

VGU

45° washer for VGS

Bright zinc plated carbon steel



FIELD OF USE

Connections of timber elements with steel plates by means of full-threaded screws inclined at 45°

- solid timber
- glulam (Glued Laminated Timber)
- XLAM (Cross Laminated Timber)
- LVL (Laminated Veneer Lumber)
- wood-based panels

RESISTANCE

Use of 45° inclined VGS screws, in combination with steel plates, guarantees very high sliding-resistance values

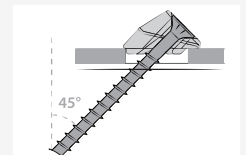
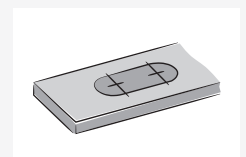


PLATE ADAPTER

The VGU washer allows to insert VGS screws at a 45° angle on plates without countersunk holes



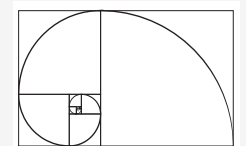
EASE OF HANDLING

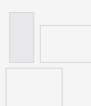
The ergonomic shape ensures a secure and precise grip during installation



UNIVERSAL SIZE

Two sizes compatible with all 9mm and 11mm diameter VGS are available for plates of varying thickness





SAFETY

The washer is designed to ensure the screw insertion at precisely 45° to the plane and the connector feed in the correct direction



EASE OF HANDLING

The regular cylindrical shape of the diameter external to the countersink and the anti-slip knurling assure a firm grip during the assembling phase

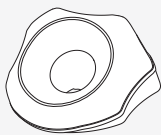


AESTHETICS

The perfect matching between VGS head and the countersunk washer creates a compact and aesthetically pleasing joint finish.

CODES AND DIMENSIONS

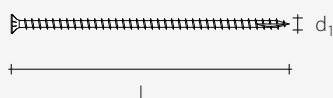
VGU WASHER



code	screw	pcs/box
VGU945	VGS Ø9	25
VGU1145	VGS Ø11	25

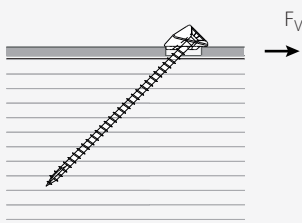
Screws not included in the box

VGS



code	d ₁ [mm]	L [mm]	TX	pcs/box
VGS9160	9	160	TX40	25
VGS9200	9	200	TX40	25
VGS9240	9	240	TX40	25
VGS9280	9	280	TX40	25
VGS9320	9	320	TX40	25
VGS9360	9	360	TX40	25
VGS11100	11	100	TX50	25
VGS11150	11	150	TX50	25
VGS11200	11	200	TX50	25
VGS11250	11	250	TX50	25
VGS11300	11	300	TX50	25
VGS11350	11	350	TX50	25
VGS11400	11	400	TX50	25
VGS11450	11	450	TX50	25
VGS11500	11	500	TX50	25
VGS11550	11	550	TX50	25
VGS11600	11	600	TX50	25

EXTERNAL LOADS



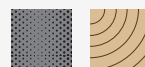
MATERIAL AND DURABILITY

VGU: S235 bright zinc plated steel.

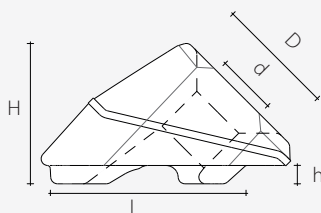
To be used in Service class 1 and 2 (EN 1995:2008).

FIELD OF USE

Steel to timber joints

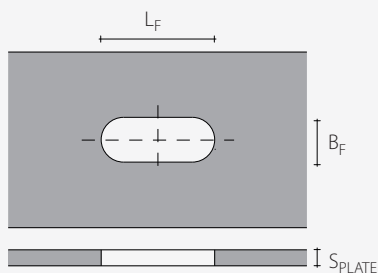


GEOMETRY



WASHER		VGU945	VGU1145
VGS screw diameter	d ₁ [mm]	9,0	11,0
Internal diameter	d [mm]	9,7	11,8
External diameter	D [mm]	19,0	23,0
Base length	L [mm]	31,8	38,8
Base height	h [mm]	3,0	3,6
Global height	H [mm]	23,0	28,0

INSTALLATION



WASHER		VGU945	VGU1145
Slotted-hole length	L_F [mm]	min 35,0 max 36,0	min 43,0 max 44,0
Slotted-hole width	B_F [mm]	min 14,0 max 15,0	min 17,0 max 18,0
Steel plate thickness	S_{PLATE} [mm]	min 3,0 max 12,0*	min 4,0 max 15,0*

* For thicker plates it is necessary to realize a countersink in the lower part of the steel plate.

