



ICC-ES Listing Report ELC-4645

Reissued July 2025

This listing is subject to renewal in July 2026.

CSI: DIVISION: 06 00 00—WOOD, PLASTIC AND COMPOSITES
Section: 06 05 23—Wood, Plastic and Composite Fastenings

Product Certification System:

The ICC-ES product-certification system includes evaluating reports of tests of standard manufactured product, prepared by accredited testing laboratories and provided by the listee, to verify compliance with applicable codes and standards. The system also involves factory inspections, and assessment and surveillance of the listee's quality system.

Product: Rotho Blaas Self-tapping Wood Screws

Listee: ROTHO BLAAS S.R.L.

Compliance with the following standards:

The Rotho Blaas Self-tapping Wood Screws, when installed in accordance with the manufacturer's instructions, conform to the following standard:

- Clauses 12.6 and 12.11 of CSA O86 (2019 and 2014), Engineering Design in Wood, CSA Group.

Compliance with the following codes:

The Rotho Blaas Self-tapping Wood Screws described in this listing report are alternative dowel-type self-drilling fasteners addressed in the Note for Clause 12.6.1.1 of CSA O86 (2019 and 2014). The note references the CWC Commentary on CSA O86, which in turn allows reliance on test results determined in accordance with ICC-ES AC233 [ICC-ES Acceptance Criteria for Dowel-type Threaded Fasteners Used in Wood (AC233)]. For placement requirements, the most conservative requirements between Clauses 12.6.1.1 and 12.11 of CSA O86 and AC233 are considered applicable. The Rotho Blaas screws have met the mandatory testing requirements in Table 1.2 of AC233, addressing fastener tension strength, bending yield strength, withdrawal resistance, lateral resistance and head pull-through resistance, as shown in [ESR-4645](#). The fasteners were evaluated using the resulting test data, together with an engineering analysis to derive corresponding Limit States Design (LSD) values detailed in Tables 1 through 5 to meet the requirements noted in Clause 12.6 of CSA O86 (2019 and 2014), as referenced in the applicable sections of the following code editions:

- *National Building Code of Canada*® 2020
Applicable Section: Volume 1 - Division B: 4.3.1.1.(1)
Volume 2 - Division B: 9.4.1.1.(1)
- *National Building Code of Canada*® 2015
Applicable Section: Volume 1 - Division B: 4.3.1.1.(1)
Volume 2 - Division B: 9.4.1.1.(1)

Symbols and Notation:

D_{nom}	=	Fastener size designation used by the applicant
d_F	=	Nominal diameter (outside thread diameter)
d_r	=	Nominal minor thread (root) diameter, used as the nominal diameter for lateral resistance calculations
d_s	=	Unthreaded shank diameter
d_w	=	Head diameter or head width across flats

ϕf_u	=	Factored tensile strength of the screw determined in accordance with Section K2.1.1 of CSA S136.
$F_{y,des}$	=	Bending yield strength value to be used for lateral design, based on the root diameter and testing in accordance with ASTM F1575.
L	=	Screw length measured from bottom of head or integral washer to tip; or from top of head to tip for embedded head designs
$L_{emb,w}$	=	Minimum required embedded thread length in holding member, including tip, applicable to tabulated withdrawal design values
L_{thread}	=	Length of threaded portion of the screw, including the tip
L_{tip}	=	Length of tip
Y_W	=	Specified unit withdrawal capacity determined from testing and analysis.

Description of product:

The Rotho Blaas Self-tapping Wood Screws are dowel-type threaded fasteners designed to be installed in wood without the need to drill a lead hole, due to the self-drilling tip design. The screws are manufactured from carbon steel or stainless steel wire complying with the manufacturer's specifications. Following the head forming and thread rolling processes, the carbon steel screws are heat treated. The carbon steel screws are zinc plated or coated with a proprietary multi-layer corrosion-resistant coating designated as EVO.

The screw dimensions and strengths are provided in Tables 1 through 4. Screws with intermediate lengths are also available upon request.

Partially-threaded Carbon Steel Screws:

HBS and HBS EVO Screws: HBS and HBS EVO screws are available in various diameters and lengths as shown in Table 1A and Figure 1. The screws have a countersunk head with milling ribs under the head. HBS and HBS EVO screws have zinc plating and EVO coating, respectively. HBS and HBS EVO screws are compatible with HUS and HUS EVO countersunk washers described in this report.

HBS PLATE and HBS PLATE EVO Screws: HBS PLATE and HBS PLATE EVO screws are available in various diameters and lengths as shown in Table 1B and Figure 1. The screws have a washer head combined with a cylindrical feature under the head. HBS PLATE and HBS PLATE EVO screws have zinc plating and EVO coating, respectively.

TBS, TBS MAX and TBS EVO screws: TBS, TBS MAX and TBS EVO screws are available in various diameters and lengths as shown in Table 1C and Figure 1. TBS and TBS EVO screws have zinc plating and EVO coating, respectively. TBS MAX screws are zinc plated.

Fully-threaded Carbon Steel Screws:

LBS and LBS EVO Screws: LBS and LBS EVO screws are available in various diameters and lengths as shown in Table 2A and Figure 2. The screws have a round head combined with a cylindrical feature under the head. LBS and LBS EVO screws have zinc plating and EVO coating, respectively.

VGZ and VGZ EVO Screws: VGZ and VGZ EVO screws are available in various diameters and lengths as shown in Table 2B and Figure 3. The screws have a cylindrical head. VGZ and VGZ EVO screws have a zinc plating and EVO coating, respectively.

VGS and VGS EVO Screws: VGS and VGS EVO screws are available in various diameters and lengths as shown in Table 2C and Figure 3. The screws have either a countersunk or hexagonal star drive head. VGS and VGS EVO screws have zinc plating and EVO coating, respectively. VGS and VGS EVO screws with a countersunk head are compatible with the Rotho Blaas washers described in this report.

