

45° WASHER FOR VGS

SAFETY

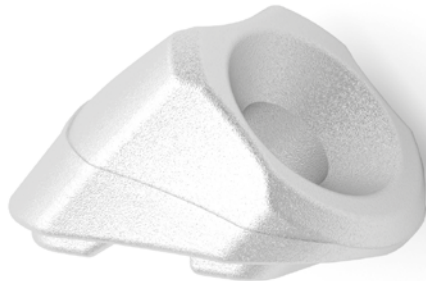
The VGU washer makes possible to install VGS screws at a 45° angle on steel plates.

STRENGTH

Using the VGU washer with VGS screws inclined at 45° angle on steel plates restores the sliding strength.

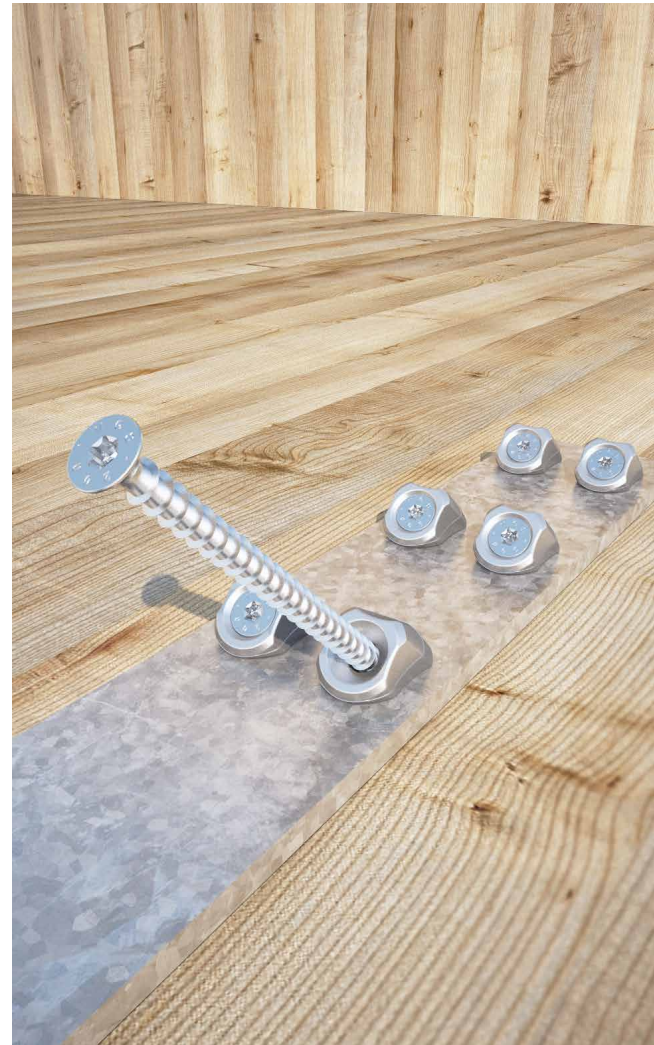
PRACTICALITY

The ergonomic shape ensures a firm, precise grip during installation. Three versions of washer, compatible with VGS Ø9 mm | 0.36 inch, Ø11 mm | 0.44 inch and Ø13 mm | 0.52 inch, for plates of variable thickness.



CHARACTERISTICS

FOCUS	45° steel-to-timber joints	
PLATE THICKNESS	from 3,0 to 20,0 mm	from 0.12 to 0.79 inches
PLATE HOLES	slotted	
WASHER HOLE	9,0 11,0 13,0 mm	0.36 0.44 0.52 inches



VIDEO

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



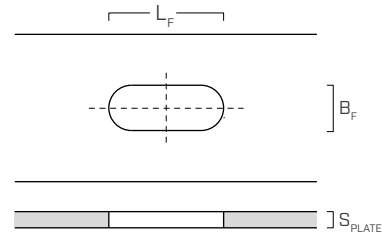
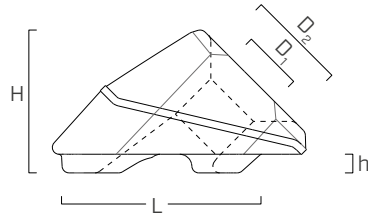
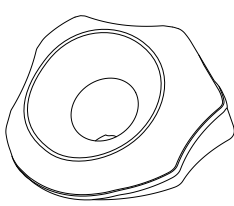
MATERIAL

Bright zinc plated carbon steel.

