SFS intec

Timber Work:
Innovative fastening systems and application expertise

V1

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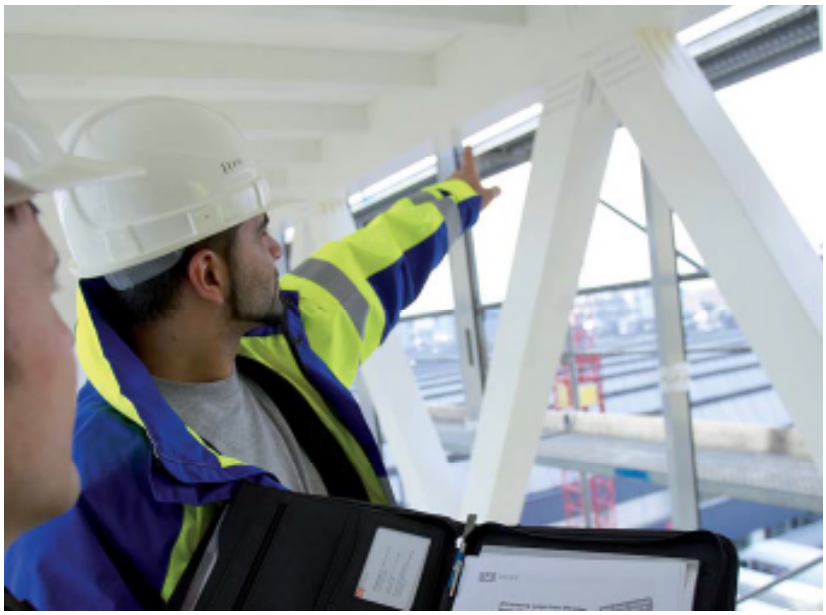
Make life easier for yourself
with the complete spectrum of support from SFS intec.



Finely-honed fastening solutions are only one part of the comprehensive support package offered by SFS intec.

Whether it's a new build or restoration project, we support you all the way from the planning phase through to the construction phase, with a complete money-saving service package.

In **Chapter 13**, learn more about how working with SFS intec can make your job so much easier.

Innovative Business Solutions

By improving efficiencies all along the collaboration chain one can:

- reduce costs
- optimise processes
- transparent information flows

We are keen to work with you closely on your specific needs; developing optimum solutions for your particular requirements.

Business Solutions from SFS intec simply make life easier.

For more information see **Chapter 13.**

Generally valid – Instructions for Use
The details stated are results of tests and/or calculations and therefore are non-binding and do not represent guaranties or warranted characteristics for not specified applications. All calculations therefore have to be checked and approved by the responsible planner ahead of execution. The user is responsible to assure compliance with all applicable laws and regulations.

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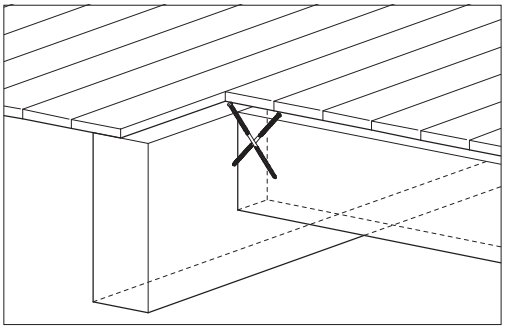
1 Application index

Timber Work

timber to timber connection in wall and floor

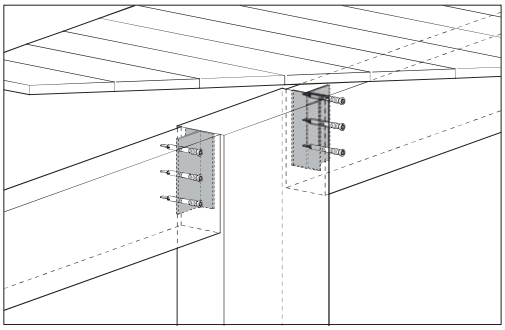
main/secondary beam connection



Type	System: Recommendation	System: Alternative	Chapter
WT-T-6,5	■	-	3
WT-S-6,5	■	-	3
WT-T-8,2	■	-	3
WR-T-9	■	-	4
WR-T-13	-	●	4
WB-T-16	-	●	5
WB-T-20	-	●	5
WS-T-7	■	-	6

timber to timber connection in wall and floor

post/beam connection



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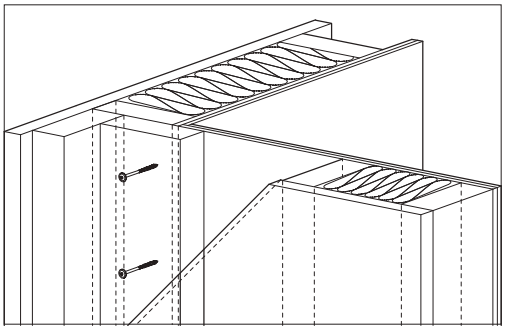
WT-S-6,5	■	-	3
WT-T-8,2	■	-	3
WR-T-9	■	-	4
WR-T-13	-	●	4
WB-T-16	-	●	5
WB-T-20	-	●	5
WS-T-7	■	-	6