Double-thread Carbon Steel Screws:

DGZ, DGZ EVO and CTC Screws: DGZ, DGZ EVO and CTC screws are double threaded and available in various diameters and lengths as shown in Table 3 and Figures 4 and 5. The screws have a cylindrical head. The outside thread diameter and root diameter are the same for both threaded portions of the screw. For the DGZ and DGZ EVO screws, both threads are oriented in the same direction. For the CTC screws, the threads at the head end of the screw are reversed. DGZ and DGZ EVO screws have zinc plating and EVO coating, respectively. CTC screws are zinc plated.

Partially-threaded Stainless Steel Screws:

KKF Screws: KKF screws are available in various diameters and lengths as shown in Table 4A and Figure 6. The screws have a washer head combined with a cylindrical feature under the head. The screws are made of martensitic stainless steel Type 410.

SHS AS Screws: SHS AS screws are available in various diameters and lengths as shown in Table 4B and Figure 6. The screws have a countersunk head combined with milling ribs under the head. The screws are made of martensitic stainless steel Type 410.

Rotho Blaas Steel Washers:

HUS and HUS EVO Countersunk Washers: HUS and HUS EVO countersunk washers are available for use with countersunk screws used in wood-to-wood and metal-to-wood connections. The HUS and HUS EVO washers are formed from carbon steel and have zinc plating and EVO coating, respectively. See Figure 7 for washer dimensions and a depiction of the washer.

VGU 45° and VGU EVO 45° Countersunk Washers: VGU 45° and VGU EVO 45° countersunk washers are available for use with VGS and VGS EVO screws with countersunk heads used in metal-to-wood connections with the screws oriented at 45° angle to the face of the members. VGU 45° and VGU EVO 45° countersunk washers are formed from carbon steel and have zinc plating and EVO coating, respectively. See Figure 8 for washer dimensions and a depiction of the washer.

Alternative Product Names:

Some of the products addressed in this report are available with alternative product names, as shown in the table below:

PRIMARY PRODUCT DESIGNATION	ALTERNATIVE PRODUCT DESIGNATION
HBS HBS EVO	SNK SNK EVO
HBS PLATE (HBSP) HBS PLATE EVO (HBSP EVO)	KGL KGL EVO
TBS TBS EVO	TLL TLL EVO
LBS	SBL
DGZ	DWZ
KKF	KGA

Identification:

1. The ICC-ES mark of conformity, electronic labeling, the evaluation report number (ICC-ES ESR-4645) or the listing report number (ICC-ES ELC-4645), and when applicable, the ICC-ES listing mark, along with the name, registered trademark, or registered logo of the report holder must be included in the product label.
2. In addition, the packaging for the screws is labeled with the product designation (or alternative product designation shown above), which includes the nominal diameter and length in millimeters; the nominal diameter (D_{nom}), the screw length, the thread length the head type and drive size.
3. “EVO coating” is either reported on the label or in the leaflet inside the packages of screws and washers with EVO coating.
4. The screw head is marked with the product family type according to Figures 1 through 6.
5. The packaging for the Rotho Blaas washers is labeled with the product type.
6. The report holder’s contact information is the following:

ROTHO BLAAS S.R.L.
VIA DELL’ADIGE 2/1
CORTACCIA, BOLZANO (BZ) 39040
ITALY
+39-0471-8184-00
www.rothoblaas.com
info@rothoblaas.com

Installation:

The Rotho Blaas screws must be installed in accordance with Rotho Blaas published installation instructions, this listing report and all applicable codes. The most restrictive requirements govern if there are any conflicts amongst these documents.

Installation may be performed with or without predrilling wood members. If predrilling is performed, it must be in accordance with the manufacturer’s published installation instructions, taking into account the footnotes to Table 6. Edge distances, end distances and spacing of the screws must be sufficient to prevent splitting of the wood, or as required by Table 6, whichever is more restrictive.

For TBS, TBS MAX and TBS EVO screws the underside of the flat screw head must bear against the surface of the wood side member. For LBS, LBS EVO, HBS PLATE, HBS PLATE EVO and KKF screws, and VGS and VGS EVO screws with a hexagonal head, the underside of the flat portion of the screw head must bear against the surface of the metal plate.

For HBS, HBS EVO, VGZ, VGZ EVO, DGZ, DGZ EVO, CTC and SHS AS screws, and VGS and VGS EVO screws with a countersunk head, the top of the screw head must either be flush with the surface of the wood side member or recessed into the wood side member, if a pre-drilled hole of the size of the screw head is made. Side member thickness requirements apply to the wood dimension below the top of the screw head.

For screws with countersunk heads (HBS, HBS EVO, VGS, VGS EVO) installed in combination with HUS and HUS EVO countersunk washer, the underside of the countersunk washer must bear against the wood or metal side member with the underside of the screw head seated in the washer.

Screws must not be overdriven. The tip end of the screw must be fully embedded into the main member. The screws must be installed by turning with a power driver, not by driving with a hammer, using the bit size provided by the report holder.

Wood Members:

For purposes of connection design, sawn lumber members, structural glued laminated timber (GL), and cross-laminated timber (CLT) must have an assigned relative density (specific gravity) value, SG_{O86} , as indicated in the tables in this report. Sawn lumber members must have a moisture content of 19 percent or less.

Use of the screws in engineered wood products (EWP) other than those addressed above is outside the scope of this report.

SG_{O86} values of common wood products are shown in the table below in accordance with CSA O86 Table A.11:

Visually Stress graded lumber	Glued-laminated timber	CLT	Mean oven-dry relative density
D Fir-Larch	D Fir-Larch, Hem-Fir	V1	0.49
Hem-Fir	Hem-Fir		0.46
	Spruce-Pine		0.44
Spruce-Pine-Fir		V2, E1	0.42
Northern Species		E3	0.35

Limit States Design:

The factored withdrawal resistance must be determined in accordance with Clause 12.6.6.1 of CSA O86-19, using the applicable specified withdrawal resistance value, Y_w , shown in Table 5.

