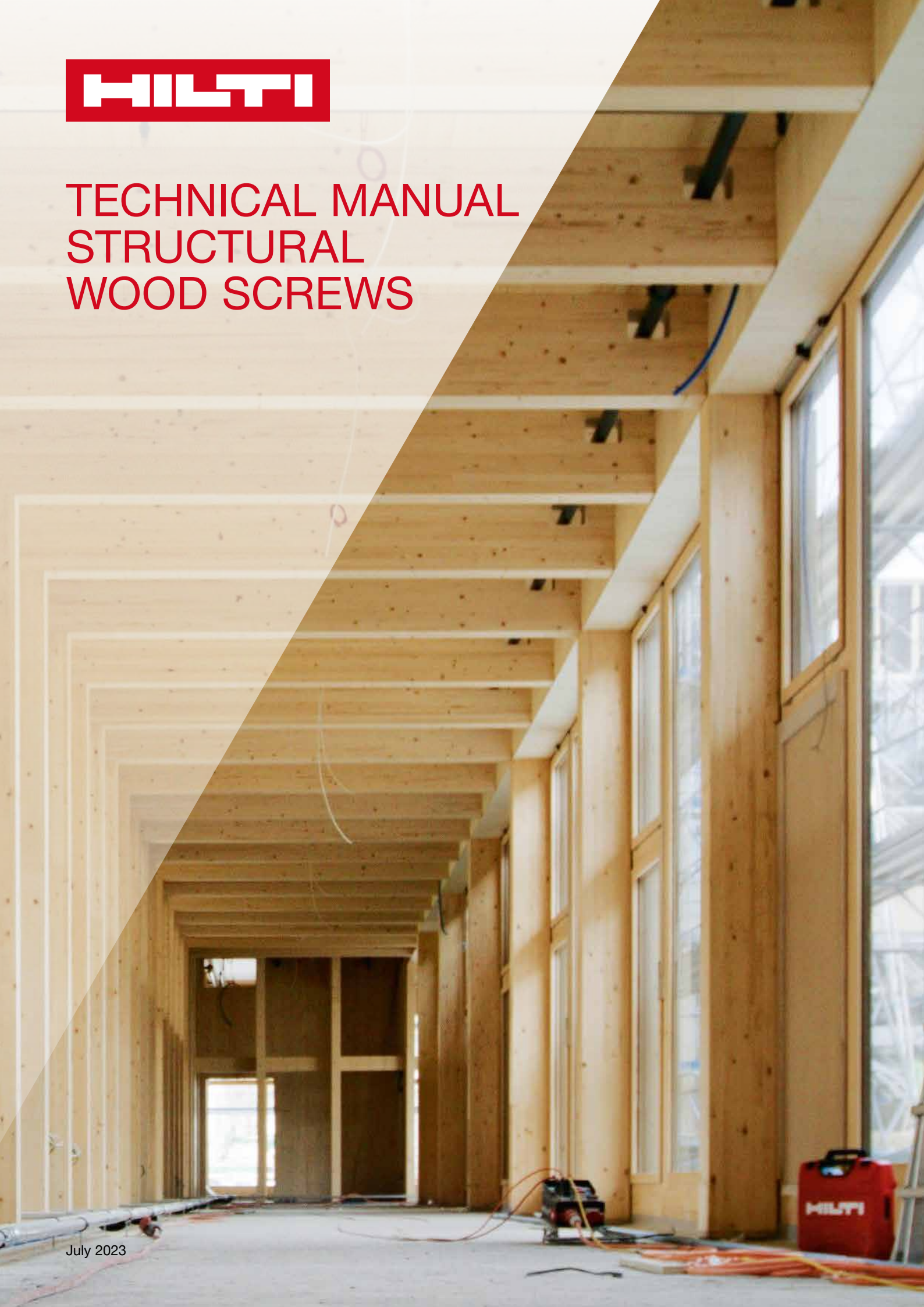
TECHNICAL MANUAL STRUCTURAL WOOD SCREWS



July 2023

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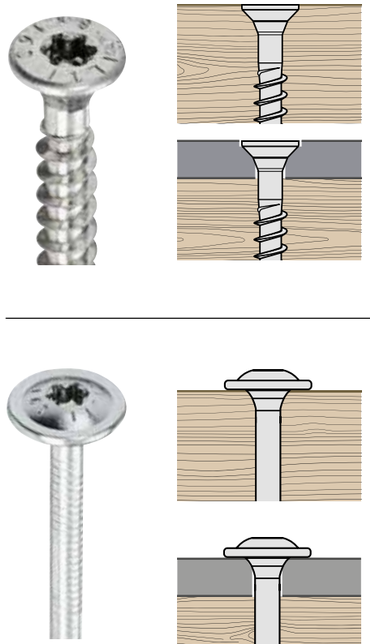
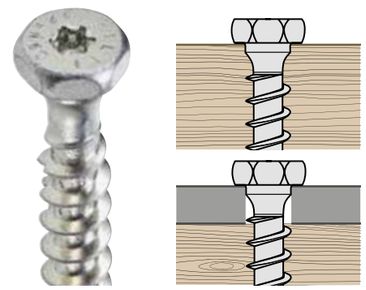
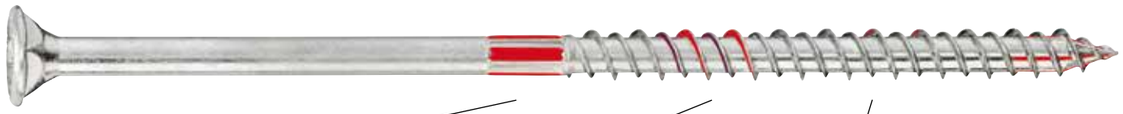
1. STRUCTURAL WOOD SCREWS INTRODUCTION

Head shapes and thread geometry

Head shapes	Features	Product range
	**90° countersunk head with milling pockets** • Milling pockets reduce tearing and splitting in the wood structure • Ideal for metal/wood connections • Fits perfectly into metal parts	**S-WCF-H Z** – Full threaded screw with countersunk head Ø 8 mm L: 120–580 mm Ø 10 mm L: 120–580 mm **S-WCP-S Z** – Partial threaded screw with 90° countersunk head Ø 5 mm L: 40–100 mm Ø 6 mm L: 50–180 mm Ø 8 mm L: 80–400 mm Ø 10 mm L: 160–400 mm
	Washer head • Highest head pull-through resistance values for sturdy joints pulled tightly together • No washers are required, which makes processing faster	**S-WWP-S Z**– Partial threaded screw with washer head Ø 6 mm L: 60–200 mm Ø 8 mm L: 80–580 mm Ø 10 mm L: 140–580 mm
	**Cylinder head** • Reduced blast effect so that wood surface does not splinter • Head is able to countersink deep into wood by using a long insert bit	**S-WXF-S Z** – Full threaded screw with cylindric head (full tip) Ø 8 mm L: 120–500 mm **S-WXF-H Z** – Full threaded screw with cylindric head (half tip) Ø 10 mm L: 200–500 mm
	**Dual head** • The hexagonal recess allows better force transfer • Recommended for wood structure with higher density • Additional TORX® recess saves the time of changing tools	**S-WDF-S Z**– Full threaded screw with dual head Ø 12 mm L: 60–160 mm

Thread types

Partial threaded screw



Straight friction part
- Lower screw-in resistance/ lower torque
- Allows longer battery reach

Hi-Lo thread
- Faster screw-in possible
- Higher load values

Grooved thread
- Reduces blast effect
- Faster screw-in possible

Full thread
- Excellent thread pull-out values
- Excellent pressure values
- Maximum load-bearing capacity

Tip types

Stitch point tip (full tip)
- Self-drilling tip with compressor
- Saves time by drilling precisely and instantly, even with oblique and end grain connections
- Less wood splitting and lower screw-in resistance compared to conventional wood construction screws
- No pre-drilling (depends on wood type)

Half tip with core fins
- Can be placed significantly closer to the edge & end-grain
- Less wood splitting
- No pre-drilling needed

Portfolio overview and naming

Material description chart

S - WWP - S - 8x220 100Z

❶ ❷ ❸ ❹ ❺ ❻ ❼

❶	S	Screw fastening technology
❷	W	Application type: structural wood
❸	Head type	C = countersunk head W = washer head X = cylinder head D = dual head (HEX & TORX®)
❹	Thread type	F = full threaded P = partial threaded
❺	Tip types	S = stitch point tip (full tip) H = half tip
❻	Dimension	8 = screw diameter in mm; 220 = screw length in mm; 100 = thread length, mm
❼	Coating/Corrosion protection	Z = Carbon steel, electro galvanized and passivated with anti friction coating

Corrosion protection information

Wood is a versatile building material that has been used to construct durable structures for centuries. Even to chemically aggressive environments, wood is very resistant, so that the use of wood in these areas can be very economical.

Due to their high mechanical strength and ease of processing, wood construction screws are being used more and more frequently compared to classic wood-wood connections. However, metal sometimes reacts very sensitively to chemicals. Some woods contain acids that can cause destruction of the metal fastener. Dissimilar metals can destroy each other through galvanic (contact) corrosion. Therefore, when selecting wood construction screws, the type of wood, the wood ingredients from wood preservation or wood treatment (e.g. thermal treatment, acetylated wood), as well as the chemical and climatic ambient conditions must be taken into account.

When using wood construction screws in wood structures, the fastener may be exposed to corrosion in different ways. The external part of the fastener (screw head) is exposed to corrosion from the atmosphere and depends on relative humidity, air pollution, chloride content and if the connection is weathered (exposed to rain) or non-weathered. The corrosion exposure of the part of the wood construction screws screwed into the wood depends on wood species, wood treatment and moisture content. Therefore, wood construction screws shall withstand corrosion exposure of both the wood and the atmosphere for the design service life of 50 years.

The minimum requirements for corrosion protection of wood construction screws are regulated in EN 1995-1-1:2012, DIN SPEC 1052-100:2013 and EN 14592:2022.

Table 4.1 in EN 1995-1-1(see Table 1) defines the minimum requirements for corrosion protection for wood construction screws. For wood construction screws with a nominal diameter d > 4 mm, no corrosion protection is required for the use of the screws in service classes 1 and 2.

Fastener	Service Class		
	1	2	3
Nails and screws with d ≤ 4 mm	None	Fe/Zn 12c	Fe/Zn 12c
Bolts, dowels, nails and screws with d > 4 mm	None	None	Fe/Zn 12c

Table 1: Table 4.1 from EN 1995-1-1: Examples of minimum specifications for material protection against corrosion for fasteners (related to ISO 2081)

In Germany, in addition to EN 1995-1-1, the standard (see Table 2) must also be observed. According to DIN SPEC 1052-100, slightly higher zinc coating thicknesses are required. Table 2 shows the part of DIN 1052-100 relevant for wood construction screws.

	Construction materials, Fasteners	Corrosion protection based on DIN EN ISO 2081 or average zinc coating thickness in µm and/or protective measures			
		with moderate corrosion exposure (corrosivity category C3[a])		in case of high and very high corrosion load (corrosivity categories C4 and C5[a])	
		Service Class 1	Service Class 2	Service Classes 1, 2 and 3 at C4	Service Class 3 at C5
1	Nails and screws with d ≤ 4 mm	None[d]	Fe/Zn 12c	55	suitable stainless steel
2	Nails d > 4 mm, Screws d > 4 mm, Dowels, bolts, washers, nuts	None[d]	None[d]	55	suitable stainless steel

[a] According to DIN EN ISO 12944-2

[d] In case of steel-to-wood connections with external steel plates, nails and screws must have an average zinc coating thickness of at least 7 µm

Table 2: Extract from Table 1, DIN 1052-100: Examples of minimum requirements for the construction materials or corrosion protection of Fasteners for moderate, high or very high corrosion loads

Service Classes:
Due to the physical properties of wood materials, wood structures must be assigned to specific service classes that characterize the atmospheric conditions of the structure's environment during its use (see Table 3).

Service class	Environment climate	Typical Environments	Average moisture content
1	20 °C moisture content ≤ 65 %	**Interior:** dry, heated buildings with clean atmospheres, e.g. offices, shops, schools, hotels **Exterior:** n.a.	5 %–15 %
2	20 °C moisture content ≤ 85 %	**Interior:** unheated buildings where condensation can occur, e.g. depots, sport halls **Exterior:** protected outdoor environment and roofed, open structures e.g. halls, storage areas, parking decks which are open to the outside	10 %–20 %
3	Higher moisture contents than in service class 2	**Interior:** high humidity, e.g. food-processing plants, laundries, breweries, dairies **Exterior:** directly exposed to external atmosphere, e.g. unprotected outdoor environment, exposed directly to atmosphere, coastal areas	12 %–24 %

Table 3: Overview of the classification of Service classes

Service class 1 is characterised by a moisture content in the wood materials corresponding to a temperature of 20° C and the relative humidity of the surrounding air only exceeding 65 % for a few weeks per year, e.g. structures closed on all sides and heated.
In service class 1 the average moisture content in most softwoods will not exceed 12 %.

Service class 2 is characterised by a moisture content in the wood materials corresponding to a temperature of 20° C and the relative humidity of the surrounding air only exceeding 85 % for a few weeks per year, e.g. for roofed, open structures.
In service class 2 the average moisture content in most softwoods will not exceed 20 %.

Service class 3 is characterised by climate conditions leading to higher moisture contents than in service class 2, e.g. structures directly exposed to external atmosphere and areas with high humidity

EN 14592, Chapter 4 and Annex B, defines how to determine the corrosion protection for dowel-type fasteners.
Wood construction screws shall withstand corrosion exposure of both the wood and the atmosphere for the design service life of 50 years. Pure zinc coated fasteners shall be assigned to a T-category and C-category.

The T-category concerns corrosion caused by the wood and the appropriate category should be determined from Table B.3 in EN 14592. Moisture content, treatments applied to the wood, wood species (pH value) and fire retardants influence the corrosion rate.

The C-category refers to the fastener resistance with respect corrosion caused by the atmosphere and the appropriate category should be determined from Table B.1 and Table B.2 in EN 14592.

The minimum thickness for pure zinc coating of wood construction screws made of carbon steel can be determined according to Table 1 and Table 2 of EN 14592.

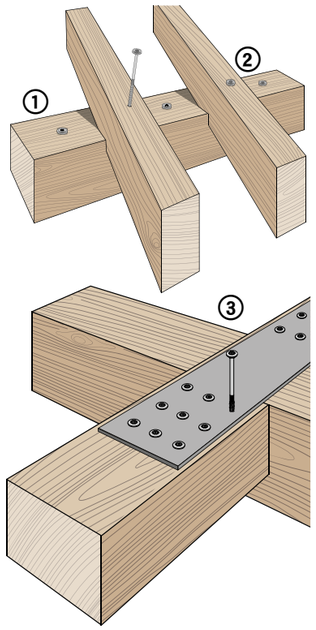
For the use of the screws in the wood category T1 and atmosphere category C1 no corrosion protection is required. Electrogalvanized wood construction screws made of carbon steel with a zinc coating thickness of 10 µm can be used in Wood categories T1 and T2 and the atmosphere categories C1 and C2nw. For applications in C2 atmospheres, CrIII passivation may reduce the required coating thickness by 25 %, and with CrVI passivation the required coating thickness may be reduced by 50 %.

