VGS A4

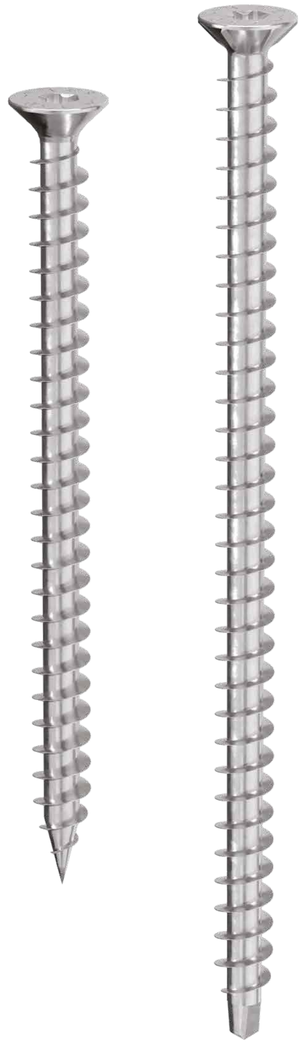
FULL THREAD CONNECTOR WITH COUNTERSUNK HEAD

ELC-4645 | ESR-4645 | ETA-11/0030

A4 | AISI316
A4 | AISI316 austenitic stainless steel for high corrosion resistance. Ideal for environments adjacent to the sea in corrosivity class C5 and for insertion on the most aggressive timbers in class T5.

T5 TIMBER CORROSIVITY
Suitable for use in applications on agressive woods with an acidity (pH) level below 4 such as oak, Douglas fir and chestnut, and in wood moisture conditions above 20%.

EXPOSED STRUCTURAL USE
VGS A4 is the structural wood screw with total thread, perfect for making joints that require high tension or sliding strength in extremely aggressive environments.

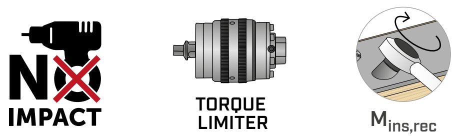


MANUALS

BIT INCLUDED

DIAMETER [mm]	9 (9 – 11) 15
LENGTH [mm]	80 (100 – 600) 2000
SERVICE CLASS	SC1 SC2 SC3 SC4
ATMOSPHERIC CORROSIVITY	C1 C2 C3 C4 C5
WOOD CORROSIVITY	T1 T2 T3 T4 T5
MATERIAL	A4 AISI 316 — A4 | AISI316 austenitic stainless steel (CRC III)

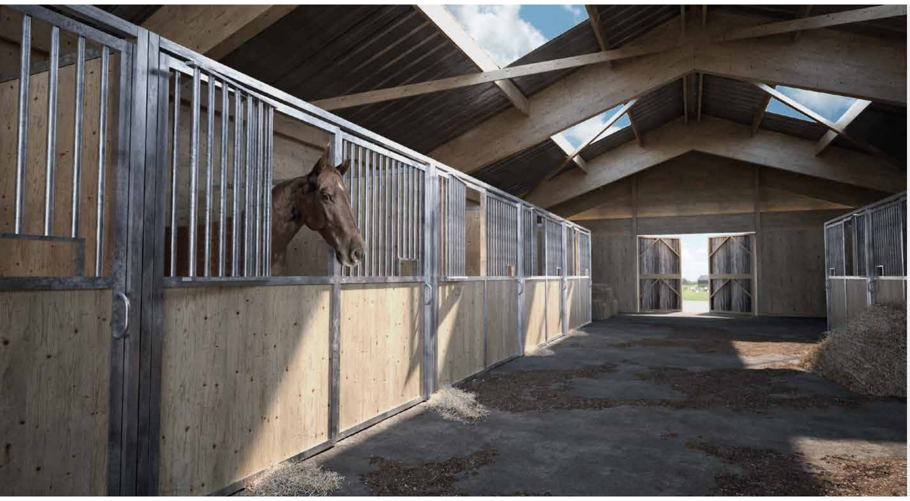
METAL-to-TIMBER recommended use:



FIELDS OF USE

- timber based panels
- solid timber and glulam
- CLT and LVL
- ACQ, CCA treated timber

rothoblaas



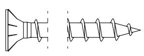
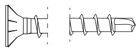
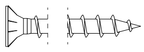
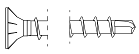
HYBRID STEEL-TIMBER STRUCTURES

Ideal for steel structures where high-strength customised connections are required, particularly in adverse climatic contexts such as the marine environment and acidic woods.

