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ICC-ES Listing Report
ELC-4645

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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 evidence in support of test data provided by the listee to verify compliance with the standard(s) listed below. 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 6 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
f_{pt}	=	Specified head pull-through resistance determined from testing and analysis

ϕf_u = Factored tensile strength of the screw determined in accordance with Section K2.1.1 of CSA S136.

F_y = 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

SG_{O86} = Assigned specific gravity determined in accordance with Table A.11 of CSA O86.

ϕv_s = Factored shear resistance of the screw determined from testing and analysis.

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, with or without a colored E-coating, or are coated with EVO or EVO C5 coatings, which are proprietary multi-layer corrosion-resistant coatings. The EVO coating is gray in color.

The screw dimensions and strengths are provided in Tables 1 through 4. Screws with intermediate lengths are also available upon request. Screw geometry (available head type and tip type) is shown in Figures 1 through 6, as indicated below. Some of the products addressed in this report are available with alternative product names, as shown on page 3. Tabulated design and connection geometry information for zinc plated, carbon steel screws and washers also applies to EVO, E-coating and EVO C5 coated screws and washers.

Partially-threaded Screws:

HBS and HBS EVO Screws: HBS and HBS EVO screws are carbon steel screws available in various diameters and lengths as shown in Table 1A and Figure 1A. The screws have a countersunk head with milling ribs under the head. HBS and HBS EVO screws have zinc plating and EVO (or EVO C5) coating, respectively. HBS and HBS EVO screws are compatible with HUS, HUS EVO and HUS15 countersunk washers described in this report.

HBS PLATE and HBS PLATE EVO Screws: HBS PLATE and HBS PLATE EVO screws are carbon steel screws available in various diameters and lengths. The version of these screws designated HBSP have a washer head combined with a cylindrical feature under the head, as shown in Table 1B and Figure 1B. The version of these screws designated HBSPL have a small washer head combined with a cylindrical feature under the head, as shown in Table 1C and Figure 1B. HBS PLATE and HBS PLATE EVO screws have zinc plating and EVO coating, respectively.

HBS PLATE A4 Screws: HBS PLATE A4 screws are made of austenitic stainless steel Type 316 and are available in various diameters and lengths as shown in Table 1D and Figure 1B. The screws have a small washer head combined with a smooth cylindrical feature under the head.

KKF Screws: KKF screws are made of martensitic stainless steel Type 410 and 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.

SHS AS Screws: SHS AS screws are made of martensitic stainless steel Type 410, and are available with or without a black E-coating. The 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.

TBS, TBS MAX, TBS FRAME and TBS EVO screws: TBS, TBS MAX, TBS FRAME and TBS EVO screws are carbon steel screws available in various diameters and lengths as shown in Table 1E and Figure 1A. TBS and TBS EVO screws have zinc plating and EVO (or EVO C5) coating, respectively. TBS MAX screws are zinc plated. TBS FRAME screws have zinc plating and a black E-coating.

Fully-threaded Screws:

LBS and LBS EVO Screws: LBS and LBS EVO screws are carbon steel screws 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.

LBSH and LBSH EVO Screws: LBSH and LBSH EVO screws are carbon steel screws 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 and a knurled tip design. LBSH and LBSH EVO screws have zinc plating and EVO coating, respectively.

VGZ and VGZ EVO Screws: VGZ and VGZ EVO screws are carbon steel screws 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 (or EVO C5) coating, respectively.

VGS and VGS EVO Screws: VGS and VGS EVO screws are carbon steel screws 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 (or EVO C5) coating, respectively. VGS and VGS EVO screws with a countersunk head are compatible with the Rotho Blaas washers described in this report.

VGS PLATE Screws: VGS PLATE screws are carbon steel screws available in various diameters and lengths as shown in Table 2D and Figure 3. The screws have a countersunk hexagonal washer head combined with a cylindrical feature under the head. VGS PLATE screws have black zinc plating.

VGS A4 Screws: VGS A4 screws are made of austenitic stainless steel Type 316 and are available in various diameters and lengths as shown in Table 2E and Figure 3. The screws have a countersunk head with milling ribs under the head and 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.

Rotho Blaas Steel Washers:

HUS, HUS EVO and HUS15 Countersunk Washers: HUS, HUS EVO and HUS15 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. The HUS15 washers are formed from aluminum. 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
DGZ	DWZ
HBS HBS EVO	SNK SNK EVO
HBS PLATE (HBSP) HBS PLATE EVO (HBSP EVO)	KGL KGL EVO
HBS PLATE (HBSPL) HBS PLATE EVO (HBSPL EVO)	KGLPL KGLPL EVO
KKF	KGA
LBS	SBL
TBS TBS EVO	TLL TLL EVO
VGZ (Ø5.3 and Ø5.6) VGZ EVO (Ø5.3 and Ø5.6)	GWZ (Ø5.3 and Ø5.6) GWZ EVO (Ø5.3 and Ø5.6)

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 screw size (D_{nom}) and length, the thread length and the head type and drive size. The packaging also bears an image of the screw showing the head, thread and tip design.
3. "C4 EVO coating" and "C5 EVO coating" is either reported on the label or in the leaflet inside the packages of screws and washers with EVO or EVO C5 coating, respectively.
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:

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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 as required by the Authority Having Jurisdiction (AHJ). The most restrictive requirements govern if there are any conflicts amongst these documents.

Typically, installation may be performed with or without predrilling wood members. Predrilling is required for $SG_{O86} > 0.55$. For $SG_{O86} \leq 0.55$, predrilling is optional. The respective drill hole diameter requirements are given below.

