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Eurotec Inc.

The specialist for fastening technology

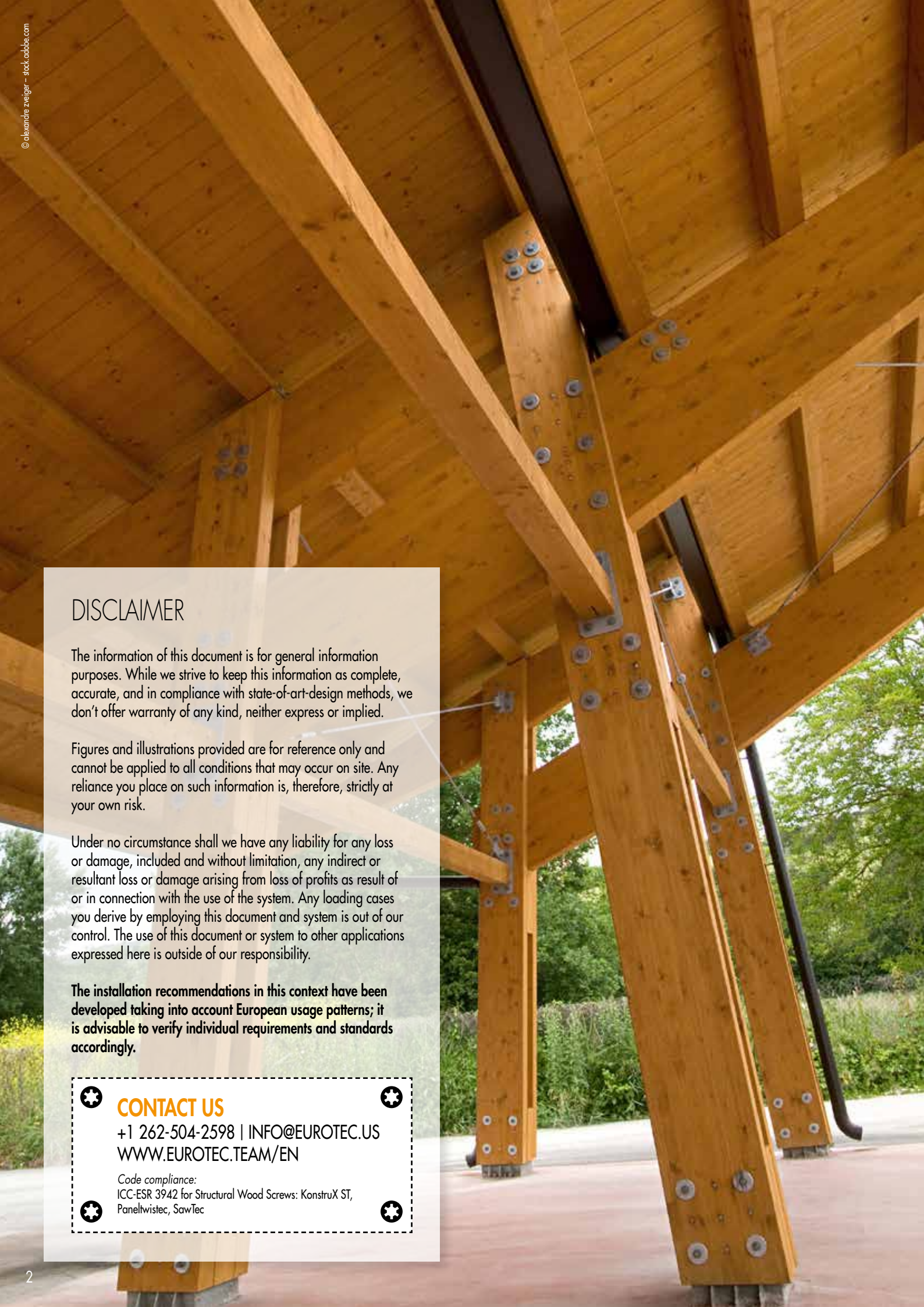
ICC-ES CERTIFICATE

USA DESIGN GUIDE FOR STRUCTURAL WOOD SCREWS

KONSTRUX ST

PANELTWISTEC

SAWTEC



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The installation recommendations in this context have been developed taking into account European usage patterns; it is advisable to verify individual requirements and standards accordingly.

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Code compliance:
ICC-ESR 3942 for Structural Wood Screws: KonstruX ST, Paneltwistec, SawTec

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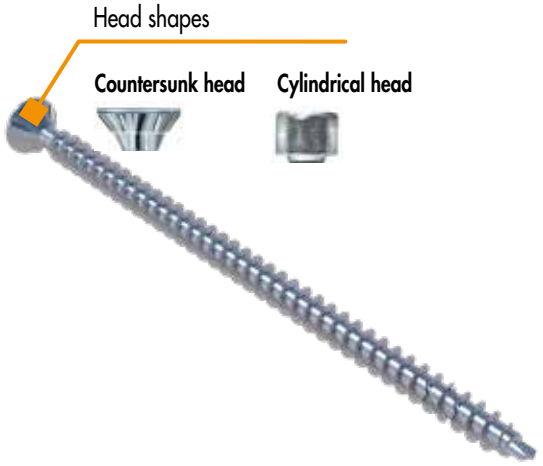
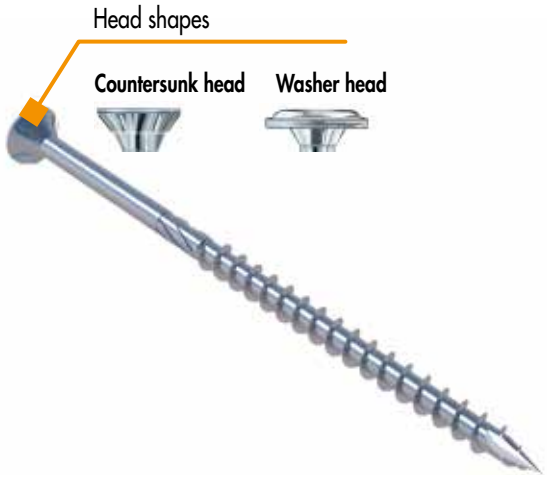


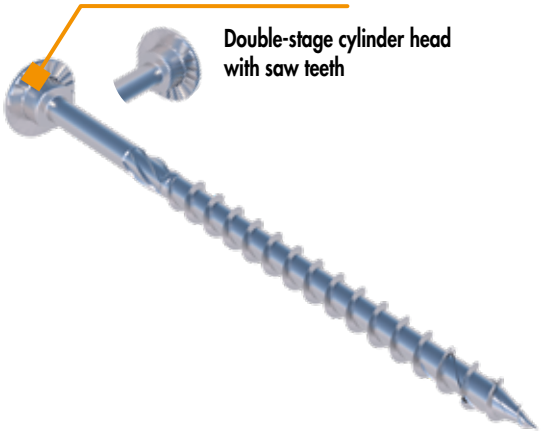
PANELTWISTEC

Head shapes



SAWTEC

Head shapes



NOTES TO THE DESIGNER

- Reference design values, minimum spacing distances, and recommendations herein presented are based on **ICC-ESR 3942** and **European Technical Approval ETA-11/0024**, unless noted otherwise, taking into account the National Design Standards (NDS) 2018 provisions. This guide must be used and interpreted by a qualified designer;

- All suggestions and details shown are to be treated as **general cases** and cannot be assumed to be valid for all construction situations and site conditions;

- Structural screws described in this guide may be used only in **dry service conditions (CM = 1)**, considering a moisture content of **19 %** or less and **16 %** or less for structural sawn lumber members and engineered wood products detailed in **ICC-ESR 3942,** respectively, as per **NDS provisions**;

- Conforming with ICC-ER's scope, use of the screws in connections with saltwater exposure or saltwater spray, as well as in contact with preservative / fire-retardant-treated wood, shall be made with the **responsibility of the designer**;

- In case **splitting of wood member** or **engineered wood product** is observed during or prior to fastener installation, a **design professional must be contacted** immediately and appropriated measures must be taken. The same applies in the event of fastener damage or breakage;

- When the capacity of a connection is controlled by the **fastener's strength**, the allowable connection strength must not be increased by the **adjustment factors** specified in the **NDS**;

- A load bearing connection shall consist of at least two **(2) wood screws**;

- For screws loaded in withdrawal from the narrow edge of CLT, the **reference withdrawal value W** shall be multiplied by the **end grain factor C_{eg} = 0.75**, regardless of grain orientation, as per **Clause 12.2.1.5**;

- Load duration factors $C_D \leq 1.6$ may be applied to fastener design, except when connection capacity is based on **design of metal parts**, according to **Appendix B** and **Clause 11.2.3 of the NDS**;

- **No reduction** to the reference design values is anticipated if soap or other lubricant is used on the wood screw to or lead hole to facilitate installation and to **prevent damage** to the wood screw, according to **clause 12.1.5.5 of the NDS**;

- The allowable lateral load for a two-member single screw connection shall be the minimum of:

  Min ($Z_{||}' = Z_{||}$ · Applicable adjustment factors of NDS;
  Allowable shear strength of screw)

- The allowable lateral load for a two-member single screw connection in which the screw is **subject to tension**, with L_e as the **thread penetration length**, shall be the minimum of:

  (W' · L_e = W · L_e · Applicable adjustment factors of NDS ;
  W_H' = W · Applicable adjustment factors of NDS ;
  Allowable screw tension strength)

- All reference design values must be **multiplied by all applicable adjustment factors** for wood screws in accordance with the NDS. Depending on the design approach adopted, **Allowable Stress Design (ASD) method** or **Load and Resistance Factor Design (LRFD)** method, values must be affected as follows:

  For Lateral loads:
  $Z' = Z\ C_D\ C_M\ C_t\ C_g\ C_\Delta\ C_{eg}\ C_{di}\ C_{tn}$ (ASD)
  $Z' = Z\ C_M\ C_t\ C_g\ C_\Delta\ C_{eg}\ C_{di}\ C_{tn}\ 3.32{\cdot}0.65\ \lambda$ (LRFD)

  For Withdrawl loads:
  $W' = W\ C_D\ C_M\ C_t\ C_{eg}\ C_{tn}$ (ASD)
  $W' = W\ C_D\ C_M\ C_t\ C_{eg}\ C_{tn}\ 3.32{\cdot}0.65\ \lambda$ (LRFD)

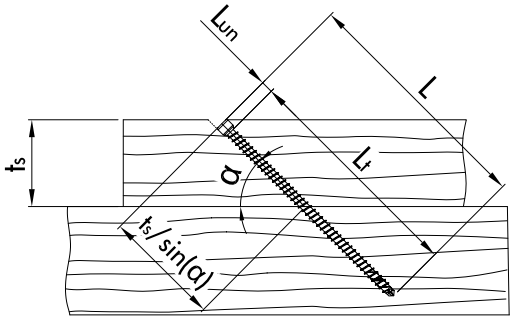
  For Pull-through loads:
  WH' = WH CD CM Ct (ASD)
  $WH' = W_H\ C_M\ C_t\ 3.32{\cdot}0.65\ \lambda$ (LRFD)

- The **Effective embedded thread length** is the length of fastener thread in a wood member that is **completely surrounded by the wood**. In a wood-wood connection the **effective lengths** in the side and main members are determined as follows:

$$L_{eff,s} = \left(\frac{t_s}{sin(\alpha)}\right) - L_{un}$$

$$L_{eff,m} = \left[L - \left(\frac{t_s}{sin(\alpha)}\right)\right] - L_{tip} \leq L_t$$

