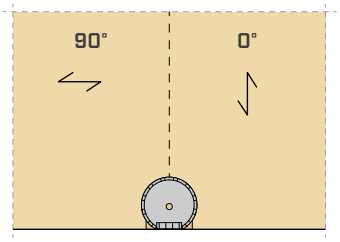


CODE	$R_{1,c}$ GL24h 0° [kN]	$R_{1,c}$ GL24h 90° [kN]	$R_{1,c}$ CLT 0° [kN]	$R_{1,c}$ CLT 90° [kN]	$K_{1,c\,ser}$ GL24h 0° [N/mm]	$K_{1,c\,ser}$ GL24h 90° [N/mm]	$K_{1,c\,ser}$ CLT 0° [N/mm]	$K_{1,c\,ser}$ CLT 90° [N/mm]
RING90C	77,0	38,5	70,0	35,0	51333	16042	46667	43750

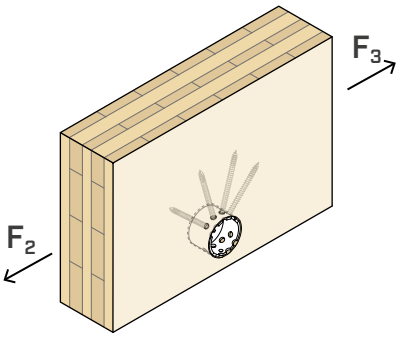
[1] Verify that there are no brittle failures before reaching the connection strength. If reinforcements are necessary, they must be properly designed.

STRUCTURAL VALUES | $F_{2/3}$

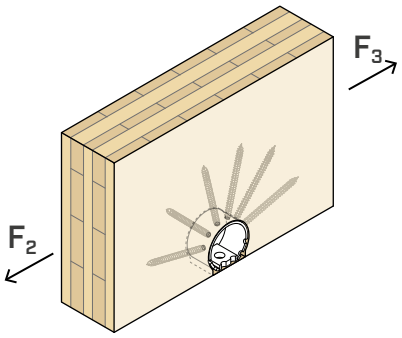
SHEAR JOINTS[1]



RING60T



RING90C



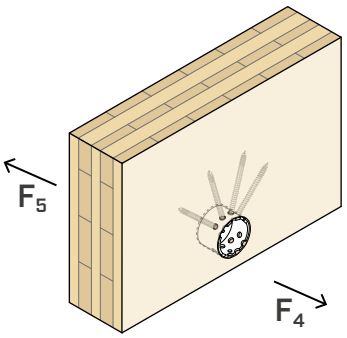
CODE	configuration	LBSHEVO	n_V	n_H	$R_{2/3,t\,k}$				$K_{2/3,t\,ser}$			
					GL24h		CLT		GL24h		CLT	
		Ø x L			0°	90°	0°	90°	0°	90°	0°	90°
		[mm]	[pcs]	[pcs]	[kN]	[kN]	[kN]	[kN]	[N/mm]	[N/mm]	[N/mm]	[N/mm]
RING60T	-	Ø7 x 120	4	5	17,8	17,8	18,9	18,9	29603	29603	31500	31500
		Ø7 x 160			23,4	23,4	25,3	25,3	39000	39000	42167	42167
		Ø7 x 200			29,0	29,0	31,5	31,5	48333	48333	51667	51667
RING60T	with XYLOFON	Ø7 x 120	4	5	16,4	16,4	15,3	15,3	13667	13667	12750	12750
		Ø7 x 160			22,1	22,1	20,7	20,7	18417	18417	17250	17250
		Ø7 x 200			27,7	23,1	25,8	25,8	19250	19250	21500	21500
RING90C	pattern 1	Ø7 x 120	4	-	43,8	52,7	40,2	48,2	6257	7529	5743	6886
		Ø7 x 160			44,8	53,7	41,2	49,4	6400	7671	5886	7057
		Ø7 x 200			45,5	54,4	41,9	50,0	6500	7771	5986	7143
RING90C	pattern 2	Ø7 x 120	6	-	49,0	57,9	45,3	53,4	7000	8271	6471	7629
		Ø7 x 160			50,2	59,2	46,6	54,7	7171	8457	6657	7814
		Ø7 x 200			51,0	59,9	47,4	55,5	7286	8557	6771	7929

[1] The friction coefficient considered for CLT panels is μ_{23} = 0.5, while for laminated timber it is μ_{23} = 0.25.

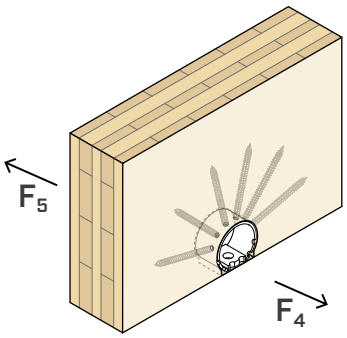
STRUCTURAL VALUES | $F_{4/5}$

SHEAR JOINTS[1]

RING60T



RING90C



CODE	configuration	LBSHEVO	n_V	n_H	$R_{4/5,t\,k}$		$K_{4/5\,ser}$	
					GL24h	CLT	GL24h	CLT
		Ø x L						
		[mm]	[pcs]	[pcs]	[kN]	[kN]	[N/mm]	[N/mm]
RING60T	-	Ø7 x 200	4	5	3,3	3,0	11000	10000
RING90C	pattern 2	Ø7 x 200	6	-	13,2	12,0	1886	1714

[1] Values relating to experimental tests on specific configurations.

GENERAL PRINCIPLES

- The design values are derived from the characteristic values determined in accordance with ETA-25/0316, ETA-11/0030 and EN 1995:2014.
- The design values are obtained as follows:

$$R_d = min \begin{cases} \dfrac{R_{k\,timber} \text{ or } R_{k\,CLT} \cdot k_{mod}}{\gamma_M} \\ \dfrac{R_{k\,bolt}}{\gamma_{M2}} \quad (RING90C) \end{cases}$$

  The coefficients k_{mod}, γ_M and γ_{M2} should be taken according to the current regulations used for the calculation.
- Only LBSH screws can be used, as these ensure correct operation of the connector. The minimum length required for correct positioning is 120 mm.
- The maximum density of timber or timber-based products that can be used in the tests is ρ_k = 420 kg/m^3. For higher values, refer to the value ρ_k = 420 kg/m^3.
- The static values shown in the tables for the RING90C connector refer to the configuration with open routing (no contact between the rear plate and the timber). In the event of contact, the strengths can be increased according to the formulas given in ETA25-/0316.
- The steel-side failure mechanisms of the connector are over-resistance compared to the timber-side strength, so they are not shown in the tables above.
- The calculation process used a timber characteristic density of ρ_k=385 kg/m^3 for glulam and ρ_k=350 kg/m^3 for CLT panels.
- For higher ρ_k values, the strength on timber side and the stiffness can be converted by the k_{dens} value shown in the table:

ρ_k [kg/m^3]	350	**385**	420
$k_{dens,v}$	1,00	1,07	1,15

- In the case of loads perpendicular to the plane of the panel, it is recommended to check there are no brittle failures before reaching the connection strength.
- K_{ser} values refer to the connector. In the case of panel-to-panel connection using two RING90C connectors, the rigidity must be halved since in this case the coupling is in series. Any slippage due to tolerance between the hole and the bolt must be considered separately.