Nominal Diameter D_{nom} (mm)	Drill Hole Diameter $SG_{O86} \leq 0.55$ (mm)	Drill Hole Diameter for $SG_{O86} > 0.55$ (mm)	Nominal Diameter D_{nom} (mm)	Drill Hole Diameter $SG_{O86} \leq 0.55$ (mm)	Drill Hole Diameter for $SG_{O86} > 0.55$ (mm)
3.5	2	2	7.0	4.0	5.0
4.0	2.5	2.5	8.0	5.0	6.0
4.5	2.5	2.5	9.0	5.0	6.0
5.0	3.0	3.5	10.0	6.0	7.0
5.3	3.5	4.0	11.0	6.0	7.0
5.6	3.5	4.0	12.0	7.0	8.0
6.0	4.0	4.0	13.0	8.0	9.0

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, TBS FRAME 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, LBSH, LBSH EVO, HBS PLATE (HBSP and HBSPL), HBS PLATE EVO (HBSP EVO and HBSPL EVO), HBS PLATE A4 and KKF screws, and VGS, VGS EVO and VGS PLATE 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, VGS EVO and VGS A4 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, HUS EVO and HUS15 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.

For wood-to-wood and metal-to-wood connections with screws installed at 45˚ angle to the grain, a 45˚ angle assembly jig is offered and recommended by the report holder to facilitate the installation.

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 shown in Table 6. 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 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_r 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 building 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.

TABLE 1A—HBS SCREW DIMENSIONS AND STRENGTHS[1]

D_{nom} (mm)	L[2] (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
3.5	40	18	7.00	TX 15	2.45	2.25	3.50	3.50	1537	2.36	1.53
	45 to 50	24									
4	30 to 35	18	8.00	TX 20	2.75	2.55	4.00	4.00	1482	3.11	1.96
	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	2.36
	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	3.49
	60	30									
	70	35									
	80	40									
	90	45									
	100	50									
	120	60									
6	40 to 50	35	12.00	TX 30	4.30	3.95	6.00	6.00	1188	8.56	4.71
	60	30									
	70 to 80	40									
	90 to 100	50									
	110 to 130	60									
	140 to 400	75									
8	80 to 100	52	14.50	TX 40	5.80	5.40	8.00	8.00	1047	14.70	8.79
	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	12.35
	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	13.95
	320 to 1000	120									

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.

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

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

D_{nom} (mm)	L^2 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
5	50	30	9.65	TX 25	3.65	3.40	5.00	5.00	1315	4.97	3.49
	60	35									
	70	40									
	80	50									
6	80	50	12.00	TX 30	4.30	3.95	6.00	6.00	1188	8.56	4.71
	90	55									
8	40	32	14.50	TX 40	5.80	5.40	8.00	8.00	1047	14.70	8.79
	60	52									
	80	55									
	100	75									
	120	95									
	140	110									
	160	130									
10	60	52	18.25	TX 40	7.00	6.40	10.00	10.00	1080	19.51	12.35
	80	55									
	100	75									
	120	95									
	140	110									
	160	130									
	180	150									
12	100	75	20.75	TX 50	8.00	6.80	12.00	12.00	1114	22.11	13.95
	120	90									
	140	110									
	160	120									
	180	140									
	200	160									

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.
[2]The overall length is measured from the underside of the washer head to the screw tip, as shown in Figure 1B.

TABLE 1C—HBS PLATE (HBSPL) SCREW DIMENSIONS AND STRENGTHS[1]

D_{nom} (mm)	L^2 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
8	40	32	13.50	TX 40	6.30	5.90	8.00	8.00	1018	19.18	10.51
	60	52									
	80	55									
	100	75									
	120	95									
	140	110									
	160	130									
10	60	52	16.50	TX 40	7.20	6.60	10.00	10.00	969	24.17	13.14
	80	55									
	100	75									
	120	95									
	140	110									
	160	130									
	180	150									
12	100	75	18.50	TX 50	8.55	7.30	12.00	12.00	1060	31.08	16.07
	120	90									
	140	110									
	160	120									
	180	140									
	200	160									

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.
[2]The overall length is measured from the underside of the washer head to the screw tip, as shown in Figure 1B.

TABLE 1D—HBS PLATE A4 SCREW DIMENSIONS AND STRENGTHS[1]

D_{nom} (mm)	L^2 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
8	60	52	13.50	TX 40	6.30	5.90	8.00	8.00	631	9.23	5.91
	80	55									
	100	75									
	120	95									
	140	110									
	160	130									
10	80	55	16.50	TX 40	7.20	6.60	10.00	10.00	619	10.89	7.39
	100	75									
	120	95									
	140	110									
	160	130									
	180	150									
12	100	75	18.50	TX 50	8.55	7.30	12.00	12.00	655	17.15	9.04
	120	90									
	140	110									
	160	120									
	180	140									
	200	160									

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.
[2]The overall length is measured from the underside of the washer head to the screw tip, as shown in Figure 1B.

TABLE 1E—TBS, TBS MAX AND TBS FRAME SCREW DIMENSIONS AND STRENGTHS[1]

D_{nom} (mm)	L^2 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
TBS											
6	60 to 70	40	15.50	TX 30	4.30	3.95	6.00	6.00	1188	8.56	4.71
	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	8.79
	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	12.35
	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	13.95
	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	8.79
	160 to 400	120									
TBS FRAME											
8	73 to 175	34	19.00	TX 40	5.80	5.40	8.00	8.00	1047	14.70	8.79

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.
[2]The overall length is measured from the underside of the large washer head to the screw tip, as shown in Figure 1A.