$L_{eff,s}$ / $L_{eff,m}$: effective embedded thread length in the side / main wood member.
L_{un}: unthreaded length of screw, measured from the head to the start of the threads
L_t: threaded length of the screw
L: total length of the screw
α: angle of inclination
t_s: thickness of wood side member

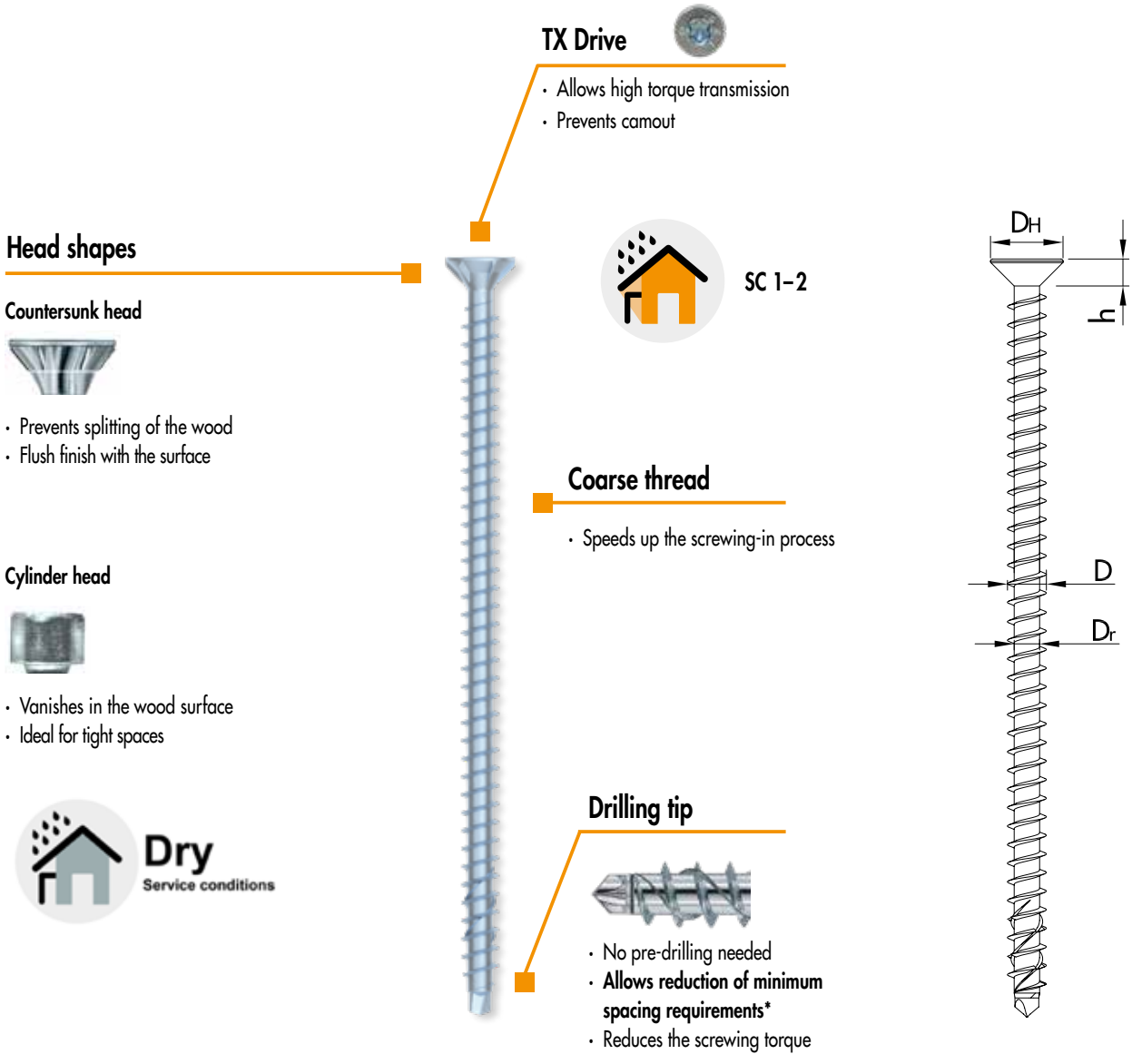


1. EUROTEC STRUCTURAL WOOD SCREWS

KONSTRUX ST

THE HIGH-PERFORMANCE SOLUTION FOR NEW CONSTRUCTION AND REINFORCEMENT

KonstruX ST fully threaded screws maximize the load-bearing capacity of a connection due to the high thread extraction resistance in both components. When using partially threaded screws, the significantly lower head pull-through resistance in the attachment part limits the load-bearing capacity of the connection. KonstruX ST fully threaded screw provides a cost-saving alternative to traditional connectors or timber connectors such as joist shoes and joist girders.

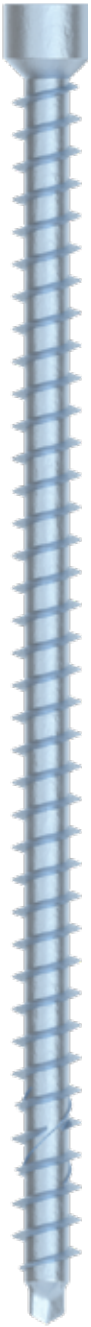


KonstruX ST					
Geometric properties					
Major diameter D		Root diameter D_r	Head diameter D_H [in]		Head depth h [in]
[in]	[mm]	[in]	Countersunk	Cylinder	Countersunk
1/4	6.5	0.177	0.472	0.315	0.224
5/16	8	0.205	0.571	0.394	0.291
3/8	10	0.232	0.701	0.512	0.343

*For additional information, please refer to pages 24 and 25.

KONSTRUX ST

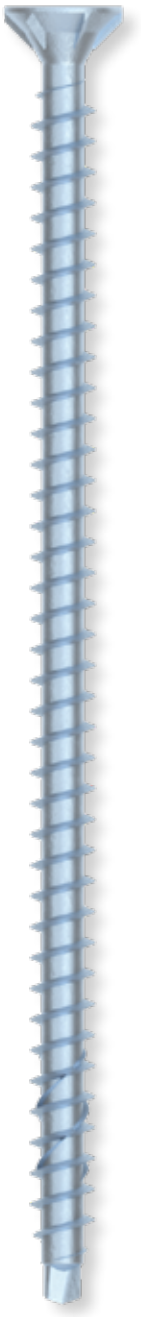
Cylinder head, zink-galvanized



Art. no.	Imperial [in]	Dimensions [mm]	Drive-bit	Box size
904808	1/4" x 3-1/8"	6.5 x 80	TX30 ●	100
904809	1/4" x 4"	6.5 x 100	TX30 ●	100
904810	1/4" x 4-3/4"	6.5 x 120	TX30 ●	100
904811	1/4" x 5-1/2"	6.5 x 140	TX30 ●	100
904812	1/4" x 6-1/4"	6.5 x 160	TX30 ●	100
904813	1/4" x 7-11/16"	6.5 x 195	TX30 ●	100
100063	1/4" x 7-5/8"	6.5 x 200	TX30 ●	100
100064	1/4" x 8-5/8"	6.5 x 220	TX30 ●	100
100065	1/4" x 9-1/2"	6.5 x 240	TX30 ●	100
100066	1/4" x 10-1/4"	6.5 x 260	TX30 ●	100
904825	5/16" x 6-1/8"	8.0 x 155	TX40 ●	50
904826	5/16" x 7-5/8"	8.0 x 195	TX40 ●	50
904827	5/16" x 8-5/8"	8.0 x 220	TX40 ●	50
904828	5/16" x 9-5/8"	8.0 x 245	TX40 ●	50
904834	5/16" x 10-5/8"	8.0 x 270	TX40 ●	50
904829	5/16" x 11-5/8"	8.0 x 295	TX40 ●	50
904830	5/16" x 13"	8.0 x 330	TX40 ●	50
904831	5/16" x 14-3/4"	8.0 x 375	TX40 ●	50
904832	5/16" x 15-3/4"	8.0 x 400	TX40 ●	50
944804	5/16" x 16-7/8"	8.0 x 430	TX40 ●	50
944805	5/16" x 18-7/8"	8.0 x 480	TX40 ●	50
944806	5/16" x 20-7/8"	8.0 x 530	TX40 ●	50
944807	5/16" x 22-7/8"	8.0 x 580	TX40 ●	50
904815	3/8" x 11-7/8"	10.0 x 300	TX50 ●	25
904816	3/8" x 13"	10.0 x 330	TX50 ●	25
904817	3/8" x 14-1/4"	10.0 x 360	TX50 ●	25
904818	3/8" x 15-3/4"	10.0 x 400	TX50 ●	25
904819	3/8" x 17-3/4"	10.0 x 450	TX50 ●	25
904820	3/8" x 19-5/8"	10.0 x 500	TX50 ●	25
904821	3/8" x 21-5/8"	10.0 x 550	TX50 ●	25
904822	3/8" x 23-5/8"	10.0 x 600	TX50 ●	25
100080	3/8" x 25-5/8"	10.0 x 650	TX50 ●	25
100081	3/8" x 27-1/2"	10.0 x 700	TX50 ●	25
100082	3/8" x 29-1/2"	10.0 x 750	TX50 ●	25
100083	3/8" x 31-1/2"	10.0 x 800	TX50 ●	25

KONSTRUX ST

Countersunk head, zink-galvanized



Art. no.	Imperial [in]	Dimensions [mm]	Drive-bit	Box size
904857	1/4" x 3-1/8"	6.5 x 80	TX30 ●	100
904858	1/4" x 4"	6.5 x 100	TX30 ●	100
904859	1/4" x 4-3/4"	6.5 x 120	TX30 ●	100
904860	1/4" x 5-1/2"	6.5 x 140	TX30 ●	100
904790	5/16" x 3-3/4"	8.0 x 95	TX40 ●	50
904791	5/16" x 4-7/8"	8.0 x 125	TX40 ●	50
904792	5/16" x 6-1/8"	8.0 x 155	TX40 ●	50
904793	5/16" x 7-5/8"	8.0 x 195	TX40 ●	50
904794	5/16" x 8-5/8"	8.0 x 220	TX40 ●	50
904795	5/16" x 9-5/8"	8.0 x 245	TX40 ●	50
904796	5/16" x 10-5/8"	8.0 x 270	TX40 ●	50
904797	5/16" x 11-5/8"	8.0 x 295	TX40 ●	50
904798	5/16" x 13"	8.0 x 330	TX40 ●	50
904799	5/16" x 14-3/4"	8.0 x 375	TX40 ●	50
904800	5/16" x 15-3/4"	8.0 x 400	TX40 ●	50
904801	5/16" x 16-7/8"	8.0 x 430	TX40 ●	50
904802	5/16" x 18-7/8"	8.0 x 480	TX40 ●	50
904803	5/16" x 21-1/2"	8.0 x 545	TX40 ●	50
904770	3/8" x 4-7/8"	10.0 x 125	TX50 ●	25
904771	3/8" x 6-1/8"	10.0 x 155	TX50 ●	25
904772	3/8" x 7-5/8"	10.0 x 195	TX50 ●	25
904773	3/8" x 8-5/8"	10.0 x 220	TX50 ●	25
904774	3/8" x 9-5/8"	10.0 x 245	TX50 ●	25
904775	3/8" x 10-5/8"	10.0 x 270	TX50 ●	25
904776	3/8" x 11-7/8"	10.0 x 300	TX50 ●	25
904777	3/8" x 13"	10.0 x 330	TX50 ●	25
904778	3/8" x 14-1/4"	10.0 x 360	TX50 ●	25
904779	3/8" x 15-3/4"	10.0 x 400	TX50 ●	25
904780	3/8" x 17-3/4"	10.0 x 450	TX50 ●	25
904781	3/8" x 19-5/8"	10.0 x 500	TX50 ●	25
904782	3/8" x 21-5/8"	10.0 x 550	TX50 ●	25
904783	3/8" x 23-5/8"	10.0 x 600	TX50 ●	25
100090	3/8" x 25-5/8"	10.0 x 650	TX50 ●	25
100091	3/8" x 27-1/2"	10.0 x 700	TX50 ●	25
100092	3/8" x 29-1/2"	10.0 x 750	TX50 ●	25
100093	3/8" x 31-1/2"	10.0 x 800	TX50 ●	25

PANELTWISTEC AG

THE HIGH FIDELITY PARTIALLY THREADED SCREW FOR ASSEMBLY

The Paneltwistec AG wood construction screw is made of hardened carbon zink-galvanized steel. It is equipped with a special tip with folded-down thread, which reduces the screw-in torque and increases the grip. Paneltwistec wood construction screws are available in both countersunk head and washer head versions. The larger washer head diameter allows for considerably higher head pull-through capacity.