For VGS screw-lengths > 300 mm a Ø5 predrill is recommended.
The assembly must be performed so as to guarantee that the stress is evenly distributed among all the installed VGU washers.



STATIC VALUES - STEEL-TO-TIMBER JOINT

SLIDING RESISTANCE R_V

	CHARACTERISTIC VALUES ⁽¹⁾ $S_{PLATE} = 3 \text{ mm}$					ADMISSIBLE VALUES $S_{PLATE} = 3 \text{ mm}$	CHARACTERISTIC VALUES ⁽¹⁾ $S_{PLATE} = 12 \text{ mm}$					ADMISSIBLE VALUES $S_{PLATE} = 12 \text{ mm}$
screw				TIMBER	STEEL				TIMBER	STEEL		
d_1 [mm]	L [mm]	S_g [mm]	A_{MIN} [mm]	$R_{V,k}$ [kN]	$R_{tens,k 45^\circ}$ [kN]	$V_{adm 45^\circ}$ [kg]	S_g [mm]	A_{MIN} [mm]	$R_{V,k}$ [kN]	$R_{tens,k 45^\circ}$ [kN]	$V_{adm 45^\circ}$ [kg]	
VGS 9	160	140	120	10,12	17,96	445	125	110	9,04	17,96	398	
	200	180	145	13,01		573	165	135	11,93		525	
	240	220	175	15,90		700	205	165	14,82		652	
	280	260	205	18,80		827	245	195	17,71		780	
	320	300	230	21,69		903	285	220	20,60		903	
	360	340	260	24,58		903	325	250	23,50		903	
	$S_{PLATE} = 4 \text{ mm}$					$S_{PLATE} = 4 \text{ mm}$	$S_{PLATE} = 15 \text{ mm}$					$S_{PLATE} = 15 \text{ mm}$
VGS 11	100	80	75	7,07	26,87	311	65	60	5,74	26,87	253	
	150	130	110	11,49		506	115	95	10,16		447	
	200	180	145	15,90		700	165	130	14,58		642	
	250	230	185	20,32		894	215	170	19,00		836	
	300	280	220	24,74		1089	265	205	23,41		1031	
	350	330	255	29,16		1130	315	240	27,83		1130	
	400	380	290	33,58		1130	365	275	32,25		1130	
	450	430	325	37,99		1130	415	310	36,67		1130	
	500	480	360	42,41		1130	465	345	41,09		1130	
	550	530	395	46,83		1130	515	380	45,50		1130	
	600	580	430	51,25		1130	565	415	49,92		1130	

GENERAL PRINCIPLES

- Characteristic values consistent with EN 1995:2008 and in accordance with ETA-11/0030.
- Admissible values are obtained according to DIN 1052:1988.
- For the calculation process a timber density of $\rho_k = 380 \text{ kg/m}^3$ has been considered.
- The fastener pull-out strength has been evaluated by considering a 45° angle to the grain and an effective length of the threaded part equal to S_g .

NOTES

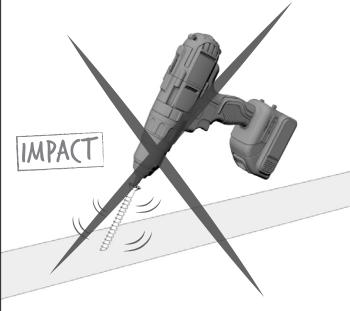
⁽¹⁾ The design shear strength of the joint is the minimum among the timber design shear strength ($R_{V,d}$) and the steel design shear strength ($R_{tens,d 45^\circ}$).

$$R_{V,d} = \min \left\{ \begin{array}{l} R_{V,k} \cdot \frac{k_{mod}}{\gamma_m} \\ \frac{R_{tens,k 45^\circ}}{\gamma_{m2}} \end{array} \right.$$

For the correct realization of the joint, the fastener head should be fully embedded into the VGU washer. For intermediate values of S_{PLATE} linear interpolation is allowed. Dimensioning and verification of timber elements and steel plates shall be carried out separately.