Factored head pull-through resistance is outside the scope of this report. For fully-threaded screws pull-through resistance must be based on withdrawal resistance considering the embedded thread length in the side member.

Factored lateral resistance must be determined in accordance with Clause 12.6.5 of CSA O86-19, under the following conditions:

- The applicable value of $F_{y,des}$ from Tables 1 to 4 must be used in the calculation.
- For partially-threaded screws, use d_s from Tables 1, 3 and 4 in lieu of d_f to determine the unit lateral strength resistance. For fully-threaded screws, use d_f from Table 2 in lieu of d_f to determine the unit lateral strength resistance.
- The minimum penetration into the main member must be $8d_f$.
- The minimum side member thickness must be determined in accordance with Clause 12.6.4.1 of CSA O86.

Conditions of listing:

The Rotho Blaas screws described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in this report, subject to the following conditions:

1. The listing addresses only conformance with the standards and code sections noted above.
2. Approval of the Rotho Blaas screws use is the sole responsibility of the local code official.
3. The listing report applies to the materials submitted for review by ICC-ES.
4. The Rotho Blaas screws are manufactured under a quality control program with inspections by ICC-ES.

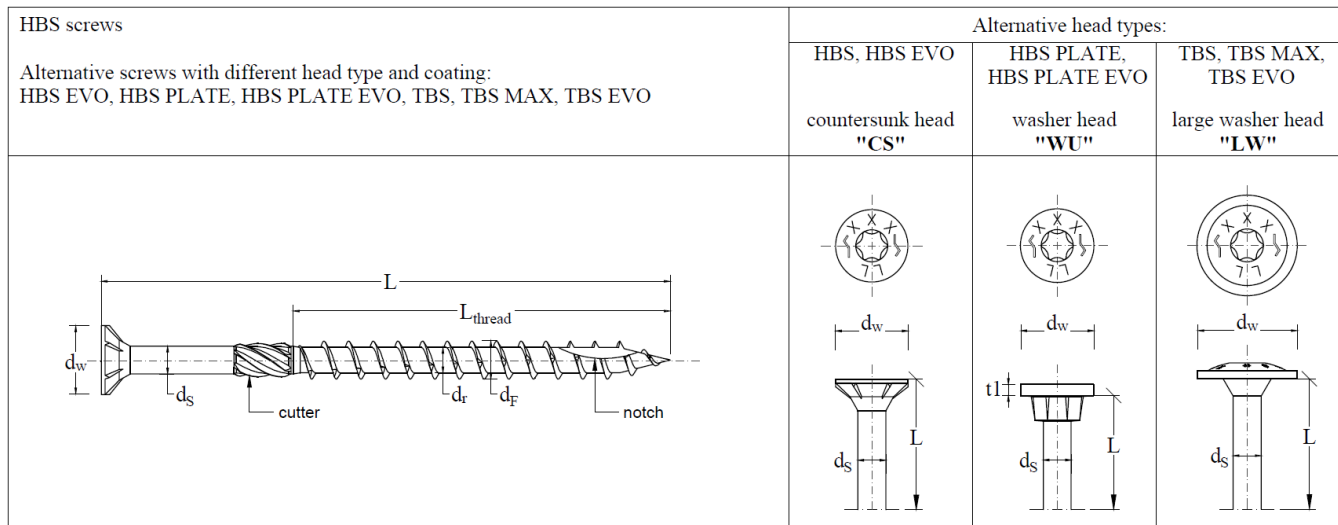


FIGURE 1—TYPICAL PARTIALLY-THREADED CARBON STEEL SCREWS
 Note: The presence or absence of the reamer knurl (cutter) and notch depends on screw size and length.

TABLE 1A—HBS AND HBS EVO SCREW DIMENSIONS AND STRENGTHS

D_{nom} (mm)	L^1 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE AND SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	$F_{y,des}$ (MPa)	ϕf_u (kN)
3.5	40	18	7.00	TX 15	2.45	2.25	3.50	3.50	1537	2.36
	45 to 50	24								
4	30 to 35	18	8.00	TX 20	2.75	2.55	4.00	4.00	1482	3.11
	40	24								
	45 to 50	30								
	60	35								
	70 to 80	40								
4.5	40	24	9.00	TX 20	3.15	2.80	4.50	4.50	1515	3.91
	45 to 50	30								
	60	35								
	70 to 80	40								
5	40 to 50	24	10.00	TX 25	3.65	3.40	5.00	5.00	1315	4.97
	60	30								
	70	35								
	80	40								
	90	45								
	100	50								
6	40 to 50	35	12.00	TX 30	4.30	3.95	6.00	6.00	1188	8.56
	60	30								
	70 to 80	40								
	90 to 100	50								
	110 to 130	60								
8	80 to 100	52	14.50	TX 40	5.80	5.40	8.00	8.00	1047	14.70
	120 to 140	60								
	160 to 280	80								
	300 to 600	100								
10	80 to 100	52	18.25	TX 40	7.00	6.40	10.00	10.00	1080	19.51
	120 to 140	60								
	160 to 280	80								
	300 to 600	100								
12	120 to 280	80	20.75	TX 50	8.00	6.80	12.00	12.00	1114	22.11
	320 to 1000	120								

¹The overall length is measured from the top of the head to the screw tip, as shown in Figure 1.