TX Drive

- Allows high torque transmission
- Prevents camout

Head shapes

Countersunk head

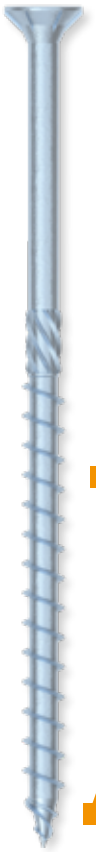
- Prevents splitting of the wood
- Flush finish with the surface

Washer head

- The larger contact surface allows a higher pull-through resistance

Shank cutter

- Friction part creates space for the shank thereby reduces the insertion resistance

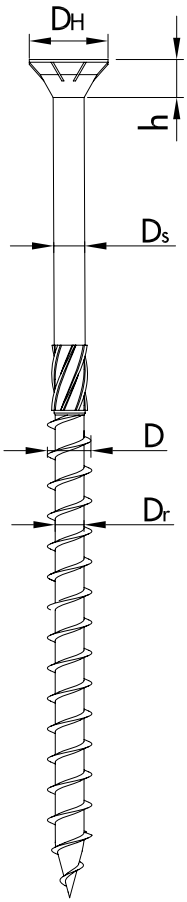


Coarse thread

- Speeds up the screwing-in process

AG tip

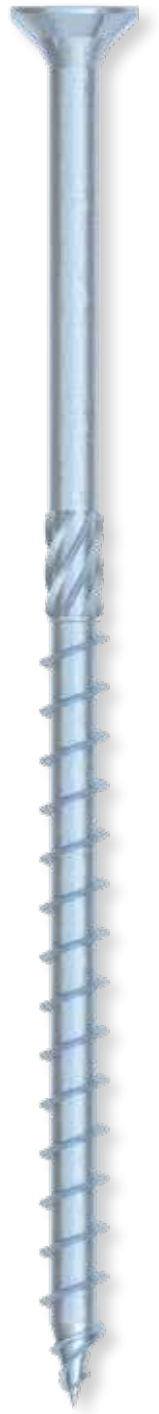
- Ensures quick and easy screwing in



Paneltwistec AG						
Geometric properties						
Major diameter D		Root diameter D_r	Shaft diameter D_s	Head depth h [in]	Head diameter D_H [in]	
[in]	[mm]	[in]	[in]	Countersunk	Countersunk	Washer
1/4	6	0.157	0.169	0.224	0.472	0.551
5/16	8	0.209	0.224	0.276	0.571	0.866
3/8	10	0.248	0.272	0.343	0.701	0.984

PANELTWISTEC AG

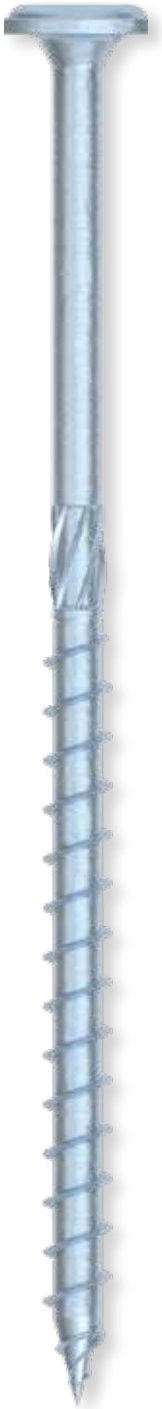
Countersunk head screw, zink-galvanized



Art. no.	Imperial [in]	Thread [in]	Dimensions [mm]	Thread [mm]	Drive-bit	Box size
945583	1/4" x 2-3/8"	1.42	6.0 x 60	36	TX30	200
945584	1/4" x 2-3/4"	1.65	6.0 x 70	42	TX30	200
945632	1/4" x 3-1/8"	1.89	6.0 x 80	48	TX30	200
945633	1/4" x 3-1/2"	2.13	6.0 x 90	54	TX30	100
945634	1/4" x 4"	2.36	6.0 x 100	60	TX30	100
945635	1/4" x 4-3/8"	2.76	6.0 x 110	70	TX30	100
945636	1/4" x 4-3/4"	2.76	6.0 x 120	70	TX30	100
945637	1/4" x 5-1/8"	2.76	6.0 x 130	70	TX30	100
945638	1/4" x 5-1/2"	2.76	6.0 x 140	70	TX30	100
945639	1/4" x 5-7/8"	2.76	6.0 x 150	70	TX30	100
945640	1/4" x6-1/4"	2.76	6.0 x 160	70	TX30	100
945641	1/4" x 7-1/8"	2.76	6.0 x 180	70	TX30	100
945642	1/4" x 7-7/8"	2.76	6.0 x 200	70	TX30	100
945643	1/4" x 8-5/8"	2.76	6.0 x 220	70	TX30	100
945644	1/4" x 9-1/2"	2.76	6.0 x 240	70	TX30	100
945645	1/4" x 10-1/4"	2.76	6.0 x 260	70	TX30	100
945646	1/4" x 11"	2.76	6.0 x 280	70	TX30	100
945647	1/4" x 11-7/8"	2.76	6.0 x 300	70	TX30	100
944715	5/16" x 3-1/8"	1.89	8.0 x 80	48	TX40	50
944716	5/16" x 4"	2.36	8.0 x 100	60	TX40	50
944717	5/16" x 4-3/4"	2.60	8.0 x 120	66	TX40	50
944718	5/16" x 5-1/2"	3.74	8.0 x 140	95	TX40	50
944719	5/16" x 6-1/4"	3.74	8.0 x 160	95	TX40	50
944720	5/16" x 7-1/8"	3.74	8.0 x 180	95	TX40	50
944721	5/16" x 7-7/8"	3.74	8.0 x 200	95	TX40	50
944722	5/16" x 8-5/8"	3.74	8.0 x 220	95	TX40	50
944723	5/16" x 9-1/2"	3.74	8.0 x 240	95	TX40	50
944724	5/16" x 10-1/4"	3.74	8.0 x 260	95	TX40	50
944725	5/16" x 11"	3.74	8.0 x 280	95	TX40	50
944726	5/16" x 11-7/8"	3.74	8.0 x 300	95	TX40	50
944727	5/16" x 12-5/8"	3.74	8.0 x 320	95	TX40	50
944728	5/16" x 13-3/8"	3.74	8.0 x 340	95	TX40	50
944729	5/16" x 14-1/4"	3.74	8.0 x 360	95	TX40	50
944730	5/16" x 15"	3.74	8.0 x 380	95	TX40	50
944731	5/16" x 15-3/4"	3.74	8.0 x 400	95	TX40	50
944732	5/16" x 16-1/2"	3.74	8.0 x 420	95	TX40	25
944733	5/16" x 17-3/8"	3.74	8.0 x 440	95	TX40	25
944734	5/16" x 18-1/8"	3.74	8.0 x 460	95	TX40	25
944735	5/16" x 18-7/8"	3.74	8.0 x 480	95	TX40	25
944736	5/16" x 19-5/8"	3.74	8.0 x 500	95	TX40	25
944737	5/16" x 21-5/8"	3.74	8.0 x 550	95	TX40	25
944739	5/16" x 23-5/8"	3.74	8.0 x 600	95	TX40	25
945687	3/8" x 4"	2.36	10.0 x 100	60	TX50	50
945688	3/8" x 4-3/4"	2.76	10.0 x 120	70	TX50	50
945689	3/8" x 5-1/2"	3.15	10.0 x 140	80	TX50	50
945690	3/8" x 6-1/4"	3.54	10.0 x 160	90	TX50	50
945691	3/8" x 7-1/8"	3.94	10.0 x 180	100	TX50	50
945692	3/8" x 7-7/8"	3.94	10.0 x 200	100	TX50	50
945693	3/8" x 8-5/8"	3.94	10.0 x 220	100	TX50	50
945694	3/8" x 9-1/2"	3.94	10.0 x 240	100	TX50	50
945695	3/8" x 10-1/4"	3.94	10.0 x 260	100	TX50	50
945696	3/8" x 11"	3.94	10.0 x 280	100	TX50	50
945697	3/8" x 11-7/8"	3.94	10.0 x 300	100	TX50	50
945698	3/8" x 12-5/8"	3.94	10.0 x 320	100	TX50	50
945699	3/8" x 13-3/8"	3.94	10.0 x 340	100	TX50	50
945703	3/8" x 14-1/4"	3.94	10.0 x 360	100	TX50	50
945709	3/8" x 15"	3.94	10.0 x 380	100	TX50	50
945711	3/8" x 15-3/4"	3.94	10.0 x 400	100	TX50	50
100036	3/8" x 16-1/2"	3.94	10.0 x 420	100	TX50	25
100037	3/8" x 17-3/8"	3.94	10.0 x 440	100	TX50	25
100038	3/8" x 18-1/8"	3.94	10.0 x 460	100	TX50	25
100039	3/8" x 18-7/8"	3.94	10.0 x 480	100	TX50	25
100040	3/8" x 19-5/8"	3.94	10.0 x 500	100	TX50	25
100041	3/8" x 21-5/8"	3.94	10.0 x 550	100	TX50	25
100042	3/8" x 23-5/8"	3.94	10.0 x 600	100	TX50	25

