VGZ

CE
ETA 11/0030

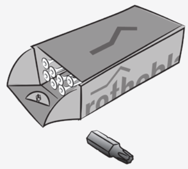
Total thread connector with cylindrical head

Carbon steel with white galvanic zinc coating

software myProject

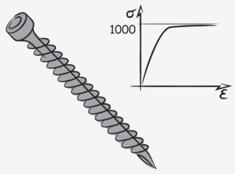
PACKAGING

Box + BIT



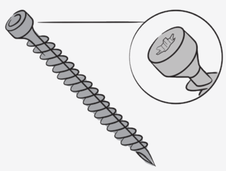
SPECIAL STEEL

Deep thread and high resistance steel ($f_{y,k}$ = 1000 N/mm^2) for excellent tensile performance



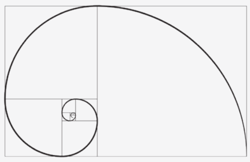
CYLINDRICAL HEAD

Cylindrical head that is hidden in the wood



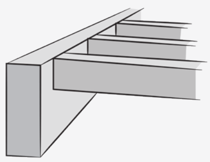
DIAMETERS Ø5, Ø7 AND Ø9

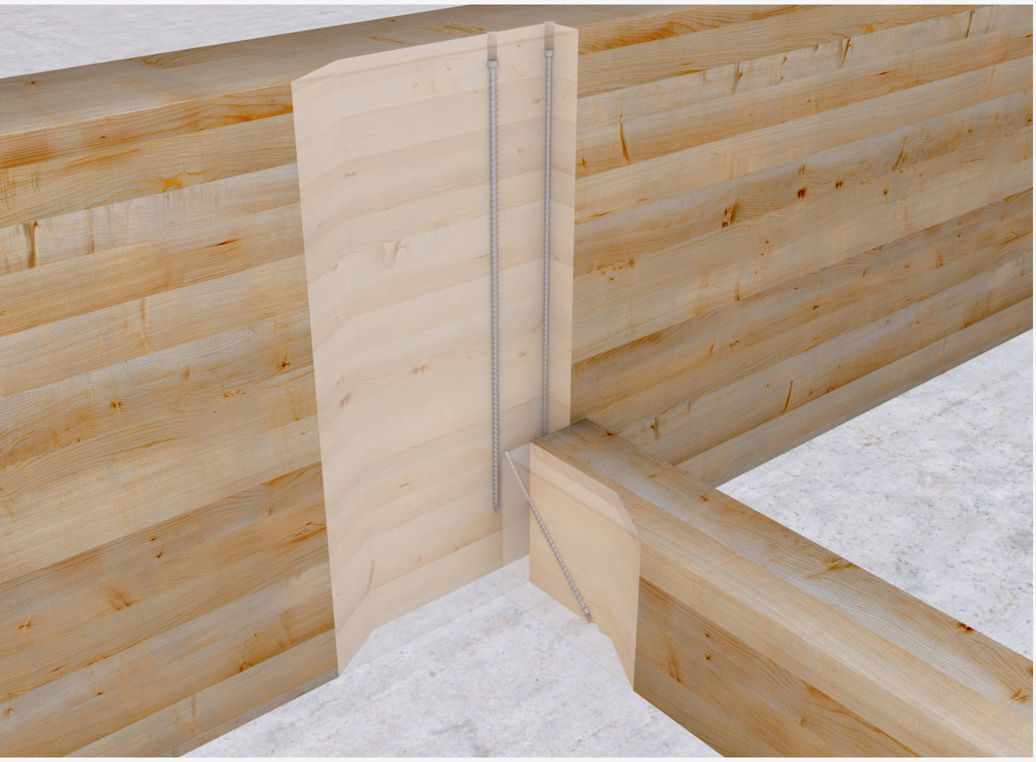
Optimise the minimum dimensions of the beams to be joined



FIELDS OF USE

Solid-wood, glulam, X-Lam, LVL, wood-based-panel joints, reinforcements and couplings. Service classes 1 and 2





CONCEALED JUNCTION

The pair of connectors at a 45° angle guarantees a highly resistant and rigid retractable junction, protected from fire and appropriate for earthquakes

COUPLING

The total thread of the connector placed at an angle guarantees high rigidity for the joint, ideal for coupling beams and floors