TABLE 1B—HBS PLATE (HBSP) AND HBS PLATE EVO (HBSP EVO) SCREW DIMENSIONS AND STRENGTHS

D_{nom} (mm)	L^1 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE AND SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	$F_{y,des}$ (MPa)	ϕf_u (kN)
5	50	30	9.65	TX 25	3.65	3.40	5.00	5.00	1315	4.97
	60	35								
	70	40								
	80	50								
6	80	50	12.00	TX 30	4.30	3.95	6.00	6.00	1188	8.56
	90	55								
8	40	32	14.50	TX 40	5.80	5.40	8.00	8.00	1047	14.70
	60	52								
	80	55								
	100	75								
	120	95								
	140	110								
10	60	52	18.25	TX 40	7.00	6.40	10.00	10.00	1080	19.51
	80	55								
	100	75								
	120	95								
	140	110								
	160	130								
12	100	75	20.75	TX 50	8.00	6.80	12.00	12.00	1114	22.11
	120	90								
	140	110								
	160	120								
	180	140								
	200	160								

¹The overall length is measured from the underside of the washer head to the screw tip, as shown in Figure 1.

TABLE 1C—TBS, TBS EVO AND TBS MAX SCREW DIMENSIONS AND STRENGTHS

D_{nom} (mm)	L (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE AND SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	$F_{y,des}$ (MPa)	ϕf_u (kN)
TBS and TBS EVO										
6	60 to 70	40	15.50	TX 30	4.30	3.95	6.00	6.00	1188	8.56
	80 to 90	50								
	100	60								
	120 to 200	75								
	220 to 400	100								
8	40	32	19.00	TX 40	5.80	5.40	8.00	8.00	1047	14.70
	73 to 175	34								
	60 to 100	52								
	120 to 140	80								
	160 to 600	100								
10	100	52	25.00	TX 50	7.00	6.40	10.00	10.00	1080	19.51
	120 to 140	60								
	160 to 180	80								
	200 to 300	100								
	320 to 600	120								
12	100 to 360	120	29.00	TX 50	8.00	6.80	10.00	10.00	1114	22.11
	400 to 600	140								
	800 to 1000	160								
TBS MAX										
8	120	100	24.50	TX 40	5.80	5.40	8.00	8.00	1047	14.70
	160 to 400	120								

¹The overall length is measured from the underside of the large washer head to the screw tip, as shown in Figure 1.

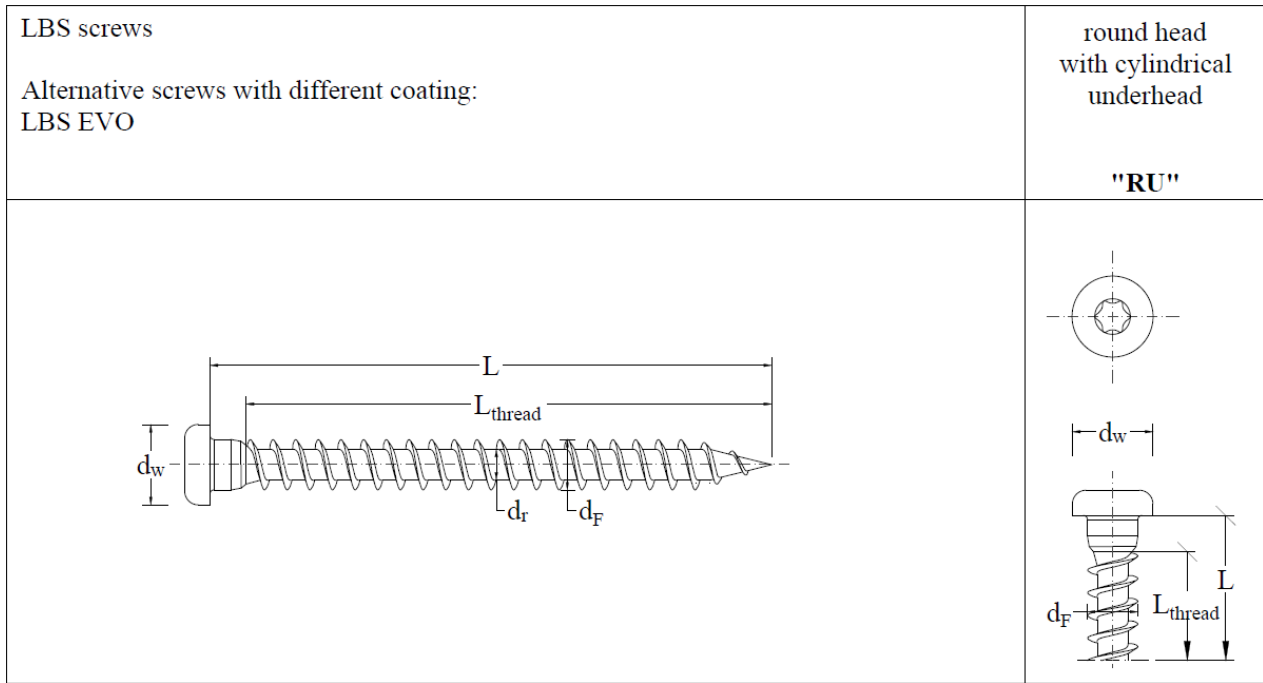


FIGURE 2—LBS AND LBS EVO FULLY THREADED SCREWS

TABLE 2A—LBS AND LBS EVO SCREW DIMENSIONS AND STRENGTHS

D_{nom} (mm)	L^1 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE AND SIZE	d_r (mm)	d_F (mm)	L_{tip} (mm)	$F_{y,des}$ (MPa)	ϕf_u (kN)
5	25 to 70	$L - 4$	7.80	TX 20	3.00	5.00	5.00	1066	5.36
7	60 to 100	$L - 5$	11.00	TX 30	4.40	7.00	7.00	1102	11.59

¹The overall length is measured from the underside of the head to the screw tip, as shown in Figure 2.