PANELTWISTEC AG

Washer head screw, zink-galvanized

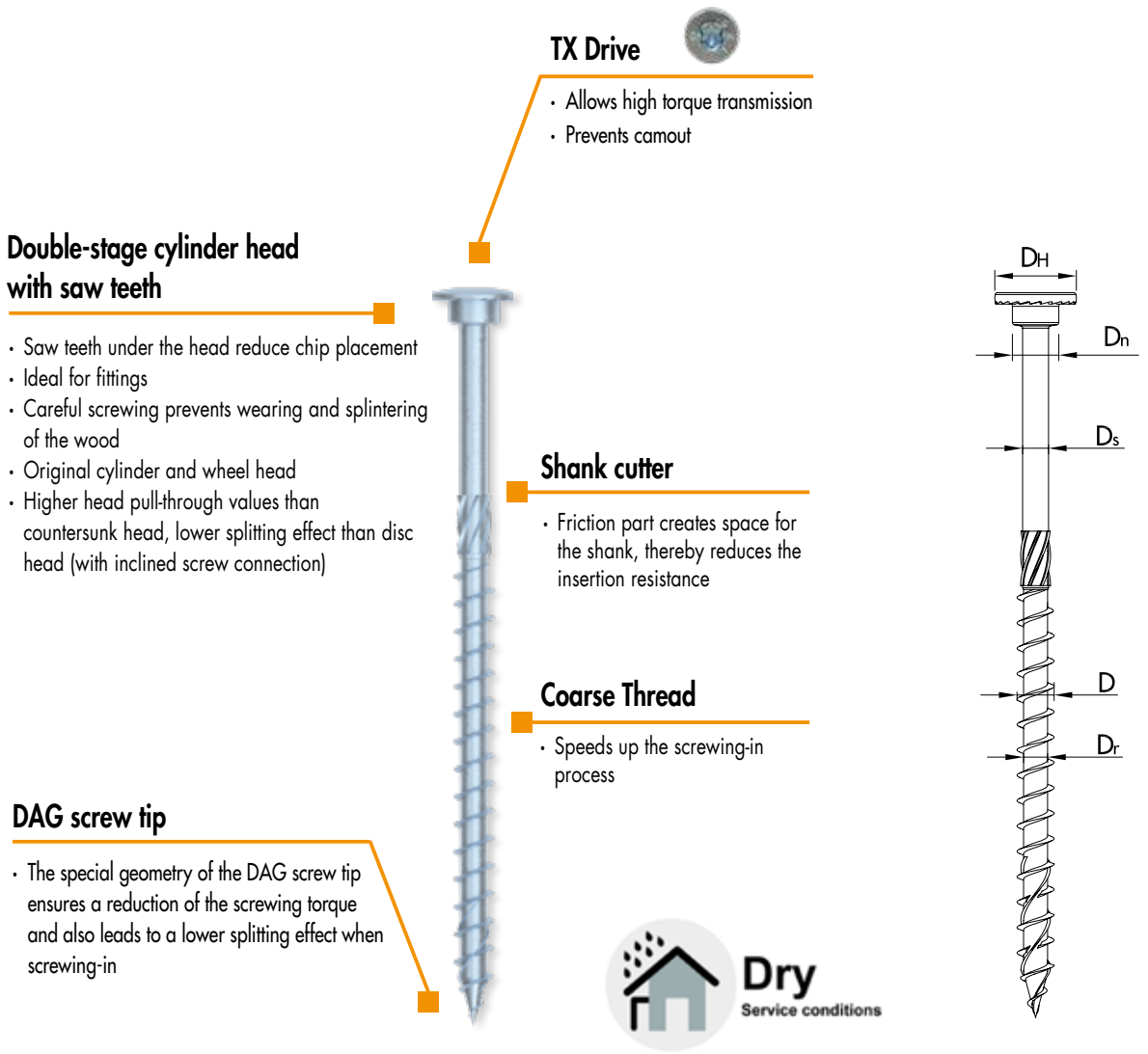


Art. no.	Imperial [in]	Thread [in]	Dimensions [mm]	Thread [mm]	Drive-bit	Box size
945947	1/4" x 1-3/16"	Fully threaded	6.0 x 30	Fully threaded	TX30 ●	100
945948	1/4" x 1-9/16"	Fully threaded	6.0 x 40	Fully threaded	TX30 ●	100
945712	1/4" x 2"	1.18	6.0 x 50	30	TX30 ●	100
945713	1/4" x 2-3/8"	1.42	6.0 x 60	36	TX30 ●	100
945716	1/4" x 2-3/4"	1.65	6.0 x 70	42	TX30 ●	100
945717	1/4" x 3-1/8"	1.89	6.0 x 80	48	TX30 ●	100
945718	1/4" x 3-1/2"	2.13	6.0 x 90	54	TX30 ●	100
945719	1/4" x 4"	2.36	6.0 x 100	60	TX30 ●	100
945720	1/4" x 4-3/8"	2.76	6.0 x 110	70	TX30 ●	100
945721	1/4" x 4-3/4"	2.76	6.0 x 120	70	TX30 ●	100
945722	1/4" x 5-1/8"	2.76	6.0 x 130	70	TX30 ●	100
945723	1/4" x 5-1/2"	2.76	6.0 x 140	70	TX30 ●	100
945724	1/4" x 5-7/8"	2.76	6.0 x 150	70	TX30 ●	100
945725	1/4" x 6-1/4"	2.76	6.0 x 160	70	TX30 ●	100
945726	1/4" x 7-1/8"	2.76	6.0 x 180	70	TX30 ●	100
945727	1/4" x 7-7/8"	2.76	6.0 x 200	70	TX30 ●	100
945728	1/4" x 8-5/8"	2.76	6.0 x 220	70	TX30 ●	100
945729	1/4" x 9-1/2"	2.76	6.0 x 240	70	TX30 ●	100
945730	1/4" x 10-1/4"	2.76	6.0 x 260	70	TX30 ●	100
945731	1/4" x 11"	2.76	6.0 x 280	70	TX30 ●	100
945732	1/4" x 11-7/8"	2.76	6.0 x 300	70	TX30 ●	100
945806	5/16" x 2-3/8"	1.89	8.0 x 60	48	TX40 ●	50
944588	5/16" x 3-1/8"	1.89	8.0 x 80	48	TX40 ●	50
944589	5/16" x 4"	2.36	8.0 x 100	60	TX40 ●	50
944590	5/16" x 4-3/4"	2.60	8.0 x 120	66	TX40 ●	50
944591	5/16" x 5-1/2"	3.74	8.0 x 140	95	TX40 ●	50
944592	5/16" x 6-1/4"	3.74	8.0 x 160	95	TX40 ●	50
944593	5/16" x 7-1/8"	3.74	8.0 x 180	95	TX40 ●	50
944594	5/16" x 7-7/8"	3.74	8.0 x 200	95	TX40 ●	50
944595	5/16" x 8-5/8"	3.74	8.0 x 220	95	TX40 ●	50
944596	5/16" x 9-1/2"	3,74	8.0 x 240	95	TX40 ●	50
944597	5/16" x 10-1/4"	3.74	8.0 x 260	95	TX40 ●	50
944598	5/16" x 11"	3.74	8.0 x 280	95	TX40 ●	50
944599	5/16" x 11-7/8"	3.74	8.0 x 300	95	TX40 ●	50
944600	5/16" x 12-5/8"	3.74	8.0 x 320	95	TX40 ●	50
944601	5/16" x 13-3/8"	3.74	8.0 x 340	95	TX40 ●	50
944602	5/16" x 14-1/4"	3.74	8.0 x 360	95	TX40 ●	50
944603	5/16" x 15"	3.74	8.0 x 380	95	TX40 ●	50
944604	5/16" x 15-3/4"	3.74	8.0 x 400	95	TX40 ●	50
944605	5/16" x 16-1/2"	3.74	8.0 x 420	95	TX40 ●	25
944606	5/16" x 17-3/8"	3.74	8.0 x 440	95	TX40 ●	25
944607	5/16" x 18-1/8"	3.74	8.0 x 460	95	TX40 ●	25
944608	5/16" x 18-7/8"	3.74	8.0 x 480	95	TX40 ●	25
944609	5/16" x 19-5/8"	3.74	8.0 x 500	95	TX40 ●	25
944610	5/16" x 21-5/8"	3.74	8.0 x 550	95	TX40 ●	25
944611	5/16" x 23-5/8"	3.74	8.0 x 600	95	TX40 ●	25
945750	3/8" x 3-1/8"	1.97	10.0 x 80	50	TX50 ●	50
945751	3/8" x 4"	2.36	10.0 x 100	60	TX50 ●	50
945752	3/8" x 4-3/4"	2.76	10.0 x 120	70	TX50 ●	50
945753	3/8" x 5-1/2"	3.15	10.0 x 140	80	TX50 ●	50
945754	3/8" x 6-1/4"	3.54	10.0 x 160	90	TX50 ●	50
945755	3/8" x 7-1/8"	3.94	10.0 x 180	100	TX50 ●	50
945756	3/8" x 7-7/8"	3.94	10.0 x 200	100	TX50 ●	50
945757	3/8" x 8-5/8"	3.94	10.0 x 220	100	TX50 ●	50
945758	3/8" x 9-1/2"	3.94	10.0 x 240	100	TX50 ●	50
945759	3/8" x 10-1/4"	3.94	10.0 x 260	100	TX50 ●	50
945760	3/8" x 11"	3.,94	10.0 x 280	100	TX50 ●	50
945761	3/8" x 11-7/8"	3.94	10.0 x 300	100	TX50 ●	50
945762	3/8" x 12-5/8"	3.94	10.0 x 320	100	TX50 ●	50
945763	3/8" x 13-3/8"	3.94	10.0 x 340	100	TX50 ●	50
945764	3/8" x 14-1/4"	3.94	10.0 x 360	100	TX50 ●	25
945765	3/8" x 15"	3.94	10.0 x 380	100	TX50 ●	25
945766	3/8" x 15-3/4"	3.94	10.0 x 400	100	TX50 ●	25
100020	3/8" x 17-3/8"	3.94	10.0 x 440	100	TX50 ●	25
100021	3/8" x 18-1/8"	3.94	10.0 x 460	100	TX50 ●	25
100022	3/8" x 18-7/8"	3.94	10.0 x 480	100	TX50 ●	25
100023	3/8" x 19-5/8"	3.94	10.0 x 500	100	TX50 ●	25
100024	3/8" x 21-5/8"	3.94	10.0 x 550	100	TX50 ●	25
100025	3/8" x 23-5/8"	3.94	10.0 x 600	100	TX50 ●	25

SAWTEC

CONSTRUCTION SCREW SUITABLE FOR WOOD-WOOD AND WOOD-STEEL JOINTS

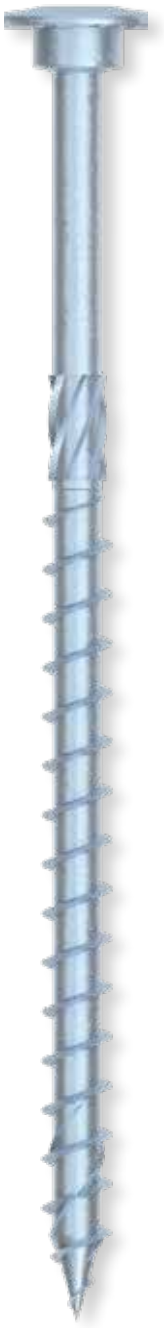
The Sawtec is a hardened carbon steel wood construction screw with a special screw tip and saw teeth below the head. The screw has a double-stage cylinder head. The special geometry of the screw tip reduces the screwing torque and leads to a lower splitting effect when screwing in.