FIELDS OF USE

- sawn lumber and timber
 - Glued Laminated Timber
 - CLT
 - high density woods
- Dry in-service conditions

GEOMETRY



Washer			VGU945	VGU1145	VGU1345
VGS screw diameter	d_1	[in] ⁽¹⁾ [mm]	0.36 9,0	0.44 11,0	0.52 13,0
VGS screw pre-drilling hole diameter ⁽²⁾	d_V	[in]	0.20	0.24	0.31
Internal diameter	D_1	[in]	0.382	0.465	0.551
External diameter	D_2	[in]	0.748	0.906	1.079
Base length	L	[in]	1.252	1.528	1.803
Base	h	[in]	0.118	0.142	0.169
Global	H	[in]	0.906	1.102	1.299
Slotted-hole length	L_F	[in]	min. 1.30 max. 1.34	min. 1.61 max. 1.65	min. 1.93 max. 1.97
Slotted-hole width	B_F	[in]	min. 0.55 max. 0.59	min. 0.67 max. 0.71	min. 0.79 max. 0.83
Steel plate thickness	S_{PLATE}	[in]	min. 0.12 max. 0.50(*)	min. 0.20 max. 0.56(*)	min. 0.20 max. 0.56(*)

(1) The nominal diameter of the screw is converted into imperial units and rounded up to the nearest decimal point.

(2) Pre-drilling valid for softwood.

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

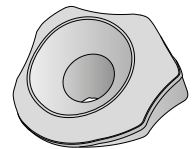
For VGS screw-lengths $L > 11 \frac{3}{4}$ inch a $\varnothing 0.20$ inch pre-drill is recommended.

The assembly must be performed ensuring that the stress is evenly distributed among all the installed VGU washers.

CODES AND DIMENSIONS

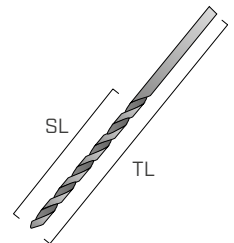
VGU WASHER

CODE	screw		d_V		pcs
	[mm]	[in]	[mm]	[in]	
VGU945	VGS $\varnothing 9$	VGS 0.36	5	0.20	25
VGU1145	VGS $\varnothing 11$	VGS 0.44	6	0.24	25
VGU1345	VGS $\varnothing 13$	VGS 0.52	8	0.32	25



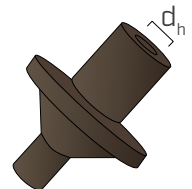
HSS WOOD DRILL BIT

CODE	d_V		TL		SL		pcs
	[mm]	[in]	[mm]	[in]	[mm]	[in]	
F1599105	5	0.20	150	6	100	4	1
F1599106	6	0.24	150	6	100	4	1
F1599108	8	0.32	150	6	100	4	1



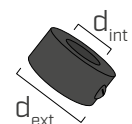
JIG VGU TEMPLATE

CODE	washer	d_h		d_V		pcs
		[mm]	[in]	[mm]	[in]	
JIGVGU945	VGU945	5,5	0.22	5	0.20	1
JIGVGU1145	VGU1145	6,5	0.26	6	0.24	1
JIGVGU1345	VGU1345	8,5	0.34	8	0.32	1