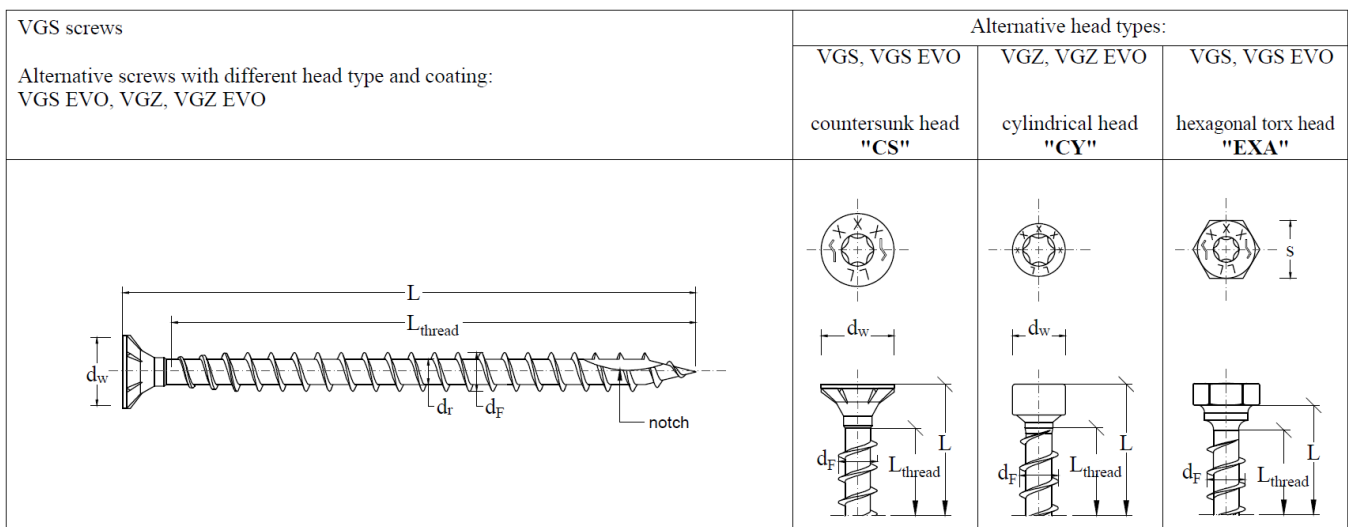


FIGURE 3—TYPICAL VGS, VGS EVO, VGZ AND VGZ EVO FULLY THREADED SCREWS

Note: The presence or absence of the milling ribs and notch depends on screw size and length.

TABLE 2B—VGZ AND VGZ EVO SCREW DIMENSIONS AND STRENGTHS

D_{nom} (mm)	L^1 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE AND SIZE	d_r (mm)	d_F (mm)	L_{tip} (mm)	$F_{y,des}$ (MPa)	ϕf_u (kN)
5.3	80 to 120	L – 10	8.00	TX 25	3.60	5.30	5.30	1021	7.49
5.6	140 to 160	L – 10	8.00	TX 25	3.80	5.60	5.60	1021	8.08
7	80 to 400	L – 10	9.50	TX 30	4.60	7.00	7.00	1111	10.64
9	160 to 600	L – 10	11.50	TX 40	5.90	9.00	9.00	1069	17.84
11	150 to 1000	L – 10	13.50	TX 50	6.60	11.00	11.00	1026	23.17

¹The overall length is measured from the top of the head to the screw tip, as shown in Figure 3.

TABLE 2C—VGS AND VGS EVO SCREW DIMENSIONS AND STRENGTHS

D_{nom} (mm)	HEAD STYLE	L^1 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE AND SIZE	d_r (mm)	d_F (mm)	L_{tip} (mm)	$F_{y,des}$ (MPa)	ϕf_u (kN)
9	Countersunk (CS)	100 to 600	L – 10	16.00	TX 40	5.90	9.00	9.00	1069	17.84
11	Countersunk (CS)	80 to 600	L – 10	19.30	TX 50	6.60	11.00	11.00	1026	23.17
	Hexagonal (EXA)	650 to 1000	L – 20	17.00	SW 17					
13	Countersunk (CS)	80 to 250	L – 10	22.00	TX 50	8.00	13.00	13.00	960	31.96
		300 to 600	L – 20	22.00	TX 50					
	Hexagonal (EXA)	650 to 1500	L – 20	19.00	SW 19					

¹The overall length is measured from the underside of the head to the screw tip, as shown in Figure 3.

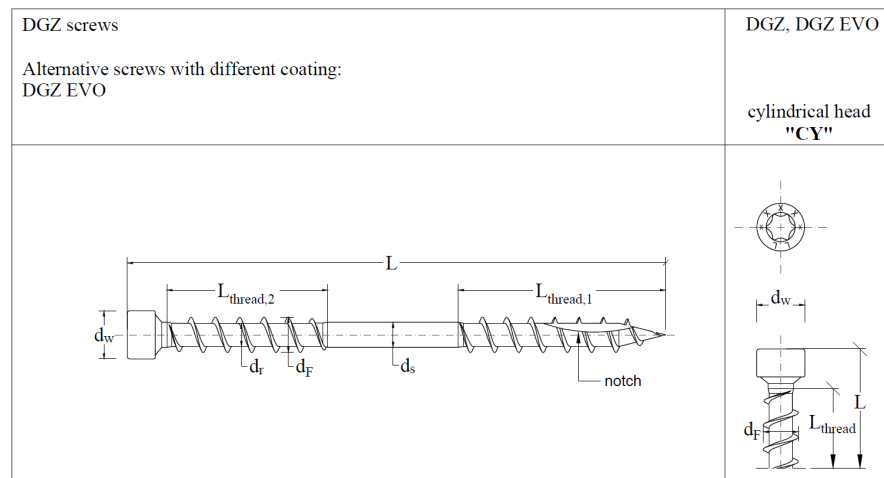


FIGURE 4—DGZ AND DGZ EVO DOUBLE THREADED SCREWS

Note: The presence or absence of the notch depends on screw size and length.