timber to timber connection in wall and floor

panel joint



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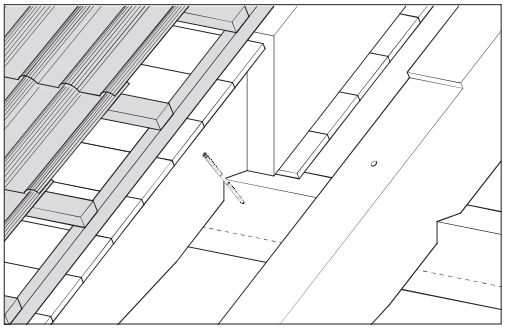
WT-S-6,5	■	-	3
WT-T-8,2	■	-	3
WR-T-13	-	●	4
WFD-T	-	●	7
WFO-T	■	-	7

timber to timber connection of rafter and purlin

rafter/purlin connection



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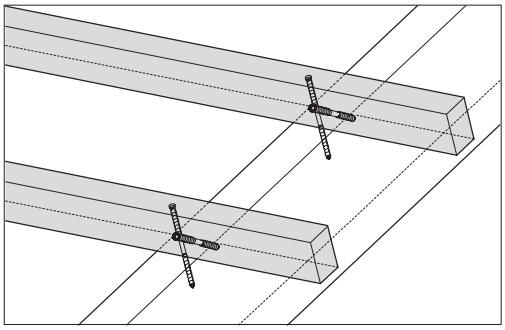
WT-S-6,5	■	-	3
WT-T-8,2	■	-	3
WR-T-9	-	●	4
WFD-T	-	●	7
WFO-T	-	●	7

timber to timber connection of rafter and purlin

purlin/main truss connection



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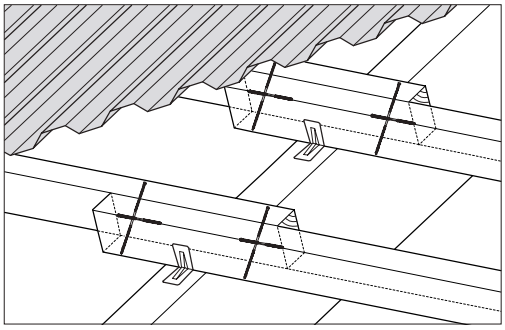
WT-T-6,5	■	-	3
WT-S-6,5	■	-	3
WT-T-8,2	■	-	3
WR-T-9	-	●	4
WR-T-13	-	●	4
WB-T-16	-	●	5
WB-T-20	-	●	5
WFD-T	-	●	7
WFO-T	-	●	7

timber to timber connection of rafter and purlin

lap joint



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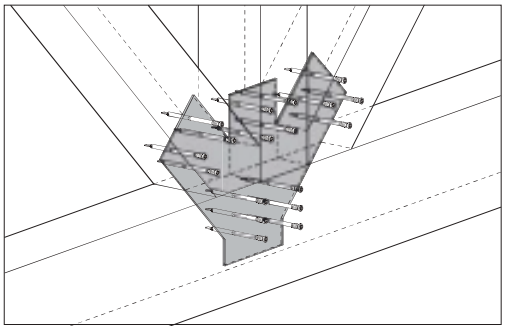
WT-T-6,5	-	●	3
WT-S-6,5	-	●	3
WT-T-8,2	■	-	3

timber to timber connection in timber engineering

truss joint



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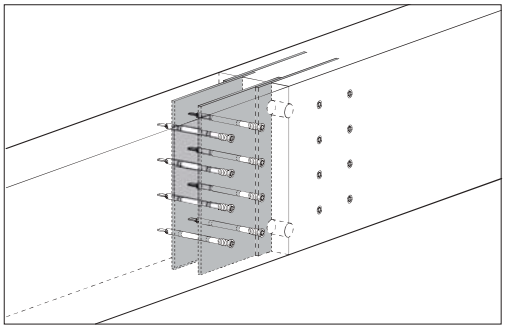
WR-T-13	-	●	4
WS-T-7	■	-	6

timber to timber connection in timber engineering

site connection



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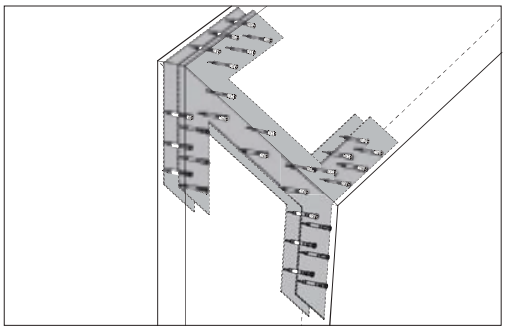
WR-T-13	-	●	4
WS-T-7	■	-	6

timber to timber connection in timber engineering

frame corner



Type	System		Chapter
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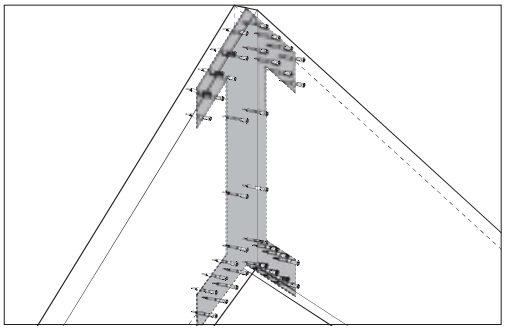
WR-T-13	■	-	4
WS-T-7	■	-	6

