

SPIDER

CONNECTION AND REINFORCEMENT SYSTEM FOR COLUMNS AND FLOORS

MULTI-STOREY BUILDINGS

It allows the construction of multi-storey buildings with a post-and-slab structure. Certified, calculated and optimised for glulam, LVL, steel and reinforced concrete columns. New architectural and structural horizons.

COLUMN-TO-COLUMN

The steel core of the system prevents the CLT panels from being crushed and allows more than 5000 kN of vertical load to be transferred between the columns.

REINFORCEMENT SYSTEM FOR CLT

The arms of the system ensure the punching shear reinforcement of the CLT panels, allowing exceptional shear strength values. Column spacing greater than 7,0 x 7,0 m structural grid.



USA, Canada and more design values available online.



VIDEO



PATENTED



ETA-19/0700

SERVICE CLASS

SC1

SC2

MATERIAL

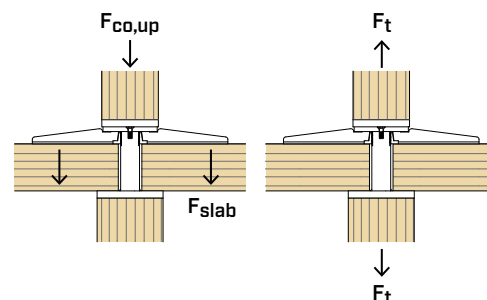
S355
Fe/Zn12c

S355 + Fe/Zn12c carbon steel

S690
Fe/Zn12c

S690 + Fe/Zn12c carbon steel

EXTERNAL LOADS



VIDEO

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



FIELDS OF USE

Multi-storey buildings with post-and-slab system. Solid timber, glulam, high density timber, CLT, LVL, steel and concrete columns.



WOODEN SKYSCRAPERS

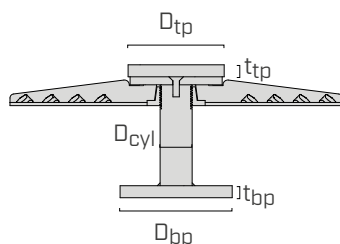
Standard connection and reinforcement system to build wooden skyscrapers with post-and-slab system. New architectural possibilities in construction.

CROSS CLT PANELS

Exceptional strength and stiffness of the structure with crossed arrangement of the CLT floors. It is possible to create free spans greater than 6,0 x 6,0 m even without the use of moment joints.

CODES AND DIMENSIONS

SPIDER CONNECTOR

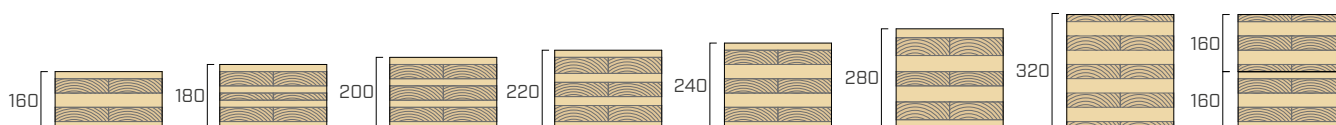


The code consists of the respective CLT panel thickness in mm (XXX = t_{CLT}).
SPI80MXXX for CLT panels with XXX = t_{CLT} = 200 mm : code **SPI80M200**.