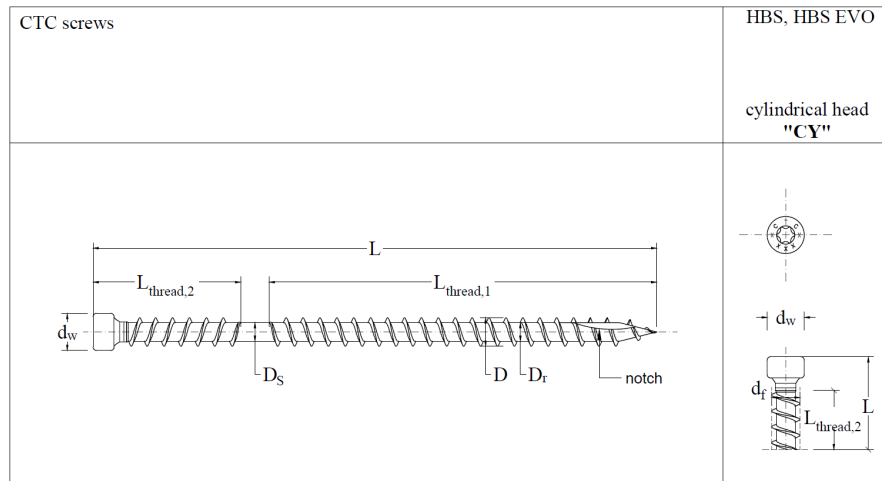


FIGURE 5—CTC DOUBLE THREADED SCREWS

Note: The presence or absence of the notch depends on screw size and length.

TABLE 3—DGZ, DGZ EVO AND CTC SCREW DIMENSIONS AND STRENGTHS

D_{nom} (mm)	DESIGNATION	L^1 (mm)	$L_{thread,1} - L_{thread,2}$ (mm)	d_w (mm)	DRIVE TYPE AND SIZE	d_s (mm)	d_r (mm)	d_f (mm)	L_{tip} (mm)	$F_{y,des}$ (MPa)	ϕf_u (kN)
7	DGZ DGZ EVO	220 to 380	100 – 60	9.50	TX 30	5.00	4.60	7.00	7.00	1111	12.72
	CTC	160	110 – 40								
		240	190 – 40								
9	DGZ DGZ EVO	240 to 520	100 – 60	11.50	TX 40	6.50	5.90	9.00	9.00	1069	20.97
	CTC	160	110 – 40								
		240	190 – 40								

¹The overall length is measured from the top of the head to the screw tip, as shown in Figures 4 and 5.

² $L_{thread,1}$ includes tip. $L_{thread,2}$ is located towards the screw head, as shown in Figures 4 and 5.

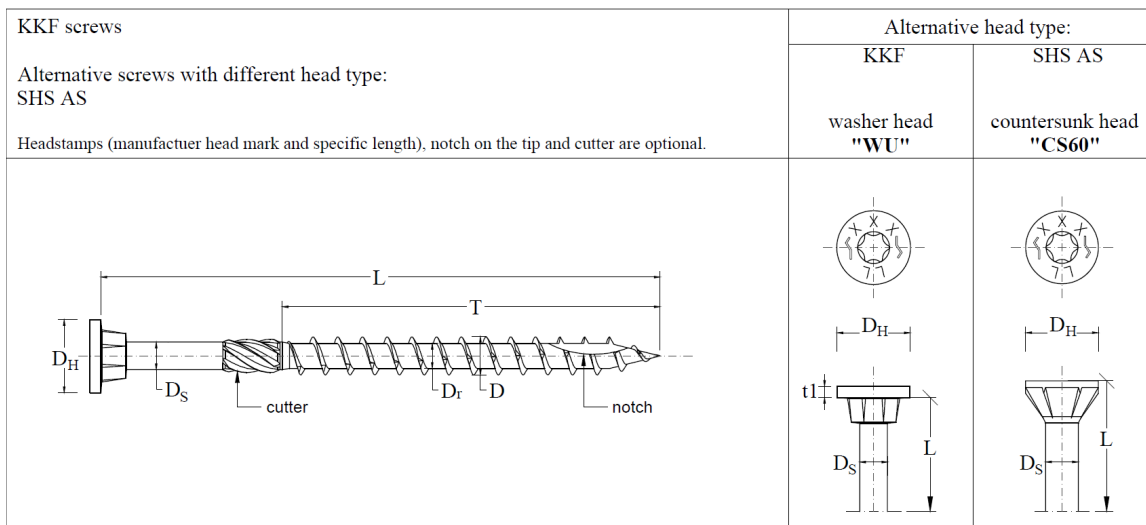


FIGURE 6—KKF AND SHS AS PARTIALLY THREADED STAINLESS-STEEL SCREWS

Note: The presence or absence of the reamer knurl (cutter) and notch depends on screw size and length.

TABLE 4A—KKF SCREW DIMENSIONS AND STRENGTHS

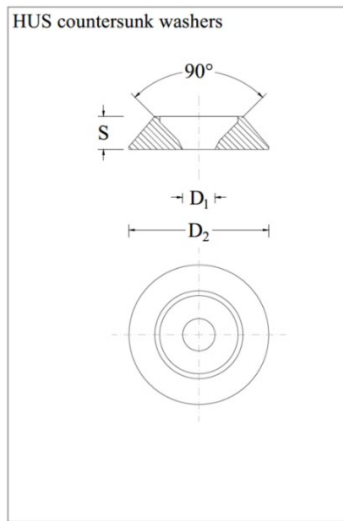
D_{nom} (mm)	L^1 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE AND SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	$F_{y,des}$ (MPa)	ϕf_u (kN)
4	30	18	7.70	TX 20	2.90	2.60	4.00	4.00	1066	3.48
	35	20								
	40	24								
	45 to 50	30								
4.5	20	15	8.70	TX 20	3.35	3.05	4.50	4.50	1102	5.39
	40	24								
	45 to 50	30								
	60	35								
	70	40								
5	40	24	9.65	TX 25	3.60	3.25	5.00	5.00	981	5.86
	50	30								
	60	35								
	70	40								
	80	50								
	90	55								
6	80	50	11.65	TX 30	4.30	4.05	6.00	6.00	896	8.47
	100	60								
	120	75								

¹The overall length is measured from the underside of the washer head to the screw tip, as shown in Figure 6.