SWELLING OF TIMBER

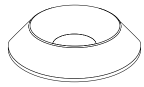
Application in combination with polymeric interlayers such as XYLOFON WASHER gives the joint a certain adaptability to mitigate stresses resulting from shrinkage/swelling of the wood.

CODES AND DIMENSIONS

d_1 [mm]	CODE	L [mm]	b [mm]	pcs	
9 TX 40	VGS9120A4	120	110	25	
	VGS9160A4	160	150	25	
	VGS9200A4	200	190	25	
	VGS9240A4	240	230	25	
	VGS9280A4	280	270	25	
	VGS9320A4	320	310	25	
	VGS9360A4	360	350	25	
11 TX 50	VGS11100A4	100	90	25	
	VGS11150A4	150	140	25	
	VGS11200A4	200	190	25	
	VGS11250A4	250	240	25	
	VGS11300A4	300	290	25	
	VGS11350A4	350	340	25	
	VGS11400A4	400	390	25	
	VGS11500A4	500	490	25	
	VGS11600A4	600	590	25	

A4
AISI 316

HUS A4 - turned washer



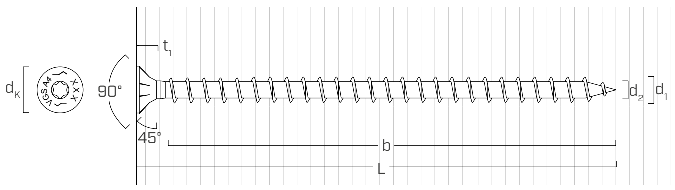
CODE	$d_{VGS\ A4}$ [mm]	pcs
HUS8A4	9	100
HUS10A4	11	50

RELATED PRODUCTS

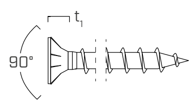
TORQUE LIMITER
TORQUE LIMITER

JIG VGZ 45°
TEMPLATE FOR 45° SCREWS

GEOMETRY AND MECHANICAL CHARACTERISTICS

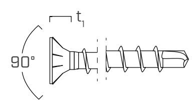


VGS Ø9
L ≤ 240 mm



VGS Ø11
L ≤ 250 mm

VGS Ø9
240 mm < L ≤ 360 mm



VGS Ø11
250 mm < L ≤ 600 mm

Nominal diameter	d_1	[mm]	9	11
Head diameter	d_K	[mm]	16,00	19,30
Head thickness	t_1	[mm]	6,50	8,20
Internal thread diameter	d_2	[mm]	5,90	6,60
Pre-drilling hole diameter(1)	$d_{V,S}$	[mm]	5,0	6,0

(1) Pre-drilling valid for softwood.
Pre-drilling is mandatory for connectors with L > 400 mm or when fastening to elements with a characteristic density ρ_k>500 kg/m^3.

CHARACTERISTIC MECHANICAL PARAMETERS

Nominal diameter	d_1	[mm]	9	11
Tensile strength	$f_{tens,k}$	[kN]	21,0	27,0
Yield moment	$M_{y,k}$	[Nm]	24,0	34,0
Yield strength	$f_{y,k}$	[N/mm^2]	550	550
Recommended insertion moment	$M_{ins,rec}$	[Nm]	18,0	29,0

The specified insertion moment is to be considered as the maximum applicable value; valid for applications on metal plates.
Installation must stop as soon as the screw head comes into contact with the metal element.

			softwood *(softwood)*
Withdrawal resistance parameter	$f_{ax,k}$	[N/mm^2]	11,7
Associated density	ρ_a	[kg/m^3]	350
Calculation density	ρ_k	*[kg/m^3]*	*≤ 440*

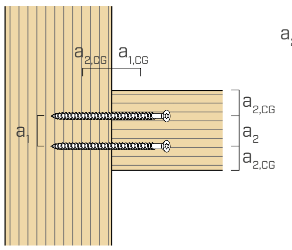
For applications with different materials please see ETA-11/0030.