CODE	cylinder		bottom plate		top plate		weight		pcs
	D_{cyl}		$D_{bp} \times t_{bp}$		$D_{tp} \times t_{tp}$		[kg]	[lb]	
	[mm]	[in]	[mm]	[in]	[mm]	[in]			
SPI60SXXX⁽¹⁾	60	2 3/8	200 x 30	8 x 1 3/16	200 x 20 ⁽¹⁾	8 x 13/16 ⁽¹⁾	52,2	127.2	1
SPI80SXXX	80	3 1/8	240 x 30	9 1/2 x 1 3/16	200 x 20	8 x 13/16	63,6	145.5	1
SPI80MXXX	80	3 1/8	280 x 30	11 x 1 3/16	240 x 30	9 1/2 x 1 3/16	73,1	168.4	1
SPI80LXXX	80	3 1/8	280 x 40	11 x 1 9/16	280 x 30	11 x 1 3/16	87,0	199.1	1
SPI100SXXX	100	4	240 x 30	9 1/2 x 1 3/16	240 x 20	9 1/2 x 13/16	74,9	172.6	1
SPI100MXXX	100	4	280 x 30	11 x 1 3/16	280 x 30	11 x 1 3/16	86,1	199.1	1
SPI120SXXX	120	4 3/4	280 x 30	11 x 1 3/16	280 x 30	11 x 1 3/16	91,6	210.1	1
SPI120MXXX	120	4 3/4	280 x 40	11 x 1 9/16	280 x 40	11 x 1 9/16	111.6	254.2	1
SPI100LXXX	100	4	240 x 20	9 1/2 x 13/16	not provided		64,6	149.7	1
SPI120LXXX	120	4 3/4	240 x 20	9 1/2 x 13/16	not provided		70.1	164.7	1

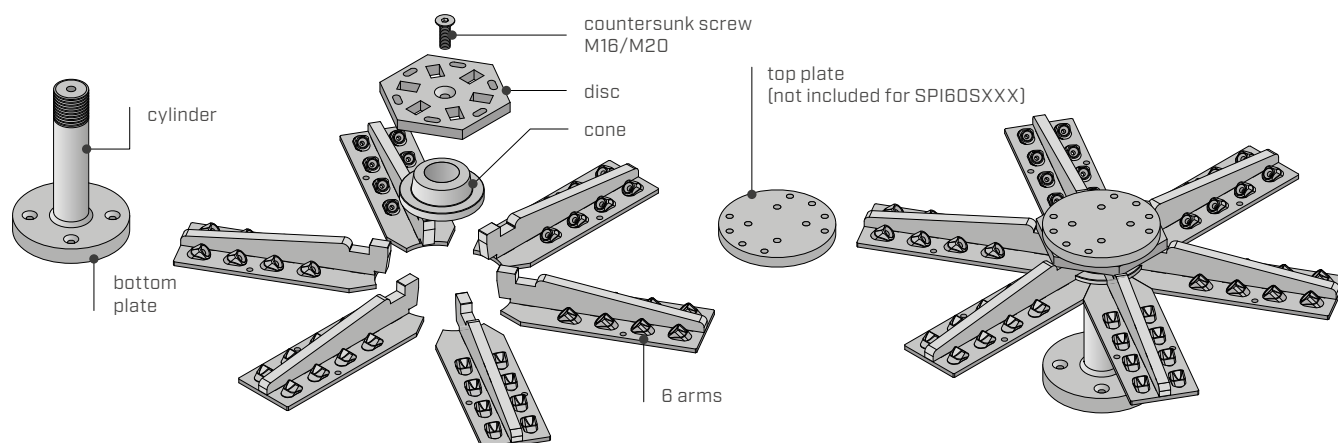
⁽¹⁾SPI60S is supplied without top plate. This can be ordered separately with the code STP20020C.

XXX = t_{CLT}							
[mm] [in]							
160	180	200	220	240	280	320	320
6 1/4	7 1/8	8	8 5/8	9 1/2	11	12 5/8	12 5/8



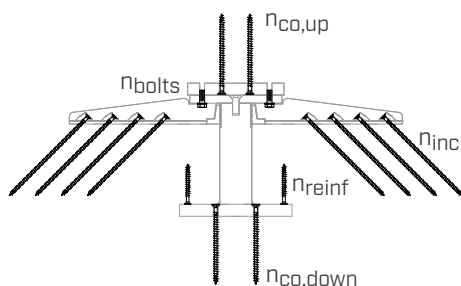
Also available for intermediate t_{CLT} thickness values not shown in the table.

Each code includes the following components:



CODES AND DIMENSIONS

NUMBER OF SCREWS FOR EACH CONNECTOR



	SPI60S - SPI80S - SPI100S-SPI100L - SPI120L	SPI80M - SPI80L - SPI100M - SPI120S - SPI120M	
n_{incl}	48	48	VGS Ø9
$n_{co,up}$	4	4	VGS Ø11
$n_{co,down}$	4	4	VGS Ø11
n_{bolts}	4	4	SPBOLT1235 - SPROD1270
n_{reinf}	14	16	VGS Ø9

Screws and bolts not included in the package.
The n_{reinf} reinforcement screws are optional.