TABLE 4B—SHS AS SCREW DIMENSIONS AND STRENGTHS

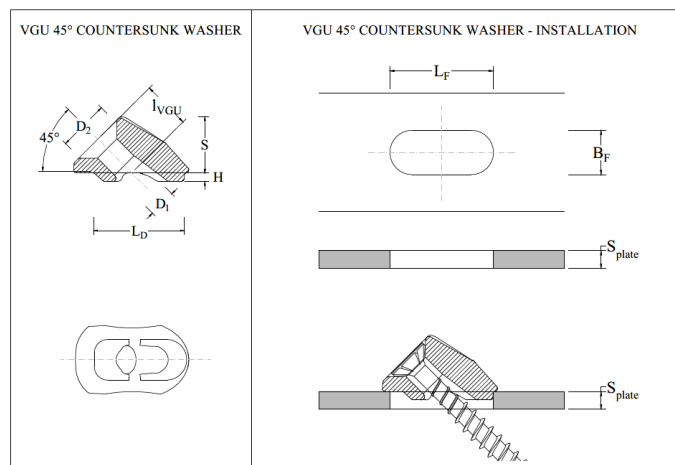
D_{nom} (mm)	L^1 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE AND SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	$F_{y,des}$ (MPa)	ϕf_u (kN)
4.5	50	30	7.50	TX 20	3.35	3.05	4.50	4.50	1102	5.39
	60	35								
	70	40								
5	50	24	8.50	TX 25	3.61	3.25	5.00	5.00	981	5.86
	60	30								
	70	35								
	80	40								
	100	50								
6	80	40	11.00	TX 30	4.30	4.04	6.00	6.00	896	8.47
	100	50								
	120	60								
	140 to 200	75								
8	120 to 140	60	13.00	TX 40	5.80	5.40	8.00	8.00	1074	15.78
	160 to 280	80								

¹The overall length is measured from the top of the head to the screw tip, as shown in Figure 6.



DESIGNATION	APPLICABLE SCREW TYPE	D_1 (mm)	D_2 (mm)	S (mm)
HUS6, HUSEVO6	HBS6, HBSEVO6	7.50	20.00	4.50
HUS8, HUSEVO8	HBS8, HBSEVO8, VGS9, VGSEVO9	8.50	25.00	5.50
HUS10, HUSEVO10	HBS10, HBSEVO10, VGS11, VGSEVO11	10.80	30.00	6.50
HUS12, HUSEVO12	HBS12, HBSEVO12, VGS13, VGSEVO13	14.00	37.00	8.50

FIGURE 7—HUS AND HUS EVO COUNTERSUNK WASHER



DESIGNATION	APPLICABLE SCREW TYPE	D_1 (mm)	D_2 (mm)	S (mm)	H (mm)	L_D (mm)	I_{VGU} (mm)	SLOTTED HOLE LENGTH L_F (mm)	SLOTTED HOLE WIDTH B_F (mm)	METAL PLATE THICKNESS S_{plate}^1 (mm)
VGU945	VGS9, VGSEVO9	9.70	19.00	20.00	3.00	31.80	18.80	min. 33.0 max. 34.0	min. 14.0 max. 15.0	min. 3.0 max. 12.0
VGU1145	VGS11, VGSEVO11	11.80	23.00	24.4	3.60	38.80	23.00	min. 41.0 max. 42.0	min. 17.0 max. 18.0	min. 4.0 max. 15.0
VGU1345	VGS13, VGSEVO13	14.00	27.40	28.70	4.30	45.80	26.90	min. 49.0 max. 50.0	min. 20.0 max. 21.0	min. 5.0 max. 15.0

¹For metal plates with thickness greater than the tabulated maximum, the bottom of the hole must be flared to prevent contact between the screw thread and the metal plate.

FIGURE 8—VGU 45° AND VGU 45° EVO COUNTERSUNK WASHER

TABLE 5—SPECIFIED RESISTANCE VALUES, Y_w , FOR INSTALLATION PERPENDICULAR THE FACE OF THE WOOD MEMBER^{1,2}

SCREW DESIGNATION ³	D_{nom} (mm)	SPECIFIED WITHDRAWAL RESISTANCE, Y_w (N/mm) FOR SELECTED SG_{O86} VALUES:			
		0.35	0.42	0.49	0.55
HBS	3.5	36.60	42.35	47.91	52.55
HBS / KKF	4	41.83	48.40	54.75	60.05
HBS / KKF / SHS AS	4.5	47.06	54.45	61.60	67.56
HBS / HBS PLATE / KKF / SHS AS / LBS	5	52.29	60.50	68.44	75.07
HBS / TBS / HBS PLATE / KKF / SHS AS	6	52.38	60.60	68.55	75.19
HBS / TBS / TBS MAX / HBS PLATE / KKF / SHS AS	8	69.83	80.80	91.40	100.3
HBS / TBS / HBS PLATE	10	87.29	101.0	114.3	125.3
HBS / TBS / HBS PLATE	12	104.8	121.2	137.11	150.4
VGZ	5.3	55.43	64.13	72.55	79.57
VGZ	5.6	58.56	67.76	76.65	84.07
VGZ / DGZ / CTC / LBS	7	61.10	70.70	79.98	87.72
VGZ / VGS / DGZ / CTC	9	78.56	90.90	102.8	112.8
VGZ / VGS	11	96.02	111.1	125.7	137.9
VGS	13	113.5	131.3	148.5	162.9