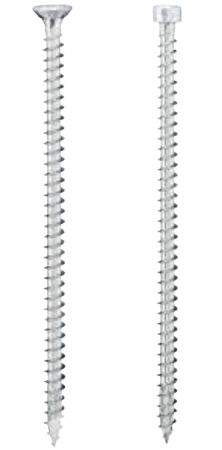
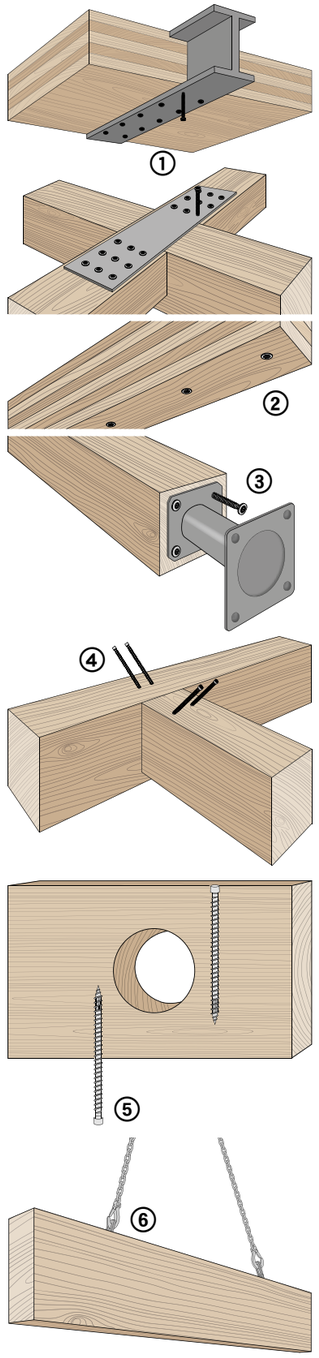
For applications in the wood categories T3 to T5 and atmosphere categories C2w to C5, carbon steel screws with a higher zinc coating thickness, screws with alternative coatings or stainless steel screws shall be used.

The wood categories T1 to T5 do not correspond directly with the Service Classes in EN 1995-1-1:2004. However, for most climates the annual average moisture content in softwood will not exceed 10 % for heated spaces, so that T1 almost corresponds to Service Class 1 and 16 % for unheated spaces, so that T2 almost corresponds to Service Class 2.

Corrosion protection of Hilti wood construction screws according to ETA 22/0772:
The Hilti self-tapping screws for use in wood constructions according to ETA-22/0772 are made from special carbon steel. They are hardened, electrogalvanized and passivated (CRIII / blue) and anti-friction coated.
The corrosion resistance of Hilti screw can be expressed to T2/C2nw according to the standard EN 14592:2022-04 and exceeds the minimum requirements for corrosion protection of the standards EN 1995-1-1 and DIN SPEC 1052-100.
Hilti screws can be used in all wood species mentioned in the ETA 22/0772 if the annual average moisture content of 16 % is not exceeded, service classes 1 and 2 according to EN 1995-1-1:2004 resp. wood category T1 and T2 acc. to EN 14592:2022.
Furthermore, Hilti screws can be used in corrosivity category C1 and C2 (non-weathered) according to EN ISO 9223:2012 or atmosphere category C1 and C2nw according to EN 14592:2022.
Typical indoor and outdoor environmental conditions in which Hilti self-tapping screws can be used are listed in Table 3 (service classes 1 and 2).

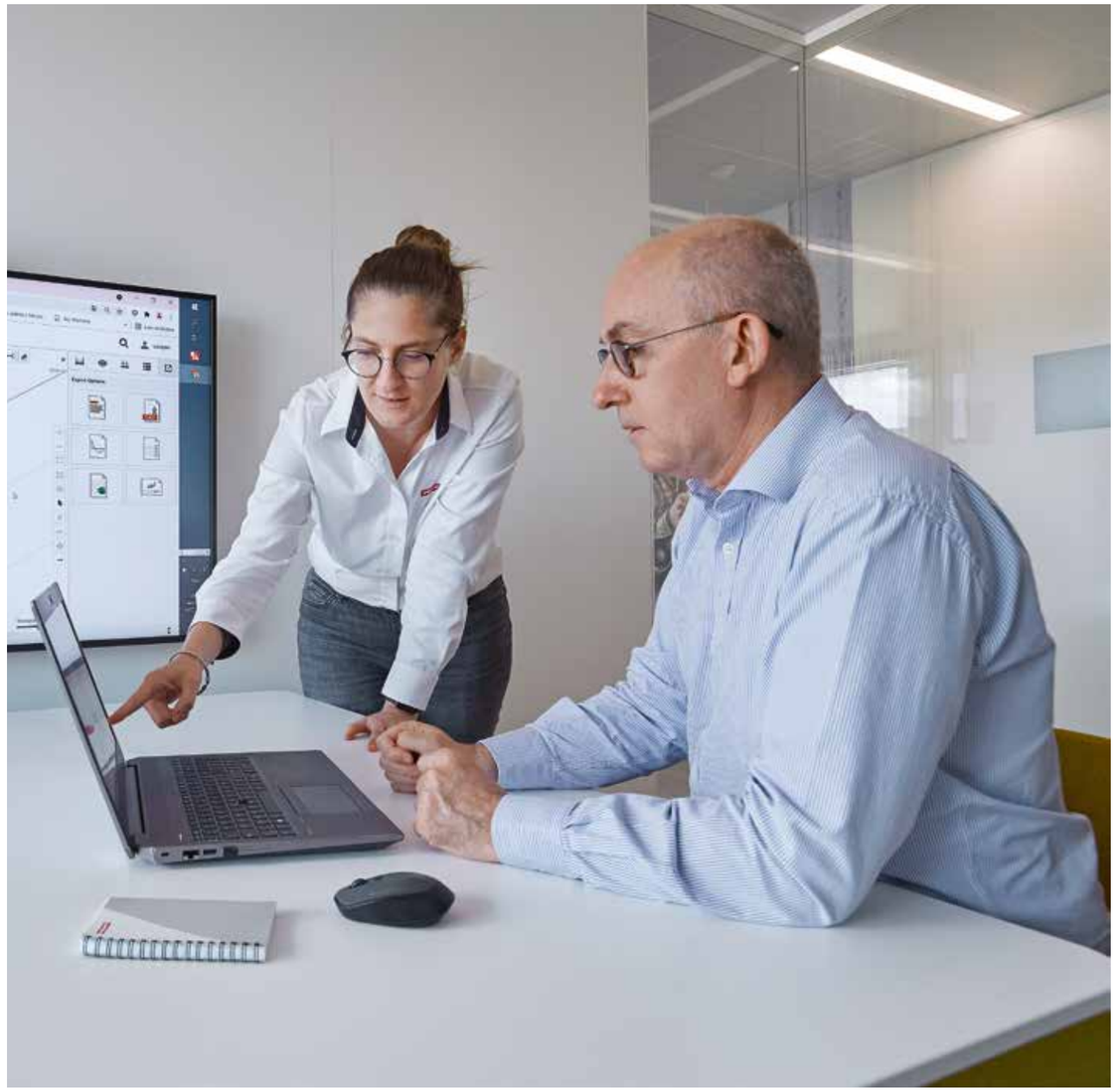
Structural wood screws portfolio applications overview

Screw portfolio	Application picture	Application overview	Key Features
 **S-WCP-S Z** Partial threaded screw with countersunk head **S-WWP-S Z** Partial threaded screw with washer head	  	**Doubling Rafters** ① **S-WCP-S** Doubling for reinforcement is usually done on the top or side of the rafter. **RAFTERS** ② **S-WWP-S** Partial thread screws transfer the wind suction load and shear forces to the substructure through the screw heads. **Metal sheets and shaped sheet/Metal parts to wood** **S-WWP-S** ④, **S-WCP-S** ③ screws are optimal for metal sheets and shaped sheet metal parts. These screws have milling pockets that allow them to be optimally centered and to fit perfectly into metal parts. **CLT Walls and ceilings** Cross-Laminated-Wood (CLT) – ceiling panel screwed to the walls with **S-WCP-S**. Hilti screws are approved for all applications side grain and end grain (0° and 90°) as well as CLT wide face and narrow face. **Corner and wall screw connections** are pulled tightly together and securely screwed with S-WWP-S.	**S-WWP-S** Washer head eliminates the need to use a separate washer, higher head pull-through values. Significant lower torque requirement for the screw-in process. Straight friction part reduces torque requirement by removing material. Longer battery life for a screwdriver drill. **S-WCP-S** Countersunk head 90° with milling pockets. Ideal for metal/wood connections. Fits perfectly into metal parts. Partial thread Hi/Low allows a faster screw setting process. The highest technical values guarantee a secure hold even for oblique and end grain connections.

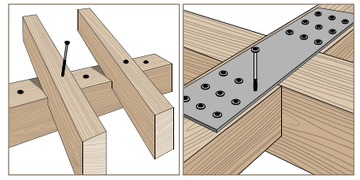
Screw portfolio	Application picture	Application overview	Key Features
 **S-WCF-H Z** Full threaded screw with countersunk head **S-WXF-S Z** Full threaded screw with cylindric head (full tip)  **S-WDF-S Z** Full threaded screw with dual head		**Support reinfocement with steel plate and full thread screws** ① **S-WCF-H** full-thread screws transfer the support load from the wood section directly to the steel plate through the screw heads. They distribute the force evenly into the end grain of the support. **Transverse tension reinforcement for notching** ② **S-WXF-S** and **S-WXF-H** full thread screws will be used to reinforce and secure the beam in the red line area. **Connections at the base point of the support** ③ **S-WCF-H** full-thread screws with a countersunk head are best suited for this application. Shear forces and wind suction are effectively transferred. **Cross-laminated wood (ceiling rib)** ④ **S-WXF-S** and **S-WXF-H** are ideal screws for shear-resistant crosswise screwing for cross-laminated wood ceilings. **Reinforcement of openings with long full-thread screws** ⑤ Long full-thread screws **S-WXF-S** and **S-WF-H** with cylinder heads are recommended for the application **S-WDF-S** ⑥ screws are used in wood constructions as a lifting system for prefabricated roofs, walls and ceilings, in wood frame construction for the prefab house industry, solid wood boards, cross-laminated wood.	**S-WCF-H** screw with a countersunk head 90° ideal for metal/wood connections. The under-head design fits perfectly into metal parts. The half-tip design ensures that screws > 200 mm penetrate w/o bending. Lower edge distances possible: can achieve down to 3-4 x diameter (depending on wood type and application), typically 5-10 x diameter. **S-WXF-S** screws Help to reduce the wood-splitting effect. The screw head can be penetrated deep into the wood. **S-WDF-S** dual head screws with the HEX (hexagonal) recess provide good force transfer of loads. An additional TX (TORX) drive saves the time of changing tools.

Wood screw design software

- Easy and intuitive to operate - takes much less time to calculate structurtal wood application
- The software takes national regulations into account and supports multi-language interface
- The software provides the result of the calculations in PDF-File report



2. PARTIAL THREADED STRUCTURAL WOOD SCREWS

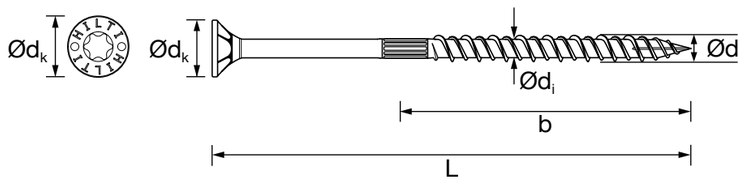


S-WCP-S Z – Partial threaded screw with 90° countersunk head

- Countersunk head 90° with milling pockets.
- Ideal for metal/wood connections. Fits perfectly into metal parts
- Partial thread Hi/Low allows a faster screw setting process
- A secure hold even for oblique and end grain connections

Item name	d [mm]	L [mm]	Thread length b [mm]	Head Ø d_k [mm]	Recess drive	Pcs. per box	Item number
S-WCP-S-5x40/25 Z	5.0	40	25	10	TX25	500	**2363555**
S-WCP-S-5x50/30 Z		50	30			250	**2363556**
S-WCP-S-5x60/40 Z		60	40			250	**2363557**
S-WCP-S-5x70/40 Z		70	40			200	**2363558**
S-WCP-S-5x80/50 Z		80	50			200	**2363559**
S-WCP-S-5x90/50 Z		90	50			100	**2363620**
S-WCP-S-5x100/60 Z		100	60			100	**2363621**
S-WCP-S-6x50/30 Z	6.0	50	30	12	TX30	250	**2363622**
S-WCP-S-6x60/40 Z		60	40			200	**2363623**
S-WCP-S-6x70/40 Z		70	40			200	**2363624**
S-WCP-S-6x80/50 Z		80	50			100	**2363625**
S-WCP-S-6x90/50 Z		90	50			100	**2363626**
S-WCP-S-6x100/60 Z		100	60			100	**2363627**
S-WCP-S-6x110/60 Z		110	60			100	**2363628**
S-WCP-S-6x120/70 Z		120	70			100	**2363629**
S-WCP-S-6x130/70 Z		130	70			100	**2363630**
S-WCP-S-6x140/70 Z		140	70			100	**2363631**
S-WCP-S-6x150/70 Z		150	70			100	**2363632**
S-WCP-S-6x160/70 Z		160	70			100	**2363633**
S-WCP-S-6x180/70 Z		180	70			100	**2363634**
S-WCP-S-8x80/50 Z	8.0	80	50	15	TX40	75	**2363635**
S-WCP-S-8x90/50 Z		90	50			75	**2363636**
S-WCP-S-8x100/60 Z		100	60			75	**2363637**
S-WCP-S-8x120/80 Z		120	80			75	**2363638**
S-WCP-S-8x140/80 Z		140	80			75	**2363639**
S-WCP-S-8x160/80 Z		160	80			75	**2363640**
S-WCP-S-8x180/100 Z		180	100			75	**2363641**
S-WCP-S-8x200/100 Z		200	100			75	**2363642**
S-WCP-S-8x220/100 Z		220	100			75	**2363643**
S-WCP-S-8x240/100 Z		240	100			75	**2363644**
S-WCP-S-8x260/100 Z		260	100			75	**2363645**
S-WCP-S-8x280/100 Z		280	100			75	**2363646**
S-WCP-S-8x300/100 Z		300	100			75	**2363647**
S-WCP-S-8x320/100 Z		320	100			75	**2363648**
S-WCP-S-8x340/100 Z		340	100			75	**2363649**

Item name	d [mm]	L [mm]	Thread length b [mm]	Head Ø d_k [mm]	Recess drive	Pcs. per box	Item number
S-WCP-S-8x360/100 Z	8.0	360	100	15	TX40	75	2363650
S-WCP-S-8x380/100 Z		380	100			75	2363651
S-WCP-S-8x400/100 Z		400	100			75	2363652
S-WCP-S-10x160/80 Z	10	160	80	18.5	TX50	50	2363653
S-WCP-S-10x180/100 Z		180	100			50	2363654
S-WCP-S-10x200/100 Z		200	100			50	2363655
S-WCP-S-10x220/100 Z		220	100			50	2363656
S-WCP-S-10x240/100 Z		240	100			50	2363657
S-WCP-S-10x260/100 Z		260	100			50	2363658
S-WCP-S-10x280/100 Z		280	100			50	2363659
S-WCP-S-10x300/100 Z		300	100			50	2363660
S-WCP-S-10x320/100 Z		320	100			50	2363661
S-WCP-S-10x340/100 Z		340	100			50	2363662
S-WCP-S-10x360/100 Z		360	100			50	2363663
S-WCP-S-10x380/100 Z		380	100			50	2363664
S-WCP-S-10x400/100 Z		400	100			50	2363665

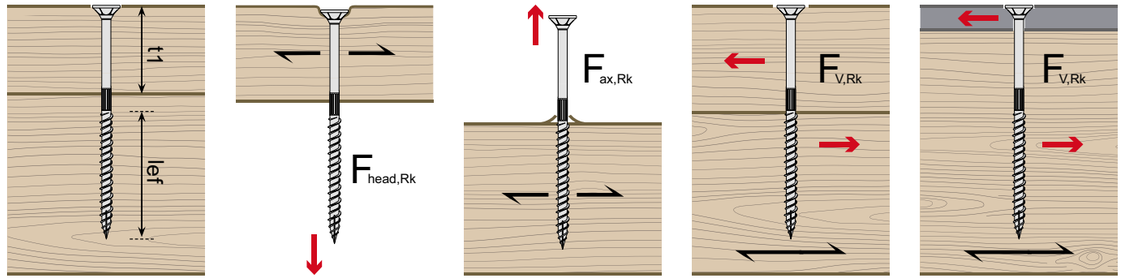


GEOMETRY AND MECHANICAL CHARACTERISTICS for C24 wood

Technical data:					
Nominal diameter	d [mm]	Ø5	Ø6	Ø8	Ø10
Head diameter	d_k [mm]	10.0	12.0	15.0	18.5
Shank diameter	d_i [mm]	3.25	4.00	5.35	6.80
Characteristic withdrawal parameter	$f_{ax,k,90°}$ [N/mm²]	13.6	13.0	10.9	11.0
Characteristic head pull-through parameter	$f_{head,k}$ [N/mm²]	14.6	14.6	12.4	12.2
Characteristic tensile strength	$f_{tens,k}$ [kN]	8.8	13.1	23.3	35.0
Characteristic yield moment	$M_{y,k}$ [Nmm]	5900	10700	22600	33600

Values for C24 (ρ_k = 350 kg/m³), axial axis to grain: 30°–90°, $F_{ax,Rk}$ = thread withdrawal, $F_{head,Rk}$ = head pull through, $F_{v,Rk}$ = shear (// to grain 0°–⊥ to grain 90°), wood/steel plate: l_{ef} = thread length b, t_1 min = minimum wood thickness, t_1 max = maximum wood thickness, add-on part (L-b),$F_{V,Rk,thin}$ = steel sheet t ≤ d/2, $F_{V,RK,thick}$ = steel sheet t ≥ d

Type and printing errors reserved. The values stated are meant to serve as planning guides; projects should only be undertaken by authorised professionals.