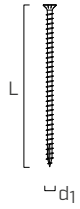
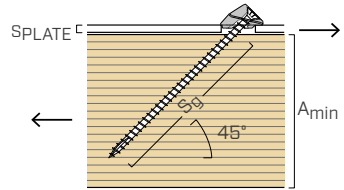
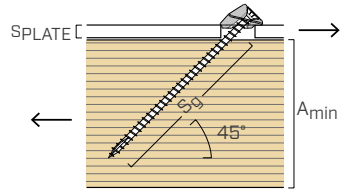


LOCKING RING FOR HSS BITS

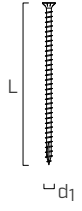
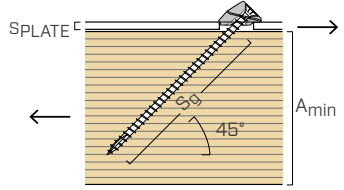
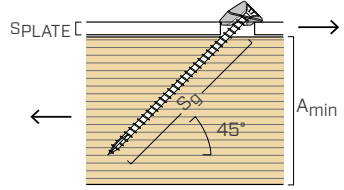
CODE	d_V		d_{int}		d_{ext}		pcs
	[mm]	[in]	[mm]	[in]	[mm]	[in]	
F2108005	5	0.20	5	0.20	10	0.40	10
F2108006	6	0.24	6	0.24	12	0.48	10
F2108008	8	0.32	8	0.32	16	0.63	10