REINFORCEMENT

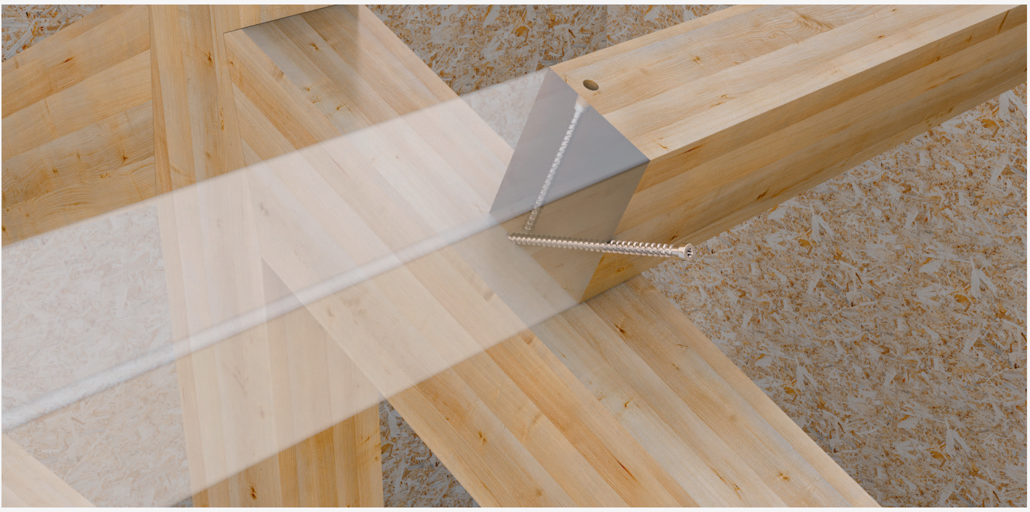
The total thread distributes the perpendicular tensile stress to the fibres along the height of the beam, guaranteeing reinforcement

Applications

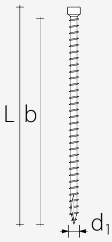
High performance fastening of X-Lam flooring placed side by side

Fastening of X-Lam flooring to X-Lam walls for major stresses

Inclined fastening of the secondary rafter on the main beam



Codes and dimensions

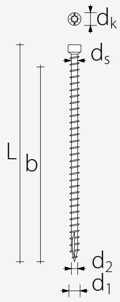


d_1 [mm]	code	L [mm]	b [mm]	pcs/pckg
5,3* *TX25*	**VGZ580**	80	70	50
	VGZ5100	100	90	
	VGZ5120	120	110	
5,6* *TX25*	**VGZ5140**	140	130	50
	VGZ5160	160	150	
7 *TX30*	**VGZ7100**	100	90	25
	VGZ7140	140	130	
	VGZ7180	180	170	
	VGZ7220	220	210	
	VGZ7260	260	250	
	VGZ7300	300	290	
	VGZ7340	340	330	
9 *TX40*	**VGZ9160**	160	150	25
	VGZ9200	200	190	
	VGZ9240	240	230	
	VGZ9280	280	270	
	VGZ9320	320	310	
	VGZ9360	360	350	
	VGZ9400	400	390	
	VGZ9450	450	440	
	VGZ9500	500	490	

* Diameter 5,3 and 5,6 screws have not been granted the CE mark.

Geometry and minimum distances

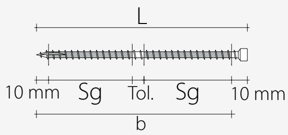
GEOMETRY AND MECHANICAL CHARACTERISTICS



VGZ CONNECTOR					
Nominal diameter	**d_1 [mm]**	**5,3***	**5,6***	**7**	**9**
Head diameter	d_K [mm]	8,0	8,0	9,50	11,50
Tip diameter	d_2 [mm]	3,6	3,8	4,60	5,90
Shank diameter	d_S [mm]	3,95	4,15	5,00	6,50
Pre-bored hole diameter	d_V [mm]	3,0	3,0	4,0	5,0
Characteristic yield moment	$M_{y,k}$ [Nmm]	6303,3	7273,5	14174,2	27244,1
Characteristic extraction-resistance parameter	$f_{ax,k}$ [N/mm^2]	11,7	11,7	11,7	11,7
Characteristic tensile strength	$f_{tens,k}$ [kN]	8,8	9,9	15,4	25,4
Characteristic yield strength	$f_{y,k}$ [N/mm^2]	1000	1000	1000	1000

* Mechanical parameters used for the calculation.