ADDITIONAL PRODUCTS - FASTENING

SCREWS

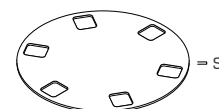
type	description		d [mm]	support	page
HBS PLATE	pan head screw		8		573
VGS	fully threaded countersunk screw		9-11		575

BOLTS - METRIC

CODE	description		d [mm]	L [mm]	SW [mm]	page
SPBOLT1235	hexagonal head bolt 8.8 DIN 933 EN 15048		M12	35	19	-
SPROD1270	threaded rod 8.8 DIN 976-1		M12	70	-	-
MUT93412	hexagonal nut class 8 DIN 934-M12		M12	-	19	178
ULS13242	DIN 125 washer					176

ASSEMBLY ACCESSORIES

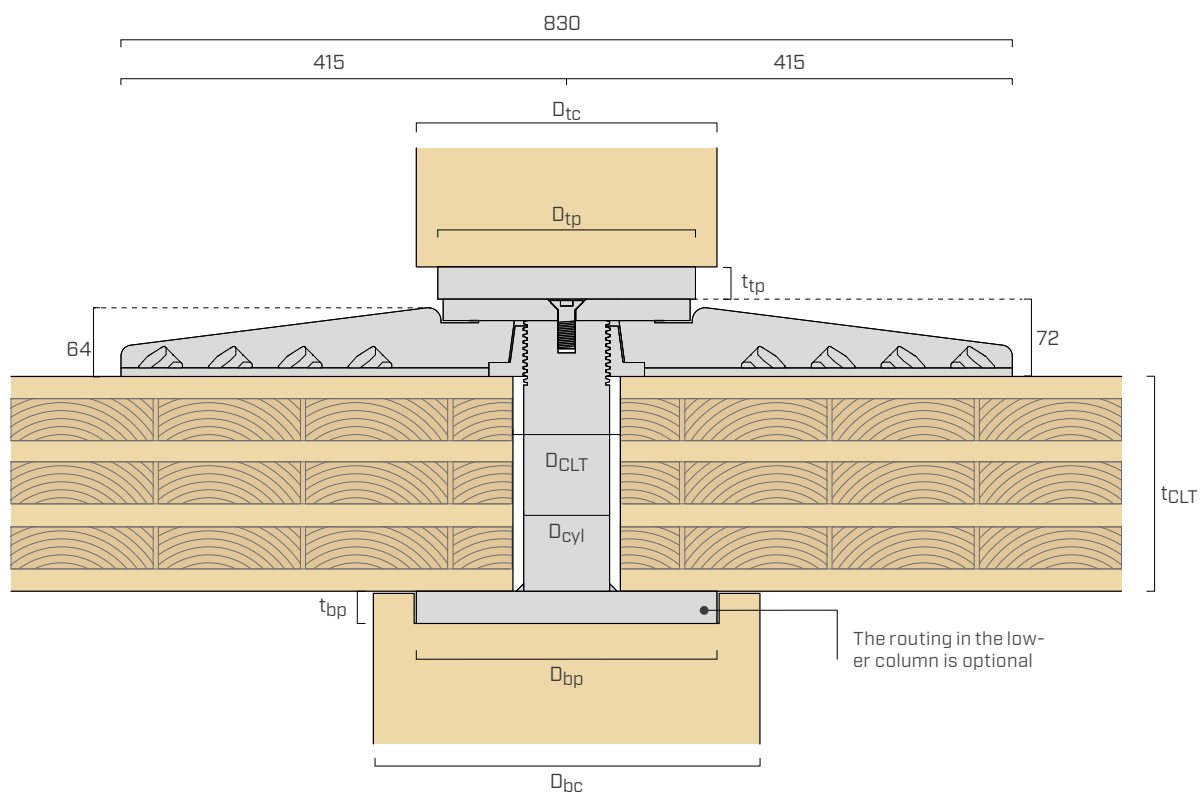
CODE	description	s [mm]	pcs
SPISHIM10	levelling shim	1	20
SPISHIM20	levelling shim	2	10