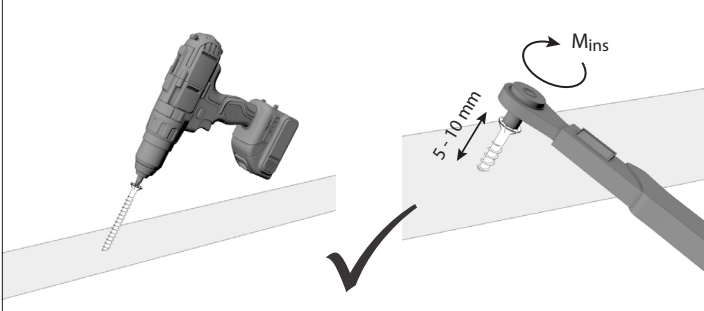
1 APPARECCHI DI POSA / GERÄTE ZUR VERLEGUNG / INSTALLATION EQUIPMENT / HERRAMIENTAS DE INSTALACIÓN / DISPOSITIF DE MISE EN PLACE / FERRAMENTAS DE INSTALAÇÃO / ОБОРУДОВАНИЕ ДЛЯ УКЛАДКИ

A Avvitatore ad impulso / Schlagschrauber / Impact screwdriver / Atornillador de impacto / Visseuse à impulsion / Aparafusadora de impacto / Импульсный шурупверт

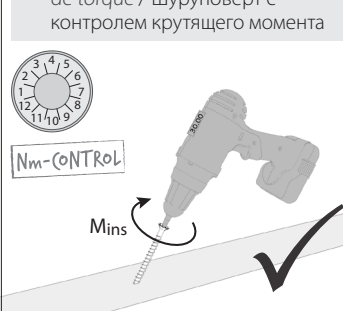


B Avvitatore non ad impulso / Kein Impulsschrauber / Drill screwdriver / Atornillador no de impacto / Visseuse non à impulsion / Aparafusadora não de impacto / Не импульсный шурупверт

+ Chiave dinamometrica / Drehmomentschlüssel / Torque wrench / Llave dinamometrica / Clé dynamométrique / Chave dinamométrica / Динамометрический ключ



C Avvitatore a controllo di coppia torcente / Drehmomentschrauber / Screwdriver with torque control / Atornillador a control de par / Visseuse à contrôle de couple / Aparafusadora com controlo de torque / Шурупверт с контролем крутящего момента



M_{ins}

Momento di avvitamento consigliato / Empfohlenes Anzugsdrehmoment / Recommended moment load / Momento de atornillado aconsejado / Moment de vissage conseillé / Momento de enroscamento aconselhado / Рекомендуемый момент затягивания

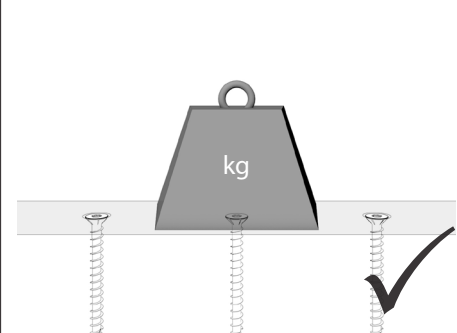
VGS Ø11 L < 400 mm M_{ins} = 30 Nm

VGS Ø11 L ≥ 400 mm M_{ins} = 40 Nm

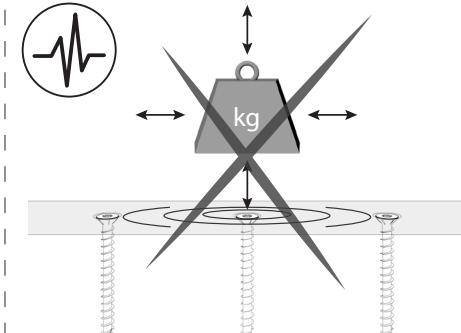
VGS Ø9 M_{ins} = 20 Nm

2 CAMPI D'IMPIEGO / ANWENDUNGSBEREICH / AREAS OF APPLICATION / CAMPOS DE APLICACIÓN / DOMAINE D'APPLICATION / ÁREAS DE APLICAÇÃO / ОБЛАСТИ ПРИМЕНЕНИЯ

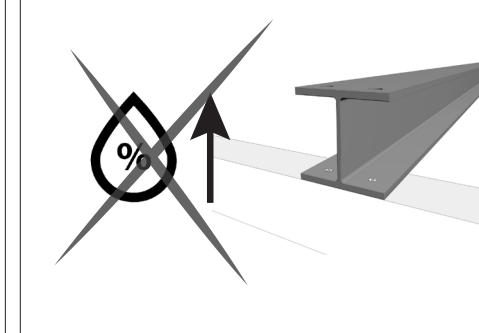
Carichi statici / Ruhende Belastung / Static loads / Cargas estáticas / Charges statiques / Cargas estáticas / Статические нагрузки



Carichi dinamici / Dynamische Belastung / Dynamic loads / Cargas dinámicas / Charges dynamiques / Cargas dinâmicas / Динамические нагрузки