Paneltwistec Inox					
Geometric properties					
Major diameter D		Root diameter D_r	Shaft diameter D_s	Neck diameter D_n	Head diameter D_H
[in]	[mm]	[in]	[mm]	[in]	[mm]
1/4	6	0.157	0.169	0.256	0.512
5/16	8	0.209	0.224	0.404	0.709
3/8	10	0.248	0.272	0.433	0.866

SAWTEC

zink-galvanized



Art. no.	Imperial [in]	Thread [in]	Dimensions [mm]	Thread [mm]	Drive-bit	Box size
954128	1/4" x 2-3/8"	1.42	6.0 x 60	36	TX30 ●	100
954129	1/4" x 2-3/4"	1.65	6.0 x 70	42	TX30 ●	100
954130	1/4" x 3-1/8"	1.89	6.0 x 80	48	TX30 ●	100
954131	1/4" x 4"	2.36	6.0 x 100	60	TX30 ●	100
954133	1/4" x 4-3/4"	2.36	6.0 x 120	60	TX30 ●	100
954135	1/4" x 5-1/2"	2.76	6.0 x 140	70	TX30 ●	100
954137	1/4" 6-1/4"	2.76	6.0 x 160	70	TX30 ●	100
954138	1/4" 7-1/8"	2.76	6.0 x 180	70	TX30 ●	100
954145	5/16" x 3-1/8"	1.89	8.0 x 80	48	TX40 ●	50
954146	5/16" x 4"	2.36	8.0 x 100	60	TX40 ●	50
954147	5/16" x 4-3/4"	2.36	8.0 x 120	60	TX40 ●	50
954148	5/16" x 5-1/2"	3.74	8.0 x 140	95	TX40 ●	50
954149	5/16" x 6-1/4"	3.74	8.0 x 160	95	TX40 ●	50
954150	5/16" x 7-1/8"	3.74	8.0 x 180	95	TX40 ●	50
954151	5/16" x 7-7/8"	3.74	8.0 x 200	95	TX40 ●	50
954152	5/16" x 8-5/8"	3.74	8.0 x 220	95	TX40 ●	50
954153	5/16" x 9-1/2"	3.74	8.0 x 240	95	TX40 ●	50
954154	5/16" x 10-1/4"	3.74	8.0 x 260	95	TX40 ●	50
954155	5/16" x 11"	3.74	8.0 x 280	95	TX40 ●	50
954156	5/16" x 11-7/8"	3.74	8.0 x 300	95	TX40 ●	50
954157	5/16" x 12-5/8"	3.74	8.0 x 320	95	TX40 ●	50
954158	5/16" x 13-3/8"	3.74	8.0 x 340	95	TX40 ●	50
954159	5/16" x 14-1/4"	3.74	8.0 x 360	95	TX40 ●	50
954160	5/16" x 15"	3.74	8.0 x 380	95	TX40 ●	50
954161	5/16" x 15-3/4"	3.74	8.0 x 400	95	TX40 ●	50
954181	5/16" x 16-1/2"	3.74	8.0 x 420	95	TX40 ●	50
954182	5/16" x 17-3/8"	3.74	8.0 x 440	95	TX40 ●	50
954183	5/16" x 18-1/8"	3.74	8.0 x 460	95	TX40 ●	50
954184	5/16" x 18-7/8"	3.74	8.0 x 480	95	TX40 ●	50
954185	5/16" x 19-5/8"	3.74	8.0 x 500	95	TX40 ●	50
954186	5/16" x 21-5/8"	3.74	8.0 x 550	95	TX40 ●	50
954187	5/16" x 23-5/8"	3.74	8.0 x 600	95	TX40 ●	50
954162	3/8" x 4"	2.36	10.0 x 100	60	TX50 ●	50
954163	3/8" x 4-3/4"	2.36	10.0 x 120	60	TX50 ●	50
954164	3/8" x 5-1/2"	3.74	10.0 x 140	95	TX50 ●	50
954165	3/8" x 6-1/4"	3.74	10.0 x 160	95	TX50 ●	50
954166	3/8" x 7-1/8"	3.74	10.0 x 180	95	TX50 ●	50
954167	3/8" x 7-7/8"	3.74	10.0 x 200	95	TX50 ●	50
954168	3/8" x 8-5/8"	3.74	10.0 x 220	95	TX50 ●	50
954169	3/8" x 9-1/2"	3.74	10.0 x 240	95	TX50 ●	50
954170	3/8" x 10-1/4"	3.74	10.0 x 260	95	TX50 ●	50
954171	3/8" x 11"	3.74	10.0 x 280	95	TX50 ●	50
954172	3/8" x 11-7/8"	3.74	10.0 x 300	95	TX50 ●	50
954173	3/8" x 12-5/8"	3.74	10.0 x 320	95	TX50 ●	50
954174	3/8" x 13-3/8"	3.74	10.0 x 340	95	TX50 ●	50
954175	3/8" x 14-1/4"	3.74	10.0 x 360	95	TX50 ●	25
954176	3/8" x 15"	3.74	10.0 x 380	95	TX50 ●	25
954177	3/8" x 15-3/4"	3.74	10.0 x 400	95	TX50 ●	25

SELECTING THE RIGHT SCREW MATERIAL / COATING

Select the right screw material for your project by observing the following principles. Go through the three points one after the other. The right material is marked for points 1 and 2 with (✓) at least, or even better with ✓. In the event of additional chemical stress, point 3 must conform as well.

1. What's the component's situation? Is it exposed to the weather (pergola beam) or is it protected (ceiling beam)?
2. Which wood is being fastened? Is it simple construction wood, or tannin-rich tropical wood?
3. Are there any additional stresses in situ that encourage corrosion? Location near the sea? Heavy industry, etc.?

Example: fastening a façade made of Douglas fir

1. Exterior (Wet), because of weather exposure. Aesthetic requirement also required → at least AISI 410 steel.
2. Douglas fir → at least AISI 410, but AISI 304 or AISI 316 steel is preferred.
3. This point is not required, because there are no further corrosive agents.

Choice: AISI 410 is possible, but AISI 304 or AISI 316 is preferred.

Steel group	Hardened Carbon steel		Stainless steel (martensitic)	Stainless steel (austenitic)	
	zink-galvanized	Special coating	AISI 410	AISI 304	AISI 316
Product examples	Paneltwistec AG	Paneltwistec 1000	Paneltwistec AISI 410	Paneltwistec AISI 304	Paneltwistec AISI 316
1. Location of the components?					
Interior (Dry) [k]	✓	✓	✓	✓	✓
Exterior (Wet) [k]	-	(✓) [a]	✓	✓	✓
2. Which wood?					
Structural timber, wood-based materials [b]	✓	✓	✓	✓	✓
Beech (red beech)	✓	✓	✓	✓	✓
Douglas fir	-	-	(✓) [a]	✓	✓
Spruce	✓	✓	✓	✓	✓
Pine	✓	✓	✓	✓	✓
Larch	-	-	(✓) [a]	✓	✓
Coniferous wood, pressure-impregnated	(✓) [a]	(✓) [a]	(✓) [a]	(✓) [a]	✓
Red cedar	-	-	-	(✓) [d]	✓
Fir	✓	✓	✓	✓	✓
Coniferous wood, thermotreated	-	-	-	(✓) [d]	✓
Abachi	-	-	-	(✓) [d]	✓
Afzelia, doussié	-	-	-	(✓) [d]	✓
Azobé, bongossi	-	-	-	-	✓
Bangkirai, balau	-	-	(✓) [c]	✓	✓
Bilinga	-	-	-	(✓) [d]	✓
Courbaril, jatobá	-	-	-	-	✓
Cumarú	-	-	-	(✓) [d]	✓
Sweet chestnut	-	-	-	-	✓
Oak	-	-	-	-	✓
Eukalyptus	-	-	-	-	✓
Garapa	-	-	-	-	✓
Ipé	-	-	(✓) [c]	✓	✓
Iroko	-	-	(✓) [c]	✓	✓
Itaúba	-	-	-	-	✓
Kosipo	-	-	-	-	✓
Massaranduba	-	-	-	-	✓
Merbau	-	-	-	-	✓
Robinie	-	-	-	-	✓
Hardwood, thermotreated	-	-	-	(✓) [d]	✓
3. Additional corrosive agents?					
Constant condensation [e]	-	-	-	(✓) [a]	✓
Salt load [f]	-	-	-	(✓) [a]	✓
Aggressive atmospheres [g]	-	-	-	-	(✓) [i]
Chlorous atmospheres [h]	-	-	-	-	-

a) Recommended only for less significant fastening points, or for temporary objects, or if there are no aesthetic requirements.
b) Untreated: spruce, fir, pine, composite timber, LVL, plywood, OSB, fiberboard, cement-based and gypsum fiberboard, etc.
c) In our experience, using this type of wood with AISI 410 does not lead to problems with corrosion or timber discoloration. However, depending on the origin of the timber, this cannot be ruled out completely. Please also inquire at your timber dealer.
d) Use of AISI 316 is recommended. Please contact your timber dealer as well.
e) Uninterrupted condensation in a water vapor atmosphere with only slight impurities.
f) Building components close to roads heavily affected by salting in winter, coastal areas, in offshore and other industrial conditions.
g) Building components in road tunnels, pig stalls, or in other aggressive atmospheres, possibly with additional higher air humidity.
h) Building components in indoor swimming pools or other chlorous atmospheres.
i) To be checked for each individual case.
j) Stainless steel (austenitic) screws are not covered by ICC-ESR 3942. For all versions of Eurotec screws please visit our website.
k) Wood seasoned to a moisture content of 19 % or less and used under Dry continuously dry conditions (covered structure). Unseasoned or partially seasoned wood or exposed to Wet service conditions in use, with moisture content above 19 %.

This overview cannot take account of all applications. Materials can be specified to more unfavorable conditions on a case-by-case basis. The installation recommendations in this context have been developed taking into account European usage patterns; it is advisable to verify individual requirements and standards accordingly.

INSTALLATION RECOMMENDATIONS FOR EUROTEC STRUCTURAL WOOD SCREWS

The quality of a timber connection depends not only on the quality of the fasteners used, but also on proper installation methods and equipment. For instance, material type of fastener, nominal diameter of fastener, length of fastener, and wood density have major influence. Eurotec provides recommendations on this matter, as well as the appropriate tools and accessories needed for achieving an accurate, safe, and efficient installation of a timber connection with fasteners.

Accessories:
Installing Eurotec wood screws requires nothing more than the typical carpentry bits and accessories available on the market. Our complete range of screws features a TX-type head, which allows the right amount of tightness and torque transmission needed. A few points that the installer should consider when assembling his / her set of tools and accessories are:

- Drill bits and impact driver bits are different. There are adaptors for using them interchangeably, but it´s better to avoid them to achieve the shortest force path.
- The size and type of accessory to use with your power tool depend on the type and diameter of the fastener to be installed. Please check **the Table 1** below for guidance.
- The materials of the bit / accessory and the fastener should match. For example, we recommend using our stainless-steel bits for installing our range of AISI 304 and AISI 316 stainless-steel screws. This measure prevents the risk of a stripped screw, galvanic corrosion from happening.
- A magnetic screw holder can be of great help for overhead installation of screws.

Table 1: Bit sizes for Eurotec screws

Screw type	Nominal diameter		Bit			
	[in]	[mm]	TX20 ●	TX30 ●	TX40 ●	TX50 ●
KonstruX ST (fully threaded)	1/4	6.5	–	✓	–	–
	5/16	8.0	–	–	✓	–
	3/8	10.0	–	–	–	✓
Paneltwistec (partially threaded)	1/4	6.0	–	✓	–	–
	5/16	8.0	–	–	✓	–
	3/8	10.0	–	–	–	✓
SawTec (partially threaded)	1/4	6.0	–	✓	–	–
	5/16	8.0	–	–	✓	–
	3/8	10.0	–	–	–	✓

Discover our bits and aids range:

Magnetic screw holder

Short and long S2 steel bits (drill or Impact power tools)

Long carbon steel bits (drill)

Long stainless-steel bits (drill)

Power tools:
Eurotec wood screws can be installed with traditional drills and are also approved for use with tangential impact drivers (only carbon steel and stainless-steel AISI 410 screws). This is possible due to the exceptional torsional strength to insertion moment ratio of the screws, otherwise, they shear-off during installation. The use of an impact driver has many advantages, like preventing screw cam out and being safer for the installer due to the isolation of the torque between the screw and the tool. In contrast, the drill doesn't have these benefits, but is rather faster for installing long screws of more than 11-7/8 (300 mm) without wobbling.