S-WCP-S Z – Partial threaded screw with 90° countersunk head

Thread type – Partial threaded – Friction part – Hi/Low

Diameter Ø 5 mm			Tension		Shear			
			Head pull-through	Thread withdrawal	Wood to wood	Steel to wood		
Description	L/b [mm]	$t_{t,min}$ [mm]	$F_{head,Rk}$ [kN]	$F_{ax,Rk}$ [kN]	$F_{v,Rk}$ [kN]	$F_{V,Rk,thin}$ [kN]	$F_{V,Rk,thick}$ [kN]	Item no.
S-WCP-S-5x40/25 Z	40/25	–	1.46	1.70	–	1.24	1.94	2363555
S-WCP-S-5x50/30 Z	50/30	–	1.46	2.04	–	1.59	2.17	2363556
S-WCP-S-5x60/40 Z	60/40	–	1.46	2.72	–	1.86	2.34	2363557
S-WCP-S-5x70/40 Z	70/40	30	1.46	2.72	1.49	1.86	2.34	2363558
S-WCP-S-5x80/50 Z	80/50	30	1.46	3.40	1.49	2.03	2.51	2363559
S-WCP-S-5x90/50 Z	90/50	40	1.46	3.40	1.54	2.03	2.51	2363620
S-WCP-S-5x100/60 Z	100/60	40	1.46	4.08	1.54	2.20	2.68	2363621

Diameter Ø 6 mm			Tension		Shear			
			Head pull-through	Thread withdrawal	Wood to wood	Steel to wood		
Description	L/b [mm]	$t_{t,min}$ [mm]	$F_{head,Rk}$ [kN]	$F_{ax,Rk}$ [kN]	$F_{v,Rk}$ [kN]	$F_{V,Rk,thin}$ [kN]	$F_{V,Rk,thick}$ [kN]	Item no.
S-WCP-S-6x50/30 Z	50/30	–	2.10	2.34	–	1.77	2.75	2363622
S-WCP-S-6x60/40 Z	60/40	–	2.10	3.12	–	2.17	3.17	2363623
S-WCP-S-6x70/40 Z	70/40	30	2.10	3.12	1.93	2.47	3.17	2363624
S-WCP-S-6x80/50 Z	80/50	30	2.10	3.90	1.93	2.66	3.36	2363625
S-WCP-S-6x90/50 Z	90/50	40	2.10	3.90	2.20	2.66	3.36	2363626
S-WCP-S-6x100/60 Z	100/60	40	2.10	4.68	2.20	2.86	3.56	2363627
S-WCP-S-6x110/60 Z	110/60	50	2.10	4.68	2.21	2.86	3.56	2363628
S-WCP-S-6x120/70 Z	120/70	50	2.10	5.46	2.21	3.05	3.75	2363629
S-WCP-S-6x130/70 Z	130/70	50	2.10	5.46	2.21	3.05	3.75	2363630
S-WCP-S-6x140/70 Z	140/70	50	2.10	5.46	2.21	3.05	3.75	2363631
S-WCP-S-6x150/70 Z	150/70	50	2.10	5.46	2.21	3.05	3.75	2363632
S-WCP-S-6x160/70 Z	160/70	50	2.10	5.46	2.21	3.05	3.75	2363633
S-WCP-S-6x180/70 Z	180/70	50	2.10	5.46	2.21	3.05	3.75	2363634

S-WCP-S Z – Partial threaded screw with 90° countersunk head

Thread type – Partial threaded – Friction part – Hi/Low

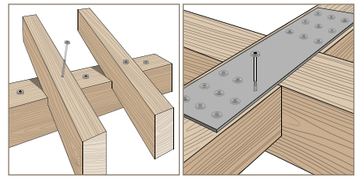
Diameter Ø 8 mm

			Tension		Shear			
			Head pull-through	Thread withdrawal	Wood to wood	Steel to wood		
Description	L/b [mm]	$t_{1,min}$ [mm]	$F_{head,Rk}$ [kN]	$F_{ax,Rk}$ [kN]	$F_{v,Rk}$ [kN]	$F_{V,Rk,thin}$ [kN]	$F_{V,Rk,thick}$ [kN]	Item no.
S-WCP-S-8x80/50 Z	80/50	30	2.79	4.36	2.69	3.54	4.93	2363635
S-WCP-S-8x90/50 Z	90/50	40	2.79	4.36	2.97	3.80	4.93	2363636
S-WCP-S-8x100/60 Z	100/60	40	2.79	5.23	2.97	4.02	5.14	2363637
S-WCP-S-8x120/80 Z	120/80	40	2.79	6.98	2.97	4.46	5.58	2363638
S-WCP-S-8x140/80 Z	140/80	60	2.79	6.98	3.41	4.46	5.58	2363639
S-WCP-S-8x160/80 Z	160/80	60	2.79	6.98	3.41	4.46	5.58	2363640
S-WCP-S-8x180/100 Z	180/100	60	2.79	8.72	3.41	4.89	6.02	2363641
S-WCP-S-8x200/100 Z	200/100	60	2.79	8.72	3.41	4.89	6.02	2363642
S-WCP-S-8x220/100 Z	220/100	60	2.79	8.72	3.41	4.89	6.02	2363643
S-WCP-S-8x240/100 Z	240/100	60	2.79	8.72	3.41	4.89	6.02	2363644
S-WCP-S-8x260/100 Z	260/100	60	2.79	8.72	3.41	4.89	6.02	2363645
S-WCP-S-8x280/100 Z	280/100	60	2.79	8.72	3.41	4.89	6.02	2363646
S-WCP-S-8x300/100 Z	300/100	60	2.79	8.72	3.41	4.89	6.02	2363647
S-WCP-S-8x320/100 Z	320/100	60	2.79	8.72	3.41	4.89	6.02	2363648
S-WCP-S-8x340/100 Z	340/100	60	2.79	8.72	3.41	4.89	6.02	2363649
S-WCP-S-8x360/100 Z	360/100	60	2.79	8.72	3.41	4.89	6.02	2363650
S-WCP-S-8x380/100 Z	380/100	60	2.79	8.72	3.41	4.89	6.02	2363651
S-WCP-S-8x400/100 Z	400/100	60	2.79	8.72	3.41	4.89	6.02	2363652

Diameter Ø 10 mm

			Tension		Shear			
			Head pull-through	Thread withdrawal	Wood to wood	Steel to wood		
Description	L/b [mm]	$t_{1,min}$ [mm]	$F_{head,Rk}$ [kN]	$F_{ax,Rk}$ [kN]	$F_{v,Rk}$ [kN]	$F_{V,Rk,thin}$ [kN]	$F_{V,Rk,thick}$ [kN]	Item no.
S-WCP-S-10x160/80 Z	160/80	60	4.18	8.80	4.62	5.78	7.26	2363653
S-WCP-S-10x180/100 Z	180/100	60	4.18	11.00	4.62	6.33	7.81	2363654
S-WCP-S-10x200/100 Z	200/100	60	4.18	11.00	4.62	6.33	7.81	2363655
S-WCP-S-10x220/100 Z	220/100	60	4.18	11.00	4.62	6.33	7.81	2363656
S-WCP-S-10x240/100 Z	240/100	60	4.18	11.00	4.62	6.33	7.81	2363657
S-WCP-S-10x260/100 Z	260/100	60	4.18	11.00	4.62	6.33	7.81	2363658
S-WCP-S-10x280/100 Z	280/100	60	4.18	11.00	4.62	6.33	7.81	2363659
S-WCP-S-10x300/100 Z	300/100	60	4.18	11.00	4.62	6.33	7.81	2363660
S-WCP-S-10x320/100 Z	320/100	60	4.18	11.00	4.62	6.33	7.81	2363661
S-WCP-S-10x340/100 Z	340/100	60	4.18	11.00	4.62	6.33	7.81	2363662
S-WCP-S-10x360/100 Z	360/100	60	4.18	11.00	4.62	6.33	7.81	2363663
S-WCP-S-10x380/100 Z	380/100	60	4.18	11.00	4.62	6.33	7.81	2363664
S-WCP-S-10x400/100 Z	400/100	60	4.18	11.00	4.62	6.33	7.81	2363665

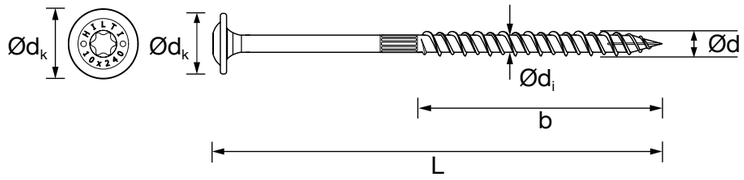
S-WWP-S Z – Partial threaded screw with washer head



- Washer head eliminates the need to use a separate washer
- Higher head pull-through values
- Straight friction part reduces torque requirement by removing material

Item name	d [mm]	L [mm]	Thread length b [mm]	Head Ø d_k [mm]	Recess drive	Pcs. per box	Item number
S-WWP-S-6x60/40 Z	6.0	60	40	14	TX 30	100	2363516
S-WWP-S-6x80/50 Z		80	50			100	2363517
S-WWP-S-6x100/60 Z		100	60			100	2363518
S-WWP-S-6x120/70 Z		120	70			100	2363519
S-WWP-S-6x140/70 Z		140	70			100	2363520
S-WWP-S-6x160/70 Z		160	70			50	2363521
S-WWP-S-6x180/70 Z		180	70			50	2363522
S-WWP-S-6x200/70 Z		200	70			50	2363523
S-WWP-S-8x80/50 Z	8.0	80	50	20	TX 40	50	2363524
S-WWP-S-8x100/60 Z		100	60			50	2363525
S-WWP-S-8x120/80 Z		120	80			50	2363526
S-WWP-S-8x140/80 Z		140	80			50	2363527
S-WWP-S-8x160/80 Z		160	80			50	2363528
S-WWP-S-8x180/100 Z		180	100			50	2363529
S-WWP-S-8x200/100 Z		200	100			50	2363530
S-WWP-S-8x220/100 Z		220	100			50	2363531
S-WWP-S-8x240/100 Z		240	100			50	2363532
S-WWP-S-8x260/100 Z		260	100			50	2363533
S-WWP-S-8x280/100 Z		280	100			50	2363534
S-WWP-S-8x300/100 Z		300	100			50	2363535
S-WWP-S-8x320/100 Z		320	100			50	2363536
S-WWP-S-8x340/100 Z		340	100			50	2363537
S-WWP-S-8x360/100 Z		360	100			50	2363538
S-WWP-S-8x380/100 Z		380	100			50	2363539
S-WWP-S-8x400/100 Z		400	100			50	2363540
S-WWP-S-8x500/100 Z		500	100			50	2372406
S-WWP-S-8x580/100 Z		580	100			25	2372407
S-WWP-S-10x140/80 Z	10	140	80	25	TX 50	25	2363541
S-WWP-S-10x160/80 Z		160	80			25	2363542
S-WWP-S-10x180/100 Z		180	100			25	2363543
S-WWP-S-10x200/100 Z		200	100			25	2363544
S-WWP-S-10x220/100 Z		220	100			25	2363545
S-WWP-S-10x240/100 Z		240	100			25	2363546
S-WWP-S-10x260/100 Z		260	100			25	2363547
S-WWP-S-10x280/100 Z		280	100			25	2363548

Item name	d [mm]	L [mm]	Thread length b [mm]	Head Ø d_k [mm]	Recess drive	Pcs. per box	Item number
S-WWP-S-10x300/100 Z	10	300	100	25	TX 50	25	**2363549**
S-WWP-S-10x320/100 Z		320	100			25	**2363550**
S-WWP-S-10x340/100 Z		340	100			25	**2363551**
S-WWP-S-10x360/100 Z		360	100			25	**2363552**
S-WWP-S-10x380/100 Z		380	100			25	**2363553**
S-WWP-S-10x400/100 Z		400	100			25	**2363554**
S-WWP-S-10x500/100 Z		500	100			25	**2372408**
S-WWP-S-10x580/100 Z		580	100			25	**2372409**



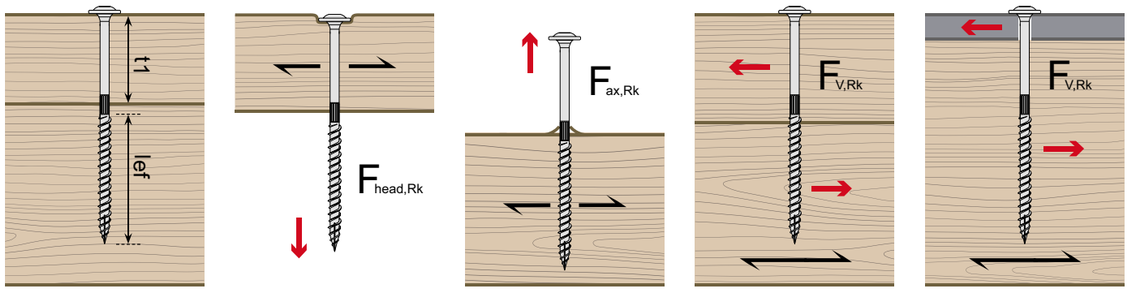
GEOMETRY AND MECHANICAL CHARACTERISTICS for C24 wood

Technical data:

		Ø6	Ø8	Ø10
Nominal diameter	d [mm]	Ø6	Ø8	Ø10
Head diameter	d_k [mm]	14.0	20.0	25.0
Shank diameter	d_i [mm]	4.00	5.35	6.80
Characteristic withdrawal parameter	$f_{ax,k,90°}$ [N/mm²]	13.0	10.9	11.0
Characteristic head pull-through parameter	$f_{head,k}$ [N/mm²]	16.7	17.6	15.2
Characteristic tensile strength	$f_{tens,k}$ [kN]	13.1	23.3	35.0
Characteristic yield moment	$M_{y,k}$ [Nmm]	10 700	22 600	33 600

Values for C24 (ρ_k = 350 kg/m³), axial axis to grain: 30°–90°, $F_{ax,Rk}$ = thread withdrawal, $F_{head,Rk}$ = head pull through, $F_{v,Rk}$ = shear (// to grain 0°–⊥ to grain 90°), wood/steel plate: l_{ef} = thread length b, t_1 min = minimum wood thickness, t_1 max = maximum wood thickness, add-on part (L-b), $F_{V,Rk,thin}$ = steel sheet t≤d/2, $F_{V,RK,thick}$ = steel sheet t≥d

Type and printing errors reserved. The values stated are meant to serve as planning guides; projects should only be undertaken by authorised professionals.