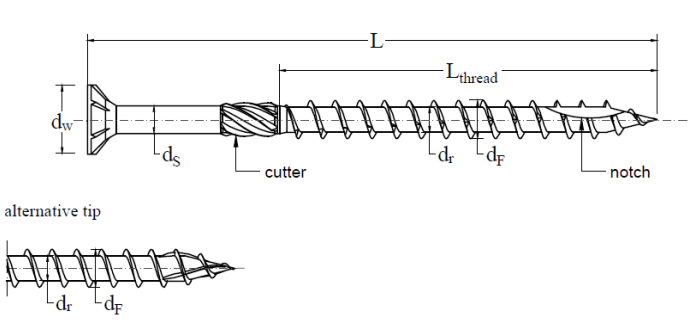
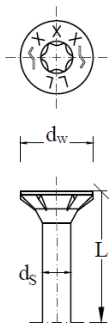
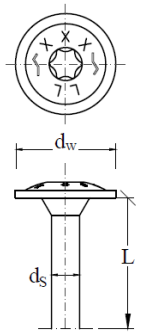
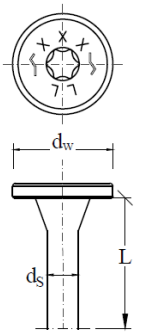
HBS screws Alternative screws with different head type (included EVO or EVO C5 coated): TBS, TBS MAX, TBS FRAME	Alternative head types:		
	HBS countersunk head **"CS"**	TBS, TBS MAX large washer head **"LW"**	TBS FRAME large washer head **"LWF"**
			

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

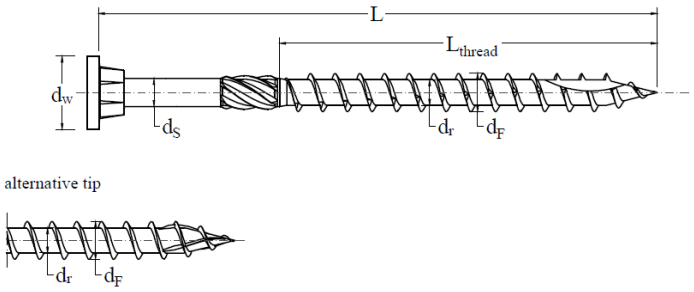
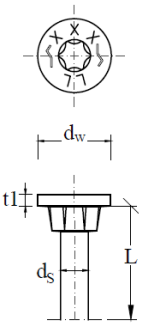
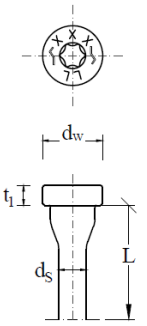
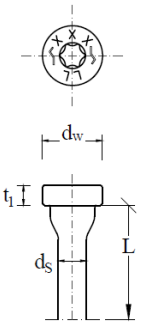
HBS PLATE (HBSP) screws Alternative screws with different head type (included EVO or EVO C5 coated): HBS PLATE (HBSPL), HBS PLATE A4	Alternative head types:		
	HBS PLATE (HBSP) washer head **"WU"**	HBS PLATE (HBSPL) washer head **"WUPL"**	HBS PLATE A4 washer head **"WUPLA"**
			

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

TABLE 2A—LBS AND LBSHSCREW DIMENSIONS AND STRENGTHS[1]

D_{nom} (mm)	L^2 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
LBS										
5	25 to 70	L – 4	7.80	TX 20	3.00	5.00	5.00	1075	5.36	2.71
7	60 to 100	L – 5	11.00	TX 30	4.40	7.00	7.00	1146	11.59	5.84
LBSH										
5	40 to 120	L - 4	7.80	TX20	3.48	5.00	5.00	1122	7.09	3.65
7	60 to 200	L - 5	11.00	TX30	4.85	7.00	7.00	1186	14.83	7.09

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.
[2]The overall length is measured from the underside of the head to the screw tip, as shown in Figure 2.