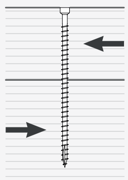
EFFECTIVE THREAD USED IN CALCULATION



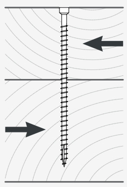
b = L - 10 mm represents the entire length of the threaded part.
s_g = (L - 10 mm - 10 mm - Tol.) / 2 represents the partial length of the threaded part net of a laying tolerance (Tol.) di posa di 10 mm.

The extraction, shear and sliding values were calculated placing the centre of gravity of the connector in correspondence with the shear plane and considering an effective thread of Sg.

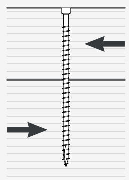
MINIMUM DISTANCES FOR SHEAR LOADS (1)



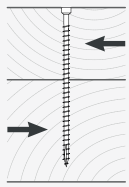
Angle between strength and grain α = 0°



Angle between strength and grain α = 90°



Angle between strength and grain α = 0°

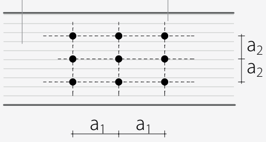


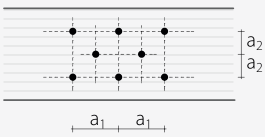
Angle between strength and grain α = 90°

		SCREWS INSERTED WITHOUT PRE-BORED HOLES								SCREWS INSERTED WITH PRE-BORED HOLES							
		5,3	**5,6**	**7**	**9**	**5,3**	**5,6**	**7**	**9**	**5,3**	**5,6**	**7**	**9**	**5,3**	**5,6**	**7**	**9**
a_1	[mm]	64	67	84	108	27	28	35	45	27	28	35	45	21	22	28	36
a_2	[mm]	27	28	35	45	27	28	35	45	16	17	21	27	21	22	28	36
$a_{3,t}$	[mm]	80	84	105	135	53	56	70	90	64	67	84	108	37	39	49	63
$a_{3,c}$	[mm]	53	56	70	90	53	56	70	90	37	39	49	63	37	39	49	63
$a_{4,t}$	[mm]	27	28	35	45	53	56	70	90	16	17	21	27	37	39	49	63
$a_{4,c}$	[mm]	27	28	35	45	27	28	35	45	16	17	21	27	16	17	21	27

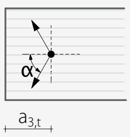
Direction of the grain

Means of connection

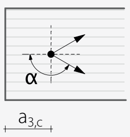




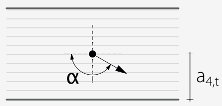
stressed end
-90° < α < 90°



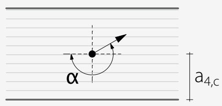
discharged end
90° < α < 270°



stressed edge
0° < α < 180°

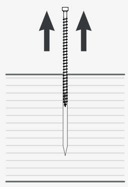


unload edge
180° < α < 360°



Geometry and minimum distances

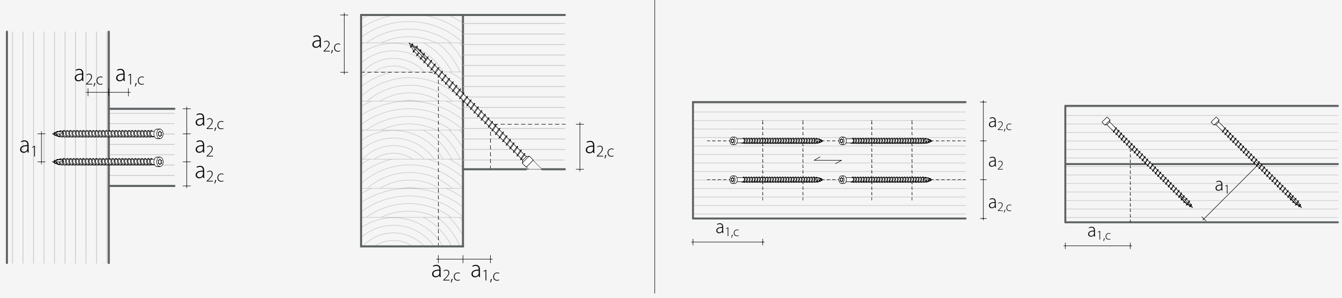
MINIMUM DISTANCES FOR AXIAL STRESSES (2)