■ STRUCTURAL VALUES | SLIDING RESISTANCE (R_v) | STEEL-TO-WOOD

geometry				R _v							R _v						
																	
VGU	VGS			S _g	A _{min}	G=0.35	G=0.42	G=0.49	G=0.55	S _g	A _{min}	G=0.35	G=0.42	G=0.49	G=0.55		
	d ₁	L															
	[mm] [in]	[mm] [in]		[in]	[in]	[lbf]	[lbf]	[lbf]	[lbf]	[in]	[in]	[lbf]	[lbf]	[lbf]	[lbf]		
				S _{PLATE} = 1/8"							S _{PLATE} = 1/2"						
VGU945	9 0.36	100 ⁽¹⁾	4	3 1/8	2 15/16	227	262	304	332	2 9/16	2 9/16	182	211	245	267		
		120	4 3/4	4	3 1/2	289	334	387	423	3 3/8	3 1/8	245	283	328	359		
		140	5 1/2	4 3/4	4 1/8	351	405	471	514	4 1/8	3 3/4	307	355	412	450		
		160	6 1/4	5 1/2	4 3/4	413	477	554	606	4 15/16	4 3/8	369	427	495	541		
		180	7 1/8	6 1/4	5 5/16	486	561	652	712	5 11/16	4 15/16	442	510	593	647		
		200	8	7 1/8	5 11/16	559	645	749	818	6 1/2	5 5/16	515	594	690	754		
		220	8 5/8	8	6 1/4	610	705	819	894	7 1/4	6	566	654	760	830		
		240	9 1/2	8 5/8	6 7/8	683	789	916	1001	8 1/16	6 1/2	639	738	857	936		
		260	10 1/4	9 1/2	7 1/2	745	861	1000	1092	8 7/8	7 1/8	701	810	940	1027		
		280	11	10 1/4	8 1/16	808	933	1083	1183	9 5/8	7 11/16	764	882	1024	1119		
		300	11 3/4	11	8 5/8	870	1005	1167	1274	10 7/16	8 1/16	826	954	1107	1210		
		320	12 5/8	11 3/4	9 1/16	942	1089	1264	1381	11 1/4	8 5/8	898	1038	1205	1316		
		340	13 3/8	12 5/8	9 5/8	1005	1160	1347	1472	12	9 1/4	961	1110	1288	1408		
		360	14 1/4	13 3/8	10 1/4	1077	1244	1445	1578	12 3/4	10	1033	1194	1386	1514		
		380	15	14 1/4	10 7/8	1140	1316	1528	1670	13 9/16	10 7/16	1096	1265	1469	1605		
		400	15 3/4	15	11 7/16	1202	1388	1612	1761	14 3/8	11	1158	1337	1553	1696		
		440	17 1/4	16 9/16	12 3/8	1326	1532	1779	1943	15 15/16	12	1282	1481	1720	1879		
		480	19	18 1/8	13 9/16	1472	1700	1974	2156	17 1/2	13 3/16	1428	1649	1915	2092		
		520	20 1/2	19 3/4	14 3/4	1596	1844	2141	2339	19 1/8	14 3/8	1552	1793	2082	2274		
				S _{PLATE} = 3/16"							S _{PLATE} = 9/16"						
VGU1145	11 0.44	100 ⁽¹⁾	4	2 15/16	2 15/16	228	264	296	324	2 3/8	2 3/8	178	205	230	252		
		125	4 15/16	4	3 1/2	317	367	412	450	3 3/8	3 1/8	267	308	346	379		
		150	6	4 15/16	4 3/8	419	484	543	594	4 3/8	4	368	425	478	522		
		175	6 7/8	6	4 15/16	502	580	651	712	5 5/16	4 1/2	451	522	586	641		
		200	8	6 7/8	5 11/16	609	704	790	864	6 1/4	5 5/16	559	645	725	793		
		225	8 7/8	8	6 1/4	692	800	898	982	7 1/4	6	642	742	833	911		
		250	10	8 7/8	7 1/8	800	924	1037	1135	8 1/4	6 3/4	749	865	972	1063		
		275	10 7/8	10	7 11/16	883	1020	1145	1253	9 1/4	7 1/4	832	962	1080	1181		
		300	11 3/4	10 7/8	8 7/16	966	1116	1253	1371	10 1/4	8 1/16	916	1058	1188	1299		
		325	12 3/4	11 3/4	9 1/16	1061	1226	1377	1506	11 1/4	8 5/8	1011	1168	1311	1434		
		350	13 3/4	12 3/4	10	1157	1336	1501	1641	12 3/16	9 1/2	1106	1278	1435	1570		
		375	14 3/4	13 3/4	10 7/16	1252	1446	1624	1776	13 3/16	10 1/16	1201	1388	1559	1705		
		400	15 3/4	14 3/4	11 1/4	1347	1556	1748	1911	14 1/4	10 7/8	1297	1498	1682	1840		
		450	17 3/4	16 3/4	12 5/8	1538	1777	1995	2182	16 1/8	12 3/16	1487	1718	1929	2110		
		500	19 3/4	18 11/16	14	1728	1997	2242	2452	18 1/8	13 9/16	1678	1938	2176	2380		
		550	21 5/8	20 11/16	15 3/8	1907	2203	2473	2705	20 1/16	15	1856	2145	2408	2634		
		600	23 5/8	22 5/8	16 3/4	2097	2423	2721	2976	22	16 5/16	2047	2365	2655	2904		

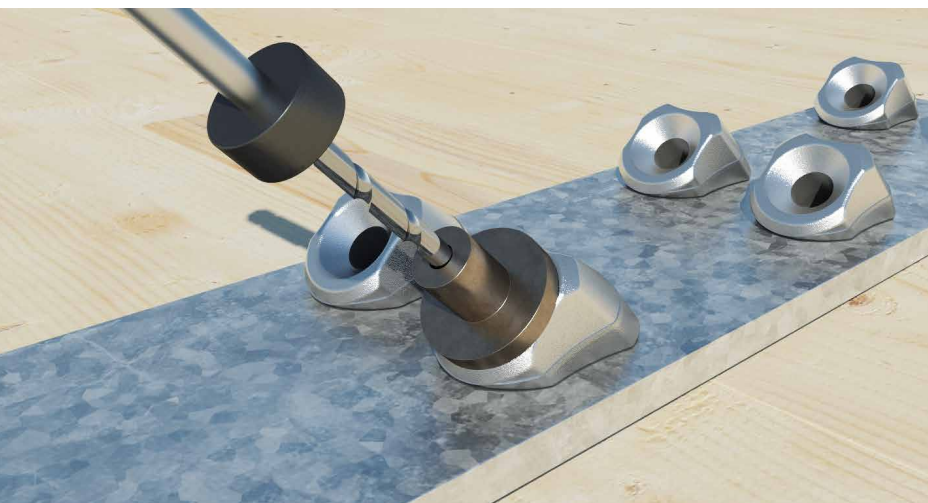
STRUCTURAL VALUES | SLIDING RESISTANCE (R_v) | STEEL-TO-WOOD