MINIMUM DISTANCES FOR AXIAL STRESSES

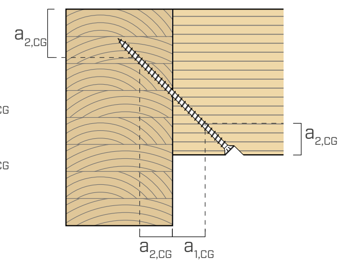
screws inserted **WITH and WITHOUT pre-drilled hole**

d_1	[mm]		9	11
a_1	[mm]	5·d	45	55
a_2	[mm]	5·d	45	55
$a_{2,LIM}$	[mm]	2,5·d	23	28
$a_{1,CG}$	[mm]	10·d	90	110
$a_{2,CG}$	[mm]	4·d	36	44
a_{CROSS}	[mm]	1,5·d	14	17

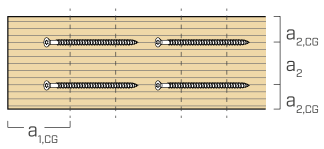
SCREWS UNDER TENSION INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN



plan



front



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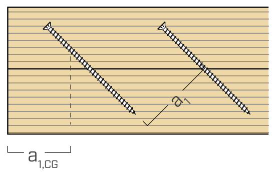
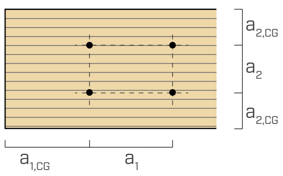


front

SCREWS INSERTED WITH α = 90° ANGLE WITH RESPECT TO THE GRAIN



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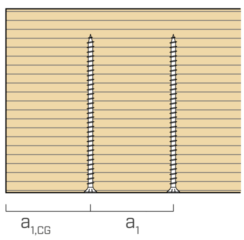

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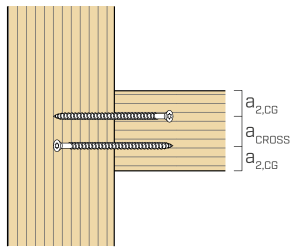
CROSS SCREWS INSERTED WITH AN ANGLE α WITH RESPECT TO THE GRAIN



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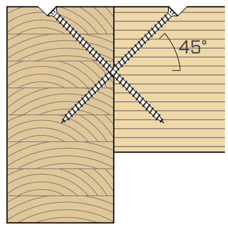
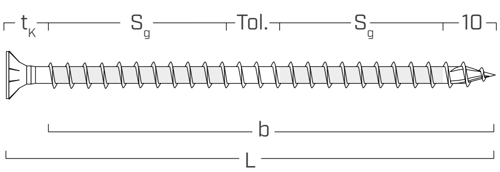


front

NOTES

- Minimum distances according to ETA-11/0030.
- The minimum distances are independent of the insertion angle of the connector and the angle of the force with respect to the grain.
- The axial distance a_2 can be reduced down to $a_{2,LIM}$ if for each connector a "joint surface" $a_1\ a_2 = 25\ d_1^2$ is maintained.
- For minimum distances for shear load screws refer to ETA-11/0030.

EFFECTIVE THREAD USED IN CALCULATION

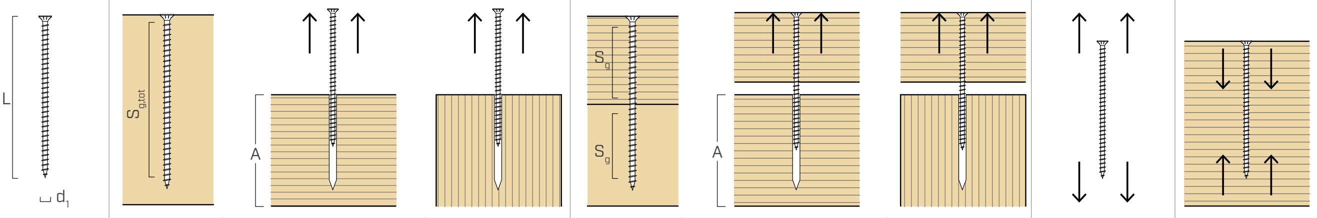


b $= S_{g,tot} = L - t_K$ — represents the entire length of the threaded part

$S_g = (L - t_K - 10\ mm - Tol.)/2$ — represents the partial length of the threaded part net of a laying tolerance (Tol.) of 10 mm

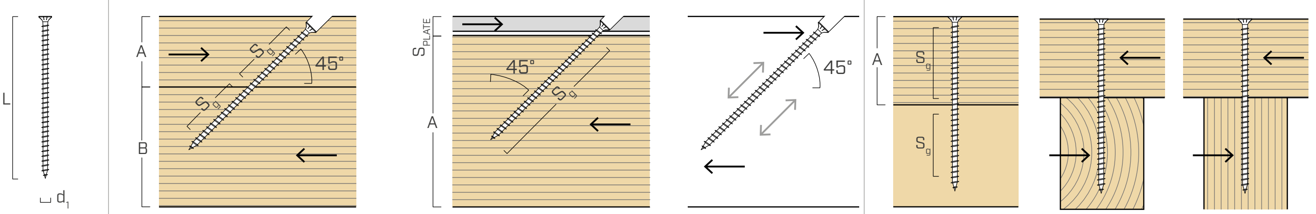
t_K = 10 mm (countersunk head)