		SCREWS INSERTED WITHOUT PRE-BORED HOLES				SCREWS INSERTED WITH PRE-BORED HOLES			
		5,3	**5,6**	**7**	**9**	**5,3**	**5,6**	**7**	**9**
a_1	[mm]	27	28	35	45	27	28	35	45
a_2	[mm]	27	28	35	45	27	28	35	45
$a_{2,LIM}$ (3)	[mm]	13	14	18	23	13	14	18	23
$a_{1,C}$	[mm]	53	56	70	90	53	56	70	90
$a_{2,C}$	[mm]	21	22	28	36	16	17	21	27
a_{CROSS}	[mm]	8	8	11	14	8	8	11	14

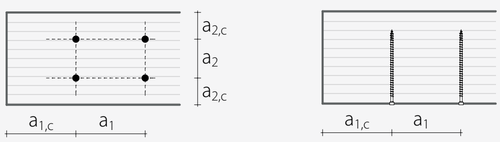
SCREWS UNDER TRACTION INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN

Plan | Front | Plan | Front



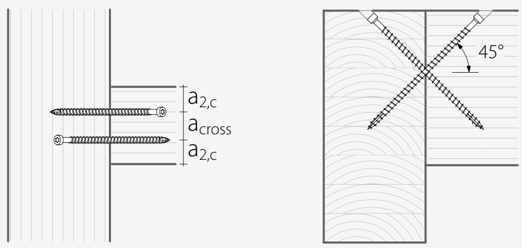
SCREWS INSERTED WITH A 90° ANGLE WITH RESPECT TO THE GRAIN

Plan | Front



CROSS SCREWS INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN

Plan | Front



NOTE

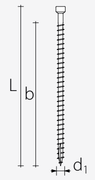
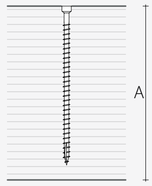
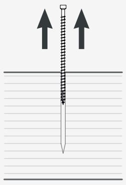
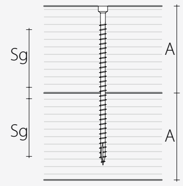
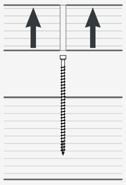
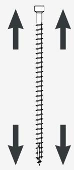
(1) The minimum distances are in accordance with EN 1995:2008, according to ETA-11/0030, considering a mass density of the wood elements of $\rho_k \leq 420$ kg/m³.

(2) The minimum distances for connectors stressed axially are independent of the insertion angle of the connector and the angle of the force with respect to the grain, in accordance with ETA-11/0030.

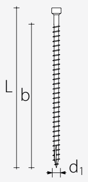
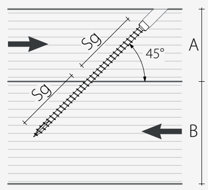
(3) The axial distance a_2 can be reduced down to $2{,}5 \cdot d_1$ if for each connector a "joint surface" $a_1 \cdot a_2 = 25 \cdot d_1^2$ is maintained.

Designer statics

TRACTION (1)

geometry		total thread withdrawal (2)			partial thread withdrawal (2)			steel traction
				 wood			 wood	 steel
d_1 [mm]	L [mm]	b [mm]	A_{min} [mm]	$R_{ax,k}$ [kN]	s_g [mm]	A_{min} [mm]	$R_{ax,k}$ [kN]	$R_{tens,k}$ [kN]
5,3	80	70	90	4,64	25	45	1,66	8,80
	100	90	110	5,96	35	55	2,32	
	120	110	130	7,28	45	65	2,98	
5,6	140	130	150	9,10	55	75	3,85	9,90
	160	150	170	10,50	65	85	4,55	
7	100	90	110	7,87	35	55	3,06	15,40
	140	130	150	11,37	55	75	4,81	
	180	170	190	14,87	75	95	6,56	
	220	210	230	18,37	95	115	8,31	
	260	250	270	21,87	115	135	10,06	
	300	290	310	25,37	135	155	11,81	
	340	330	350	28,86	155	175	13,56	
9	160	150	170	16,87	65	85	7,31	25,40
	200	190	210	21,37	85	105	9,56	
	240	230	250	25,87	105	125	11,81	
	280	270	290	30,36	125	145	14,06	
	320	310	330	34,86	145	165	16,31	
	360	350	370	39,36	165	185	18,56	
	400	390	410	43,86	185	205	20,81	
	450	440	460	49,48	210	230	23,62	
	500	490	510	55,11	235	255	26,43	