timber to timber connection in timber engineering

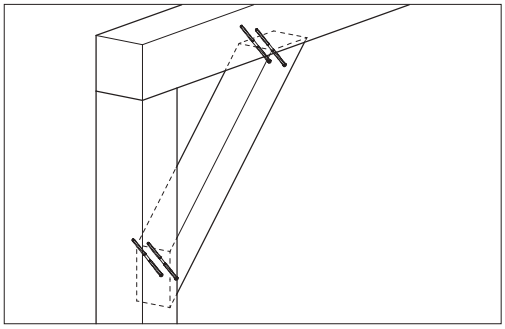
ridge connection



Type	System		Chapter
	Recommendation	Alternative	
WR-T-9	-	●	4
WR-T-13	-	●	4
WB-T-16	-	●	5
WB-T-20	-	●	5
WS-T-7	■	-	6

general timber to timber connection

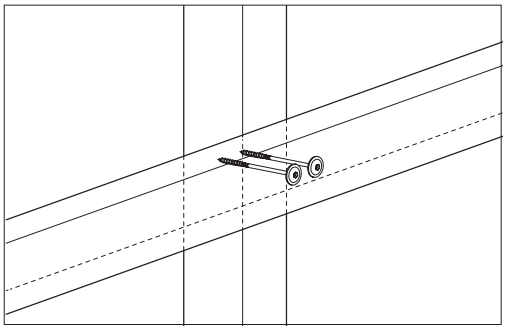
blunt step joint and strut joint



Type	System		Chapter
	Recommendation	Alternative	
WT-T-6,5	■	-	3
WT-S-6,5	■	-	3
WT-T-8,2	■	-	3
WR-T-9	-	●	4
WR-T-13	-	●	4
WB-T-16	-	●	5
WB-T-20	-	●	5
WS-T-7	-	●	6

general timber to timber connection

shear connection



Type	System		Chapter
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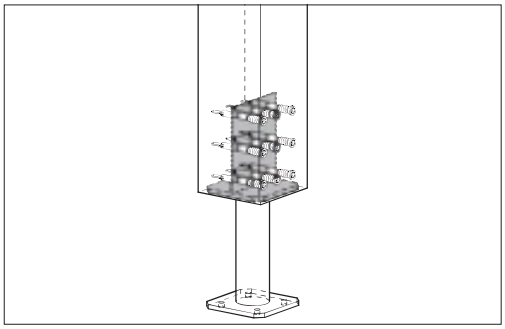
WT-S-6,5	■	-	3
WT-T-8,2	■	-	3
WR-T-9	-	●	4
WR-T-13	-	●	4
WB-T-16	-	●	5
WB-T-20	-	●	5
WFD-T	-	●	7
WFO-T	■	-	7
WFR-T	■	-	7

connection of timber to other materials

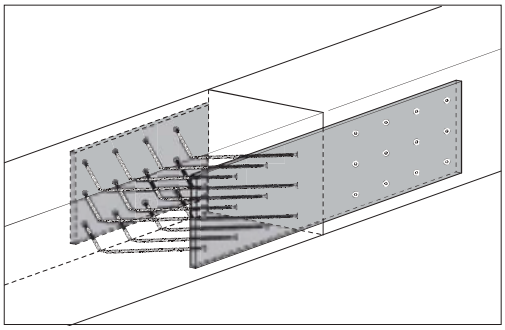
column base



Type	System		Chapter
	Recommendation	Alternative	
WR-T-9	-	●	4
WR-T-13	-	●	4
WS-T-7	■	-	6

connection of timber to other materials

timber to steel and to concrete



Type	System		Chapter
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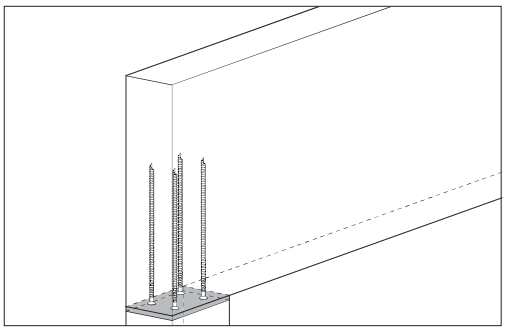
SCS	-	●	10
WR-T-9	■	-	4
WR-T-13	■	-	4
WFD-T	■	-	7
WFR-T	■	-	7
WS-T-7	■	-	6

lateral compression reinforcement

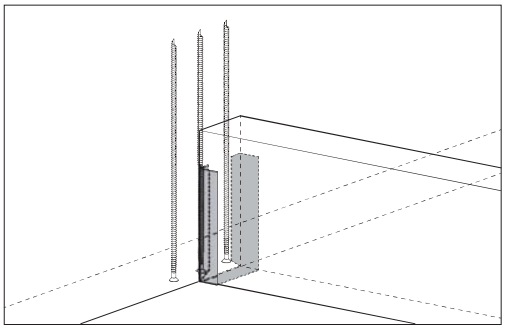
support reinforcement



Type	System		Chapter
	Recommendation	Alternative	
WT-T-8,2	■	-	3
WR-T-9	■	-	4
WR-T-13	■	-	4