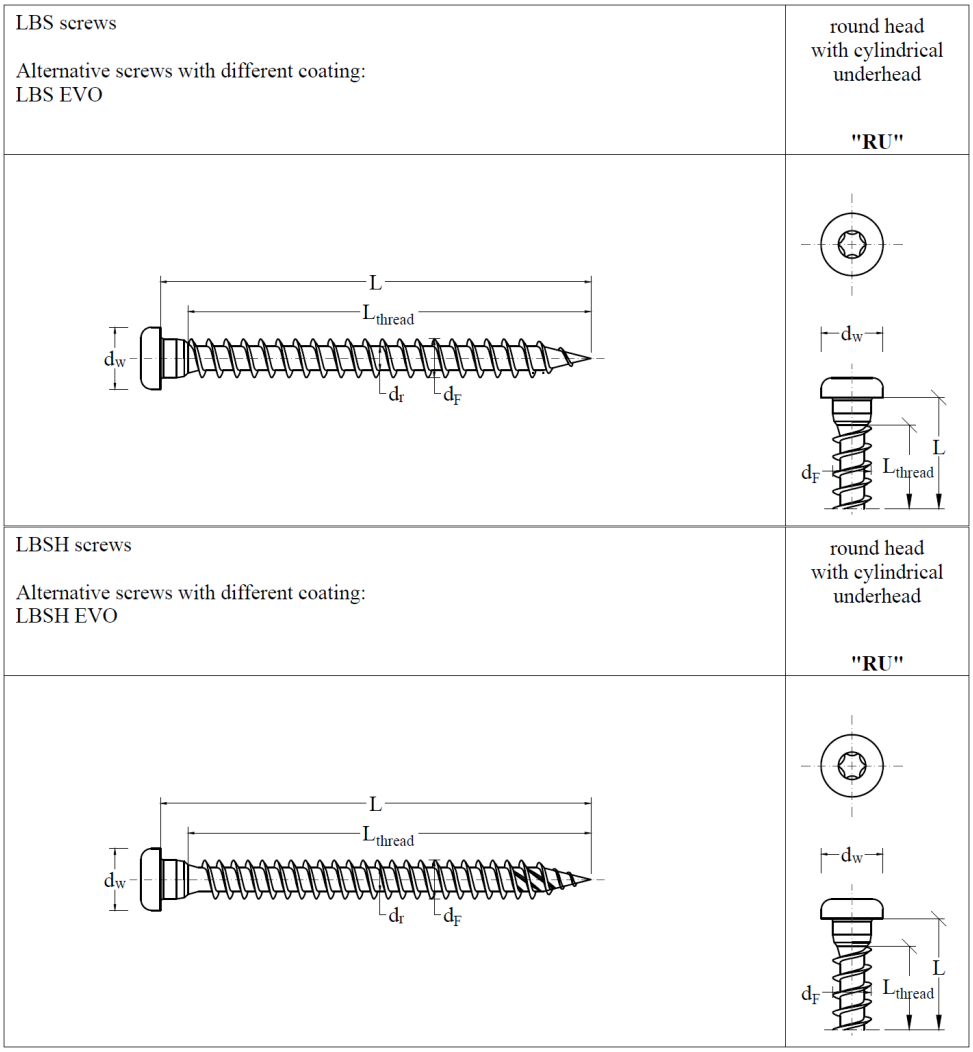


FIGURE 2—LBS, LBS EVO, LBSH AND LBSH EVO FULLY THREADED SCREWS

TABLE 2B—VGZ SCREW DIMENSIONS AND STRENGTHS[1]

D_{nom} (mm)	L^2 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
5.3	80 to 120	L – 10	8.00	TX 25	3.60	5.30	5.30	1021	7.49	3.91
5.6	140 to 160	L – 10	8.00	TX 25	3.80	5.60	5.60	1021	8.08	4.36
7	80 to 400	L – 10	9.50	TX 30	4.60	7.00	7.00	1111	10.64	6.38
9	160 to 600	L – 10	11.50	TX 40	5.90	9.00	9.00	1069	17.84	10.50
11	150 to 1000	L – 10	13.50	TX 50	6.60	11.00	11.00	1026	23.17	13.14
13	80 to 1500	L - 10	15.50	TX 50	8.00	13.00	13.00	960	31.96	19.30

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.
[2]The overall length is measured from the top of the head to the screw tip, as shown in Figure 3.

TABLE 2C—VGS SCREW DIMENSIONS AND STRENGTHS[1]

D_{nom} (mm)	HEAD STYLE	L^2 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
9	Countersunk (CS)	100 to 600	L – 10	16.00	TX 40	5.90	9.00	9.00	1069	17.84	10.50
11	Countersunk (CS)	80 to 600	L – 10	19.30	TX 50	6.60	11.00	11.00	1026	23.17	13.14
	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	19.30
		300 to 600	L – 20	22.00	TX 50						
	Hexagonal (EXA)	650 to 1500	L – 20	19.00	SW 19						

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.
[2]The overall length is measured from the underside of the head to the screw tip, as shown in Figure 3.

TABLE 2D—VGS PLATE SCREW DIMENSIONS AND STRENGTHS[1]

D_{nom} (mm)	HEAD STYLE	L^2 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
11	Countersunk (CS)	80 to 280	L – 10	20.00	TX 40 SW17	6.60	11.00	11.00	1026	23.17	13.14

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.
[2]The overall length is measured from the underside of the head to the screw tip, as shown in Figure 3.

TABLE 2E—VGS A4 SCREW DIMENSIONS AND STRENGTHS[1]

D_{nom} (mm)	HEAD STYLE	L^2 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
9	Countersunk (CS)	120 to 360	L – 10	16.00	TX 40	5.90	9.00	9.00	690	12.87	5.91
11	Countersunk (CS)	100 to 600	L – 10	19.30	TX 50	6.60	11.00	11.00	816	16.36	7.39

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.
[2]The overall length is measured from the underside of the head to the screw tip, as shown in Figure 3.