SLIDING

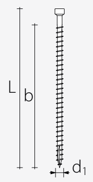
geometry			wood - wood (3)		
					
d_1 [mm]	L [mm]	S_g [mm]	A_{MIN} [mm]	B_{MIN} [mm]	$R_{V,k}$ [kN]
5,3	80	25	30	50	1,06
	100	35	40	55	1,49
	120	45	45	60	1,92
5,6	140	55	50	70	2,47
	160	65	60	75	2,92
7	100	35	40	55	1,97
	140	55	55	70	3,09
	180	75	65	85	4,22
	220	95	80	100	5,34
	260	115	95	110	6,47
	300	135	110	125	7,59
	340	155	125	140	8,72
9	160	65	60	75	4,70
	200	85	75	90	6,14
	240	105	90	105	7,59
	280	125	105	120	9,04
	320	145	115	135	10,48
	360	165	130	145	11,93
	400	185	145	160	13,37
	450	210	165	180	15,18
	500	235	180	195	16,99

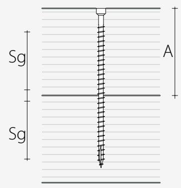
Designer statics

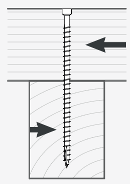
CHARACTERISTIC VALUES
EN 1995:2008

SHEAR

geometry				wood-wood







d_1 [mm]	L [mm]	S_g [mm]	A_{MIN} [mm]	$R_{V,k}$ [kN]
5,3	80	25	40	1,54
	100	35	50	1,87
	120	45	60	2,04
5,6	140	55	70	2,38
	160	65	80	2,55
7	100	35	50	2,65
	140	55	70	3,34
	180	75	90	3,78
	220	95	110	4,21
	260	115	130	4,27
	300	135	150	4,27
	340	155	170	4,27
9	160	65	80	5,06
	200	85	100	5,62
	240	105	120	6,19
	280	125	140	6,47
	320	145	160	6,47
	360	165	180	6,47
	400	185	200	6,47
	450	210	225	6,47
	500	235	250	6,47

GENERAL PRINCIPLES

- Characteristic values comply with the EN 1995:2008 standard in accordance with ETA-11/0030.
- Design values are obtained from the following characteristic values:

$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_m}$$

  The coefficients γ_m and k_{mod} should be taken according to the current regulations used for the calculation.
- For the mechanical resistance values and the geometry of the 5,3 and 5,6 diameter screws, reference was made to the parameters on page 5.
- For the mechanical resistance values and the geometry of the screws Ø7 and Ø9, reference was made to ETA-11/0030.
- In the calculations, the density of the wood elements was considered equal to $\rho_k = 380\ kg/m^3$. Characteristic resistances can also be considered as valid for larger densities, for the purposes of safety.
- Sizing and verification of the wooden elements must be done separately.
- The shear characteristic resistances are calculated for screws inserted without a pre-bored hole. In the case of screws inserted with a pre-bored hole, greater resistance values can be obtained.
- The extraction, shear and sliding values were calculated considering the centre of gravity of the connector placed in correspondence with the shear plane.
- The characteristic resistances were calculated using solid wood or glulam. In the case of joints with X-Lam elements, the resistance values may be different and should be calculated on the basis of the characteristics of the panel and the connection configuration.

NOTE

(1) The design strength of the connector is the lower between the wood-side design strength ($R_{ax,d}$) and the steel-side design strength ($R_{tens,d}$).

$$R_{ax,d} = min \begin{cases} R_{ax,k} \cdot k_{mod} \ / \ \gamma_m \\ R_{tens,k} \ / \ \gamma_{m2} \end{cases}$$

(2) The axial resistance of the thread to extraction was calculated considering a 90° angle between the fibres and the connector and for a effective thread length of b or s_g.
For intermediate s_g values it is possible to interpolate linearly.