lateral tension reinforcement

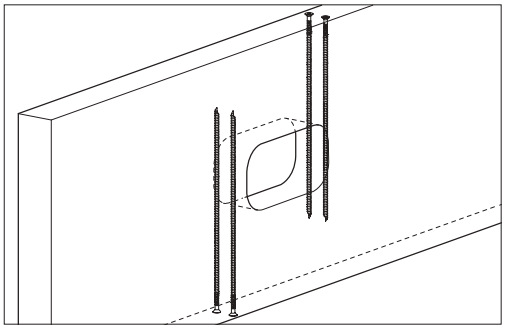
cross connection



Type	System		Chapter
	Recommendation	Alternative	
WT-T-8,2	■	-	3
WR-T-9	■	-	4
WR-T-13	■	-	4
WB-T-16	■	-	5
WB-T-20	■	-	5

lateral tension reinforcement

penetration



Type	System		Chapter
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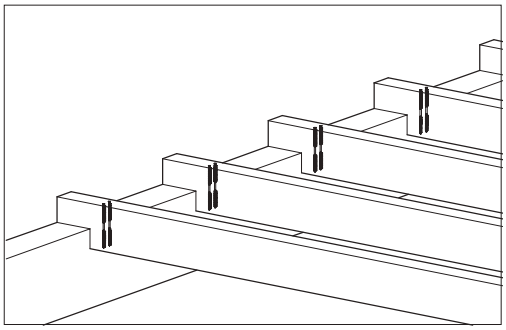
WT-T-8,2	■	-	3
WR-T-9	■	-	4
WR-T-13	■	-	4
WB-T-16	■	-	5
WB-T-20	■	-	5

lateral tension reinforcement

notch



Type	System		Chapter
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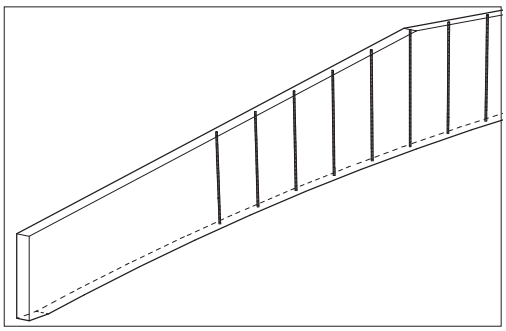
WT-T-6,5	■	-	3
WT-S-6,5	■	-	3
WT-T-8,2	■	-	3
WR-T-9	■	-	4
WR-T-13	■	-	4
WB-T-16	■	-	5
WB-T-20	■	-	5

lateral tension reinforcement

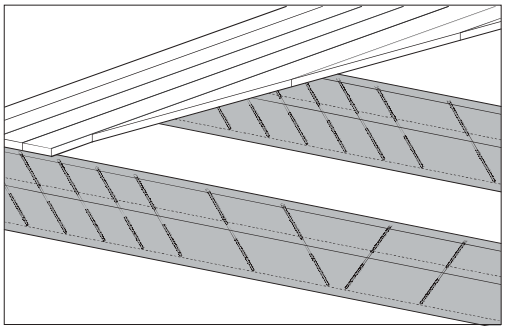
pitched or cambered glulam beam



Type	System		Chapter
	Recommendation	Alternative	
WR-T-9	-	●	4
WR-T-13	■	-	4
WB-T-16	■	-	5
WB-T-20	■	-	5

floor structure

flitch beam



Type	System		Chapter
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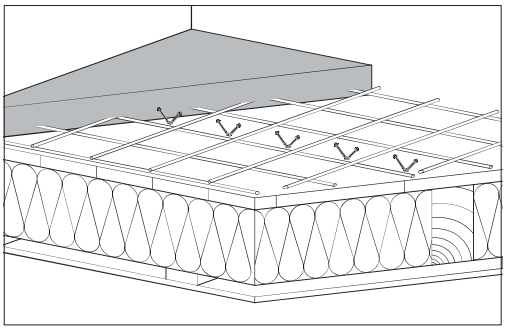
WR-T-9	■	-	4
WR-T-13	-	●	4
WB-T-16	-	●	5
WB-T-20	-	●	5

floor structure

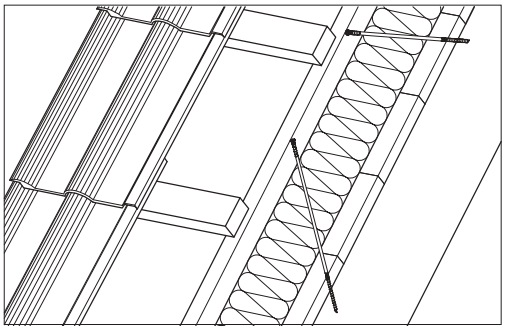
timber-concrete composite floor



Type	System		Chapter
	Recommendation	Alternative	
VB-48-7,5	■	-	8

roof and wall structure

roof top insulation with non pressure-resistant insulation



Type	System		Chapter
	Recommendation	Alternative	
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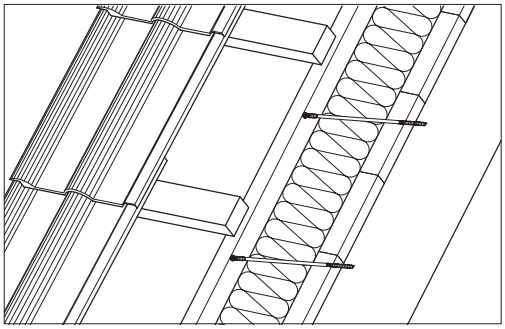
WT-S-6,5	-	●	3
TWIN UD-7,5	■	-	8