* Only on timber-timber connections

Preparation:
In general, wood screws can be installed directly, without previously drilling a pilot hole (predrilling) to prevent wood splitting. In some cases, depending on factors like the length of the screw, wood species, and small edge and end distances, it might be beneficial to predrill prior to installation. For example, softwoods (particularly Douglas fir) or hardwoods with specific gravities over 0.50 (450 kg/m^3 characteristic density), fasteners longer than 15-3/4 in (400 mm), and AISI 304 and AISI 316 stainless-steel screws are strongly recommended to be installed with predrilling. However, predrilling is mandatory for KonstruX ST AISI 316 screws. See the Table 2 for guidance on the correct pilot hole diameter for each nominal diameter size of screw. Apart from avoiding wood cracking, predrilling decreases the installation torque, increases installation precision, and causes less wear on tools resulting in higher load-carrying capacities and reduced spacing and end distances. Moreover, predrilling is also recommended for screws with a length equal or greater than 23-5/8 in (600 mm) up to a third of the screw length to assure the screw is maintaining its intended direction or angle.

The use of lubricants to simplify installation is permitted under certain conditions. Since not all lubricants are suitable for every application, the type of lubricant must be selected appropriately depending on the type of the steel and the surface coating.

Table 2: Pilot hole diameters for Eurotec screws

Nominal diameter of screw		Maximum pilot hole diameter in softwood	
[in]	[mm]	[in]	[mm]
1/4	6.0	9/64	3.5
1/4	6.5	5/32	4.0
5/16	8.0	3/16	4.5
3/8	10.0	7/32	5.5

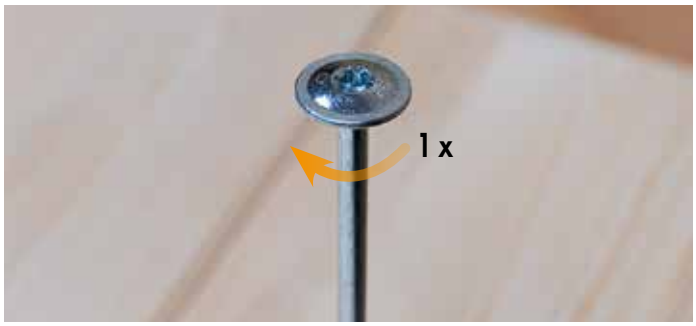
Notes:
- For installation in Douglas Fir and other species of similar or greater density, the pilot hole must have a diameter between 0.60Ds and 0.75Ds, being Ds the smooth shaft diameter of the screw;
- For installation in SPF and other species of similar density, the hole must a have a diameter between 0.40Ds and 0.70Ds;
- The pilot hole diameter must not exceed 0.9Dr (as shown in the table above), being Dr the root diameter of the screw.

The installation recommendations in this context have been developed taking into account European usage patterns; it is advisable to verify individual requirements and standards accordingly.

Installation:
Follow this step-by-step process to correctly install Eurotec wood screws:

In any case, **do not hammer the screw's head** prior to installation. This causes prestress on the screw and could also damage the head and tip, possibly reducing installation precision and strength.

Completely insert the bit in the power tool and **fully tighten** it. Always ensure that the bit and the screw's body are **aligned** at the beginning and during installation to **avoid stripping the bit** and guarantee **proper torque transmission**. The bit must be fully inserted in the screw's head.



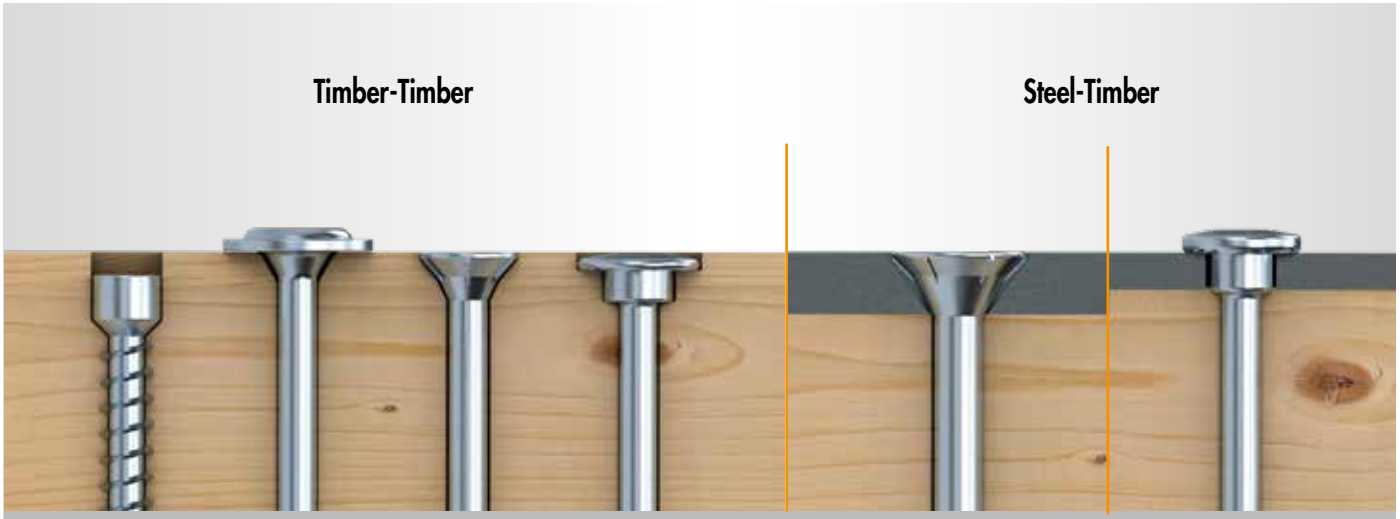
We recommend installing Eurotec wood screws in **one continuous run**. To stop and restart installation often increases the difficulty and may also **damage the screw's body** through the hot-cold transition zone.

During installation, **don't apply too much pressure**, as it may cause buckling on slender screws, not achieving the desired result.

When the fastener's head is **approximately 1-3 / 16 in (30 mm)** away from the wood's surface, we recommend **slowing down** the installation speed. This prevents **over-torquing** the screw. In case of **steel-timber** connections, this is **especially important**.

Finished look:
Correct installation of wood screws not only gives an aesthetic finish to the connection, but also contributes to creating appropriate force transfer. When it comes to partially threaded screws, head pull-through capacity is often crucial. The screw's head diameter influences its resistance exponentially, therefore, to take full advantage of it, it is important that the bottom surface of the head completely rests on the wood or steel surface.

Countersunk head screws and SawTec's head feature milling ribs and sawteeth, respectively, and thus they are intended to end flush with the wood's surface. On the other hand, washer head screws are intended to rest on the surface of wood components. If concealed fastening is desired, we recommend using cylindrical head screws, which may be drilled beyond the wood's surface to completely hide the screw from sight.

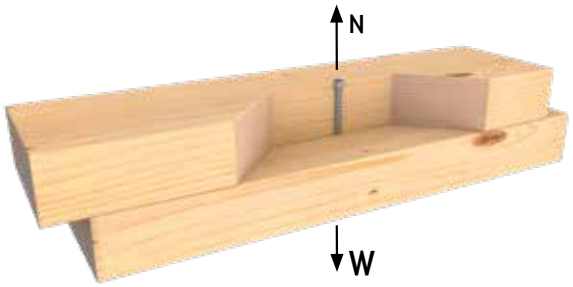


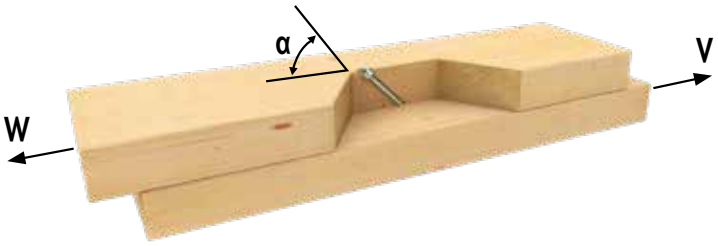
Correct finished installation look of wood screws on timber-timber and steel-timber connections.

2. REFERENCE DESIGN VALUES AND STEEL STRENGTHS

REFERENCE DESIGN VALUES AND STEEL STRENGTHS

Screw steel strengths							
Screw type	Nominal diameter (D)		Bending yield strength (F_{yb}) [psi]	Allowable steel strengths (ASD)		Design steel strengths (LRFD)	
	[in]	[mm]		Tension (lbf)	Shear (lbf)	Tension (lbf)	Shear (lbf)
Paneltwistec SawTec	1/4	6	152,000	1,160	833	1,740	1,250
	5/16	8	165,000	2,030	1,570	3,050	2,350
	3/8	10	177,000	2,350	1,780	3,530	2,680
KonstruX ST	1/4	6	229,000	1,840	1,200	2,760	1,800
	5/16	8	235,000	2,300	1,560	3,450	2,340
	3/8	10	203,000	2,880	1,910	4,310	2,870





Reference Withdrawal Design Values (W)								
Screw type	Nominal diameter (D)		Minimum thread penetration		Reference withdrawal design values (W) for selected SG values [lbf/in]			
	[in]	[mm]	[in]	[mm]	0.35	0.42	0.50	0.55
Paneltwistec SawTec	1/4	6	2–1/8	54	103	119	137	147
	5/16	8	2–7/8	73	125	145	167	180
	3/8	10	3–1/2	89	134	156	179	193
KonstruX ST	1/4	6	2–5/16	59	125	145	167	180
	5/16	8	2–7/8	73	154	178	205	221
	3/8	10	3–1/2	89	171	198	227	245

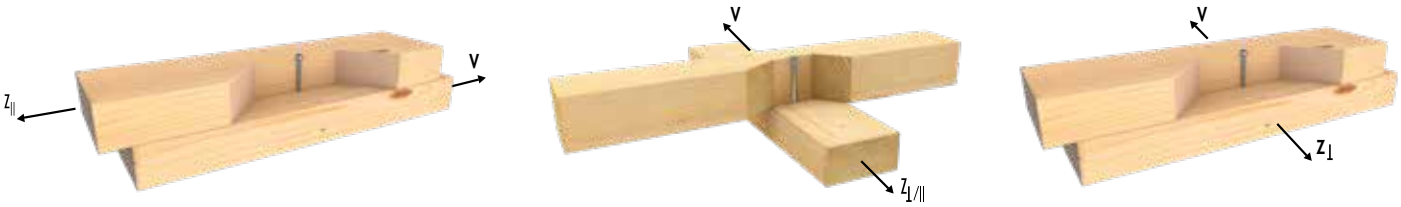
Notes:

- Tabulated W values apply to screws installed perpendicular to the grain of wood member (α = 90°). For screws installed at an angle, values shall be reduced by the correspondent angle to grain reduction factor R_α shown in the table below;
- Values must be multiplied by all applicable adjustment factors for dowel-type fasteners in accordance with the NDS;
- Thickness of the main member must be equal to or greater than the screw length minus the wood side member thickness;
- Thread penetration length is equal to the portion of screw embedded in the main member, including the screw tip.