TENSION / COMPRESSION



geometry		total thread withdrawal ε=90°			total thread withdrawal ε=0°	partial thread withdrawal ε=90°			partial thread withdrawal ε=0°	steel tension	instability ε=90°
d_1 [mm]	L [mm]	$S_{g,tot}$ [mm]	A_{min} [mm]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]	S_g [mm]	A_{min} [mm]	$R_{ax,90,k}$ [kN]	$R_{ax,0,k}$ [kN]	$R_{tens,k}$ [kN]	$R_{ki,90,k}$ [kN]
	120	110	130	12,50	3,75	45	65	5,11	1,53		
	160	150	170	17,05	5,11	65	85	7,39	2,22		
	200	190	210	21,59	6,48	85	105	9,66	2,90		
9	240	230	250	26,14	7,84	105	125	11,93	3,58	21,00	11,54
	280	270	290	30,68	9,21	125	145	14,21	4,26		
	320	310	330	35,23	10,57	145	165	16,48	4,94		
	360	350	370	39,78	11,93	165	185	18,75	5,63		
	100	90	110	12,50	3,75	35	55	4,86	1,46		
	150	140	160	19,45	5,83	60	80	8,33	2,50		
	200	190	210	26,39	7,92	85	105	11,81	3,54		
	250	240	260	33,34	10,00	110	130	15,28	4,58		
11	300	290	310	40,28	12,08	135	155	18,75	5,63	27,00	14,57
	350	340	360	47,22	14,17	160	180	22,22	6,67		
	400	390	410	54,17	16,25	185	205	25,70	7,71		
	500	490	510	68,06	20,42	235	255	32,64	9,79		
	600	590	610	81,95	24,58	285	305	39,59	11,88		

SLIDING / SHEAR



geometry		SLIDING timber-to-timber				SLIDING steel-to-timber				SLIDING steel tension	SHEAR		SHEAR timber-to-timber ε=90°	SHEAR timber-to-timber ε=0°
d_1 [mm]	L [mm]	S_g [mm]	A [mm]	B_{min} [mm]	$R_{V,k}$ [kN]	S_{PLATE} [mm]	S_g [mm]	A_{min} [mm]	$R_{V,k}$ [kN]	$R_{tens,45,k}$ [kN]	S_g [mm]	A [mm]	$R_{V,90,k}$ [mm]	$R_{V,0,k}$ [kN]
	120	45	45	60	3,62		105	95	8,44		45	60	4,33	2,24
	160	65	60	75	5,22		145	125	11,65		65	80	4,90	2,76
	200	85	75	90	6,83		185	150	14,87		85	100	5,47	3,03
9	240	105	90	105	8,44	15	225	180	18,08	14,85	105	120	6,04	3,20
	280	125	105	120	10,04		265	205	21,29		125	140	6,11	3,37
	320	145	120	135	11,65		305	235	24,51		145	160	6,11	3,54
	360	165	130	145	13,26		345	265	27,72		165	180	6,11	3,72
	100	35	40	55	3,44		80	75	7,86		35	50	4,72	2,46
	150	60	60	75	5,89		130	110	12,77		60	75	5,98	3,16
	200	85	75	90	8,35		180	145	17,68		85	100	6,85	3,83
	250	110	95	110	10,80		230	185	22,59		110	125	7,72	4,09
11	300	135	110	125	13,26	18	280	220	27,50	19,09	135	150	7,80	4,35
	350	160	130	145	15,71		330	255	32,41		160	175	7,80	4,61
	400	185	145	160	18,17		380	290	37,32		185	200	7,80	4,88
	500	235	180	195	23,08		480	360	47,14		235	250	7,80	5,40
	600	285	215	230	27,99		580	430	56,96		285	300	7,80	5,90

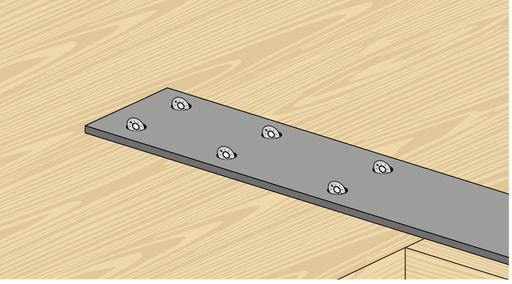
GENERAL PRINCIPLES on page 6.