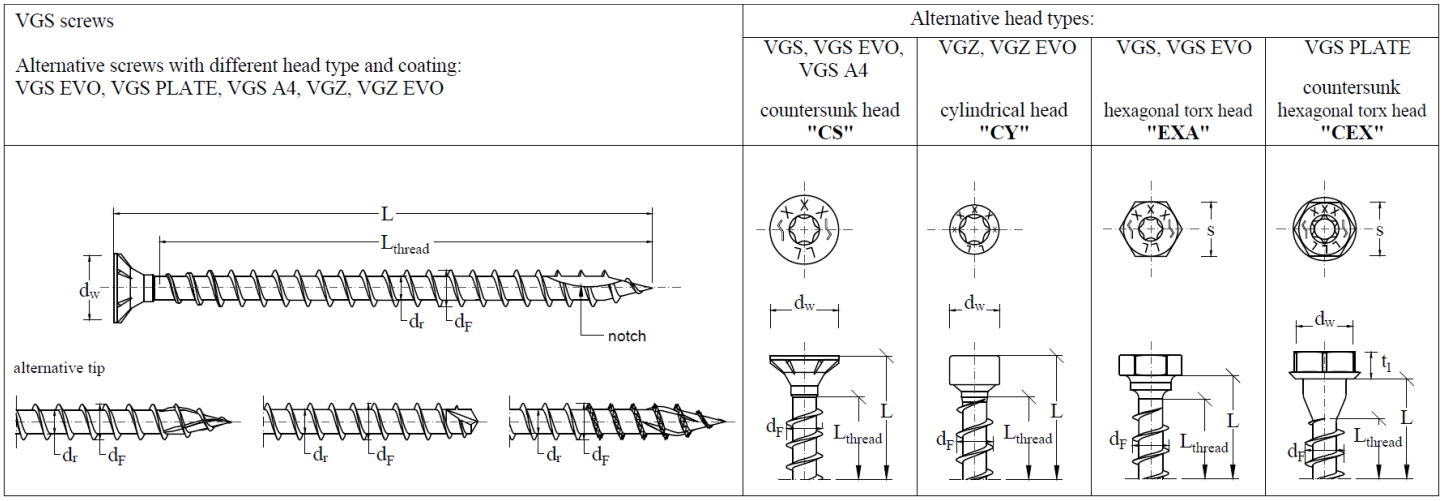


FIGURE 3—TYPICAL VGS, VGS EVO, VGZ AND VGZ EVO FULLY THREADED SCREWS
Note: The presence or absence of the milling ribs and notch depends on screw size and length.

TABLE 3—DGZ AND CTC SCREW DIMENSIONS AND STRENGTHS[1]

D_{nom} (mm)	DESIGNATION	L[2] (mm)	$L_{thread,1}$ - $L_{thread,2}$[3] (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
7	DGZ	220 to 380	100 – 60	9.50	TX 30	5.00	4.60	7.00	7.00	1111	12.72	6.38
	CTC	160	110 – 40	9.50	TX 30	5.00	4.60	7.00	7.00	1111	12.72	6.38
		240	190 – 40									
9	DGZ	240 to 520	100 – 60	11.50	TX 40	6.50	5.90	9.00	9.00	1069	20.97	10.50
	CTC	160	110 – 40	11.50	TX 40	6.50	5.90	9.00	9.00	1069	20.97	10.50
		240	190 – 40									

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.
[2]The overall length is measured from the top of the head to the screw tip, as shown in Figures 4 and 5.
[3]$L_{thread,1}$ includes tip. $L_{thread,2}$ is located towards the screw head, as shown in Figures 4 and 5.

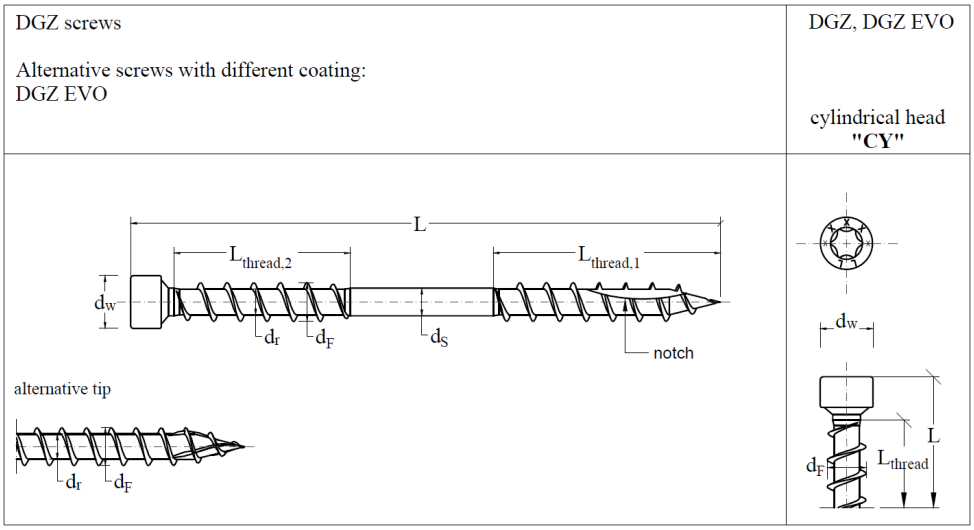


FIGURE 4—DGZ AND DGZ EVO DOUBLE THREADED SCREWS
Note: The presence or absence of the notch depends on screw size and length.

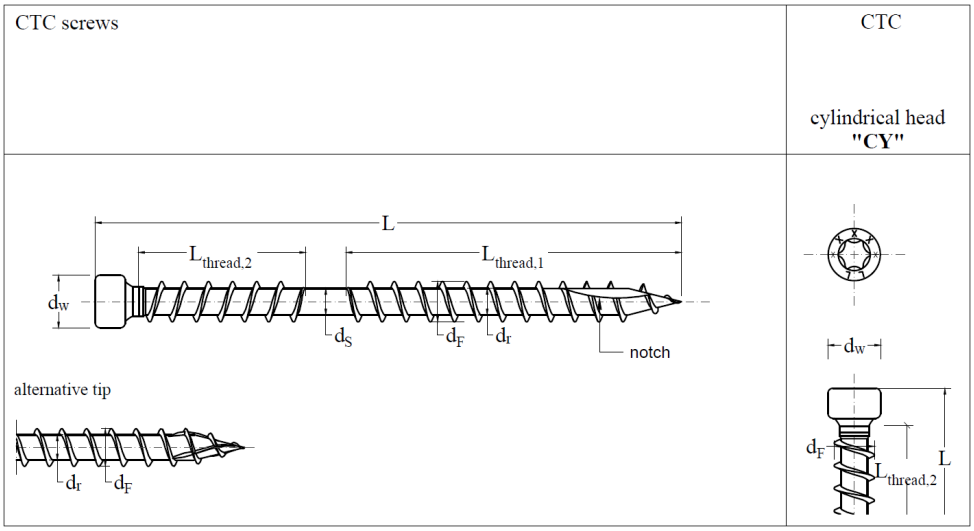


FIGURE 5—CTC DOUBLE THREADED SCREWS
Note: The presence or absence of the notch depends on screw size and length.