(3) The axial resistance of the thread to extraction was calculated considering a 45° angle between the fibres and the connector and for an effective thread length of s_g.

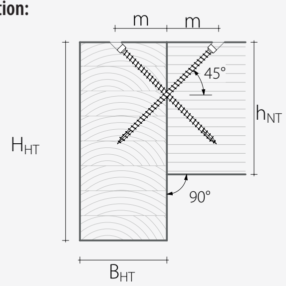
Designer statics

SHEAR CONNECTION WITH CROSSED CONNECTORS

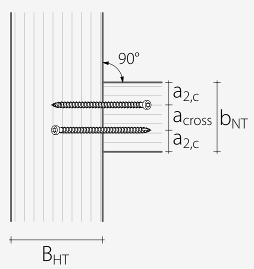
RIGHT-ANGLE JOINT - MAIN BEAM / SECONDARY BEAM

d_1 [mm]	L [mm]	s_g [mm]	$B_{HT\,min}$ [mm]	$H_{HT\,min} = h_{NT\,min}$ [mm]	$b_{NT\,min}$ [mm] without pre-bored hole	$b_{NT\,min}$ [mm] with pre-bored hole (3)	No. pairs	$R_{1\,V,k}$ (1) [kN] extraction (4)	$R_{2\,V,k}$ (1) [kN] instability	m (2) [mm]
5,3	**100**	35	55	**90**	50	40	1	3,0	8,2	38
					77	66	2	5,6	15,2	
					103	93	3	8,0	21,9	
	120	45	60	**105**	50	40	1	3,8	8,2	45
					77	66	2	7,1	15,2	
					103	93	3	10,3	21,9	
5,6	**140**	55	65	**120**	53	42	1	4,9	9,1	52
					81	70	2	9,2	17,0	
					109	98	3	13,3	24,5	
	160	65	75	**135**	53	42	1	5,8	9,1	59
					81	70	2	10,9	17,0	
					109	98	3	15,7	24,5	
7	**140**	55	65	**120**	67	53	1	6,2	13,6	53
					102	88	2	11,5	25,4	
					137	123	3	16,6	36,5	
	180	75	80	**150**	67	53	1	8,4	13,6	67
					102	88	2	15,7	25,4	
					137	123	3	22,7	36,5	
	220	95	95	**175**	67	53	1	10,7	13,6	81
					102	88	2	19,9	25,4	
					137	123	3	28,7	36,5	
	260	115	110	**205**	67	53	1	12,9	13,6	95
					102	88	2	24,1	25,4	
					137	123	3	34,8	36,5	
	300	135	125	**235**	67	53	1	15,2	13,6	109
					102	88	2	28,3	25,4	
					137	123	3	40,8	36,5	
	340	155	140	**260**	67	53	1	17,4	13,6	124
					102	88	2	32,5	25,4	
					137	123	3	46,9	36,5	
9	**160**	65	75	**135**	86	68	1	9,4	22,8	61
					131	113	2	17,5	42,6	
					176	158	3	25,3	61,3	
	200	85	90	**165**	86	68	1	12,3	22,8	75
					131	113	2	22,9	42,6	
					176	158	3	33,0	61,3	
	240	105	100	**190**	86	68	1	15,2	22,8	89
					131	113	2	28,3	42,6	
					176	158	3	40,8	61,3	
	280	125	115	**220**	86	68	1	18,1	22,8	103
					131	113	2	33,7	42,6	
					176	158	3	48,6	61,3	
	320	145	130	**250**	86	68	1	21,0	22,8	117
					131	113	2	39,1	42,6	
					176	158	3	56,4	61,3	
	360	165	145	**275**	86	68	1	23,9	22,8	131
					131	113	2	44,5	42,6	
					176	158	3	64,1	61,3	
	400	185	160	**305**	86	68	1	26,7	22,8	145
					131	113	2	49,9	42,6	
					176	158	3	71,9	61,3	
	450	210	175	**340**	86	68	1	30,4	22,8	163
					131	113	2	56,7	42,6	
					176	158	3	81,6	61,3	
	500	235	195	**375**	86	68	1	34,0	22,8	181
					131	113	2	63,4	42,6	
					176	158	3	91,3	61,3	