The **data sheet** complete with **structural values**
is available at www.rothoblaas.com



■ GEOMETRY AND MATERIALS



CONNECTOR

MODEL	bottom plate			cylinder		disc	top plate		
	$D_{bp} \times t_{bp}$ [mm]	shape	material	D_{cyl} [mm]	material		$D_{tp} \times t_{tp}$ [mm]	shape	material
SPI60S	200 x 30	○	S355	60	S355	S355	200 x 20	○ ⁽¹⁾	S355
SPI80S	240 x 30	○	S355	80	S355	S355	200 x 20	○	S355
SPI80M	280 x 30	○	S690	80	S355	S355	240 x 30	○	S355
SPI80L	280 x 40	□	S690	80	S355	S355	280 x 30	○	S690
SPI100S	240 x 30	○	S690	100	S355	S355	240 x 20	○	S690
SPI100M	280 x 30	○	S690	100	S355	S355	280 x 30	○	S690
SPI120S	280 x 30	○	S690	120	S355	S355	280 x 30	○	S690
SPI120M	280 x 40	□	S690	120	S355	S355	280 x 40	□	S690
SPI100L	240 x 20	○	S690	100	1,7225	S690	_ ⁽²⁾		
SPI120L	240 x 20	○	S690	120	1,7225	S690	_ ⁽²⁾		

⁽¹⁾SPI60S includes optional top plate.

⁽²⁾SPI100L and SPI120L provide for fastening on steel columns without using the top plate.

COLUMNS AND CLT PANELS

MODEL	upper column	lower column	CLT panel	reinforcement (optional)	
	$D_{tc,min}$ [mm]	$D_{bc,min}$ [mm]	D_{CLT} [mm]	D_{reinf} [mm]	n_{reinf}
SPI60S	200	200	80	170	14
SPI80S	200	240	100	210	14
SPI80M	240	280	100	240	16
SPI80L	280	280	100	240	16
SPI100S	240	240	120	210	14
SPI100M	280	280	120	240	16
SPI120S	280	280	140	240	16
SPI120M	280	280	140	240	16
SPI100L	240	240	120	210	14
SPI120L	240	240	140	220	14

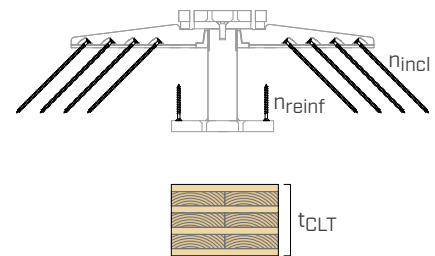
GEOMETRY AND MATERIALS

CHARACTERISTICS OF CLT PANELS

Parameter	$160 \text{ mm} \leq t_{\text{CLT}} < 200 \text{ mm}$	$t_{\text{CLT}} \geq 200 \text{ mm}$
EI_x/EI_y	0.68 - 1.46	0.84 - 1.19
$GA_{z,x}/GA_{z,y}$	0.71 - 1.40	0.76 - 1.31
Min (EI_x, EI_y)	1525 kNm ² /m	3344 kNm ² /m
Min ($GA_{z,x}, GA_{z,y}$)	11945 kNm/m	17708 kNm/m
Lamellas thickness	$\leq 40 \text{ mm}$	$\leq 40 \text{ mm}$
B/t lamellas width - thickness ratio	$\geq 3,5$	$\geq 3,5$
Minimum strength class according to EN 338	C24/T14	C24/T14
Dimensional tolerance on CLT panel thickness	$\pm 2 \text{ mm}$	$\pm 2 \text{ mm}$
EI_x, EI_y	Bending stiffness for x and y directions for the 1 m wide CLT panel	
$GA_{z,x}, GA_{z,y}$	Shear stiffness for x and y directions for the 1 m wide CLT panel	
x	Direction parallel to the upper lamellas grain	
y	Direction perpendicular to the upper lamellas grain	