TABLE 4A—KKF SCREW DIMENSIONS AND STRENGTHS[1]

D_{nom} (mm)	L^2 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
4	30	18	7.70	TX 20	2.90	2.60	4.00	4.00	1066	3.48	2.04
	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	2.81
	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	3.19
	50	30									
	60	35									
	70	40									
	80	50									
	90	55									
	100	60									
6	80	50	11.65	TX 30	4.30	4.05	6.00	6.00	896	8.47	4.95
	100	60									
	120	75									

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.
[2]The 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[1]

D_{nom} (mm)	L^2 (mm)	L_{thread} (mm)	d_w (mm)	DRIVE TYPE & SIZE	d_s (mm)	d_r (mm)	d_F (mm)	L_{tip} (mm)	F_y (MPa)	ϕf_u (kN)	ϕv_s (kN)
4.5	50	30	7.50	TX 20	3.35	3.05	4.50	4.50	1102	5.39	2.81
	60	35									
	70	40									
5	50	24	8.50	TX 25	3.60	3.25	5.00	5.00	981	5.86	3.19
	60	30									
	70	35									
	80	40									
	100	50									
6	80	40	11.00	TX 30	4.30	4.05	6.00	6.00	896	8.47	4.95
	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	8.79
	160 to 280	80									

[1]Tabulated values for zinc plated carbon steel screws also apply to EVO coated screws.
[2]The overall length is measured from the top of the head to the screw tip, as shown in Figure 6.

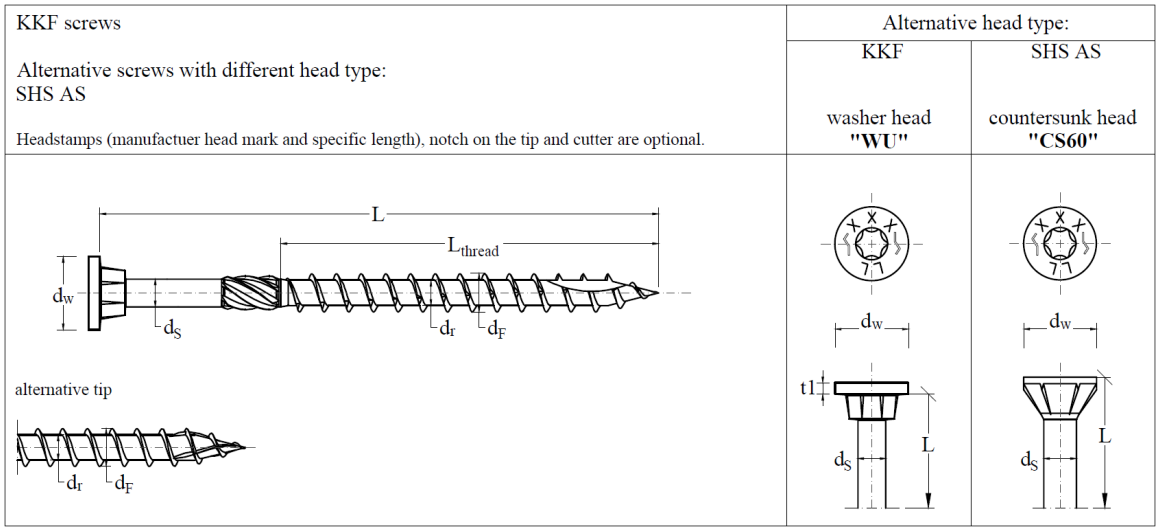
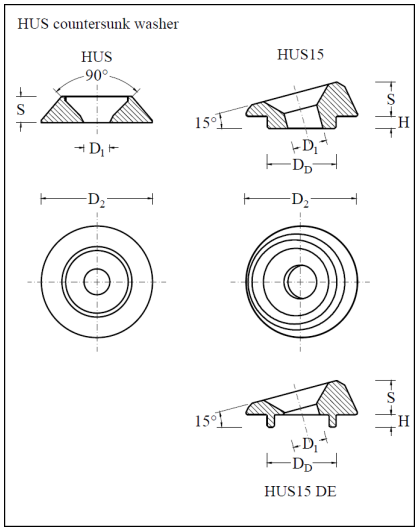
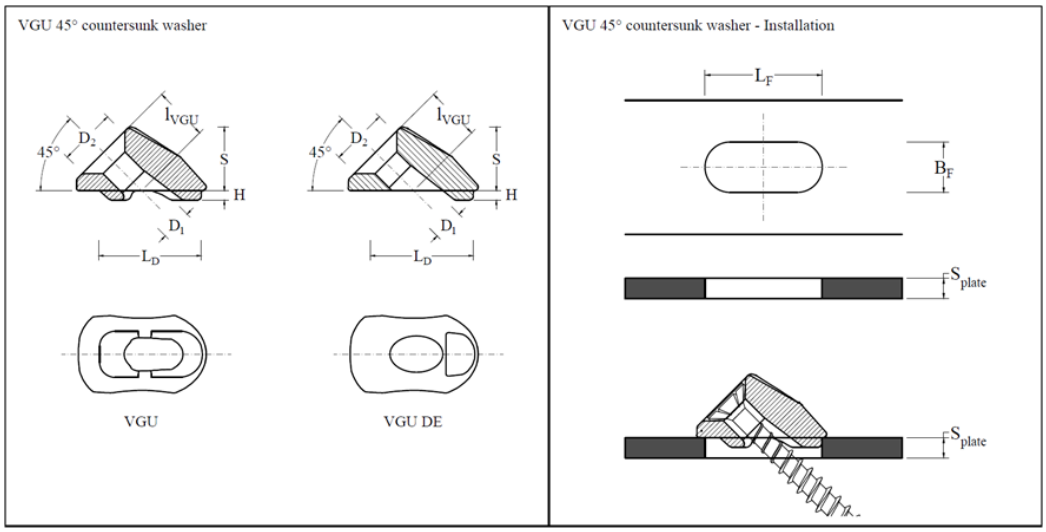


FIGURE 6—KKF AND SHS AS PARTIALLY THREADED STAINLESS-STEEL SCREWS
Note: The presence or absence of the reamer knurl (cutter) and notch depends on screw size and length.