roof and wall structure

roof top insulation with pressure-resistant insulation



Type	System		Chapter
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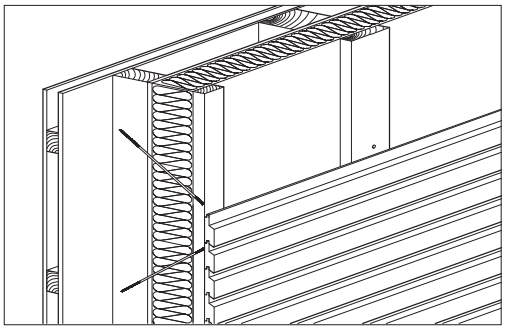
WT-S-6,5	-	●	3
TWIN UD-7,5	■	-	8

roof and wall structure

façade insulation



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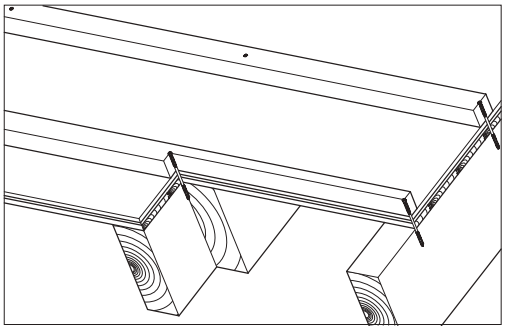
	Recommendation	Alternative	
TWIN UD-7,5	■	-	9

cover

batten connection in roof or façade



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	Recommendation	Alternative	
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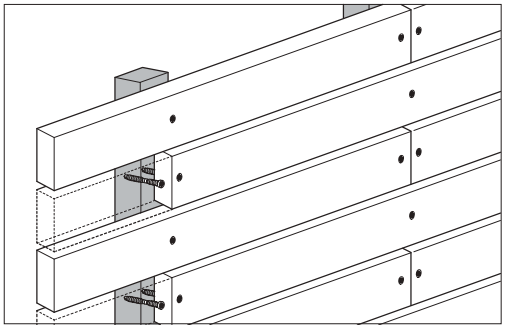
WT-S-6,5	■	-	3
WFR-T	-	●	7

cover

cladding



Type	System		Chapter
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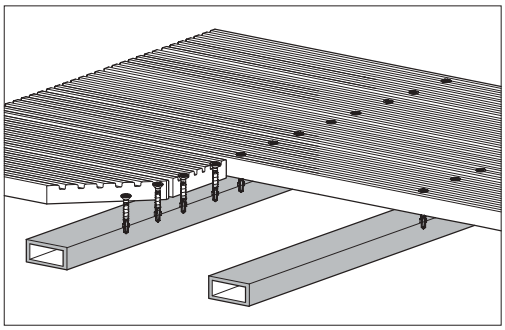
WT-T-4,5	■	-	3
WT-S-5	■	-	3
WT-T-6,5	■	-	3
WT-S-6,5	■	-	3

cover

terrace floor



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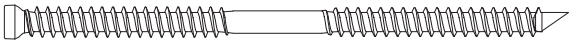
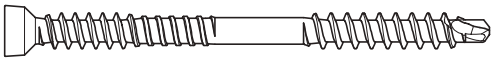
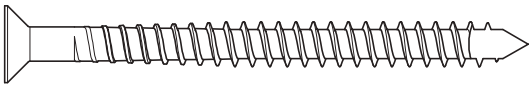
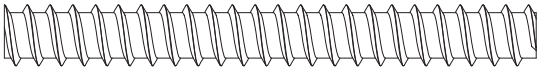
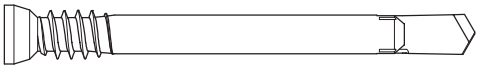
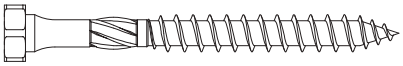
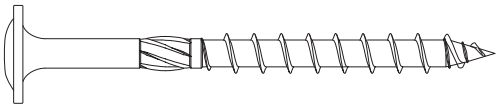
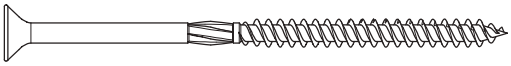
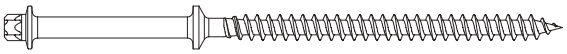
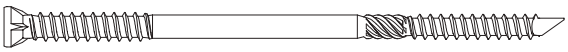
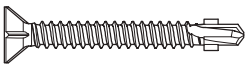
WT-T-4,5	■	-	3
WT-S-5	■	-	3
WT-T-6,5	■	-	3
WT-S-6,5	■	-	3

2 Product index

Timber Work

Type		Material: Stainless steel	Material: Carbon steel	Chapter
WT-T		-	■	3
WT-S		●	-	3
WR-T		-	■	4
WB-T		-	■	5
WS-T		-	■	6
WFD-T		-	■	7
WFO-T		-	■	7
WFR-T		-	■	7
VB		-	■	8
TWIN UD		-	■	9
SCS		●	-	10
Technical data sheets		-	-	11
Tools		-	-	12

3

Application	Product code	Page
Timber to timber connection and reinforcement	**WT-T**	▸ 3.3
Timber to timber connection	**WT-S**	▸ 3.6

The proven WT fastening system for universal application in structural timberwork

Well-conceived fastening solutions are called for to implement creative, efficient construction methods efficiently and cost-effectively in structural timberwork.

With the WT system by SFS intec, innovative architects and engineers can achieve unusual design concepts inexpensively, without compromising on safety and aesthetic aspects.