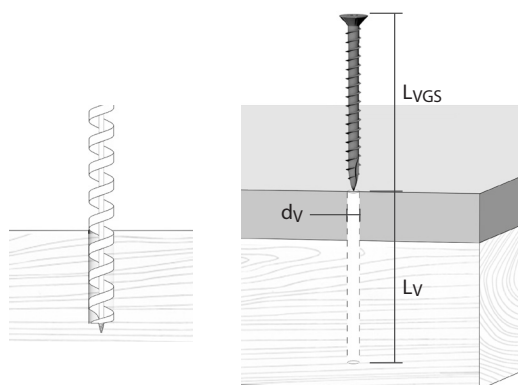


Classe di servizio 3 / Nutzungsklasse 3 / Service class 3 / Clase de servicio 3 / Classe de service 3 / Classe de serviço 3 / Рабочий класс 3



Preforo obbligatorio / Vorbohrung notwendig / Pre-drilling required / Agujero previo necesario / Pré-perçage obligatoire / Pré-furo obrigatório / Обязательное предварительное отверстие

- Legni con densità elevata / Hölzer mit hoher Dichte / Woods with high density / Maderas de alta densidad / Bois avec densité élevé / Madeiras com densidade elevada / Древесина высокой плотности: $\rho_k \geq 420 \text{ kg/m}^3$
- VGS Ø11 L ≥ 400 mm
- Inclinazione molto precisa di inserimento / Sehr genaue Neigung zur Verlegung / Very precise angle of insertion / Ángulo muy preciso de inserción / Inclinação muito precisa de inserção / Очень точный наклон ввода

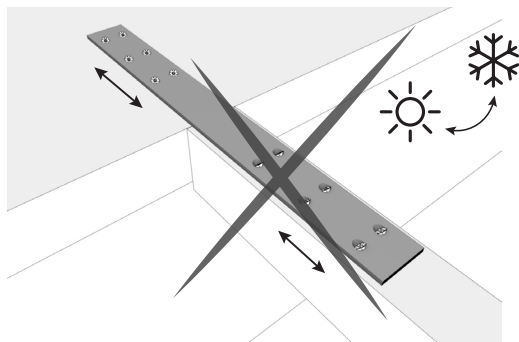


- VGS Ø11: $d_v = 6 \text{ mm}$
- VGS Ø9: $d_v = 5 \text{ mm}$

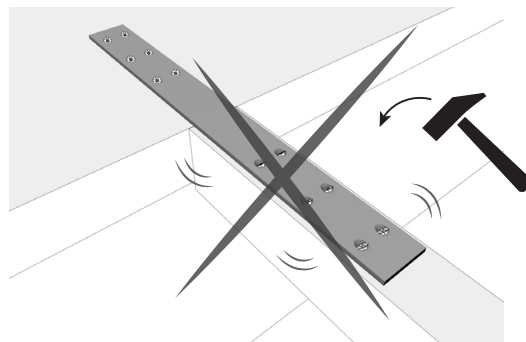
$L_v = L_{vgs}$

3 APPLICAZIONE ACCIAIO-LEGNO / ANWENDUNG FÜR HOLZ-BLECH/STAHL VERBINDUNGEN / STEEL TO TIMBER CONNECTIONS / UNIONES ACERO-MADERA / APPLICATION ACIER - BOIS / APLICAÇÃO AÇO-MADEIRA / ПРИМЕНЕНИЕ СТАЛЬ-ДРЕВЕСИНА

Evitare alterazioni dimensionali del metallo / Größenschwankungen des Blechs vermeiden / Prevent steel dimensional alterations / Evitar alteraciones dimensionales del metal / Éviter des altérations sur les dimensions de l'acier / Evitar alterações dimensionais do metal / Избегать размерные нарушения металла



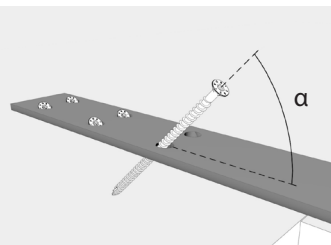
Evitare sollecitazioni accidentali in fase di montaggio / Unbeabsichtigte Beanspruchungen während der Montagephase vermeiden / Avoid applying accidental stress during assembly / Evitar esfuerzos accidentales durante la fase de montaje / Éviter des sollicitations accidentelles pendant la phase de montage / Evitar esforços accidentais na fase de montagem / Избегать случайных воздействий на этапе монтажа