geometry			R_v							R_v						
																
VGS	VGS		S_g	A_{min}	$G=0.35$	$G=0.42$	$G=0.49$	$G=0.55$		S_g	A_{min}	$G=0.35$	$G=0.42$	$G=0.49$	$G=0.55$	
	d_1	L														
	[mm] [in]	[mm] [in]	[in]	[in]	[lbf]	[lbf]	[lbf]	[lbf]		[in]	[in]	[lbf]	[lbf]	[lbf]	[lbf]	
			$S_{PLATE} = 3/16"$							$S_{PLATE} = 9/16"$						
VGS1345	13 0.52	100 ⁽¹⁾	4	2 9/16	2 9/16	290	238	267	292	1 15/16	2 3/16	219	219	219	219	
		150	6	4 1/2	4	557	458	514	563	4	3 1/2	486	486	486	486	
		200	8	6 1/2	5 5/16	825	678	762	833	6	4 15/16	754	754	754	754	
		300	11 3/4	10 7/16	8 1/16	1327	1091	1225	1340	10	7 11/16	1256	1256	1256	1256	
		400	15 3/4	14 3/8	11	1862	1531	1719	1880	13 3/4	10 7/16	1791	1791	1791	1791	
		500	19 3/4	18 5/16	13 3/4	2398	1971	2213	2421	17 3/4	13 3/8	2327	2327	2327	2327	
		600	23 5/8	22 1/4	16 9/16	2916	2398	2692	2944	21 5/8	16 1/8	2845	2845	2845	2845	

NOTES:

⁽¹⁾ The embedded thread length does not comply with the minimum requirement of ESR-4645 (8 times the outer thread diameter for screws installed at an angle $\alpha=45^\circ$ to the grain).

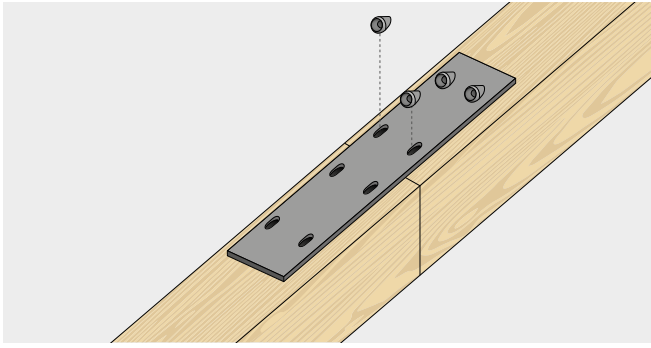
The connector tensile strength must be evaluated and verified considering a 45° angle between the fibers and the connector.