This efficient fastening system offers convincing advantages both for highly complex engineering structures and also in structural timberwork.

3

The impressive performance of the WT double threaded fasteners

Advantages:

- simple, reliable calculation
- diverse range of application
- durable joints with high load-bearing capacity
- fast, efficient installation without pre-drilling
- form-fitting joint due to double thread
- high aesthetic standard due to countersunk fastener
- high fire resistance
- special installation accessories
- European Technical Approval ETA-12/0063

Optimal combination of installation convenience and cost-effectiveness

For small dimensions like battens or heavily stressed purlin reinforcement: the WT system is a convincing solution for a very wide range of applications and offers comprehensive benefits.

Fast, secure installation

Adapted to a wide range of applications well-conceived setting tools are available for the efficient, precise installation of the fasteners and fatigue-free working.

Principles of calculation

Detailed planning documentation catering for a very wide range of applications ensures easy, reliable calculation. For special applications our structural timberwork consultants will be pleased to assist you in selecting the most efficient and cost-effective fastening method.

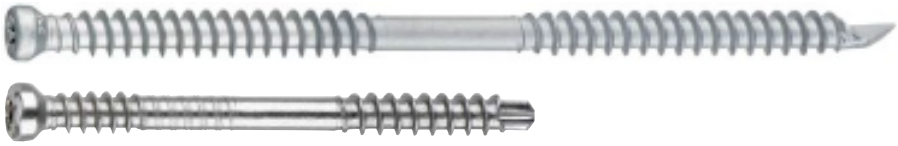
Structural-physical advantages

Particularly worth mentioning are the high fire resistance due to the concealed location of the fasteners and the elimination of heat bridges. The fasteners countersunk in the timber are also an advantage in terms of aesthetics.

Durable joints

The special fastener's double thread pulls the structural elements together to produce a form-fitting joint. Cohesion forces are optimally coordinated even with varying moisture levels in the timber.

WT-T / WT-S



3

Technical information

Application

Timber to timber connection and reinforcement

Material

Fastener

- WT-T
  Carbon steel, tempered,
  Durocoat® coated
- WT-S
  Austenitic stainless steel

Tools and accessories

BO1055

- Power drill.

ZL-WT/MS

- Setting tool for the fast and economic installation of WT fasteners crosswise in main/secondary beam connections.

Recommendation for installation

- Battery tool
  - 300 rpm - 700 rpm
  - min. 18 V
  - Battery with approx. 2,5 Ah

DI650

- Power screwdriver for manual installation of fasteners.

WT-T20

- Attachment for T20 drive.

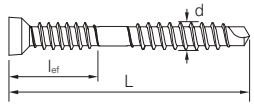
Z661-WT

- Depth locator sleeve for WT system.

Tools and accessories can be found in chapter 12

3

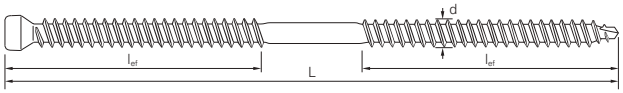
Order information



KL clamping length | **M** magazine loaded | **d** diameter | **L** Length | $\mathbf{l}_{ef}$ thread length | **t** thickness of wood | **All measures in mm**

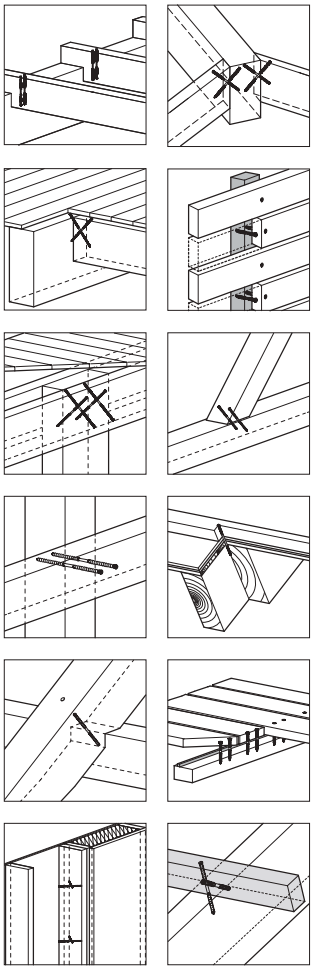
		Order code				
		WT-T-	**4,5x**	**40**		
Product / Application	Approval	Type	d	L	l_{ef}	Application information
■ Carbon steel		WT-T-	4,5x	40	**15**	
		WT-T-	4,5x	60	**17**	
		WT-T-M-	4,5x	40	**15**	
		WT-T-M-	4,5x	60	**17**	
● Stainless steel		WT-S-	5,0x	45	**17**	
		WT-S-	5,0x	60	**17**	
		WT-S-M-	5,0x	45	**17**	
		WT-S-M-	5,0x	60	**17**	

Order information



KL clamping length | **M** magazine loaded | **d** diameter | **L** Length | $\mathbf{l}_{ef}$ thread length | **t** thickness of wood | **All measures in mm**

3

Product / Application	Approval	Order code WT-S- Type	6,5x d	65 L	l_{ef}	Application information
● Stainless steel		WT-S-	6,5x	65	**28**	
		WT-S-	6,5x	90	**40**	
		WT-S-	6,5x	130	**55**	
	CE 12 ETA-12/0063					