CLT PANEL SCREWS

t_{CLT} [mm]	inclined screws n_{incl} [pcs - $\varnothing \times L$]	optional reinforcement screws n_{reinf} [pcs - $\varnothing \times L$]
160	48 VGS $\varnothing 9 \times 200$	VGS $\varnothing 9 \times 100$
180	48 VGS $\varnothing 9 \times 240$	VGS $\varnothing 9 \times 100$
200	48 VGS $\varnothing 9 \times 280$	VGS $\varnothing 9 \times 100$
220	48 VGS $\varnothing 9 \times 280$	VGS $\varnothing 9 \times 120$
240	48 VGS $\varnothing 9 \times 320$	VGS $\varnothing 9 \times 120$
280	48 VGS $\varnothing 9 \times 360$	VGS $\varnothing 9 \times 140$
320	48 VGS 9×400	VGS 9×160
320 (160 + 160)	48 VGS $\varnothing 9 \times 400$	VGS $\varnothing 9 \times 160$

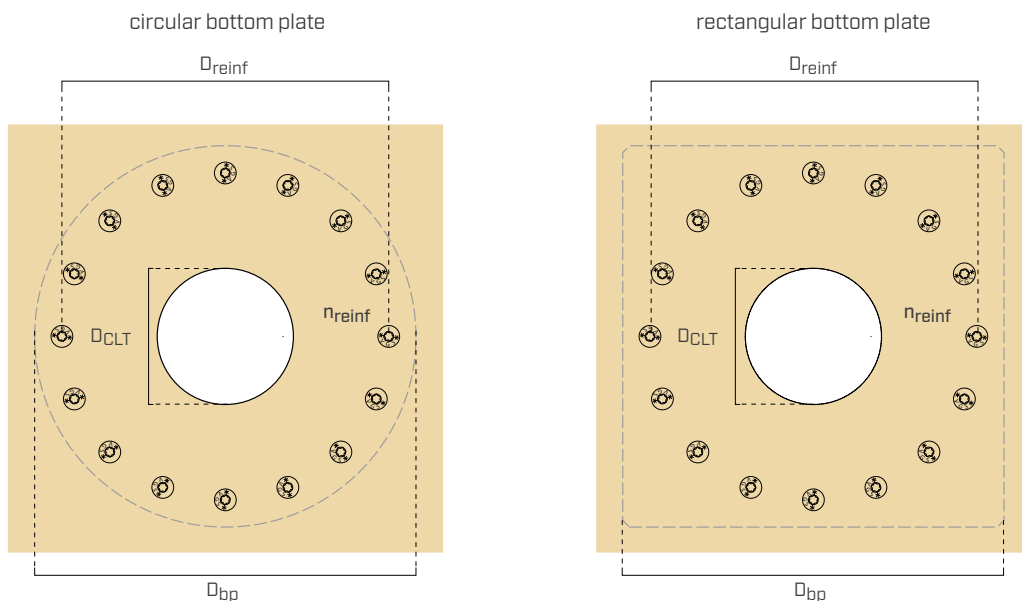


Rules for panel thickness values not included in the table:

- for inclined screws use the length provided for the panel with lower thickness;
- for the reinforcement screws use the length provided for the panel with greater thickness.

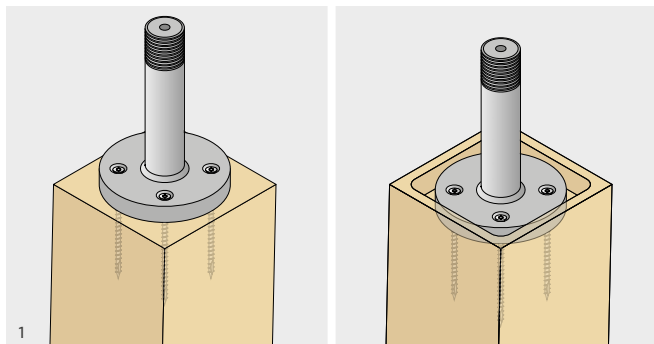
Example: for CLT panels with thickness of 250 mm we will use VGS $\varnothing 9 \times 320$ inclined screws and VGS $\varnothing 9 \times 140$ reinforcement screws.