S-WWP-S Z – Partial threaded screw with washer head

Thread type – Partial thread – Friction part – Hi/Low

Diameter Ø 6 mm			Tension		Shear			
			Head pull-through	Thread withdrawal	Wood to wood	Steel to wood		
Description	L/b [mm]	$t_{1,min}$ [mm]	$F_{head,Rk}$ [kN]	$F_{ax,Rk}$ [kN]	$F_{v,Rk}$ [kN]	$F_{V,Rk,thin}$ [kN]	$F_{V,Rk,thick}$ [kN]	Item no.
S-WWP-S-6x60/40 Z	60/40	–	3.27	3.12	–	2.17	3.17	**2363516**
S-WWP-S-6x80/50 Z	80/50	30	3.27	3.90	2.22	2.66	3.36	**2363517**
S-WWP-S-6x100/60 Z	100/60	40	3.27	4.68	2.49	2.86	3.56	**2363518**
S-WWP-S-6x120/70 Z	120/70	50	3.27	5.46	2.51	3.05	3.75	**2363519**
S-WWP-S-6x140/70 Z	140/70	50	3.27	5.46	2.51	3.05	3.75	**2363520**
S-WWP-S-6x160/70 Z	160/70	50	3.27	5.46	2.51	3.05	3.75	**2363521**
S-WWP-S-6x180/70 Z	180/70	50	3.27	5.46	2.51	3.05	3.75	**2363522**
S-WWP-S-6x200/70 Z	200/70	50	3.27	5.46	2.51	3.05	3.75	**2363523**

Diameter Ø 8 mm			Tension		Shear			
			Head pull-through	Thread withdrawal	Wood to wood	Steel to wood		
Description	L/b [mm]	$t_{1,min}$ [mm]	$F_{head,Rk}$ [kN]	$F_{ax,Rk}$ [kN]	$F_{v,Rk}$ [kN]	$F_{V,Rk,thin}$ [kN]	$F_{V,Rk,thick}$ [kN]	Item no.
S-WWP-S-8x80/50 Z	80/50	30	7.04	4.36	3.08	3.54	4.93	**2363524**
S-WWP-S-8x100/60 Z	100/60	40	7.04	5.23	3.58	4.02	5.14	**2363525**
S-WWP-S-8x120/80 Z	120/80	40	7.04	6.98	4.02	4.46	5.58	**2363526**
S-WWP-S-8x140/80 Z	140/80	60	7.04	6.98	4.46	4.46	5.58	**2363527**
S-WWP-S-8x160/80 Z	160/80	60	7.04	6.98	4.46	4.46	5.58	**2363528**
S-WWP-S-8x180/100 Z	180/100	60	7.04	8.72	4.47	4.89	6.02	**2363529**
S-WWP-S-8x200/100 Z	200/100	60	7.04	8.72	4.47	4.89	6.02	**2363530**
S-WWP-S-8x220/100 Z	220/100	60	7.04	8.72	4.47	4.89	6.02	**2363531**
S-WWP-S-8x240/100 Z	240/100	60	7.04	8.72	4.47	4.89	6.02	**2363532**
S-WWP-S-8x260/100 Z	260/100	60	7.04	8.72	4.47	4.89	6.02	**2363533**
S-WWP-S-8x280/100 Z	280/100	60	7.04	8.72	4.47	4.89	6.02	**2363534**
S-WWP-S-8x300/100 Z	300/100	60	7.04	8.72	4.47	4.89	6.02	**2363535**
S-WWP-S-8x320/100 Z	320/100	60	7.04	8.72	4.47	4.89	6.02	**2363536**
S-WWP-S-8x340/100 Z	340/100	60	7.04	8.72	4.47	4.89	6.02	**2363537**
S-WWP-S-8x360/100 Z	360/100	60	7.04	8.72	4.47	4.89	6.02	**2363538**
S-WWP-S-8x380/100 Z	380/100	60	7.04	8.72	4.47	4.89	6.02	**2363539**
S-WWP-S-8x400/100 Z	400/100	60	7.04	8.72	4.47	4.89	6.02	**2363540**
S-WWP-S-8x500/100 Z	500/100	60	7.04	8.72	4.47	4.89	6.02	**2372406**
S-WWP-S-8x580/100 Z	580/100	60	7.04	8.72	4.47	4.89	6.02	**2372407**

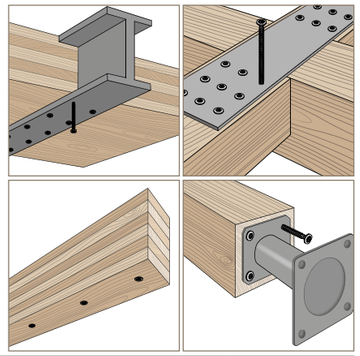
S-WWP-S Z – Partial threaded screw with washer head

Thread type – Partial thread – Friction part – Hi/Low

Diameter Ø 10 mm			Tension		Shear			
			Head pull-through	Thread withdrawal	Wood to wood	Steel to wood		
Description	L/b [mm]	$t_{1,min}$ [mm]	$F_{head,Rk}$ [kN]	$F_{ax,Rk}$ [kN]	$F_{v,Rk}$ [kN]	$F_{V,Rk,thin}$ [kN]	$F_{V,Rk,thick}$ [kN]	Item no.
S-WWP-S-10x140/80 Z	140/80	60	9.50	8.80	5.78	5.78	7.26	**2363541**
S-WWP-S-10x160/80 Z	160/80	60	9.50	8.80	5.78	5.78	7.26	**2363542**
S-WWP-S-10x180/100 Z	180/100	60	9.50	11.00	5.95	6.33	7.81	**2363543**
S-WWP-S-10x200/100 Z	200/100	60	9.50	11.00	5.95	6.33	7.81	**2363544**
S-WWP-S-10x220/100 Z	220/100	60	9.50	11.00	5.95	6.33	7.81	**2363545**
S-WWP-S-10x240/100 Z	240/100	60	9.50	11.00	5.95	6.33	7.81	**2363546**
S-WWP-S-10x260/100 Z	260/100	60	9.50	11.00	5.95	6.33	7.81	**2363547**
S-WWP-S-10x280/100 Z	280/100	60	9.50	11.00	5.95	6.33	7.81	**2363548**
S-WWP-S-10x300/100 Z	300/100	60	9.50	11.00	5.95	6.33	7.81	**2363549**
S-WWP-S-10x320/100 Z	320/100	60	9.50	11.00	5.95	6.33	7.81	**2363550**
S-WWP-S-10x340/100 Z	340/100	60	9.50	11.00	5.95	6.33	7.81	**2363551**
S-WWP-S-10x360/100 Z	360/100	60	9.50	11.00	5.95	6.33	7.81	**2363552**
S-WWP-S-10x380/100 Z	380/100	60	9.50	11.00	5.95	6.33	7.81	**2363553**
S-WWP-S-10x400/100 Z	400/100	60	9.50	11.00	5.95	6.33	7.81	**2363554**
S-WWP-S-10x500/100 Z	500/100	60	9.50	11.00	5.95	6.33	7.81	**2372408**
S-WWP-S-10x580/100 Z	580/100	60	9.50	11.00	5.95	6.33	7.81	**2372409**

3. FULL THREADED STRUCTURAL WOOD SCREWS

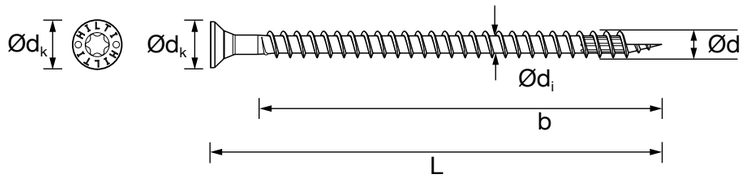
S-WCF-H Z – Full threaded screw with countersunk head – 90°



- Ideal for metal/wood connections. The under-head design fits perfectly in metal parts
- The half-tip design ensures that screws > 200 mm penetrate without bending
- Lower edge distances possible: can achieve down to 3-4 x diameter (depending on wood type and application), typically 5-10 x diameter

Item name	d [mm]	L [mm]	Thread length b [mm]	Head Ø d_k [mm]	Recess drive	Pcs. per box	Item number
S-WCF-H-8x120 Z	8.0	120	110	15	TX 40	50	**2363490**
S-WCF-H-8x140 Z		140	130			50	**2363491**
S-WCF-H-8x160 Z		160	150			50	**2363492**
S-WCF-H-8x180 Z		180	170			50	**2363493**
S-WCF-H-8x200 Z		200	190			50	**2363494**
S-WCF-H-8x220 Z		220	210			50	**2363495**
S-WCF-H-8x240 Z		240	230			50	**2363496**
S-WCF-H-8x260 Z		260	250			50	**2363497**
S-WCF-H-8x280 Z		280	270			50	**2363498**
S-WCF-H-8x300 Z		300	290			50	**2363499**
S-WCF-H-8x325 Z		325	315			50	**2363580**
S-WCF-H-8x350 Z		350	340			50	**2363581**
S-WCF-H-8x375 Z		375	365			50	**2363582**
S-WCF-H-8x400 Z		400	390			50	**2363583**
S-WCF-H-8x450 Z		450	427			25	**2363584**
S-WCF-H-8x500 Z		500	477			25	**2363585**
S-WCF-H-8x580 Z		580	577			25	**2372405**
S-WCF-H-10x120 Z	10	120	108	18.5	TX 50	50	**2363586**
S-WCF-H-10x160 Z		160	148			50	**2363587**
S-WCF-H-10x180 Z		180	168			50	**2363588**
S-WCF-H-10x200 Z		200	188			50	**2363589**
S-WCF-H-10x220 Z		220	208			50	**2363590**
S-WCF-H-10x240 Z		240	228			50	**2363591**
S-WCF-H-10x260 Z		260	248			50	**2363592**
S-WCF-H-10x280 Z		280	268			50	**2363593**
S-WCF-H-10x300 Z		300	288			50	**2363594**
S-WCF-H-10x325 Z		325	301			50	**2363595**
S-WCF-H-10x350 Z		350	326			50	**2363596**
S-WCF-H-10x375 Z		375	351			50	**2363597**
S-WCF-H-10x400 Z		400	376			50	**2363598**
S-WCF-H-10x450 Z		450	426			25	**2363599**
S-WCF-H-10x500 Z		500	476			25	**2363600**
S-WCF-H-10x580 Z		580	576			25	**2372404**

S-WCF-H Z – Full threaded screw with countersunk head – 90°



GEOMETRY AND MECHANICAL CHARACTERISTICS for C24 wood

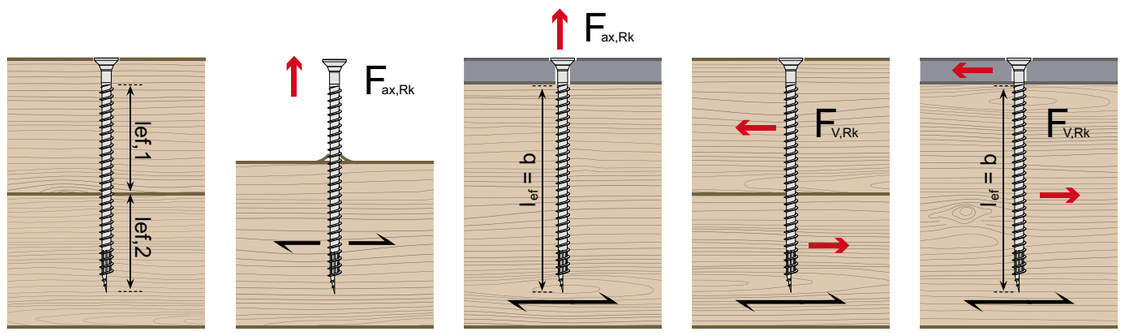
Technical data:

Nominal diameter	d [mm]	Ø8	Ø10
Head diameter	d_k [mm]	15.0	18.5
Shank diameter	d_i [mm]	5.1	6.3
Characteristic withdrawal parameter	$f_{ax,k,90°}$ [N/mm²]	13.1	12.5
Characteristic head pull-through parameter	$f_{head,k}$ [N/mm²]	12.4	12.2
Characteristic tensile strength	$f_{tens,k}$ [kN]	24.1	40.0
Characteristic yield moment	$M_{y,k}$ [Nmm]	20 300	36 700
	$N_{pl,k \cdot kc(*)}$ [kN]	12.2	18.9

*) total screw length in wood

Values for C24, axial axis to grain: 30°–90°, $F_{ax,Rk}$ = thread withdrawal, $F_{head,Rk}$ = head pull through, $F_{v,Rk}$ = shear (// to grain 0°–⊥ to grain 90°), wood/steel plate: l_{ef} = thread length b, t_1 min = minimum wood thickness, t_1 max = maximum wood thickness, add-on part (L-b), $F_{V,Rk,thin}$ = steel sheet t≤d/2, $F_{V,RK,thick}$ = steel sheet t≥d

Type and printing errors reserved. The values stated are meant to serve as planning guides; projects should only be undertaken by authorised professionals.



S-WCF-H Z – Full threaded screw with countersunk head – 90°

Thread type – Full threaded – 90°

Diameter Ø 8 mm		Axial 90°		Shear 90°			
		Wood to wood l_{ef} = b/2	Metal to wood l_{ef} = b	Wood to wood l_{ef} = b/2	Metal to wood l_{ef} = b		
Description	L/b [mm]	$F_{ax,Rk}$ [kN]	$F_{ax,Rk}$ [kN]	$F_{v,Rk}$ [kN]	$F_{V,Rk,thin}$ [kN]	$F_{V,Rk,thick}$ [kN]	Item no.
S-WCF-H-8x120 Z	120/110	5.76	11.53	4.01	5.14	6.52	2363490
S-WCF-H-8x140 Z	140/130	6.81	13.62	4.27	5.14	7.04	2363491
S-WCF-H-8x160 Z	160/150	7.86	15.72	4.54	5.14	7.27	2363492
S-WCF-H-8x180 Z	180/170	8.91	17.82	4.80	5.14	7.27	2363493
S-WCF-H-8x200 Z	200/190	9.96	19.91	5.06	5.14	7.27	2363494
S-WCF-H-8x220 Z	220/210	11.00	22.01	5.14	5.14	7.27	2363495
S-WCF-H-8x240 Z	240/230	12.05	24.10	5.14	5.14	7.27	2363496
S-WCF-H-8x260 Z	260/250	13.10	24.10	5.14	5.14	7.27	2363497
S-WCF-H-8x280 Z	280/270	14.15	24.10	5.14	5.14	7.27	2363498
S-WCF-H-8x300 Z	300/290	15.20	24.10	5.14	5.14	7.27	2363499
S-WCF-H-8x325 Z	325/315	16.51	24.10	5.14	5.14	7.27	2363580
S-WCF-H-8x350 Z	350/340	17.82	24.10	5.14	5.14	7.27	2363581
S-WCF-H-8x375 Z	375/365	19.13	24.10	5.14	5.14	7.27	2363582
S-WCF-H-8x400 Z	400/390	20.44	24.10	5.14	5.14	7.27	2363583
S-WCF-H-8x450 Z	450/427	22.37	24.10	5.14	5.14	7.27	2363584
S-WCF-H-8x500 Z	500/477	24.10	24.10	5.14	5.14	7.27	2363585
S-WCF-H-8x580 Z	580/577	24.10	24.10	5.14	5.14	7.27	2372405