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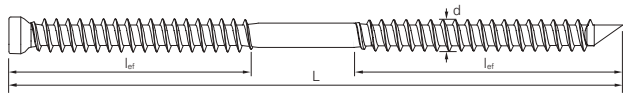
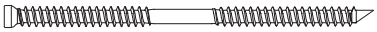
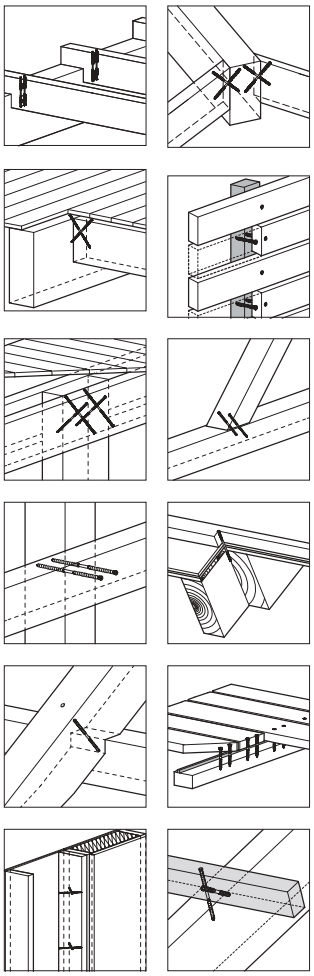
Order information



KL clamping length | **M** magazine loaded | **d** diameter | **L** Length | l_{ef} thread length | **t** thickness of wood | **All measures in mm**

Product / Application	Approval	Order code WT-T- 6,5x 65 Type	d	L	l_{ef}	Application information
■ Carbon steel		WT-T-	6,5x	65	**28**	
		WT-T-	6,5x	90	**40**	
		WT-T-	6,5x	130	**55**	
		WT-T-	6,5x	160	**65**	
		WT-T-	6,5x	190	**80**	
		WT-T-	6,5x	220	**95**	





CE 12
ETA-12/0063

Tools and accessories can be found in chapter 12

Product / Application	Approval	Order code WT-T- Type	8,2x d	160 L	l_{ef}	Application information
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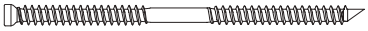
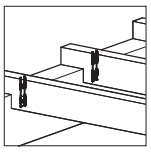
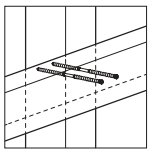
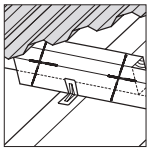
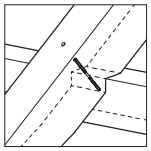
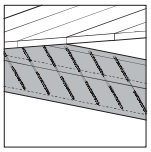
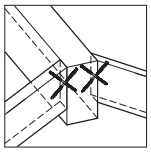
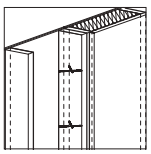
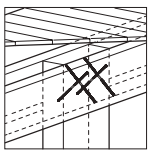
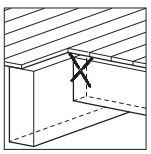
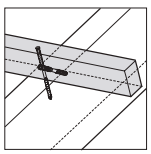
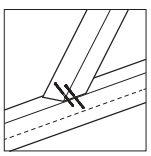
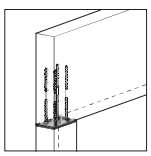
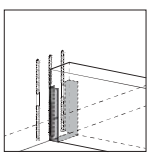
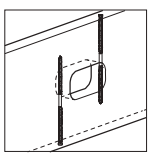
		WT-T-	8,2x	190	**80**	
 		WT-T-	8,2x	220	**95**	
 		WT-T-	8,2x	245	**107**	
 		WT-T-	8,2x	275	**122**	
 	CE 12 ETA-12/0063	WT-T-	8,2x	300	**135**	
 		WT-T-	8,2x	330	**135**	
 						
 						

3

4

Application	Product code	Page
Timber to timber connection, steel to timber connection and reinforcement	**WR-T**	▸ 4.3

The WR fixing system for fastening, strengthening and timber to steel fixing

Countless simple and efficient timber engineering applications are possible, thanks to the comprehensive range of lengths available in the WR programme. These include timber to timber connections as main/secondary beam connections, rafter/purlin connections and flitch beams. Steel components can also be fitted to timbers with the WR system for end grain connections, frame corners and wind bracings. The WR system is also ideal for compression reinforcement in support areas or tension reinforcement perpendicular to the grain.

The impressive performance of the WR full threaded fasteners

Advantages:

- very high performance
- wide range of applications
- lengths up to 1000 mm
- insertion parallel with the grain also possible
- no decline of load bearing capacity from 90° to 45° relative to the grain
- installation without pre-drilling
- low splitting tendency = small spacings and distances
- connection not visible
- high corrosion resistance (Durocoat)
- European Technical Approval ETA-12/0062