REINFORCEMENT SCREWS (OPTIONAL)

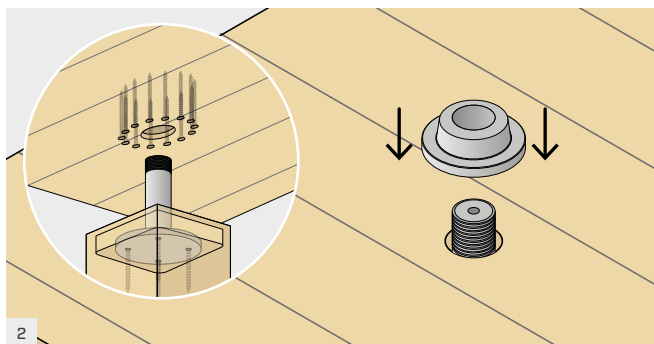


INTELLECTUAL PROPERTY

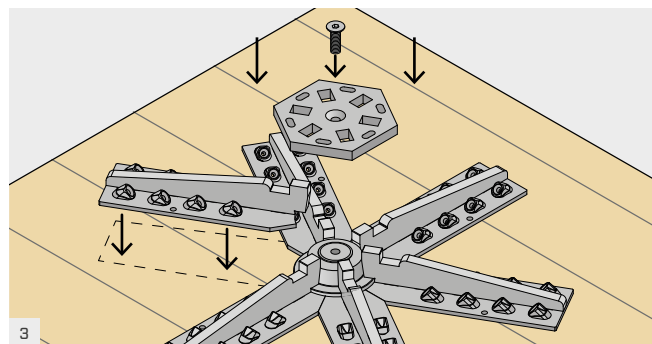
- SPIDER is protected by patent EP3.384.097B1.



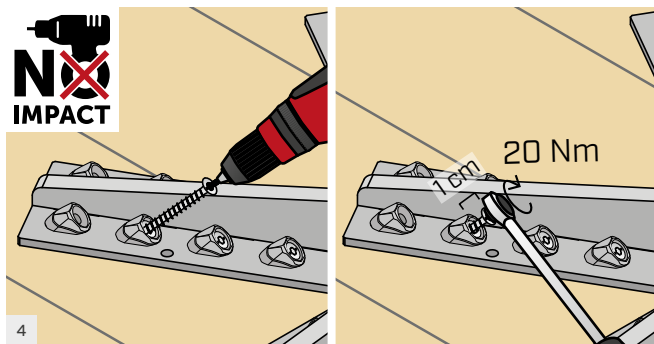
Fasten the bottom plate to the upper face of the column using the VGS Ø11 screws in accordance with the relevant installation instructions. It is possible to conceal the bottom plate in a routing prepared in the column. For installation on steel columns it is possible to use M12 countersunk head bolts. Use suitable countersunk head connectors in case of installation on reinforced concrete columns. To avoid eccentricity of the column axis line, it is essential to centre the base plate in relation to the column.



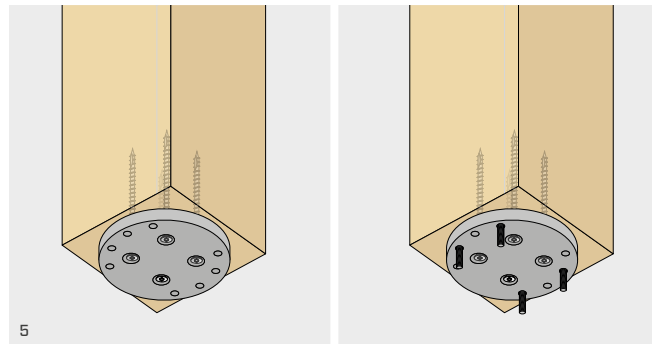
Fit the pre-drilled CLT panel with a circular hole of D_{CLT} diameter onto the cylinder. A compression reinforcement can be fitted to the bottom of the panel to increase strength. Screw the cone to the cylinder until it makes contact with the surface of the CLT panel.