DESIGNATION	APPLICABLE SCREW TYPE	D_1 (mm)	D_2 (mm)	S (mm)	H (mm)	D_D (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	-	-
HUS815, HUS815DE	HBS8, HBSEVO8, VGS9, VGSEVO9	9.50	31.40	9.60	3.50	19.40

FIGURE 7—HUS, HUS EVO AND HUS15 COUNTERSUNK WASHER



DESIGNATION	APPLICABLE SCREW TYPE	D_1 (mm)	D_2 (mm)	S (mm)	H (mm)	L_D (mm)	l_{VGU} (mm)	SLOTTED HOLE LENGTH L_F (mm)	SLOTTED HOLE WIDTH B_F (mm)	METAL PLATE THICKNESS S_{plate}[1] (mm)
VGU945 VGU945DE	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 VGU1145DE	VGS11, VGSEVO11	11.80	23.00	24.40	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 VGU1345DE	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

[1]For 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)	d_r (mm)	TIP TYPES	$L_{emb,w}$[3] (mm)	SPECIFIED WITHDRAWAL RESISTANCE, Y_W (N/mm) FOR SELECTED SG_{O86} VALUES:			
					0.35	0.42	0.49	0.55
Partially-threaded Screws								
HBS	3.5	2.25	Notch, ribbed	21	36.60	42.35	47.91	52.55
HBS	4	2.55	Notch, ribbed	24	41.83	48.40	54.75	60.05
KKF		2.60	Notch, ribbed	24	41.83	48.40	54.75	60.05
HBS	4.5	2.80	Notch, ribbed	27	47.06	54.45	61.60	67.56
KKF / SHS AS		3.05	Notch, ribbed	27	47.06	54.45	61.60	67.56
HBS HBS PLATE (HBSP)	5	3.40	Notch, ribbed	30	52.29	60.50	68.44	75.07
KKF / SHS AS		3.25	Notch, ribbed	30	52.29	60.50	68.44	75.07
HBS HBS PLATE (HBSP) TBS	6	3.95	Notch, ribbed	36	52.38	60.60	68.55	75.19
KKF / SHS AS		4.05	Notch, ribbed	36	52.38	60.60	68.55	75.19
HBS HBS PLATE (HBSP) TBS / TBS MAX / TBS FRAME SHS AS	8	5.40	Notch, ribbed	48	69.83	80.80	91.40	100.25
HBS PLATE (HBSPL) HBS PLATE (HBSPL) A4		5.90	Notch, ribbed	64	69.83	80.80	91.40	100.25
HBS HBS PLATE (HBSP) TBS	10	6.40	Notch, ribbed	60	87.29	101.00	114.26	125.32
HBS PLATE (HBSPL) HBS PLATE (HBSPL) A4		6.60	Notch, ribbed	98	87.29	101.00	114.26	125.32
HBS HBS PLATE (HBSP) TBS	12	6.80	Notch, ribbed	72	104.75	121.20	137.11	150.38
HBS PLATE (HBSPL) HBS PLATE (HBSPL) A4		7.30	Notch, ribbed	108	104.75	121.20	137.11	150.38
Fully-threaded and Double-thread Screws								
VGZ	5.3	3.60	Notch, ribbed, drill	32	55.43	64.13	72.55	79.57
VGZ	5.6	3.80	Notch, ribbed, drill	34	58.56	67.76	76.65	84.07
VGZ	7	4.60	Notch, ribbed, drill	42	61.10	70.70	79.98	87.72
DGZ / CTC		4.60	Notch, ribbed	42	61.10	70.70	79.98	87.72
VGZ / VGS / VGS A4	9	5.90	Notch, ribbed, drill	54	78.56	90.90	102.83	112.79
DGZ / CTC		5.90	Notch, ribbed	54	78.56	90.90	102.83	112.79
VGZ / VGS / VGS A4 / VGS PLATE	11	6.60	Notch, ribbed, drill	66	96.02	111.10	125.68	137.85
VGZ / VGS	13	8.00	Notch, ribbed, drill	78	113.48	131.30	148.53	162.91
LBS	5	3.00	Sharp	30	52.29	60.50	68.44	75.07
LBSH		3.48	Sharp with ribs	42	52.29	60.50	68.44	75.07
LBS	7	4.40	Sharp	42	73.20	84.70	95.82	105.09
LBSH		4.85	Sharp with ribs	70	73.20	84.70	95.82	105.09

[1]Tabulated 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.
[2]Tabulated values for zinc plated carbon steel screws also applies to EVO coated screws.
[3]Includes tip length. When calculating the total factored withdrawal resistance (P_{rw}), do not include the length of the tip.