S-WCF-H Z – Full threaded screw with countersunk head – 90°

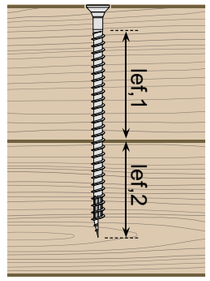
Thread type – Full threaded – 90°

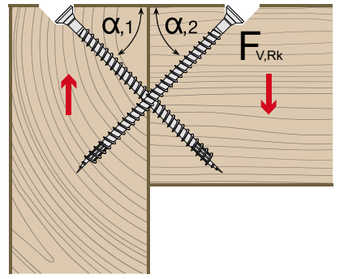
Diameter Ø 10 mm		Axial 90°		Shear 90°			
		Wood to wood l_{ef} = b/2	Metal to wood l_{ef} = b	Wood to wood l_{ef} = b/2	Metal to wood l_{ef} = b		
Description	L/b [mm]	$F_{ax,Rk}$ [kN]	$F_{ax,Rk}$ [kN]	$F_{v,Rk}$ [kN]	$F_{V,Rk,thin}$ [kN]	$F_{V,Rk,thick}$ [kN]	Item no.
S-WCF-H-10x120 Z	120/108	6.75	13.50	5.08	6.33	8.66	2363586
S-WCF-H-10x160 Z	160/148	9.25	18.50	6.05	7.47	9.91	2363587
S-WCF-H-10x180 Z	180/168	10.50	21.00	6.36	7.47	10.53	2363588
S-WCF-H-10x200 Z	200/188	11.75	23.50	6.67	7.47	10.57	2363589
S-WCF-H-10x220 Z	220/208	13.00	26.00	6.99	7.47	10.57	2363590
S-WCF-H-10x240 Z	240/228	14.25	28.50	7.30	7.47	10.57	2363591
S-WCF-H-10x260 Z	260/248	15.50	31.00	7.47	7.47	10.57	2363592
S-WCF-H-10x280 Z	280/268	16.75	33.50	7.47	7.47	10.57	2363593
S-WCF-H-10x300 Z	300/288	18.00	36.00	7.47	7.47	10.57	2363594
S-WCF-H-10x325 Z	325/301	18.81	37.63	7.47	7.47	10.57	2363595
S-WCF-H-10x350 Z	350/326	20.38	40.00	7.47	7.47	10.57	2363596
S-WCF-H-10x375 Z	375/351	21.94	40.00	7.47	7.47	10.57	2363597
S-WCF-H-10x400 Z	400/376	23.50	40.00	7.47	7.47	10.57	2363598
S-WCF-H-10x450 Z	450/426	26.63	40.00	7.47	7.47	10.57	2363599
S-WCF-H-10x500 Z	500/476	29.75	40.00	7.47	7.47	10.57	2363600
S-WCF-H-10x580 Z	580/576	36.00	40.00	7.47	7.47	10.57	2372404

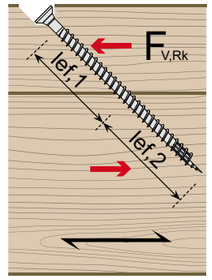
S-WCF-H Z – Full threaded screw with countersunk head – 45°

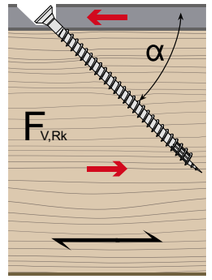
Thread type – Full threaded – 45°

Diameter Ø 8 mm		Axial 45°			Shear 45°		
		Cross-type screw fitting l_{ef} = b/2			Wood to wood l_{ef} = b/2	Metal to wood l_{ef} = b	
Description	L/b [mm]	$F_{v,X1,Rk}$ [kN]	$F_{v,X2,Rk}$ [kN]	$F_{v,X3,Rk}$ [kN]	$F_{v,Rk}$ [kN]	$F_{v,RK}$ [kN]	Item no.
S-WCF-H-8x120 Z	120/110	8.15	14.67	22.01	5.09	10.19	2363490
S-WCF-H-8x140 Z	140/130	9.63	17.34	26.01	6.02	12.04	2363491
S-WCF-H-8x160 Z	160/150	11.12	20.01	30.01	6.95	13.89	2363492
S-WCF-H-8x180 Z	180/170	12.60	22.68	34.01	7.87	15.75	2363493
S-WCF-H-8x200 Z	200/190	14.08	25.34	38.02	8.80	17.60	2363494
S-WCF-H-8x220 Z	220/210	15.56	28.01	42.02	9.73	19.45	2363495
S-WCF-H-8x240 Z	240/230	16.58	29.84	44.76	10.65	21.30	2363496
S-WCF-H-8x260 Z	260/250	17.32	31.17	46.76	11.58	21.30	2363497
S-WCF-H-8x280 Z	280/270	18.06	32.51	48.76	12.51	21.30	2363498
S-WCF-H-8x300 Z	300/290	18.80	33.84	50.76	13.43	21.30	2363499
S-WCF-H-8x325 Z	325/315	19.73	35.51	53.26	14.59	21.30	2363580
S-WCF-H-8x350 Z	350/340	20.65	37.18	55.76	15.75	21.30	2363581
S-WCF-H-8x375 Z	375/365	21.58	38.84	58.26	16.91	21.30	2363582
S-WCF-H-8x400 Z	400/390	22.51	40.51	60.77	18.06	21.30	2363583
S-WCF-H-8x450 Z	450/427	23.88	42.98	64.47	19.78	21.30	2363584
S-WCF-H-8x500 Z	500/477	25.10	45.17	67.76	21.30	21.30	2363585
S-WCF-H-8x580 Z	580/577	25.10	45.17	67.76	21.30	21.30	2372405







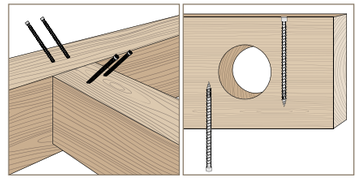


S-WCF-H Z – Full threaded screw with countersunk head – 45°

Thread type – Full threaded – 45°

Diameter Ø 10 mm		Axial 45°			Shear 45°		
		Cross-type screw fitting l_{ef} = b/2			wood to wood l_{ef} = b/2	Metal to wood l_{ef} = b	
Description	L/b [mm]	$F_{v,X1,Rk}$ [kN]	$F_{v,X2,Rk}$ [kN]	$F_{v,X3,Rk}$ [kN]	$F_{v,Rk}$ [kN]	$F_{v,RK}$ [kN]	Item no.
S-WCF-H-10x120 Z	120/108	9.55	17.18	25.77	5.97	11.93	2363586
S-WCF-H-10x160 Z	160/148	13.08	23.55	35.32	8.18	16.35	2363587
S-WCF-H-10x180 Z	180/168	14.85	26.73	40.09	9.28	18.56	2363588
S-WCF-H-10x200 Z	200/188	16.62	29.91	44.87	10.39	20.77	2363589
S-WCF-H-10x220 Z	220/208	18.38	33.09	49.64	11.49	22.98	2363590
S-WCF-H-10x240 Z	240/228	20.15	36.27	54.41	12.60	25.19	2363591
S-WCF-H-10x260 Z	260/248	21.92	39.46	59.18	13.70	27.4	2363592
S-WCF-H-10x280 Z	280/268	23.69	42.64	63.96	14.81	29.61	2363593
S-WCF-H-10x300 Z	300/288	24.86	44.75	67.12	15.91	31.82	2363594
S-WCF-H-10x325 Z	325/301	25.44	45.78	68.68	16.63	33.26	2363595
S-WCF-H-10x350 Z	350/326	26.54	47.77	71.66	18.01	35.36	2363596
S-WCF-H-10x375 Z	375/351	27.64	49.76	74.64	19.39	35.36	2363597
S-WCF-H-10x400 Z	400/376	28.75	51.75	77.62	20.77	35.36	2363598
S-WCF-H-10x450 Z	450/426	30.96	55.73	83.59	23.53	35.36	2363599
S-WCF-H-10x500 Z	500/476	33.17	59.70	89.56	26.30	35.36	2363600
S-WCF-H-10x580 Z	580/577	33.17	59.70	89.56	26.30	35.36	2372404

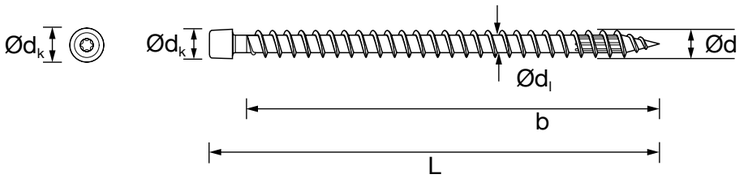
S-WXF-S Z and S-WXF-H Z – Full threaded screw with cylindrical head



- Help to reduce the wood-splitting effect
- The screw head design allows penetrate deep into the wood structure
- The screw portfolio includes half tip design (S-WXF-H) and full tip design (S-WXF-S)

Item name	d [mm]	L [mm]	Thread length b [mm]	Head Ø d_k [mm]	Recess drive	Pcs. per box	Item number
S-WXF-S-8x120 Z	8.0	120	110	10.2	TX 40	50	2363601
S-WXF-S-8x140 Z		140	130			50	2363602
S-WXF-S-8x160 Z		160	150			50	2363603
S-WXF-S-8x180 Z		180	170			50	2363604
S-WXF-S-8x200 Z		200	190			50	2363605
S-WXF-S-8x220 Z		220	210			50	2363606
S-WXF-S-8x240 Z		240	230			50	2363607
S-WXF-S-8x260 Z		260	250			50	2363608
S-WXF-S-8x280 Z		280	270			50	2363609
S-WXF-S-8x300 Z		300	290			50	2363610
S-WXF-S-8x325 Z		325	315			50	2363611
S-WXF-S-8x350 Z		350	340			50	2363612
S-WXF-S-8x375 Z		375	365			50	2363613
S-WXF-S-8x400 Z		400	390			50	2363614
S-WXF-S-8x500 Z		500	477			25	2372403
S-WXF-H-10x200 Z	10	200	188	13.4	TX 50	50	2363615
S-WXF-H-10x240 Z		240	228			50	2363616
S-WXF-H-10x260 Z		260	248			50	2363617
S-WXF-H-10x280 Z		280	268			50	2363618
S-WXF-H-10x300 Z		300	288			50	2363619
S-WXF-H-10x325 Z		325	301			50	2363510
S-WXF-H-10x350 Z		350	326			50	2363511
S-WXF-H-10x375 Z		375	351			50	2363512
S-WXF-H-10x400 Z		400	376			50	2363513
S-WXF-H-10x450 Z		450	426			25	2363514
S-WXF-H-10x500 Z		500	476			25	2363515

S-WXF-S Z and S-WXF-H Z – Full threaded screw with cylindrical head



GEOMETRY AND MECHANICAL CHARACTERISTICS for C24 wood

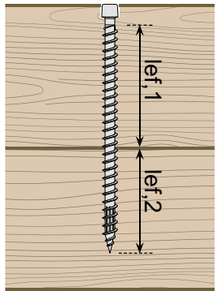
Technical data:

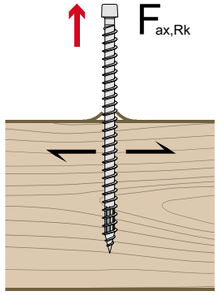
Nominal diameter	d [mm]	Ø8	Ø10
Head diameter	d_k [mm]	10.2	13.4
Shank diameter	d_1 [mm]	5.1	6.30
Characteristic withdrawal parameter	$f_{ax,k,90°}$ [N/mm^2]	13.1	12.5
Characteristic head pull-through parameter	$f_{head,k}$ [N/mm^2]	0	0
Characteristic tensile strength	$f_{tens,k}$ [kN]	24.1	40.0
Characteristic yield moment	$M_{y,k}$ [Nmm]	20 300	36 700
	$N_{pl,k \cdot kc(*)}$ [kN]	12.2	18.9

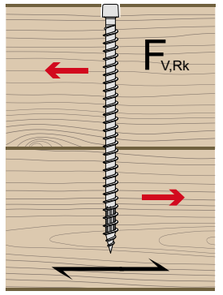
S-WXF-S Z and S-WXF-H Z – Full threaded screw with cylindrical head

Thread type – Full threaded

Diameter Ø 8 mm		Axial 90°	Shear 90°	
		Pull-through l_{ef} = b/2	Wood to wood l_{ef} = b/2	
Description	L/b [mm]	$F_{ax,Rk}$ [kN]	$F_{v,Rk}$ [kN]	Item no.
S-WXF-S-8x120 Z	120/110	5.76	4.01	**2363601**
S-WXF-S-8x140 Z	140/130	6.81	4.27	**2363602**
S-WXF-S-8x160 Z	160/150	7.86	4.54	**2363603**
S-WXF-S-8x180 Z	180/170	8.91	4.80	**2363604**
S-WXF-S-8x200 Z	200/190	9.96	5.06	**2363605**
S-WXF-S-8x220 Z	220/210	11.00	5.14	**2363606**
S-WXF-S-8x240 Z	240/230	12.05	5.14	**2363607**
S-WXF-S-8x260 Z	260/250	13.10	5.14	**2363608**
S-WXF-S-8x280 Z	280/270	14.15	5.14	**2363609**
S-WXF-S-8x300 Z	300/290	15.20	5.14	**2363610**
S-WXF-S-8x325 Z	325/315	16.51	5.14	**2363611**
S-WXF-S-8x350 Z	350/340	17.82	5.14	**2363612**
S-WXF-S-8x375 Z	375/365	19.13	5.14	**2363613**
S-WXF-S-8x400 Z	400/390	20.44	5.14	**2363614**
S-WXF-S-8x500 Z	500/477	24.10	5.14	**2372403**







S-WXF-S Z and S-WXF-H Z – Full threaded screw with cylindrical head

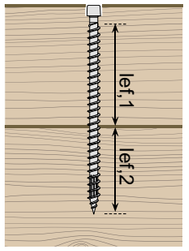
Thread type – Full threaded

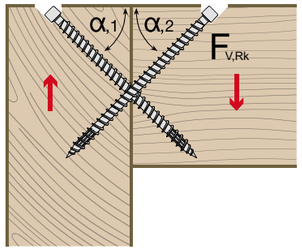
Diameter Ø 10 mm		Axial 90°	Shear 90°	
		Pull-through l_{ef} = b/2	Wood to wood l_{ef} = b/2	
Description	L/b [mm]	$F_{ax,Rk}$ [kN]	$F_{v,Rk}$ [kN]	Item no.
S-WXF-H-10x200 Z	200/188	11.75	6.67	2363615
S-WXF-H-10x240 Z	240/228	14.25	7.30	2363616
S-WXF-H-10x260 Z	260/248	15.50	7.47	2363617
S-WXF-H-10x280 Z	280/268	16.75	7.47	2363618
S-WXF-H-10x300 Z	300/288	18.00	7.47	2363619
S-WXF-H-10x325 Z	325/301	18.81	7.47	2363510
S-WXF-H-10x350 Z	350/326	20.38	7.47	2363511
S-WXF-H-10x375 Z	375/351	21.94	7.47	2363512
S-WXF-H-10x400 Z	400/376	23.50	7.47	2363513
S-WXF-H-10x450 Z	450/426	26.63	7.47	2363514
S-WXF-H-10x500 Z	500/476	29.75	7.47	2363515

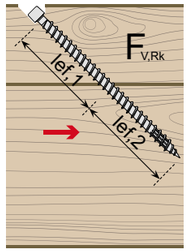
S-WXF-S Z and S-WXF-H Z – Full threaded screw with cylindrical head – 45° loads

Thread type – Full threaded

Diameter Ø 8 mm		Axial 45°			Shear 45°	
		Cross-type screw fitting l_{ef} = b/2			Wood to wood l_{ef} = b/2	
Description	L/b [mm]	$F_{v,X1,Rk}$ [kN]	$F_{v,X2,Rk}$ [kN]	$F_{v,X3,Rk}$ [kN]	$F_{v,Rk}$ [kN]	Item no.
S-WXF-S-8x120 Z	120/110	8.15	14.67	22.01	5.09	2363490
S-WXF-S-8x140 Z	140/130	9.63	17.34	26.01	6.02	2363491
S-WXF-S-8x160 Z	160/150	11.12	20.01	30.01	6.95	2363492
S-WXF-S-8x180 Z	180/170	12.60	22.68	34.01	7.87	2363493
S-WXF-S-8x200 Z	200/190	14.08	25.34	38.02	8.80	2363494
S-WXF-S-8x220 Z	220/210	15.56	28.01	42.02	9.73	2363495
S-WXF-S-8x240 Z	240/230	16.58	29.84	44.76	10.65	2363496
S-WXF-S-8x260 Z	260/250	17.32	31.17	46.76	11.58	2363497
S-WXF-S-8x280 Z	280/270	18.06	32.51	48.76	12.51	2363498
S-WXF-S-8x300 Z	300/290	18.80	33.84	50.76	13.43	2363499
S-WXF-S-8x325 Z	325/315	19.73	35.51	53.26	14.59	2363580
S-WXF-S-8x350 Z	350/340	20.65	37.18	55.76	15.75	2363581
S-WXF-S-8x375 Z	375/365	21.58	38.84	58.26	16.91	2363582
S-WXF-S-8x400 Z	400/390	22.51	40.51	60.77	18.06	2363583
S-WXF-S-8x500 Z	500/477	25.10	45.17	67.76	21.30	2363584