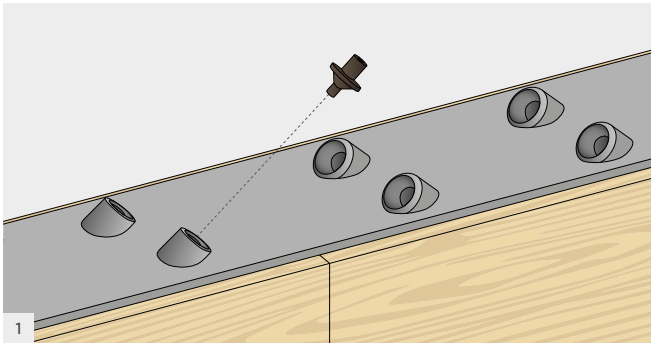
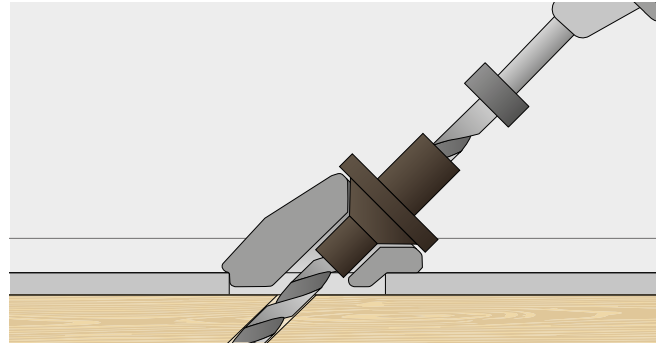
HELPS WITH INSTALLATION

The JIG VGU template makes it easy to prepare a 45° angle pre-drill, thus facilitating subsequent tightening of the VGS screws inside the washer. A pre-drill length of at least 20 mm | 0.79 inch is recommended.

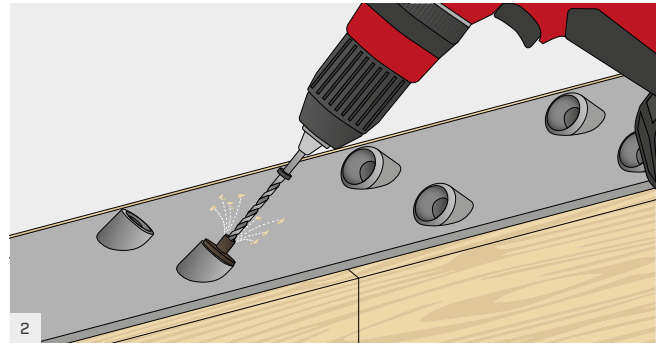
■ INSTALLATION WITH THE AID OF A PRE-DRILL TEMPLATE



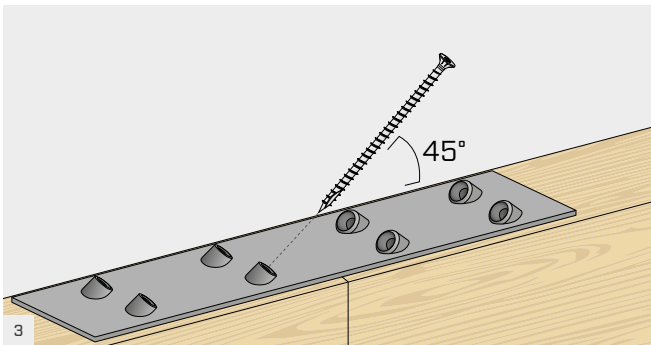
The pre-drill template makes it possible to prepare a 45° angle pre-drill to facilitate screwing.



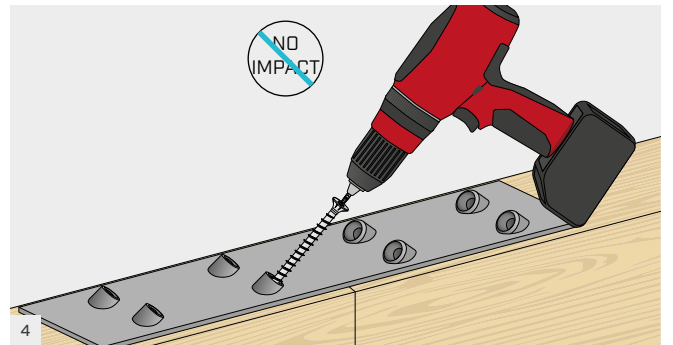
1 Place the VGU washer in the slot provided and use the JIG-VGU template of the correct diameter.