Reduction Factor for Inclined Screws in Withdrawal (R_α)		
tens	fifths	
	_5°	_0°
8_°	1.00	0.99
7_°	0.99	0.98
6_°	0.97	0.95
5_°	0.94	0.92
4_°	0.91	0.89
3_°	0.84	0.77

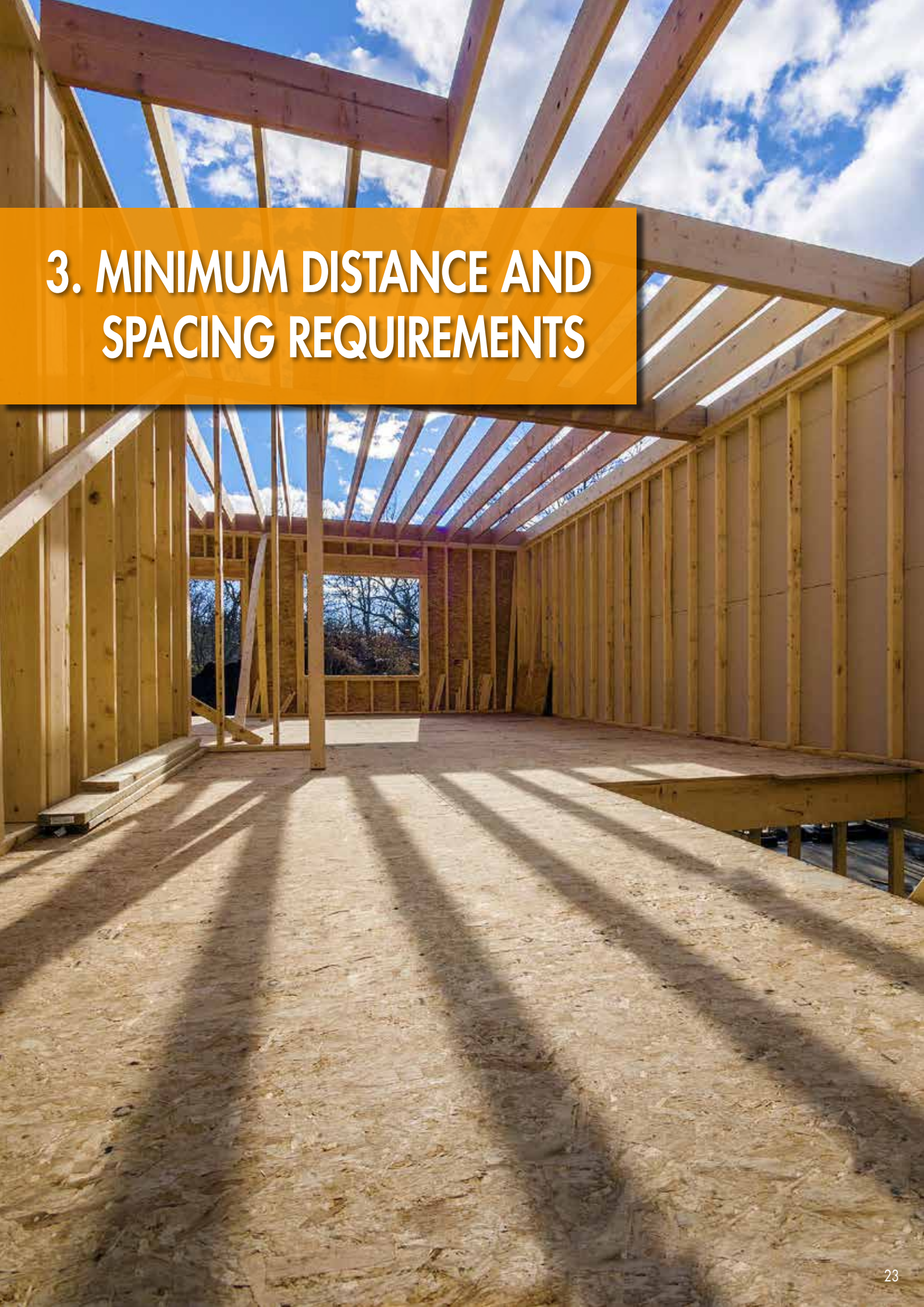
Reference Head Pull-through Design Values (W_H)							
Screw type	Head style	Nominal diameter (D)		Minimum side member thickness		Reference pull-through design values (WH) for selected SG values [lbf]	
		[in]	[mm]	[in]	[mm]	0.42 ≤ G < 0.55	G ≥ 0.55
Paneltwistec	Countersunk	1/4	6.0	1	25.4	111	168
		5/16	8.0	1-1/2	38	195	256
		3/8	10.0			286	315
	Washer	1/4	6.0	1	25.4	236	351
		5/16	8.0	1-1/2	38	436	853
		3/8	10.0			466	984
SawTec	Flat with sawteeth	1/4	6.0	1	25.4	202	226
		5/16	8.0	1-1/2	38	335	404
		3/8	10.0			444	511
KonstruX ST	Countersunk	1/4	6.5	1-1/2	38	263	323
		5/16	8.0			263*	323*
		3/8	10.0			263*	323*

Notes:
- Tabulated W_H values must be multiplied by all adjustment factors for dowel-type fasteners in accordance with NDS;
- Tabulated values are applicable to screws installed with an angle to wood grain orientation of 30° ≤ α ≤ 90°;
- * For fully threaded screws, the reference pull-through design value is the greater of the tabulated value and the reference withdrawal design value in the side member determined in accordance with the effective embedded thread length definition of Notes to the designer;
- Thickness of the main member must be equal to or greater than the screw length minus the wood side member thickness.



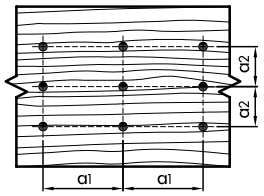
Reference Lateral Design Values (Z) for Wood-Wood Connections																
Screw type	Nominal diameter (D)		Minimum screw length (L)		Side member thickness (t_s) [in]	Reference Lateral Design Values for selected SG values [lbf]											
	[in]	[mm]	[in]	[mm]	[in]	$Z_{||}$				$Z_{\perp/||}$				$Z_{\perp}$			
						0.36	0.42	0.50	0.55	0.36	0.42	0.50	0.55	0.36	0.42	0.50	0.55
Paneltwistec Sawtec	1/4	6	3.94	100	1.75	128	147	173	189	128	147	173	189	128	147	173	189
	5/16	8	5.51	140	2.50	199	229	269	293	159	183	215	235	159	183	215	235
	3/8	10	6.30	160	3.00	252	291	341	373	202	233	273	298	202	233	273	298
KonstruX ST	1/4	6	5.51	140	2.50	192	221	260	284	154	177	208	227	154	177	208	227
	5/16	8	6.10	2.75	2.75	232	267	314	342	185	214	251	274	185	214	251	274
	3/8	10	6.30	160	3.00	255	294	345	377	204	235	276	302	204	235	276	302

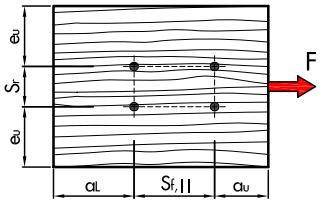
Notes:
- Tabulated Z values must be multiplied by all adjustment factors for dowel-type fasteners in accordance with NDS;
- Tabulated values are applicable to screws installed perpendicular to the faces of wood members;
- Thickness of the main member must be equal to or greater than the screw length minus the wood side member thickness;
- Side member thickness is an absolute value (not a minimum or maximum value);
- Tabulated lateral design values are based on both wood members having the same specific gravity.



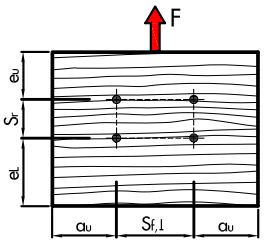
3. MINIMUM DISTANCE AND SPACING REQUIREMENTS

MINIMUM DISTANCING REQUIREMENTS





Lateral loading parallel to grain

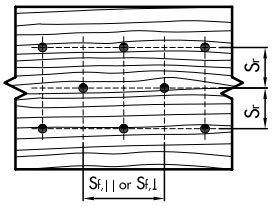


Lateral loading perpendicular to grain

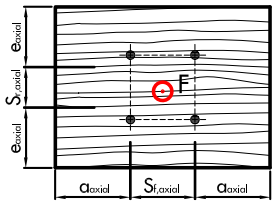
$S_{f,\perp}$
load perpendicular to grain
between fasteners
spacing requirement

e_u
unloaded edge
edge distance requirement

F outward force



Spacing between staggered screws with lateral loading parallel or perpendicular to grain



Axial loading

Sawn lumber and glued-laminated timber connection geometry requirements without predrilling

Fastener thread type	Specific gravity	End distance			Edge distance			Spacing between fasteners in a row			Spacing between rows		
		a_L	a_u	a_{axial}	e_L	e_u	e_{axial}	$S_{f,\|\|}$	$S_{f,\perp}$	$S_{f,axial}$	S_r	$S_{r,axial}$	$S_{r,X}$
Partially threaded	G < 0.50	15D	10D	10D	10D	5D	4D	15D	10D	7D	5D	4D	1.5D
	G ≥ 0.50	20D	15D	10D	12D	7D	4D	15D	10D	7D	7D	4D	1.5D
	D. Fir., G = 0.49	30D	22.5D	15D	12D	7D	4D	22.5D	15D	10.5D	7D	4D	1.5D
Fully threaded	G < 0.50	12D	7D	7D	7D	3D	3D	10D	5D	7D	4D	3D	1.5D
	G ≥ 0.50	12D	7D	7D	7D	3D	3D	10D	5D	7D	4D	3D	1.5D
	D. Fir., G = 0.49	18D	10.5D	10.5D	7D	3D	3D	15D	7.5D	10.5D	4D	3D	1.5D

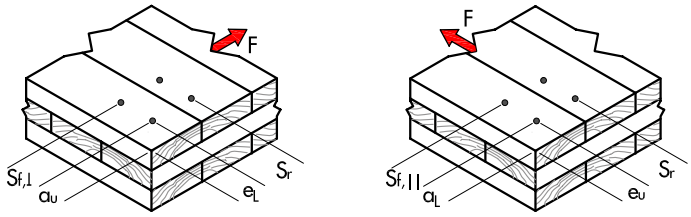
Notes:
- Tabulated values for partially threaded apply to all head styles of Paneltwistec, and SawTec screws.
- Tabulated reduced values for fully threaded apply to all head styles of KonstruX ST screws.
- End distances a_L and a_U refer, respectively, to loaded member end (fastener bearing toward end grain) and unloaded member end (fastener bearing away from end grain) including the case of perpendicular to grain loading.
- D refers to the major thread diameter of the screw.
- $S_{r,axial}$ minimum spacing for partially threaded screws with D > 5/16 in (8 mm) shall be increased to 5D.
- Stresses in wood members must be checked in accordance with Section 11.1.2 and Appendix E of the NDS, and spacings may need to be increased accordingly.