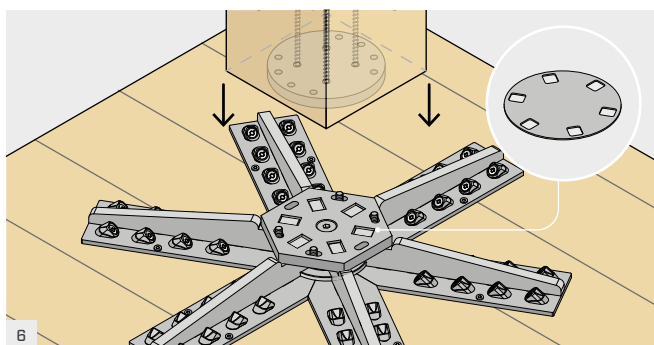
Place the 6 arms on the top surface of the CLT panel and cone. Insert the hexagonal disc in order to fit the 6 arms and fasten the countersunk head screw with a 10 or 12 mm male hexagonal wrench.



With a NON-PULSE screwdriver, insert the 48 VGS Ø9 screws inside the inclined washers, respecting the 45° insertion angle (use the JIGVGU945 pre-drilling template). Tighten by stopping about 1 cm from the washer and complete the screwing using a torque wrench by applying an insertion torque of 20 Nm.

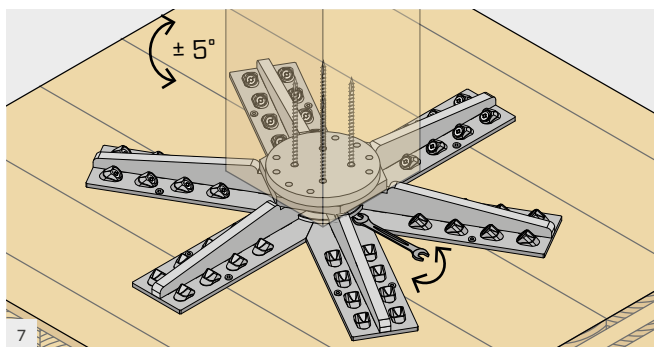


Fasten the upper plate to the lower face of the column using the VGS Ø11 screws, in accordance with the relevant installation instructions. The top plate is equipped with suitable threaded holes for fastening to the hexagonal disc. If SPRODS are used, after positioning the plate on the upper column, they must be screwed in, taking care to mark the minimum pull-through length in the upper plate.



Place the upper column on the hexagonal disc and fasten it using 4 SPBOLT1235 bolts with UL5125 washer. If the option with SPRODS was chosen, the fastening is completed using a washer and a hexagonal nut. In the case of an upper steel column, the upper plate must not be used and the column must be equipped with a suitable steel plate with holes for fastening the 4 SPBOLT1235 or 4 SPROD bolts.

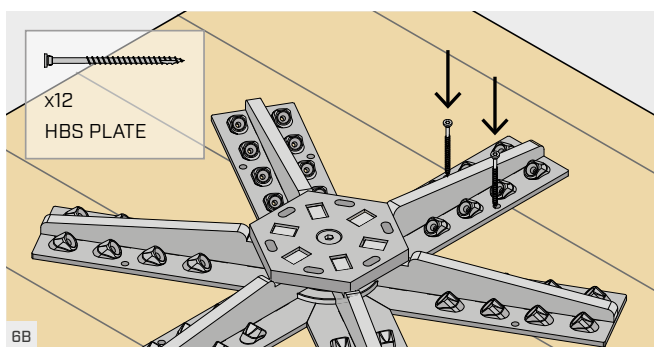
In the event of a misalignment of the column set-up dimension, e.g. due to cutting tolerances, it is possible to compensate for this by means of the SPISHIM10 (1mm) or SPISHIM20 (2mm) shims, or a combination of these two.



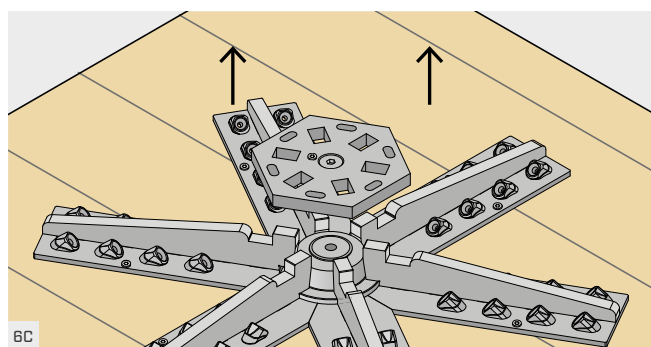
The slotted holes in the hexagonal disc allow the column to be rotated $\pm 5^\circ$. Turn the column to the correct position and tighten the 4 SPBOLT1235 bolts or MUT hex nuts of the SPRODS using a side wrench.