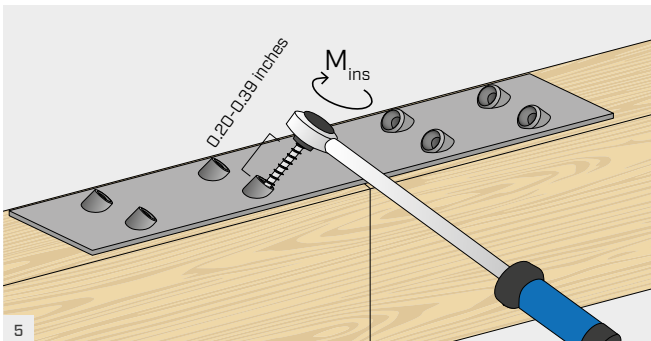
2 Using the template, prepare a pre-drill using a special bit (at least 20 mm | 0,79 inch).



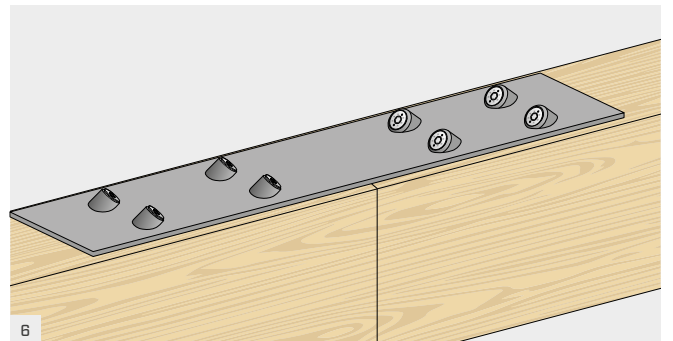
3 Position the screw and respect the 45° angle of insertion.



4 Screw down with a NON-PULSED screw gun, stopping at about 10 mm | 0,40 inch from the washer.

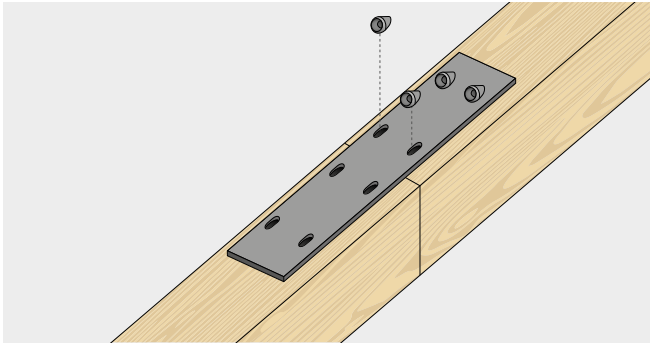


5 Complete screwing using a torque wrench, applying the correct maximum insertion moment.

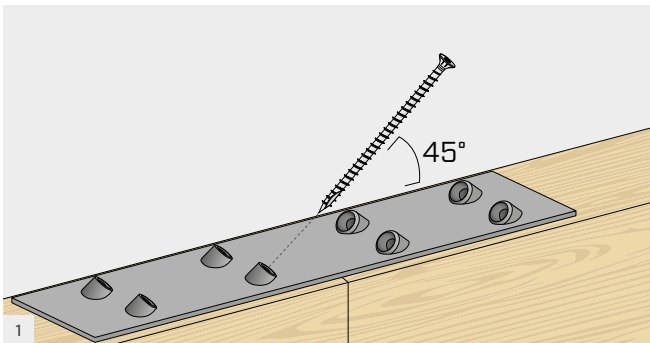
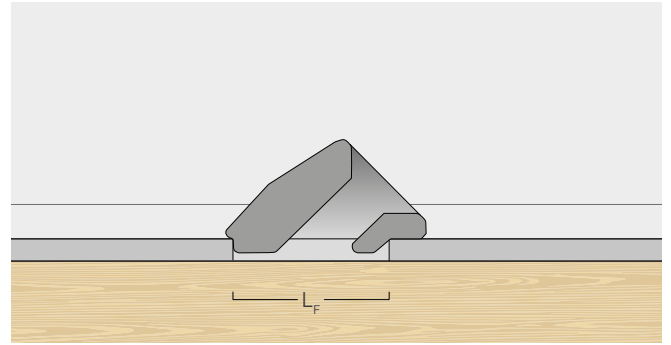