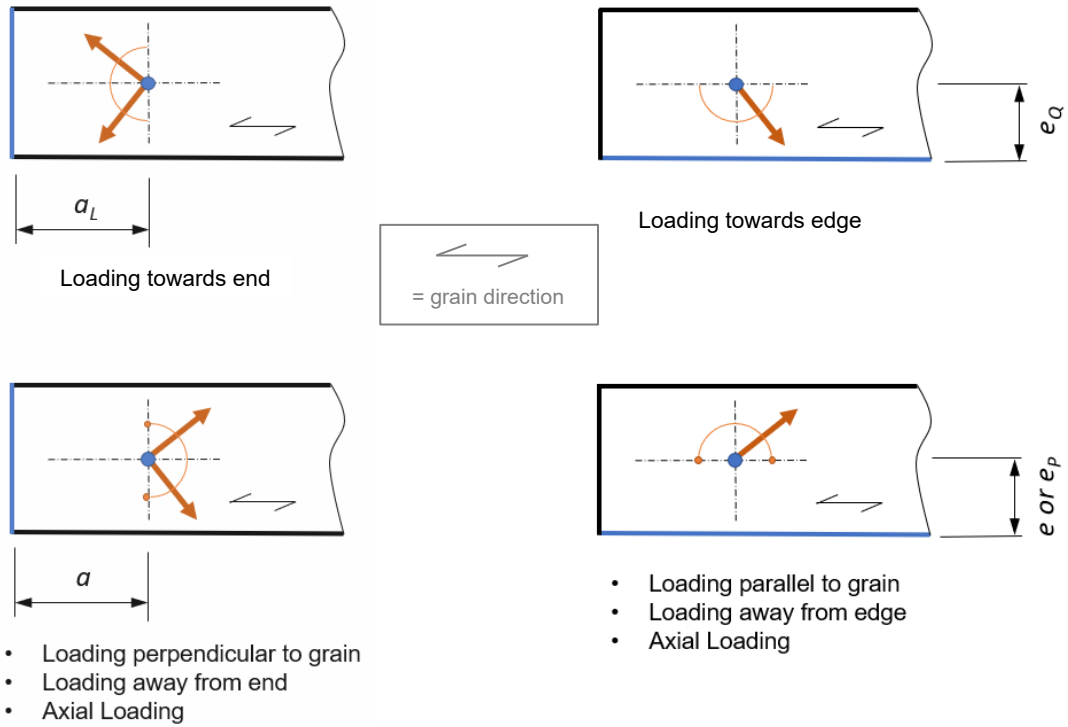
¹Tabulated values apply to standard term loading ($K_D=1.00$), dry service condition ($K_{SF}=1.00$) and wood treatment for which $K_T = 1.0$.

²Tabulated values apply to screws with embedment of $8 \cdot D_{nom}$ or greater, including the tip.

³Tabulated values for zinc plated carbon steel screws also applies to EVO coated screws.

TABLE 6—MINIMUM PLACEMENT REQUIREMENTS

CONDITION	MINIMUM DISTANCE OR SPACING		
	Self-drilled		Predrilled Holes
	$SG_{O86} \leq 0.49$	$SG_{O86} > 0.49$	Any species addressed in CSA O86
End distance - Loaded end, a_L (See Figure 9)	15 d_F	20 d_F	Larger of 7 d_F and 50 mm
End distance - Unloaded end, a (See Figure 9)	12 d_F	15 d_F	Larger of 4 d_F and 50 mm
Edge distance - Loaded, e_Q (See Figure 9)	10 d_F	12 d_F	4 d_F
Edge distance - Unloaded edge, e or e_p (See Figure 9)	5 d_F	7 d_F	3 d_F
Spacing between fasteners, parallel to grain, S_P (See Figure 10)	16 d_F	20 d_F	5 d_F
Spacing between fasteners, perpendicular to grain, S_Q (See Figure 10)	8 d_F	10 d_F	5 d_F



End Distance Definitions

Edge Distance Definitions

FIGURE 9—END AND EDGE DISTANCE DEFINITIONS FOR SCREWS INSTALLED PERPENDICULAR TO GRAIN

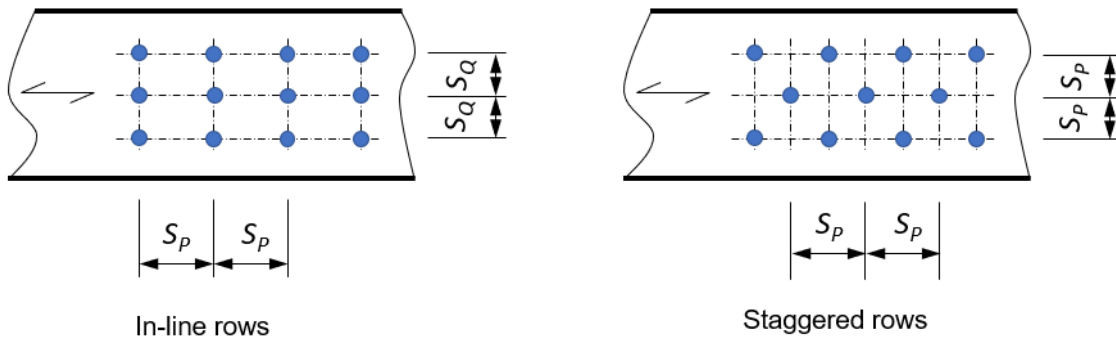


FIGURE 10—SPACING DEFINITIONS FOR SCREWS INSTALLED PERPENDICULAR TO GRAIN