S-WXF-S Z and S-WXF-H Z – Full threaded screw with cylindrical head – 45° loads

Thread type – Full threaded

Diameter Ø 10 mm		Axial 45°			Shear 45°	
		Cross-type screw fitting l_{ef} = b/2			Wood to wood l_{ef} = b/2	
Description	L/b [mm]	$F_{v,X1,Rk}$ [kN]	$F_{v,X2,Rk}$ [kN]	$F_{v,X3,Rk}$ [kN]	$F_{v,Rk}$ [kN]	Item no.
S-WXF-H-10x200 Z	200/188	16.62	29.91	44.87	10.39	2363490
S-WXF-H-10x240 Z	240/228	20.15	36.27	54.41	12.60	2363491
S-WXF-H-10x260 Z	260/248	21.92	39.46	59.18	13.70	2363492
S-WXF-H-10x280 Z	280/268	23.69	42.64	63.96	14.81	2363493
S-WXF-H-10x300 Z	300/288	24.86	44.75	67.12	15.91	2363494
S-WXF-H-10x325 Z	325/301	25.44	45.78	68.68	16.63	2363495
S-WXF-H-10x350 Z	350/326	26.54	47.77	71.66	18.01	2363496
S-WXF-H-10x375 Z	375/351	27.64	49.76	74.64	19.39	2363497
S-WXF-H-10x400 Z	400/376	28.75	51.75	77.62	20.77	2363498
S-WXF-H-10x450 Z	450/426	30.96	55.73	83.59	23.53	2363499
S-WXF-H-10x500 Z	500/476	33.17	59.70	89.56	26.30	2363580

S-WDF-S Z – Full threaded screw with dual head

- With the HEX (hexagonal) recess provide better torque transfer
- An additional TX (TORX) drive saves the time of changing tools

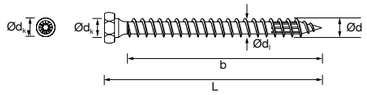
Item name	d [mm]	L [mm]	Thread length b [mm]	Head Ø d_k [mm]	Recess drive	Pcs. per box	Item number
S-WDF-S-12x60/48 Z	12	60	48	17	17 mm	30	2363666
S-WDF-S-12x80/68 Z		80	68			30	2363667
S-WDF-S-12x100/85 Z		100	85			30	2363668
S-WDF-S-12x120/105 Z		120	105			30	2363669
S-WDF-S-12x160/145 Z		160	145			30	2363670

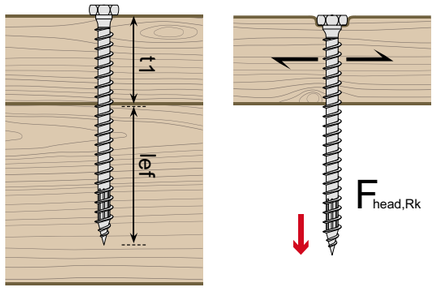
S-WDF-S – Full threaded screw with dual head

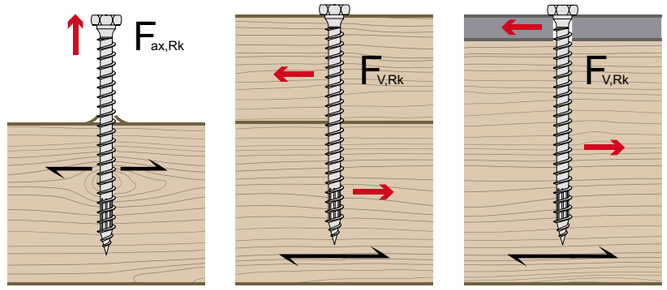
GEOMETRY AND MECHANICAL CHARACTERISTICS for C24 wood

Technical data:

Nominal diameter	d [mm]	Ø12
Head diameter	d_k [mm]	17.0
Shank diameter	d_i [mm]	7.0
Characteristic withdrawal parameter	$f_{ax,k,90°}$ [N/mm²]	11.2
Characteristic head-pull-through parameter	$f_{head,k}$ [N/mm²]	17.1
Characteristic tensile strength	$f_{tens,k}$ [kN]	45.0
Characteristic yield moment	$M_{y,k}$ [Nmm]	48500







S-WDF-S Z – Full threaded screw with dual head

Thread type – Full threaded

Diameter Ø 12 mm			Tension		Shear			
			Head pull-through	Thread withdrawal	wood to wood	steel to wood		
Description	L/b [mm]	$t_{1,min}$ [mm]	$F_{head,Rk}$ [kN]	$F_{ax,Rk}$ [kN]	$F_{V,Rk}$ [kN]	$F_{V,Rk,thin}$ [kN]	$F_{V,Rk,thick}$ [kN]	Item no.
S-WDF-S-12x60/48 Z	60/48		4.94	6.45	–	4.45	7.23	**2363666**
S-WDF-S-12x80/68 Z	80/68	–	4.94	9.13	–	5.75	8.38	**2363667**
S-WDF-S-12x100/85 Z	100/85	80	4.94	11.42	–	7.06	9.06	**2363668**
S-WDF-S-12x120/105 Z	120/105	80	4.94	14.11	–	7.86	9.73	**2363669**
S-WDF-S-12x160/145 Z	160/145	80	4.94	19.48	5.74	8.53	10.4	**2363670**

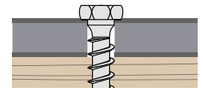
S-W LS – Lifting point solution

- Used together with S-WDF-S
- S-W Lifting sytem used in constructive wood work as a lifting system for prefabricated roofs, walls and ceilings, in wood frame construction for the prefab house industry, solid wood boards, cross laminated wood
- Suitable for cross-laminated wood, solid wood, coniferous wood-based materials (OSB, LVL etc.)
- A pre-drilling is rocondeded for deciduous wood sctructures
- Can be used for axial loads (screw subjected to tension) and transverse loads (screw subjected to shear-off stress)

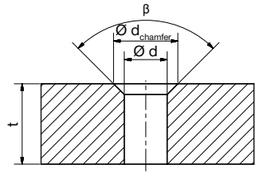
Description	Item no.
S-W Lifting system	**2372680**

4. ADDITIONAL TECHNICAL INFORMATION

Drilled holes and punched holes: the Hilti S-WDF-S Z Dual head is suitable. The screw automatically centres while screwing in and results in a perfect fit.

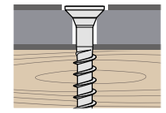
S-WDF-S Z Dual Head	
	
Ø 12 mm	⌀d = 12mm

90° countersunk drilled holes:
provide the countersunk head sufficient support on the chamfer. Washer head screws also require a chamfer due to the rounding; 1.5 x d is recommended.
The screw automatically centres while screwing in.
We recommend d +0/+1 mm for the cylindrical drilled hole in the metal
(d = outer screw diameter)

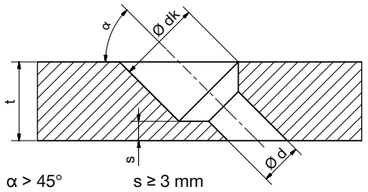


If the countersunk head should be fully countersunk into the metal, $d_{chamfer}$ must be designed with a countersinking depth of 2 mm:

$d_{chamfer}$ = d · 1.5 in mm
d = diameter of drilled hole in mm
$d_{chamfer}$ = diameter of chamfer in mm

Hilti S-WCF-H Z and S-WCP-S Z countersunk head		
	$d_{chamfer}$	Countersinking depth
Ø 6 mm	Min. 15 mm	
Ø 8 mm	Min. 15 mm	
Ø 10 mm	Min. 19 mm	
Ø 12 mm	Min. 21 mm	

Oblique drilled holes:
predominantly, 45° oblique drilled holes are used in wood engineering. The design ensures the countersunk head will fit with ETA-22/0772, which is suitable for metals with t ≥ 10 mm:



α > 45° s ≥ 3 mm
30° ≤ α≤ 45° s ≥ 2 mm

Characteristic values for the calculation of metal/wood connections should be taken from the tables in this brochure. Definition according to EC5 (EN1995-1-1)

- Thin metal sheet: Sheet thickness t ≤ 0.5 · d (outer thread diameter)
- Thick metal sheet: Sheet thickness t ≥ d (outer thread diameter)
- Sheet thicknesses between t ≤ 0.5 * d and t ≥ d should be interpolated linearly

Minimum spacing, end distance, edge distance

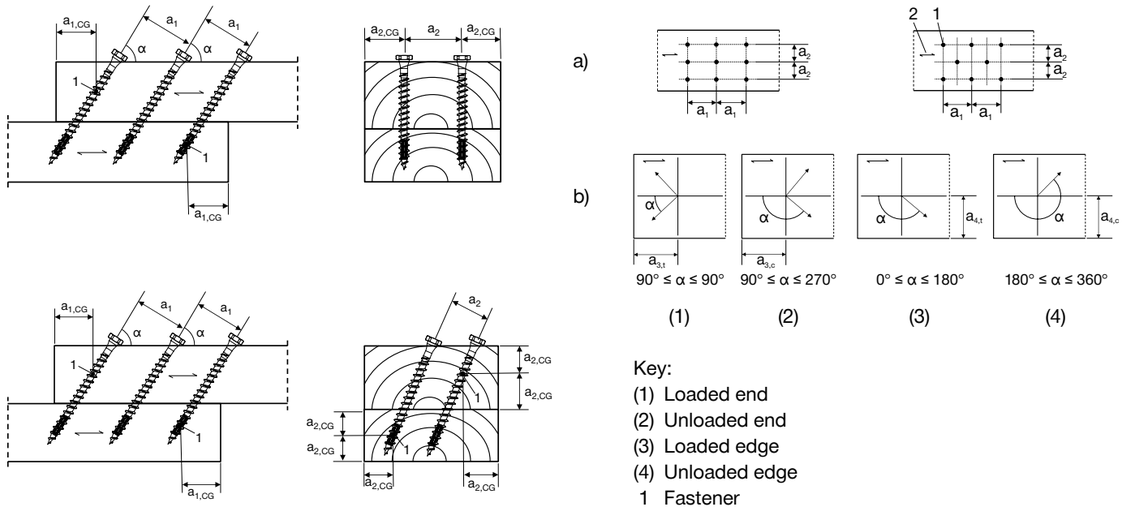
Load type		Axially loaded screws		Axially and/or laterally loaded screws				Axially and/or laterally loaded screws	
Wood type		Softwood (predrilled and non predrilled) and hardwood (predrilled)		Softwood (predrilled and non predrilled) and hardwood (predrilled)				Cross laminated wood CLT	
Screw type		**Screws with full tip** d ≤ 8 mm S-WCP-S, S-WWP-S, S-WXF-S **Screws with half tip** all diameter S-WCF-H, S-WXF-H		**Screws with full tip** all diameter S-WCP-S, S-WWP-S, S-WXF-S, S-WDF-S **Screws with half tip** all diameter S-WCF-H, S-WXF-H				**Screws with full tip** all diameter S-WCP-S, S-WWP-S, S-WXF-S, S-WDF-S **Screws with half tip** all diameter S-WCF-H, S-WXF-H	
		Side grain and end grain		Side grain and end grain				Wide face	Narrow face
Boundary condition	$a_1 \times a_2$	≥ 25 d^2	≥ 21 d^2	Angle α	Predrilled[2] (Softwood and hardwood) All screws	Non predrilled (Softwood) Screws with full tip[1]	Screws with half tip[2]	–	–
Spacing (parallel to grain)	a_1	≥ 5 d	7 d	0° ≤ α ≤ 360°	(4 + l cos α l) d	(5 + 7 l cos α l) d	(4 + l cos α l) d	4 d	10 d
End distance	$a_{1,CG}$	5 d		–	–	–	–	–	–
Spacing (perpendicular to grain)	a_2	≥ 2.5 d	3 d	0° ≤ α ≤ 360°	(3 + l sin α l) d	5 d	(3 + l sin α l) d	2.5 d	3 d
Edge distance	$a_{2,CG}$	4 d		–	–	–	–	–	–
Distance (loaded end)	$a_{3,t}$	–		-90° ≤ α ≤ 90°	(7 + 5 cos α) d	(10 + 5 cos α) d[3]	(7 + 5 cos α) d	6 d	12 d
Distance (unloaded end)	$a_{3,c}$	–		90° ≤ α ≤ 270°	7 d	10 d[3]	7 d	6 d	7 d
Distance (loaded edge)	$a_{4,t}$	–		0° ≤ α ≤ 180°	(3 + 4 sin α) d	(5 + 5 sin α) d	(3 + 4 sin α) d	6 d	5 d
Distance (unloaded edge)	$a_{4,c}$	–		180° ≤ α ≤ 360°	3 d	5 d[4]	3 d	2,5 d	3 d
Spacing between crossing screws	a_{cross}	1.5 d		1.5 d				1,5 d	
Minimum wood thickness	t	12 d[5]		Screw diameter	< 8	8	10	12	10 d
				Minimum thickness t for structural members [mm][5]	24	30	40	80	

1) Analogous to non predrilled nails according to EN 1995-1-1
2) Analogous to predrilled nails according to EN 1995-1-1
3) For screws with outer thread diameter d ≥ 8 mm in non predrilled holes in wood based members with thickness t < 5 d, the minimum distances for loaded ends ($a_{3,t}$) and unloaded ends ($a_{3,c}$) shall be 15 d.
4) Minimum distances from the unloaded edge perpendicular to the grain ($a_{4,c}$) may be reduced to 3 d also for wood thickness t < 5 d, if the spacing parallel to the grain (a_1) and the end distance ($a_{3,t}$ and $a_{3,c}$) is at least 25 d.
5) For pre-drilled wood components, the specifications for the minimum wood thickness do not apply.

Table 4: Minimum spacing, end distance, edge distance

- If the minimum wood thickness t is not met, it should generally be predrilled.
- Predrilling diameter: d_i (-0.5/+1.0 mm) for softwood and d_i (-0/+1.0 mm) for hardwood and LVL.
- Wood at risk of splitting (e.g. Douglas fir, silver fir) must be pre-drilled according to EN 1995-1-1 or larger minimum thicknesses must be used.
- Drilled holes for positioning, guidance or orientation are NOT PREDRILLED.
- The minimum penetration length of screws shall be 4 d, or 20 d in end grain.
- The minimum penetration length of screws in CLT shall be 4 d in the wide face or 10 d in the narrow face.

d = outer thread diameter of the screw
d_i = inner thread diameter of the screw
α = angle between force and grain direction. In ETA-22/0772 the angel is called ε.



Key:
(1) Loaded end
(2) Unloaded end
(3) Loaded edge
(4) Unloaded edge
1 Fastener
2 Grain direction

Spacing, end distance, edge distance acc. to EN 1995-1-1, Figure 8.11.a and Figure 8.7.

Important Notes:

- Geometry and mechanical properties comply with ETA-22/0772
- For connections of main and secondary beams, the main beam must have sufficient torsional strength and be supported by fork bearings.
- For connections of main and secondary beams, the values given apply only to vertical loads. Any transverse tensile stresses must be verified separately.
- The rope effect has been taken into account in the calculation of shear values.
- Characteristic values F_{Rk}: design according to EN 1995-1-1 and ETA-22/0772, these values are to be used for calculations.
- The design value of the load-bearing capacity $F_{v,Rd}$ for the final design of the wood connection results from the characteristic values as follows:

$$F_{Rd} = \frac{F_{Rk} \cdot k_{mod}}{\gamma_M}$$

F_{Rd} Design value of the shear or tensile load capacity per fastener
F_{Rk} Characteristic value of the shear or tensile load capacity per fastener
γ_M, k_{mod} Factors from corresponding national standards

4.1 Introduction

The S-W lifting system (HILTI S-W LS) has applications in constructive wood work as a lifting system. It is designed for safe and easy lifting of wooden components made of solid wood, cross laminated wood (CLT), glued laminated wood (glulam), or wood-based materials with CE marking (cf. materials listed in ETA-22/0772). For hardwood, we advise using the fasteners with predrilled holes. The system's flexibility allows for the application of both tension and shear stresses, opening a wide range of uses.