SPECIAL INSTRUCTIONS FOR SPI100S - SPI100M - SPI100L - SPI120S - SPI120M - SPI120L

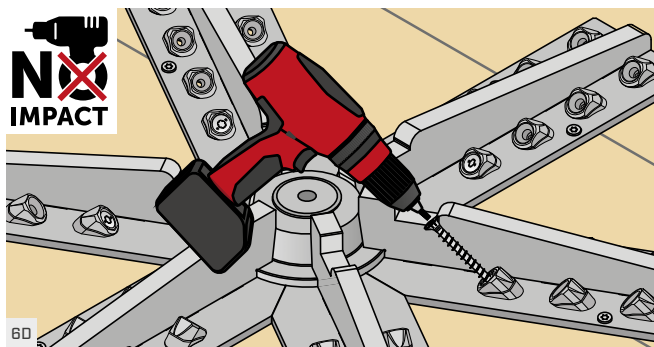
For SPIDER connectors with cylinder diameter $D_{cyl} = 100$ or 120 mm, the hexagonal disc dimension is increased. In this case, the phase **6A** must be replaced with phases **6B** - **6F**.



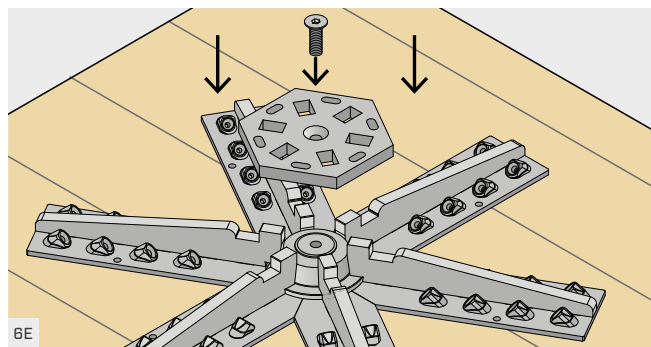
After inserting the hexagonal disc and countersunk head screw, insert 12 HBSP8120 screws into the 12 vertical holes provided in the 6 arms. These screws will hold the arms in place in the following phases.



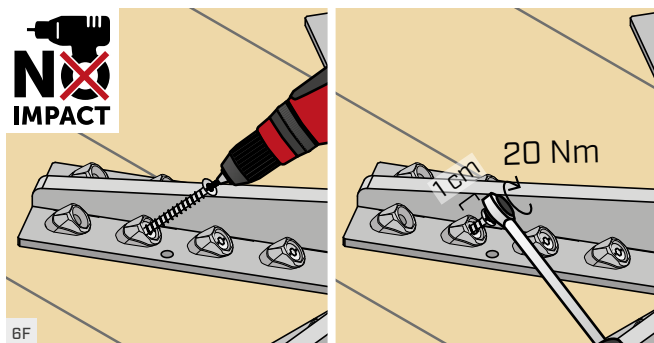
Unscrew the countersunk head screw and remove the hexagonal disc.



With a NON-PULSE screwdriver, insert the 12 VGS Ø9 screws inside the inclined washers closest to the cylinder, respecting the 45° insertion angle (use the JIGVGU945 pre-drilling template). Screw it in stopping about 1 cm from the washer.



Insert the hexagonal disc and secure the countersunk head screw with a 10 or 12 mm male hexagonal wrench.



With a NON-PULSE screwdriver, insert the remaining 36 VGS Ø9 screws inside the inclined washers, respecting the 45° insertion angle (use the JIGVGU945 pre-drilling template). Tighten by stopping about 1 cm from the washer and complete the screwing using a torque wrench by applying an insertion torque of 20 Nm.