TABLE 6—SPECIFIED HEAD PULL-THROUGH DESIGN VALUES FOR HBS, TBS, TBS FRAME AND TBS MAX SCREWS (f_{pt})[1,2]

SCREW DESIGNATION	HEAD TYPES	D_{nom} (mm)	D_H (mm)	SPECIFIED HEAD PULL-THROUGH DESIGN VALUE, f_{pt} (kN) FOR SELECTED SG_{O86} VALUES:			
				0.35	**0.42**	**0.49**	**0.55**
HBS	Countersunk	3.5	7.0	0.35	0.42	0.48	0.54
		4	8.0	0.44	0.53	0.62	0.70
		4.5	9.0	0.55	0.66	0.77	0.86
		5	10.0	0.66	0.80	0.93	1.04
		6	12.0	0.92	1.10	1.29	1.45
		8	14.5	1.28	1.53	1.79	2.01
		10	18.25	1.88	2.25	2.63	2.95
		12	20.75	2.31	2.77	3.23	3.63
TBS	Washer	6	15.5	1.79	2.15	2.50	2.81
TBS / TBS FRAME	Washer	8	19.0	2.51	3.01	3.51	3.94
TBS MAX	Large Washer	8	24.5	3.73	4.48	5.23	5.87
TBS	Washer	10	25.0	3.85	4.62	5.39	6.05
TBS	Washer	12	29.0	4.78	5.74	6.69	7.51

[1]Tabulated 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.
[2]Tabulated values apply to wood members.
[3]Tabulated values for zinc-plated carbon steel screws also apply to EVO coated screws.

TABLE 6—MINIMUM PLACEMENT REQUIREMENTS

CONDITION	MINIMUM DISTANCE OR SPACING		
	Self-drilled		Predrilled Holes
	SG_{O86} ≤ 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

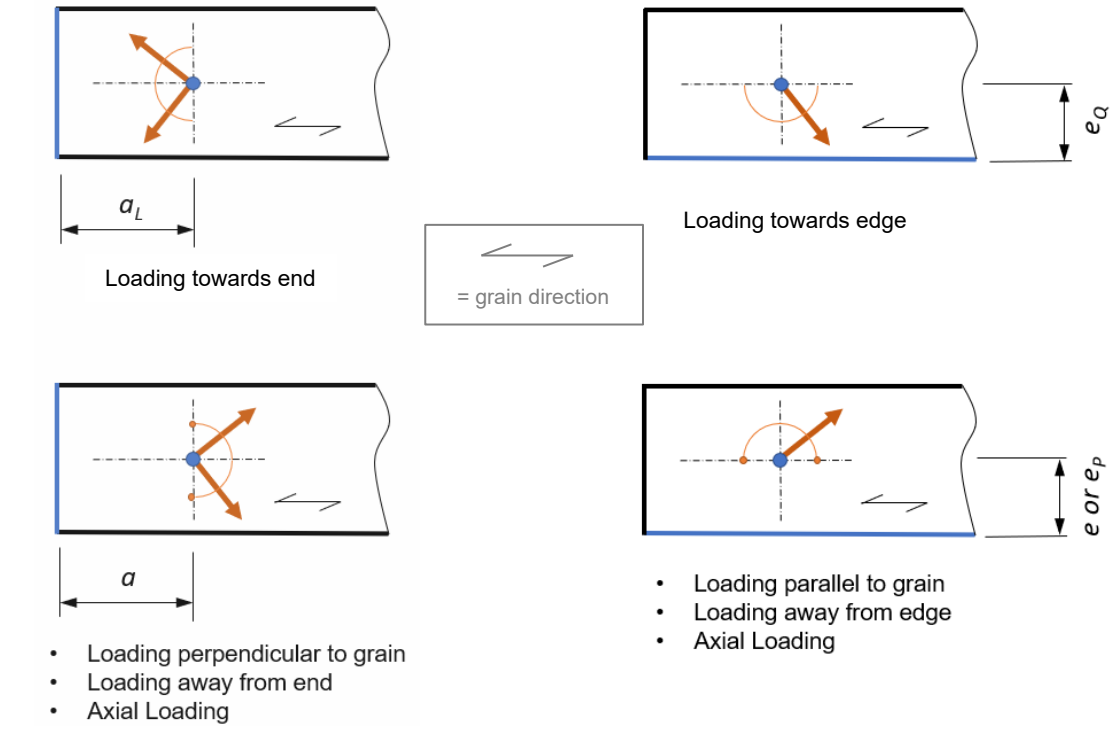


FIGURE 9—END AND EDGE DISTANCE DEFINITIONS FOR SCREWS INSTALLED PERPENDICULAR TO GRAIN

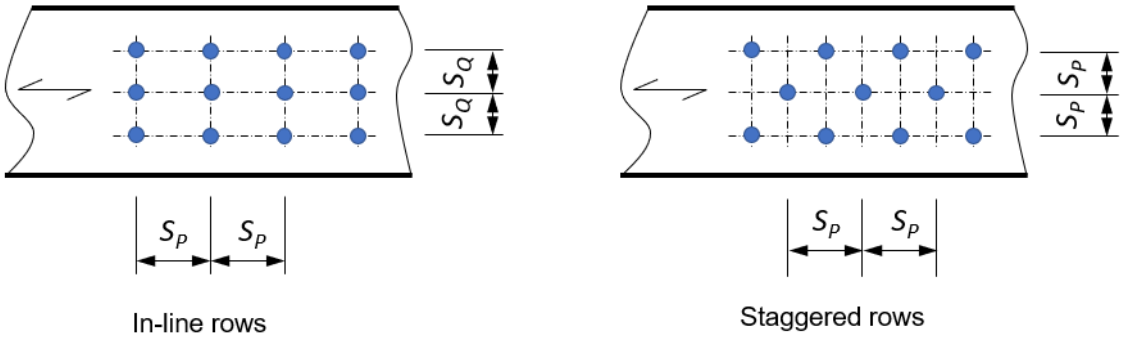


FIGURE 10—SPACING DEFINITIONS FOR SCREWS INSTALLED PERPENDICULAR TO GRAIN