Wooden components are understood to be:
- bar-shaped components
- panel-shaped parts
- composite structures (e.g. trusses, prefabricated house walls or ceiling elements).

4.1.1 Picture showing the serial number

The self-drilling S-WDF-S screw, certified under ETA-22/0772, must be used with the HILTI S-W LS ball head. The lifting system is intended for weight classes up to 1.3 t.

In accordance with EG Machine Directive 2006/42/EG, Annex II 1A (EN 13001-1, EN ISO 12100:2011-03, VDI/BV-BS 6205:2012-04). The production is monitored and externally reviewed.

References:
EN 1995-1-1, ETA-22/0772
BGR 500/UVV-VBG 9a (German accident prevention regulation)

4.2 Safety information and intended use

These operating instructions must be thoroughly read before using the HILTI S-W LS, and the user should always have access to them for reference whilst using it.

Only trained individuals (hereinafter referred to as "users") are permitted to perform lifting activities with the described HILTI S-W LS. The users must receive both theoretical and hands-on instruction in how to use the system properly before it initially goes into service. The HILTI S-W LS provides the greatest level of safety when used properly. This effectively rules out any prior excess load.

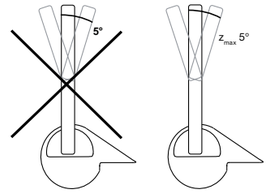
- The S-WDF-S screw may only be screwed in once and loaded multiple times in this position (i.e., moving between stations in the factory and on the jobsite).
- Used screws must be left in the component or removed and discarded according to local recycling guidelines.
- Multiple usage of the screw results in risk of failure of the screw.
- The weights of the components to be lifted must be known exactly.
- Only S-WDF-S screws calculated according to chapter 4.4 may be used. The length of the screw thread limits the load capacity of the HILTI S-W LS.
- The screws must not be screwed into shrinkage cracks, joints, or the like.
- Bar-shaped components (beams) are to be lifted with at least two S-WDF-S screws, for plate-shaped components at least at least three S-WDF-S screws must be used.

The self-drilling S-WDF-S screw is to be screwed into softwood without predrilling. (see ETA-22/0772, e.g. solid wood, LVL, glulam, board and beam plywood, etc.), but can also be partially predrilled with max. Ø 7 mm, e.g. guide and orientation hole, or completely predrilled. Use in hardwood is only permitted with Ø 7 mm predrilling. For board plywood walls, follow the instructions in the load table for walls (narrow side) in chapter 4.5. The permissible mounting positions of the HILTI S-W LS are listed in chapter 4.4 and must be observed.

Use of the HILTI S-W LS during lifting operations and transport by helicopter is not permitted.

4.2.1 Optical and yearly inspection of the HILTI S-W LS

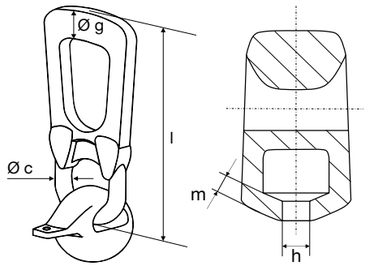
Before each use, the HILTI S-W LS must be visually inspected by the user for damage to guarantee a safe lifting process. Therefore, the user must visually check for possible cracks in both parts of the lifting system (ball head and chain link). Also, the user must check for plastic deformations – e. g., a bent chain link (> 5°), heavy wear, indentations, deformations, pressure marks caused by slings, etc. If any of these damages are observed, further use is not permitted.



The HILTI S-W LS must be inspected annually by a competent person or by a safety representative of the user's company. The degree of wear and damage must be assessed checking the dimensions m, h, c, g and z as shown below. Exceeding the permissible wear dimensions shown in the table below (wear higher then maximum value or dimension or remaining material dimension smaller than the minimum value) leads to exclusion of the ball head and chain link from further use. Modifications and repairs are not permitted. The yearly inspection must be documented together with the identification number linking to the ball head and chain link.

m (min.)	h (max.)	Ø c (min.)	g (min.)	max. bending angle z
5.5 mm	13.0 mm	10.5 mm	14 mm	5°

Table 5: Dimensions to be checked in the yearly inspection



4.3 Lifting with a crane

The load capacity of the HILTI S-W LS is determined by the minimum of the load capacities of all system components (ball head, chain link and screw). The weight forces acting on the HILTI S-W LS $F_{ax,Ed}$ can be interpreted as a quasi-static load when the wood components are lifted professionally. This means that the limitation stipulated in ETA-22/0772 of the S-WDF-S screw to predominantly static loads can be considered as fulfilled. The weight force of the wooden component to be lifted must be determined according to EN 1991, national standards (e.g. DIN 1055-1) or specific manufacturer's specifications.

Dynamic loads during lifting can be taken into account in a simplified way by corresponding coefficients.
As a recommendation, the acting forces are multiplied by the dynamic factor φ given in Table 5 as a minimum.

Lifting device	Lifting speed	Dynamic factor φ
Stationary crane, slewing	≤ 90 m/min	1.0–1.1
or rail crane	> 90 m/min	> 1.3
Lifting and transport on even ground	–	> 1.65
Lifting and transport on uneven ground	–	> 2.0

Table 6: Recommended dynamic factor φ

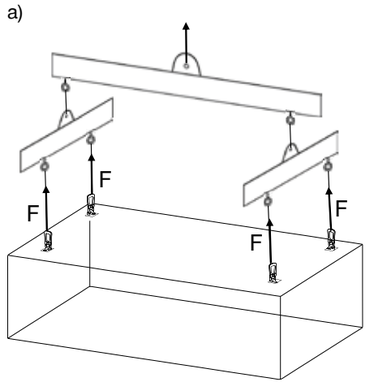
The hanging system is defined by the quantity of S-WDF-S screws. Statically indeterminate systems are basically hangers over 3 strands where the load is not evenly distributed by suitable measures, e.g. compensating crossbeams, rockers etc.

Statically indeterminate systems must be designed in accordance with UVV-VBG 9a so that two anchor points can support the complete load. The loads acting on the anchor points are to be determined by means of a triangle of forces.

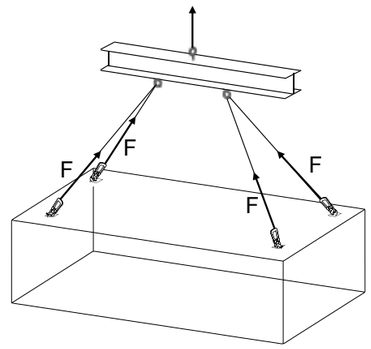
Suitable measures (e.g. compensating traverses) can be used to design attachments with more than three anchor points in a statically determinate manner. In the case of statically determinate systems, all anchor points may be used to support the load.

Three examples of statically determinate loads (a-c) and statically indeterminate load (d):

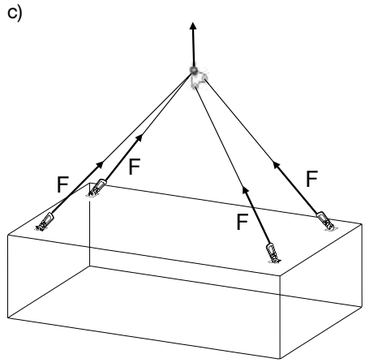
a)



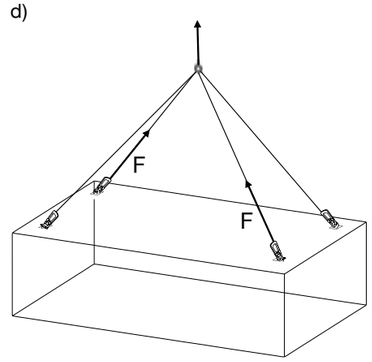
b)



c)



d)



HILTI

S-W LS

2383902-02.2023

C1 coated Tested Corrosion Resistance

S-W LS

S-WDF-S-12x60/48 Z
S-WDF-S-12x80/68 Z
S-WDF-S-12x100/85 Z
S-WDF-S-12x120/105 Z
S-WDF-S-12x160/145 Z

Dimension d × L	l_{ef} [mm]
⌀ 12 × 60 mm	48
⌀ 12 × 80 mm	68
⌀ 12 × 100 mm	85
⌀ 12 × 120 mm	105
⌀ 12 × 160 mm	145

SF 10W
TX 40
SW 17

4.4 Design principles and calculations

The S-WDF-S screw can be mounted in 3 possible variants. These are:
6.1. Loading on the screw in axial tension
6.2. Loading of the screw on oblique tension
6.3. Loading on the screw due to oblique tension with accurately fitting milling for the ball head

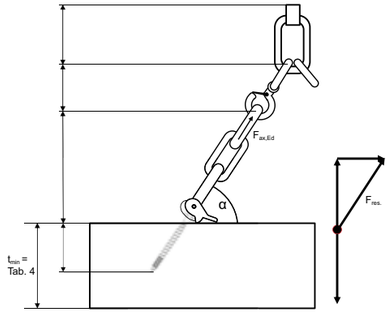
The following symbols are used:

d	outer thread diameter in mm
l_{ef}	effective thread length in the wooden component incl. thread tip in mm
ρ_k	characteristic value of wood density in kg/m³
α	angle between screw axis and wood fiber direction in deg
$F_{ax,Rk}$	characteristic pull-out resistance of the S-WDF-S screw in N
$F_{ax,Rd}$	axial pull-out resistance in design state in N
$F_{ax,Ek}$	characteristic design value of the load per screw in N
$F_{ax,Ed}$	load per screw in design state in N
k_{mod}	Modification factor
$\gamma_{M,Wood}$	Partial safety factor
φ	dynamic factor
M	lifting load (actual weight) per HILTI S-W LS in kg
g	gravitational constant in m³/(kg*s²)

4.4.1. Loading on the screw in axial tension

When the screw is loaded to pull out in the axial direction of the screw, this is referred to as an axial tensile load (see Fig. 11).
In this case the following formula for screw-in angles from α = 45° to 90° can be used.

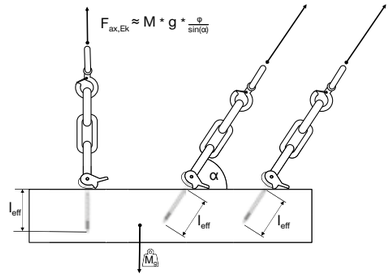
$F_{ax,\,Ed} = F_{ax,Ek} \times 1.35 = M \times g \times \varphi \,/\, \sin\alpha \times 1.35$



Calculation of the characteristic pull-out resistance in [N] e.g. For (C24, ρ_k = 350 kg/m³):

(1) $F_{ax,Rk} = 11.2\ [N/mm^2] \times d \times l_{ef} = 134.4 \times l_{ef}$

These formulas apply to screws screwed in at an angle of 45° ≤ α ≤ 90°. For board plywood walls, follow the instructions in chapter 7.2. The effective thread length l_{ef} must be at least 48 mm! Applications with an angle smaller than 45° are possible but not recommended because of the high reduction of permissible loads.



Calculation of the design value of the pull-out resistance (C24, ρ_k = 350 kg/m³):
$F_{ax,Rd} = k_{mod} / \gamma_{M,Holz} * F_{ax,Rk}$
k_{mod} = 0.9 (wood moisture ≤ 20 %). Further values for kmod can be found in EN 1995-1-1. The value k_{mod} = 1.1 for KLED "very short" was not applied to increase safety!
$\gamma_{M,Wood}$ = 1.3 (for Italy this factor needs to be 1.5)

Calculation of the maximum pull-out resistance $F_{ax,Rd}$ per S-WDF-S screw [N]:
$F_{ax,Rd} = 93.05 * l_{ef}$

A characteristic density of ρ_k = 350 kg/m³ applies. The determined load-bearing capacity must be corrected by the factor k_{tens} = (ρk/350) 0.8 (ρk in kg/m³) for deviating gross densities.
The verification is performed by comparing the pull-out resistance $F_{ax,Rd}$ with the design value of the action $F_{ax,Ed}$:
$F_{ax,Ed} = 1.35 * F_{ax,\,Ek} \le F_{ax,Rd} = 93.05 * l_{ef}$

For exact values of the load on the S-WDF-S screw, please refer to our lever load tables in chapter 5.

4.4.2 Loading of the S-WDF-S screw on oblique tension

When loading the S-WDF-S screw in axial and in transversal directions simultaneously, an oblique tension load is present (See picture 12). The angle α must be at least 60°.
For the calculation of the characteristic shear resistance according to EN 1995-1-1, the failure mode of a thin single bar steel to wood connection is assumed, which amounts to 5.5 mm due to the wall thickness of the ball head.

$$F_{v,Rk} = \min \begin{cases} 0{,}4\, f_{h,k}\, t_1\, d \\ 1{,}15\, \sqrt{2 M_{y,Rk}\, f_{h,k}}\, d + \frac{F_{ax,Rk}}{4} \end{cases}$$

$F_{v,Rd} = F_{v,Rk} * k_{mod} / \gamma_{M,Holz}$

The verification is performed with this formula:

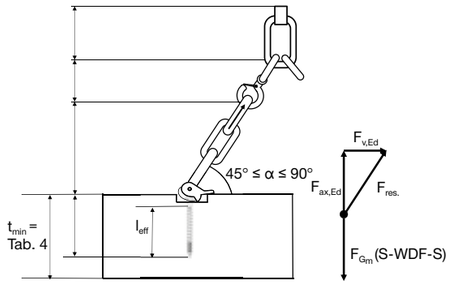
$$\left(\frac{F_{ax,Ed}}{F_{ax,Rd}}\right)^2 + \left(\frac{F_{v,Ed}}{F_{v,Rd}}\right)^2 \leq 1$$

- Characteristic yield moment of the screw: $M_{y,k}$ = 48 500 Nmm
- Diameter d_1 = 12 mm
- Modification factor for solid wood and wood materials k_{mod} = 0.9
- Partial factor for material property of solid wood and wood materials γ_M = 1.3 (Italy 1.5)
- Dynamic factor φ

With a characteristic density of at least ρ_k = 350 kg/m³ for perpendicular screws screwed into an edge is
$f_{h,\alpha,k} = 0{,}082 * \rho_k * d_{.0,3}/(2{,}5 \times \cos_2\alpha + \sin^2\alpha)$ ... α = 90° as in ETA-22/0772

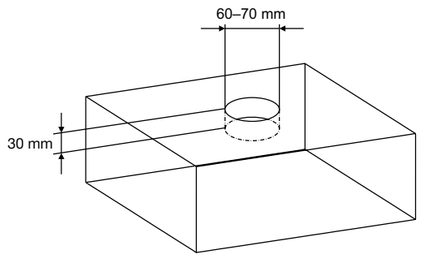
4.4.3 Loading on the screw due to oblique tension with accurately fitting milling for the ball head

With an accurately sunk ball head by means of a milling in the wood, the horizontal force of oblique tension is transferred directly into the wood. The loading therefore is equivalent to loading in axial tension and must be determined according to chapter 5.1.



The milling for the ball head must be created according to the measurements in picture 13 using a forstner bit or an equal tool, as can be seen in picture 14.

Milling diameter d = 60–70 mm, depth 30 mm, optional predrilling of 60 mm depth.

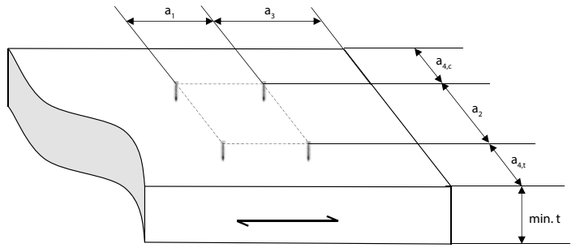


4.4.4 Screw spacing

A component must be lifted with at least two HILTI S-W LS ball heads. One S-WDF-S screw is required per anchor point for axial load. Wooden components must have a minimum thickness t and a minimum width b according to ETA-22/0772. The values in Table 4 must be observed as minimum distances. Woods at risk of splitting (e. g. Douglas fir) require an increase in the minimum spacing in the direction of the grain by 50 %.