6 Perform the operation for all washers.

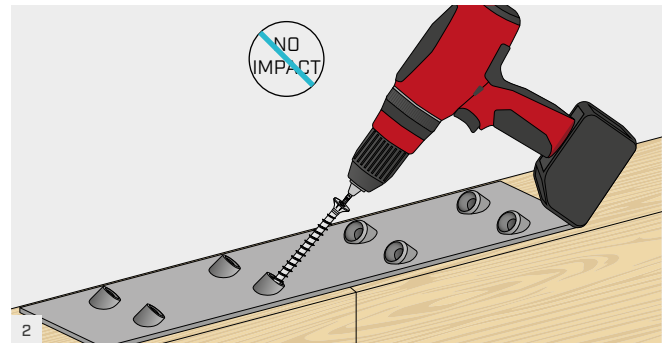
■ INSTALLATION WITHOUT PRE-DRILL



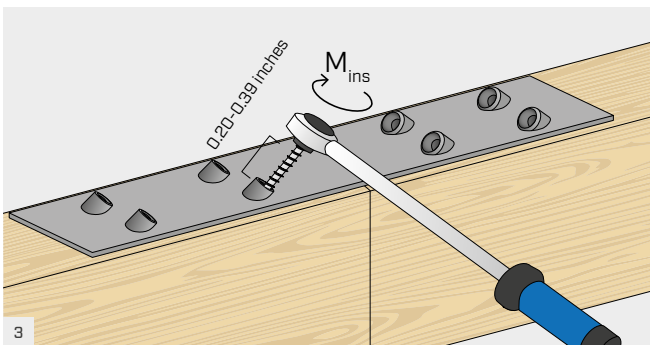
Place the steel plate on the wood and set the VGU washers in the slots provided.



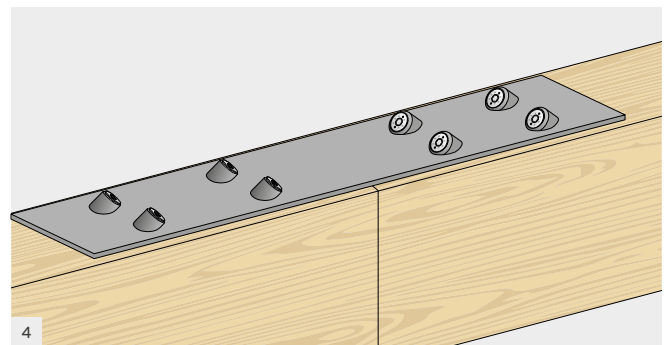
Position the screw and respect the 45° angle of insertion.



Screw down with a NON-PULSED screw gun, stopping at about 10 mm | 0,40 inch from the washer.



Complete screwing using a torque wrench, applying the correct maximum insertion moment.



Perform the operation for all washers.

■ TIMBER-TO-STEEL APPLICATION

RECOMMENDED INSERTION MOMENT: M_{ins}

VGS Ø9 mm	$M_{ins} = 20 \text{ Nm}$
VGS 0.36 inch	$M_{ins} = 14.75 \text{ lbf-ft}$
VGS Ø11 L < 400 mm	$M_{ins} = 30 \text{ Nm}$
VGS 0.44 inch L < 15 3/4 inch	$M_{ins} = 22.13 \text{ lbf-ft}$
VGS Ø11 L ≥ 400 mm	$M_{ins} = 40 \text{ Nm}$
VGS 0.44 inch L ≥ 15 3/4 inch	$M_{ins} = 29.50 \text{ lbf-ft}$
VGS Ø13 mm	$M_{ins} = 50 \text{ Nm}$
VGS 0.52 inch	$M_{ins} = 36.88 \text{ lbf-ft}$