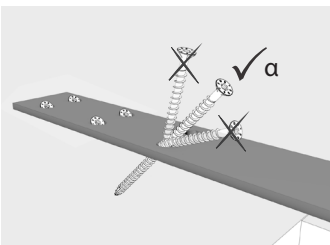
A PIASTRA SAGOMATA CON FORI SVASATI / PROFILIERTE PLATTE MIT AUFGEWEITETEN LÖCHERN / SHAPED STEEL PLATE WITH COUNTERSUNK HOLES / PLACA CONFORMADA CON AGUJEROS AVELLANADOS / PLAQUE PRÉFORMÉE AVEC TROUS CUVETTES / CHAPA MOLDADA COM FUROS ESCAREADOS / ФИГУРНАЯ ПЛАСТИНА С ОТВЕРСТИЯМИ ПОД ВИНТ С ПОТАЙНОЙ ГОЛОВКОЙ

B RONDELLA VGU / U-SCHEIBE VGU / VGU WASHER / ARANDELA VGU / RONDELLE VGU / ANILHA VGU / ШАЙБА VGU

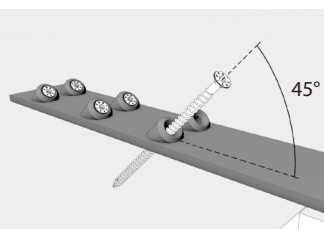
Rispettare angolo inserimento / Neigungswinkel zur Einfügung einhalten / Ensure the angle of insertion / Cumplir con el ángulo de inserción / Respecter l'angle d'insertion / Respeitar ângulo inserção / Соблюдать угол ввода



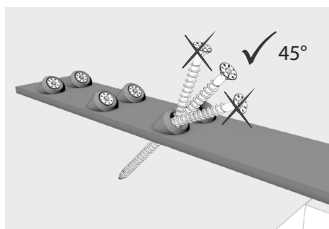
Evitare piegamento / Biegung meiden / Prevent bending of screw / Evitar flexión del tornillo / Éviter la flexion / Evitar dobramento / Избегать сгибания



Rispettare angolo inserimento 45° / 45° Neigungswinkel zur Einfügung einhalten / Ensure the angle of insertion 45° / Cumplir con el ángulo de inserción 45° / Respecter l'angle d'insertion 45° / Respeitar ângulo inserção 45° / Соблюдать угол ввода 45°



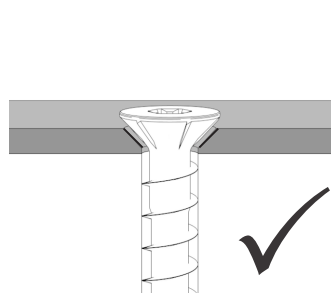
Evitare piegamento / Biegung meiden / Prevent bending of screw / Evitar flexión del tornillo / Éviter la flexion / Evitar dobramento / Избегать сгибания



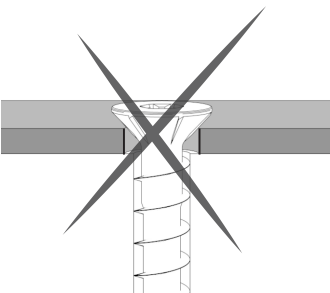
A PIASTRA SAGOMATA / PROFILIERTE PLATTE / SHAPED STEEL PLATE / PLACA METALICA CONFORMADA / PLAQUE CONFORMÉE / CHAPA MOLDADA / ФИГУРНАЯ ПЛАСТИНА

B RONDELLE / U-SCHEIBE / WASHERS / ARANDELAS / RONDELLE / ANILHAS / ШАЙБЫ

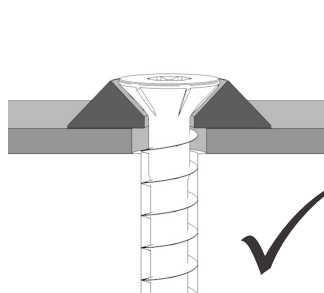
Foro svasato / Aufgeweitete Löcher / Countersunk holes / Agujero avellanado / Trous cuvettes / Furo escareado / Отверстие под винт с потайной головкой



Foro cilindrico / Kreisförmige Löcher / Cylindrical holes / Agujero cilindrico / Trou cylindrique / Furo cilindrico / Цилиндрическое отверстие



Rondella svasata / Gedrehte U-Scheibe / Countersunk washer / Arandela avellanada / Rondelle cuvette / Anilha escareada / Шайба для винта с потайной головкой



Rondella VGU / U-Scheibe VGU / VGU washer / Arandela VGU / Rondelle VGU / Anilha VGU / Шайба VGU