Sawn lumber and glued-laminated timber connection geometry requirements with predrilling

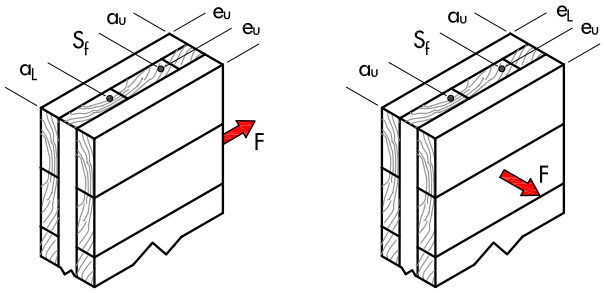
Diameter size	End distance			Edge distance			Spacing between fasteners in a row			Spacing between rows		
	a_L	a_u	a_{axial}	e_L	e_u	e_{axial}	$S_{f,\|\|}$	$S_{f,\perp}$	$S_{f,axial}$	S_r	$S_{r,axial}$	$S_{r,X}$
D ≤ 5/16 in (8mm)	12D	7D	7D	7D	3D	3D	10D	5D	7D	4D	3D	1.5D
D > 5/16 in (8mm)	7D	4D	4D	7D	3D	3D	5D	5D	5D	5D	5D	1.5D

Notes:
- Tabulated values apply to all head styles of Paneltwistec, SawTec, and KonstruX ST screws.
- End distances a_L and a_U refer, respectively, to loaded member end (fastener bearing toward end grain) and unloaded member end (fastener bearing away from end grain) including the case of perpendicular to grain loading.
- D refers to the major thread diameter of the screw.
- Minimum fastener penetration of 6D must be met.
- Pilot hole diameter must not exceed the values presented in Table 2 of p.17.

FASTENERS IN PLANE SURFACE



FASTENERS IN NARROW EDGE



CLT connection geometry requirements without predrilling												
Specific gravity	Installation CLT	End distance			Edge distance			Spacing between fasteners in a row			Spacing between rows of fasteners	
		a_L	a_u	a_{axial}	e_L	e_u	e_{axial}	$S_{f,\|\|}$	$S_{f,\perp}$	$S_{f,axial}$	S_r	$S_{r.axial}$
G < 0.50	Plane surface	15D	10D	10D	10D	5D	4D	15D	10D	7D	5D	4D
G ≥ 0.50		20D	15D	10D	12D	7D	4D	15D	10D	7D	7D	4D
Any	Narrow edge	12D	7D	7D	6D	3D	3D	10D	10D	10D	4D	4D

Notes:

- Tabulated values apply to all head styles of Paneltwistec and Sawtec screws installed without predrilling. For KonstruX ST screws installed with or without predrilling, the geometry requirements of the table below applies.
- Plane surface requirements apply to the grain orientation at the shear plane for lateral loading and to the face grain orientation for withdrawal loading.
- End distances refer to the narrow edge of CLT with most end grain layers, edge distances refer to the narrow edge with most side grain layers.
- Narrow edge requirements apply to any narrow edge of the CLT panel, regardless of the number of end grain and side grain laminations.
- Minimum distance and spacing requirements for fasteners installed into the narrow edge of CLT were derived as per European Technical Approval ETA-11/0024 for self-tapping screws.
- $S_{r.axial}$ minimum spacing for partially threaded screws with D > 5/16 in (8 mm) installed on the plane surface of CLT shall be increased to 5D.
- Tabulated values apply to CLT panels with a minimum thickness of 10D.
- Minimum screw penetration depth into the narrow edge of CLT panels of 10D.
- D refers to the major thread diameter of the screw.

CLT Connection geometry requirements with predrilling or using KonstruX without predrilling												
Installation on CLT	End distance			Edge distance			Spacing between fasteners in a row			Spacing between rows of fasteners	
	a_L	a_u	a_{axial}	e_L	e_u	e_{axial}	$S_{f,\|\|}$	$S_{f,\perp}$	$S_{f,axial}$	S_r	$S_{r.axial}$
Plane surface	12D	7D	7D	7D	3D	3D	10D	5D	7D	5D	5D
Narrow edge	7D	4D	4D	3D	3D	3D	4D	4D	4D	4D	4D

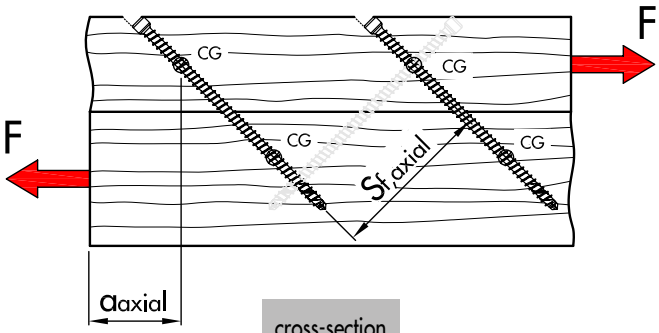
Notes:

- Tabulated values apply to all head styles of Paneltwistec and Sawtec screws installed with predrilling, and **for KonstruX ST screws installed with or without predrilling.**
- Parallel and perpendicular to grain descriptions apply to the grain orientation at the shear plane for lateral loading and to the face grain orientation for withdrawal loading.
- Geometry requirements for screws installed with predrilling apply to CLT with any specific gravity value.
- Geometry requirements for screws installed with predrilling on the narrow edge and plane surface of CLT are taken from NDS 2018 table 12.5.1.G, and ETA-11/0024, respectively.
- End distances refer to the narrow edge of CLT with most end grain layers, edge distances refer to the narrow edge with most side grain layers.
- Narrow edge requirements apply to any narrow edge of the CLT panel, regardless of the number of end grain and side grain laminations.
- Tabulated values apply to CLT panels with a minimum thickness of 10D.
- Minimum screw penetration depth into the narrow edge of CLT panels of 10D.
- D refers to the major thread diameter of the screw.

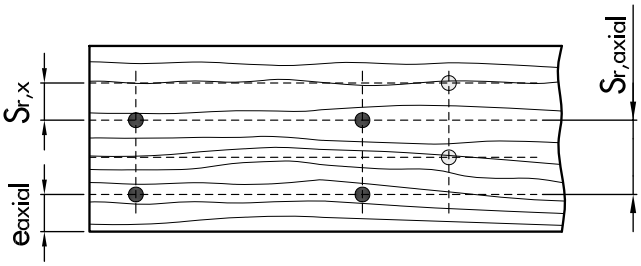
SPECIAL CONSIDERATIONS OF GEOMETRY REQUIREMENTS

Inclined and crossed screws

Inclined screws, also called shear-tension screws, are considered to be loaded axially. The corresponding minimum end and edge distances of these screws are referred to the center of gravity (CG) of the embedded thread length on each wood component. In case of using pairs of crossed screws, the screws of each pair need to be offset by at least 1.5D to prevent fastener collision.



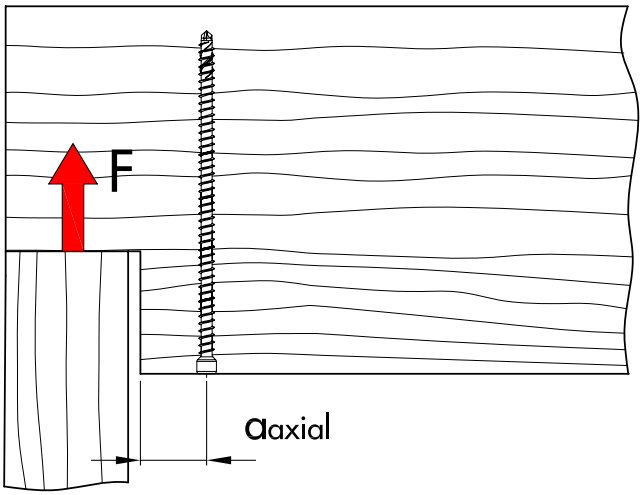
cross-section



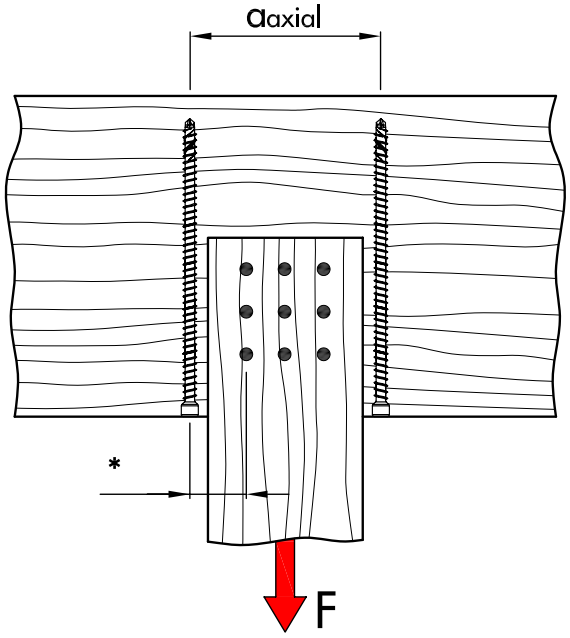
plan

Reinforcing screws near notches

Reinforcing screws for beams with notches and holes should be installed as close as possible to the where the potential crack is expected to start (stress peak zone). Nevertheless, minimum end and edge distances still must be met.

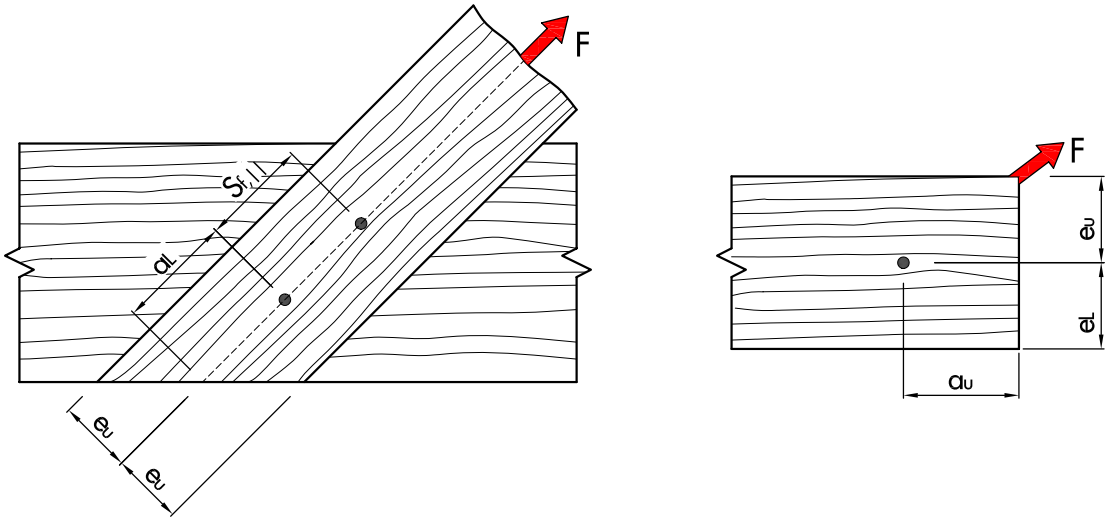


Reinforcing screws near bolted connections
Although no minimum distance is required between reinforcing screws and bolts, a minimum distance of 0.5D may be helpful to prevent fastener collision. It's essential that the screws' orientation is perpendicular to the bolt's axis. Predrilling is recommended to ensure precise installation.



Wood members and forces at an angle
Where fasteners are installed in members with miter cuts, end and edge minimum distances must be considered as shown below.

If screws are subjected predominantly to an angled force with respect to wood grain direction, loaded and unloaded minimum distances must be considered accordingly. However, it shall satisfy minimum loaded edge and end distances for reversible loading cases like increased wind and seismic actions. The embedding force of the screw onto the surrounding wood will have the same orientation but opposite direction of the external force applied on the wood component of the joint.



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