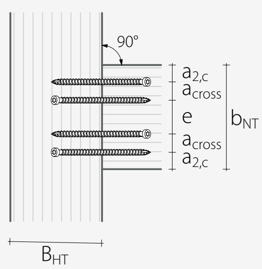
Section:



Plan - 1 pair



Plan - 2 or more pairs



Designer statics

SHEAR CONNECTION WITH CROSSED CONNECTORS

RIGHT-ANGLE JOINT - MAIN BEAM / SECONDARY BEAM

d_1 [mm]	L [mm]	s_g [mm]	$B_{HT\,min}$ [mm]	$H_{HT\,min} = h_{NT\,min}$ [mm]	$b_{NT\,min}$ [mm] without pre-bored hole	$b_{NT\,min}$ [mm] with pre-bored hole [3]	No. pairs	$R_{1V,k}$ [1] [kN] extraction [4]	$R_{2V,k}$ [1] [kN] instability	m [2] [mm]
11	**200**	85	90	**165**	105	83	1	15,0	29,1	78
					160	138	2	28,0	54,2	
					215	193	3	40,4	78,1	
	250	110	105	**200**	105	83	1	19,4	29,1	95
					160	138	2	36,3	54,2	
					215	193	3	52,2	78,1	
	300	135	125	**235**	105	83	1	23,9	29,1	113
					160	138	2	44,5	54,2	
					215	193	3	64,1	78,1	
	350	160	140	**270**	105	83	1	28,3	29,1	131
					160	138	2	52,8	54,2	
					215	193	3	76,0	78,1	
	400	185	160	**305**	105	83	1	32,7	29,1	148
					160	138	2	61,0	54,2	
					215	193	3	87,9	78,1	
	450	210	175	**340**	105	83	1	37,1	29,1	166
					160	138	2	69,2	54,2	
					215	193	3	99,7	78,1	
	500	235	195	**380**	105	83	1	41,5	29,1	184
					160	138	2	77,5	54,2	
					215	193	3	111,6	78,1	
	550	260	210	**415**	105	83	1	45,9	29,1	201
					160	138	2	85,7	54,2	
					215	193	3	123,5	78,1	
	600	285	230	**450**	105	83	1	50,4	29,1	219
					160	138	2	94,0	54,2	
					215	193	3	135,4	78,1	

VGS connectors, countersunk head Ø9 and Ø11: see VGS

MINIMUM RECOMMENDED DISTANCES [mm]

without pre- bored hole	$a_{2,c}$	a_{cross}	e
5,3	21	8	19
5,6	22	8	20
7	28	11	25
9	36	14	32
11	44	17	39

with pre- bored hole	$a_{2,c}$	a_{cross}	e
5,3	16	8	19
5,6	17	8	20
7	21	11	25
9	27	14	32
11	33	17	39

	pre-bored hole d_v [mm]
5,3	3,0
5,6	3,0
7	4,0
9	5,0
11	6,0

pre-bored hole required for connectors Ø11 ≥ 400 mm

GENERAL PRINCIPLES

- Characteristic values comply with the EN 1995:2008 standard in accordance with ETA-11/0030.
- In the calculations, the density of the wood elements was considered equal to $\rho_k = 380\ kg/m^3$.
- Sizing and verification of the wooden elements must be done separately.

NOTE

(1) The design strength of the connector is the lower between the extraction-side design strength ($R_{1V,d}$) and the instability design strength ($R_{2V,d}$).

$$R_{V,d} = min \begin{cases} R_{1V,k} \cdot k_{mod} \;/\; \gamma_m \\ R_{2V,k} \;/\; \gamma_{m1} \end{cases}$$

(2) The assembly figure (m) is valid in the case of laying of the connectors flush over the elements.

(3) In practice it is possible to reduce the minimum distances by inserting the connectors with a pre-bored hole.

(4) The axial resistance of the thread to extraction was calculated considering an effective thread length equal to s_g. The connectors must be inserted at 45° with respect to the shear plane. The centre of gravity of the connectors must be placed in correspondence with the shear plane.

- For different calculation methods, the myProject software is available (www.rothoblaas.com).