Screw spacing parameters		Minimum spacing or end/edge distance
Spacing between screws parallel to grain	$a_1 \geq 25 \times d$	300 mm
Spacing between Screws perpendicular to grain	$a_2 \geq 5 \times d$	60 mm
Distance to the unloaded edge (perpendicular to grain)	$a_{4,c} \geq 4 \times d$	36 mm
Distance to the loaded edge (perpendicular to grain)	$a_{4,t} \geq 10 \times d$	120 mm
Distance to the loaded end (parallel to grain)	$a_{3,t} \geq 25 \times d$	300 mm
Minimum thickness for plate-shaped components	t	60 mm
Minimum width for beams	b_{min}	72 mm
Minimum width for walls	b_{min} CLT walls	60 mm

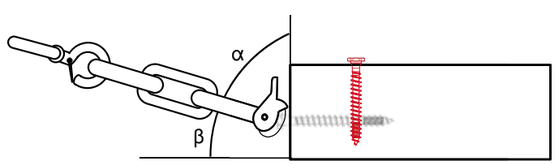
Table 7: Screw spacing parameters

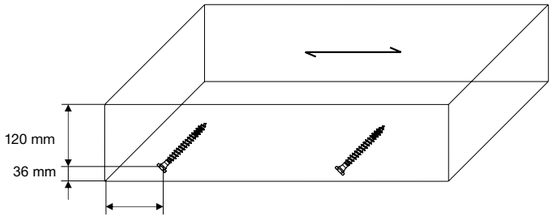


4.4.5 Lifting a flat element (wall, ceiling, etc.) with S-WDF-S screw

$a_{4,t}$ (loaded edge, ≥ 10 × d) = 120 mm
$a_{4,c}$ (unloaded edge, ≥ 3 × d) = 36 mm
} min t = 156 mm

NOTES to left figure: A mathematical verification must be used to check whether additional transverse tension securing with full threaded screws is required.
When lifting, bending of the S-WDF-S screw must be avoided (e.g. by countersinking the ball head).
the ball head). Due to the combined load, the load-bearing capacity of the screw must be verified as specified in item 6.2.





4.5 Lifting load tables

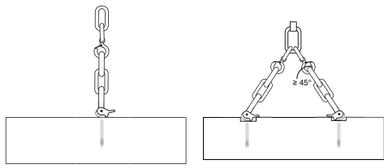
4.5.1 Lifting loads for ceilings and beams

The lifting loads in Table 1 are based on the data given in the operating instructions above for S-WDF-S screws of Hilti AG or ETA -22/0772 and are valid for softwood (solid wood, glulam, cross laminated wood) with a characteristic gross density ρk of at least 350 kg/m³ and:
a) Screw-in angle 90° to the lateral surface
b) Compliance with the minimum distances according to ETA-22/0772
c) Screwing the entire thread length into the wooden component to be lifted
d) Only axial loading of the S-WDF-S screw (see Figure 1)
e) One-time use of HILTI S-W LS
f) Short loading duration (≤ 30min)
g) No excess of the load capacity of the HILTI S-W LS (1.3 t)

Maximum lifting load		Maximum lifting load M per per S-WDF-S screw			
		Stationary crane		Mobile cranes	
		Lifting speed		Terrain conditions	
dimension	l_{ef}	≤ 90 m/min	> 90 m/min	Even ground	Uneven ground
D × L	[mm]	φ = 1.10	φ = 1.30	φ = 1.65	φ = 2.00
Ø 12 × 60 mm	48	307 kg	259 kg	204 kg	169 kg
Ø 12 × 80 mm	68	434 kg	368 kg	290 kg	239 kg
Ø 12 × 100 mm	85	562 kg	476 kg	375 kg	309 kg
Ø 12 × 120 mm	105	671 kg	567 kg	447 kg	369 kg
Ø 12 × 160 mm	145	926 kg	784 kg	617 kg	509 kg

Table 8: maximum load M(actual gross weight) per HILTI S-W LS screw for selected dynamic factor φ

The dynamic factor φ is influenced by various boundary conditions (crane type, acceleration, wind, ground, etc.) and must be selected by the user accordingly. The dynamic factor shown refer to this operating instruction.



left: purely axial loading of the screw by perpendicular rigging
right: purely axial loading of the screw through accuratly fitting millings

Basis of the design calculation:

$$M \le \min \left\{ \begin{array}{l} \text{thread stripping} \\ \text{screw shaft breakage} \\ \text{ball head load} \end{array} \right\} = \min \left\{ \frac{1}{g \cdot \gamma_G \cdot \varphi} * \min_{1300} \left\{ \frac{\frac{F_{ax,Rk} * k_{mod}}{\gamma_M}}{\frac{f_{tens,k}}{1{,}25}} \right\} \right\} [kg]$$

$$\text{with } F_{ax,Rk} = \frac{0{,}35 \times d^{0{,}8} \times l_{ef}^{0{,}9} \times \rho_k^{0{,}75}}{1{,}5\ [N]}$$

$f_{tens,k}$ = 45 000 [N]; k_{mod} = 0,9; γ_M = 1,3; γ_G = 1,35; g = 9,81 $\left[\frac{m}{s^2}\right]$;

Correction factors for deviating gross densities			
Strength class	Norm	Gross density ρ_k	Factor
[–]	[–]	[kg/m³]	[-]
C16	EN338	310	0.90
C24	EN338	350	1.00
C30	EN338	380	1.06
GL24c	EN14080	365	1.03
GL28c	EN14080	390	1.09
GL30c	EN14080	390	1.09
GL32c	EN14080	400	1.11
GL24h	EN14080	385	1.07
GL28h	EN14080	425	1.16
GL30h	EN14080	430	1.17
GL32h	EN14080	440	1.20

Note: The correction factor for the lowest strength class used shall be used.

Table 9: correction factors for deviating gross densities

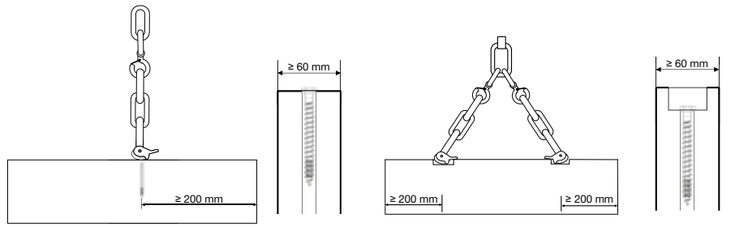
4.5.2 Lifting loads for the narrow side of CLT wall elements

The lifting loads are based on the data given in this operating instruction and on ON B 1995-1-1:2019, Annex K and are valid for CLT made of softwood with a characteristic density ρk of the inner layers of at least 350 kg/m³ and:
a) Screw-in angle 90° to the narrow face.
b) Place the screw in the middle of the narrow face (regardless of the position of the board).
c) Do not screw into joints or wood features (e.g. knots).
d) Distance between wall element end and screw axis min 25*d (see figure 1)
e) Screw the entire length of the thread into the wooden element to be lifted
f) Only axial loading of the S-WDF-S screw (see Figure 1)
g) One-time use of the S-WDF-S screw
h) Short loading duration (≤ 30min).
i) Minimum thickness of the wall element: 60 mm
j) Use of S-WDF-S-12×160/145 Z
k) No excess of the load capacity of the HILTI S-W LS (1.3 t)

For stationary cranes the maximum lifting load M per S-WDF-S screw is:
a) For a lifting speed smaller than 90 m/min (φ = 1.10): 577 kg
b) For a lifting speed higher than 90 m/min (φ = 1.30): 489 kg

For mobile cranes the maximum lifting load M per S-WDF-S screw is:
a) For Lifting and transport on even ground (φ = 1.65): 385 kg
b) For Lifting and transport on uneven ground (φ = 2.00): 318 kg

The dynamic coefficient ϕ is influenced by various boundary conditions (crane type, acceleration, wind, ground, etc.) and must be selected by the user accordingly. The dynamic coefficients shown refer to this operating instruction.



Basis of the design calculation:

$$M \le \min \left\{ \begin{array}{l} \text{thread stripping} \\ \text{screw shaft breakage} \\ \text{ball head load} \end{array} \right\} = \min \left\{ \frac{1}{g \cdot \gamma_G \cdot \varphi} * \min \left\{ \begin{array}{c} \frac{F_{ax,Rk} * k_{mod}}{\gamma_M} \\ \frac{f_{tens,k}}{1{,}25} \end{array} \right\} ; \; 1300 \right\} \; [kg]$$

with $F_{ax,Rk} = f_{ax,k,90} * l_{ef} * d * k_{ax} * k_{dens}[N]$

$f_{ax,k,90} = 11{,}2 \left[\frac{N}{mm^2}\right]$; $f_{tens,k} = 45\,000$ [N]; $k_{ax,(\alpha=90°)} = 1{,}0$; $k_{dens,(\rho_k=350}\left[\frac{kg}{m^3}\right] = 1{,}0$; $k_{mod} = 0{,}9$; $\gamma_M = 1{,}3$; $\gamma_G = 1{,}35$;

$g = 9{,}81 \left[\frac{m}{s^2}\right]$;

Correction factors for deviating gross densities			
Strength class	**Norm**	**Gross density ρk**	**Factor**
[–]	[–]	[kg/m³]	[–]
C16	EN338	310	0.91
C24	EN338	350	1.00
C30	EN338	380	1.06

Note: The correction factor for the lowest strength class employed shall be used.

Tabelle 10: correction factors for deviating gross densities.

5. TOOLS, INSERT BITS AND ACCESSORIES

Tool recommendations for structural wood screw applications

The usage of impact drills or impact wrenches with wood construction screws is neither regulated by EN 14592 nor by the European Technical Assessments, but national construction regulations may still apply. Cordless screwdrivers offering a high fastening speed are the recommended choice when fastening structural wood screws. Nevertheless, situations might require that a fastening must be done one handed. The question if the usage of impact drills is allowed often comes up in these cases.

To answer this question the effect of impacts on the Hilti structural wood screws a series of experiments were conducted. In these tests, when fastening wood(C24) to wood(C24) with the Hilti structural wood screws with a SID 4, 6 or 8 no damage to the screws was found.

The choice of the right power class of the tool depends on the type of wood, screw length, diameter and if the hole is predrilled. In any case both impact drivers and screwdrivers can overturn wood screws and cause breakage of the screw or damage of the wooden thread. Therefore, the personal fastening structural wood screws must be trained. The end of the setting, when the screw head touches the wood, must be done with special care.

Screw type		Screw geometry (bit size)	SF tools SF 4, SF 6, SF10W		SID tools SID 4, SID 6, SID 8	
			Wood-to-Wood	Metal-to-Wood	Wood-to-Wood	Metal-to-Wood
	**S-WCF-H Countersunk head, full thread**	8 × 120-580 (TX40)	●	●	◑	○
		10 × 120-580 (TX50)	●	●	◑	○
	**S-WXF-H/S Cylindric head, full thread**	8 × 120-500 (TX40)	●		◑	
		10 × 200-500 (TX50)	●		◑	
	**S-WWP-S Washer head, half thread**	6 × 60-200 (TX30)	●	●	◑	○
		8 × 80-580 (TX40)	●	●	◑	○
		10 × 140-580 (TX50)	●	●	◑	○
	**S-WCP-S Countersunk head, half thread**	5 × 40-100 (TX25)	●	●	◑	○
		6 × 50-180 (TX30)	●	●	◑	○
		8 × 80-400 (TX40)	●	●	◑	○
		10 × 160-400 (TX50)	●	●	◑	○
	**S-WDF-S Dual head, full thread**	12 × 60, 120, 180 (TX40/SW17)	●	●	◑	○

● Recommended fastening method
◑ Works but watch-out for overturning screws
○ Not recommended → head breakage likely to happen

Watch-out for overturning screws or head breakage when using impact wrenches!

Tools

Name	Type	Features	Picture	Item number
Cordless drill driver SF 4-22	Compact-class cordless drill driver with ATC (Active Torque Control) for everyday drilling and driving, especially in hard-to-reach places (NURON battery platform)	• Maximum torque (soft/hard joint): 36 Nm (soft joint), 62 Nm (hard joint) • No load RPM: gear 1: 610 rpm; gear 2: 2100 rpm • Chuck clamping range: 2–13 mm		**2343239**
Cordless drill driver SF 6-22	Power-class drill driver with Active Torque Control and advanced ergonomics for universal drilling and driving on wood and metal (NURON battery platform)	• Maximum torque (soft/hard joint): 65 Nm (soft joint), 85 Nm (hard joint) • No load RPM: gear 1: 490 rpm; gear 2: 2000 rpm • Chuck clamping range: 2–13 mm		**2253844**
Cordless drill driver SF 10W-22	Ultimate class 22 V cordless drill driver with Active Torque Control and four-speed gearing for high torque in demanding applications in wood and other materials	• Maximum torque (soft/hard joint): 95 Nm (soft joint) • No load RPM: gear 1: 330 rpm; gear 2: 560 rpm; gear 3: 1300 rpm; gear 4: 2130 rpm • Chuck clamping range: 1.5–13 mm		**2335696**

Insert bits and accessories

Torsion bits:
- Elastic torsion zone in the bit shaft cushions higher loads to extend the product service life
- High-strength steel reduces the danger of premature bit breakage

Insert bit	Recess type	Length [mm/inch]	Connection end	Pcs. per box	Item number
S-B TX25 25/1" T (10)	TX25	25/1"	1/4	10	**2039059**
S-B TX25 50/2" T (5)	TX25	50/2"		5	**2039093**
S-B TX30 25/1" T (10)	TX30	25/1"		10	**2039062**
S-B TX30 50/2" T (5)	TX30	50/2"		5	**2039096**
S-B TX40 50/2" T (5)	TX40	50/2"		5	**2039097**
S-B TX50 50/2" S (5)	TX50	50/2"		5	**2039098**
Set S-BSC TX 25/1" T (7)	TX10, TX15, TX20, TX25, TX30, TX40	25/1"		6	**2039170**
Set S-BSC TX 50/2" T (6)	TX20x2, TX25x2, TX30, TX40	50/2"		6	**2039176**

Impact bits:
- Shock-resistant steel and torsion zone optimized for use with impact loads reduces the risk of premature bit breakage
- Diamond coating for a secure fit in the screw, reducing a cam-out

Insert bit	Recess type	Length [mm/inch]	Connection end	Pcs. per box	Item number
S-B TX25 25/1" IMP (10)	TX25	25/1"	1/4	10	**2039121**
S-B TX25 50/2" IMP (5)	TX25	50/2"		5	**2039131**
S-B TX30 50/2" IMP (5)	TX30	25/1"		10	**2039132**
S-B TX30 25/1" IMP (10)	TX30	50/2"		5	**2039122**
S-B TX40 25/1" IMP (10)	TX40	25/1"		10	**2039123**
S-B TX40 50/2" IMP (5)	TX40	50/2"		5	**2039133**
S-BSC TX 50/2" IMP (6)	TX20, TX25x2, TX30x2, TX40	50/2"		6	**2039181**
S-B TX30 7/16" 70 IMP-W	TX30	70/2 ¾"	7/16	5	**2120653**
S-B TX40 7/16" 70 IMP-W	TX40	70/2 ¾"		5	**2120654**
S-B TX50 7/16" 70 IMP-W	TX50	70/2 ¾"		5	**2120656**
Set S-BSC TX 7/16" 70 IMP-W	TX30x2, TX40x2, TX50	70/2 ¾"		5	**2120657**

Bit holders and adaptors:
- For driving screws into a variety of materials
- Perfect fit with Hilti tools, screws and insert bits

Bit holder	Type	Length [mm/inch]	Connection end	Pcs. per box	Item number
S-BH M 50/2"	Magnetic	50/2"	1/4	1	**2038758**
S-BH M 75/3"	Magnetic	75/3"		1	**2038759**
S-BH QC 50/2"	Quick chuck	50/2"		1	**2039219**
S-BH IMP 75/3" RM	Quick chuck/Impact	75/3"		1	**2039216**
Adapter SI-SA 1/2" – 7/16"	Adapter ½" – 7/16"	50/2"	½"	1	**2094451**

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