EFFECTIVE NUMBER FOR AXIAL STRESSES

The load-bearing capacity of a connection made with several screws, all of the same type and size, may be lower than the sum of the load-bearing capacities of the individual connection system.

For a connection with n screws in a metal plate application, the characteristic effective sliding load-bearing capacity is equal to:

$$R_{ef,V,k} = n_{ef,ax} \cdot R_{V,k}$$



The n_{ef} value is given in the table below as a function of n (number of screws in a row).

n	2	3	4	5	6	7	8	9	10
$n_{ef,ax}$	1,87	2,70	3,60	4,50	5,40	6,30	7,20	8,10	9,00

STRUCTURAL VALUES

GENERAL PRINCIPLES

- Characteristic values comply with the EN 1995:2014 standard in accordance with ETA-11/0030.
- The tensile design strength of the connector is the lower between the timber-side design strength ($R_{ax,d}$) and the steel-side design strength ($R_{tens,d}$).

$$R_{ax,d} = min \begin{cases} \dfrac{R_{ax,k} \cdot k_{mod}}{\gamma_M} \\ \dfrac{R_{tens,k}}{\gamma_{M2}} \end{cases}$$

- The compression design strength of the connector is the lower between the timber-side design strength ($R_{ax,d}$) and the instability design strength ($R_{ki,d}$).

$$R_{ax,d} = min \begin{cases} \dfrac{R_{ax,k} \cdot k_{mod}}{\gamma_M} \\ \dfrac{R_{ki,k}}{\gamma_{M1}} \end{cases}$$

- The design sliding strength of the joint is either the timber-side design strength ($R_{V,d}$) and the design strength on the steel side projected ($R_{tens,45,d}$), whichever is lower:

$$R_{V,d} = min \begin{cases} \dfrac{R_{V,k} \cdot k_{mod}}{\gamma_M} \\ \dfrac{R_{tens,45,k}}{\gamma_{M2}} \end{cases}$$

- The design shear strength of the connector is obtained from the characteristic value as follows:

$$R_{V,d} = \frac{R_{V,k} \cdot k_{mod}}{\gamma_M}$$

- 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 screws, reference was made to ETA-11/0030.
- Sizing and verification of the timber elements and metal plates must be done separately.
- The screws must be positioned in accordance with the minimum distances.
- The characteristic thread withdrawal strengths were evaluated considering a penetration length of $S_{g,tot}$ or S_g, as shown in the table.
  For intermediate values of S_g it is possible to linearly interpolate.
- The shear srength and sliding values were evaluated considering the centre of gravity of the connector placed in correspondence with the shear plane.
- The characteristic shear resistances are calculated for screws inserted without pre-drilling hole. In the case of screws inserted with pre-drilling hole, greater resistance values can be obtained.

NOTES

- The characteristic thread withdrawal resistances were evaluated considering both an ε angle of 90° ($R_{ax,90,k}$) and of 0° ($R_{ax,0,k}$) between the grains of the timber element and the connector.
- The characteristic sliding strengths were evaluated by considering an angle ε of 45° between the grains of the timber element and the connector.
- The plate thickness (S_{PLATE}) are understood to be the minimum values to allow the head of the screw to be accommodated.
- The characteristic timber-to-timber shear strengths were evaluated considering both an ε angle of 90° ($R_{V,90,k}$) and 0° ($R_{V,0,k}$) between the grains of the second element and the connector.
- For the calculation process a timber characteristic density ρ_k = 385 kg/m^3 has been considered.
  For different ρ_k values, the strength values in the table (withdrawal, compression, sliding and shear) can be converted via the k_{dens} coefficient.

$$R'_{ax,k} = k_{dens,ax} \cdot R_{ax,k}$$
$$R'_{ki,k} = k_{dens,ki} \cdot R_{ki,k}$$
$$R'_{V,k} = k_{dens,ax} \cdot R_{V,k}$$
$$R'_{V,90,k} = k_{dens,V} \cdot R_{V,90,k}$$
$$R'_{V,0,k} = k_{dens,V} \cdot R_{V,0,k}$$

ρ_k [kg/m^3]	350	380	**385**	405	425	430	440
C-GL	*C24*	*C30*	*GL24h*	*GL26h*	*GL28h*	*GL30h*	*GL32h*
$k_{dens,ax}$	0,92	0,98	1,00	1,04	1,08	1,09	1,11
$k_{dens,ki}$	0,97	0,99	1,00	1,00	1,01	1,02	1,02
$k_{dens,v}$	0,90	0,98	1,00	1,02	1,05	1,05	1,07

Strength values thus determined may differ, for higher safety standards, from those resulting from an exact calculation.