Performance with comprehensive benefits for you

Reductions in time and cost

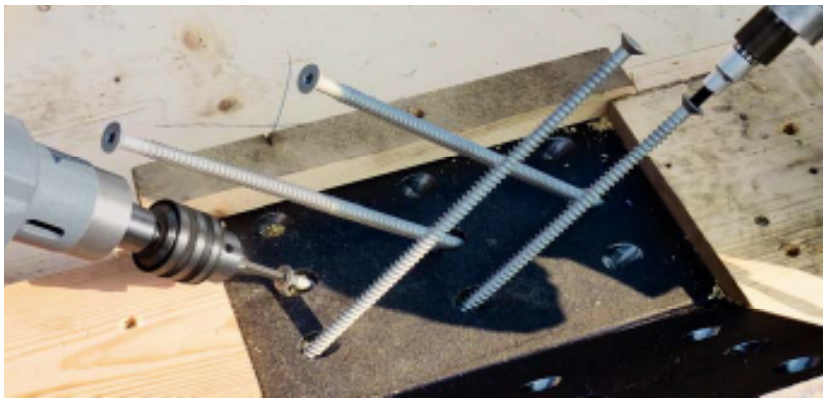
Structural timber elements are joined with the WR special fastener in a single operation, without pre-drilling. Installation is simple and secure using the recommended tools.

Wide range of application

The WR system opens up assembly solutions that were previously extremely time-consuming. This enables a variety of familiar fasteners to be replaced. Besides simplifying material management, this also results in inventory savings.

Secure joints

Screwed joints are invisible and thus aesthetically pleasing. The fastener is also largely protected against corrosion and against heat in the event of fire.



WR-T

Technical information

Application

Timber to timber connection, steel to timber connection and reinforcement

Material

Fastener

- WR-T
  Carbon steel, tempered,
  Durocoat® coated

Tools and accessories

BO1055

- Power drill.

T50-55-IQUAD1/2"

- Insert bit for T50 drive.

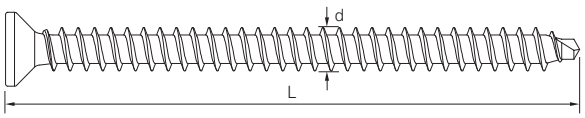
T50-36-HEX5/16"

- Insert bit for T50 drive.

Recommendation for installation

Power tool
- 100 rpm to 400 rpm
- min. 120 Nm (under load)

Order information



KL clamping length | **M** magazine loaded | **d** diameter | **L** Length | l_{ef} thread length | **t** thickness of wood | **All measures in mm**

4

Product / Application	Approval	Order code Type	d	L	l_{ef}	Application information
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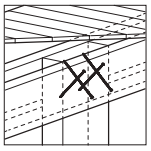
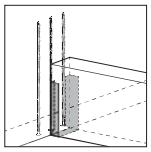
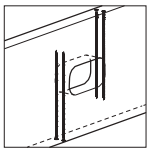
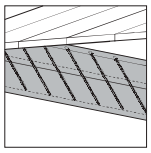
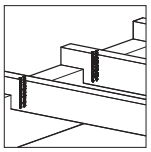
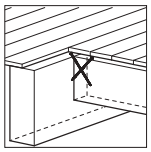
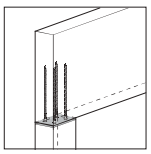
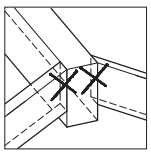
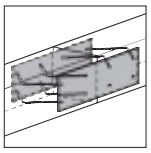
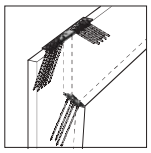
■ Carbon steel		WR-T-	9,0x	250		
		WR-T-	9,0x	300		
 		WR-T-	9,0x	350		
 		WR-T-	9,0x	400		
 	CE 12 ETA-12/0062	WR-T-	9,0x	450		
 		WR-T-	9,0x	500		
 						

		Order code				
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Product / Application	Approval	Type	d	L	l_{ef}	Application information
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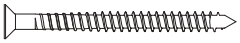
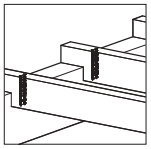
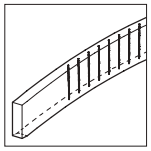
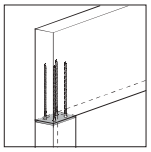
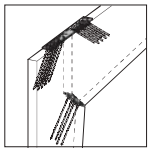
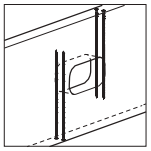
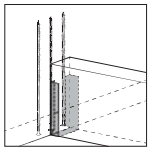
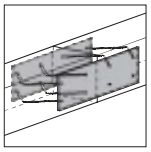
		WR-T-	13,0x	500		
 		WR-T-	13,0x	600		
 	CE 12 ETA-12/0062	WR-T-	13,0x	700		
 		WR-T-	13,0x	800		
		WR-T-	13,0x	900		
		WR-T-	13,0x	1000		

4

5

Application	Product code	Page
Reinforcement and timber to timber connection	**WB-T**	▸ 5.3

The unique WB system for cost-effective lateral tensile reinforcements in glulam structures

With the high-capacity WB system ambitious timber engineers can realise remarkable structural designs competitively. No compromise is necessary when it comes to safety or aesthetics. The benefits of the WB system convince regarding structural design and cost-efficient processing. The WB system is developed for lateral tensile reinforcements in pitched and cambered glulam beams or at notches and penetrations.

The impressive performance of the WB threaded rod bars

Advantages:

- lateral tensile reinforcement without adhesive
- force transmission through the thread
- high tensile strength of 800 N/mm²
- reliable calculation using simple general design principles
- individual length cutting
- savings of up to 50% in installation time
- extremely economical and efficient system
- invisible

5

Secure and cost-effective lateral tensile reinforcements

High tensile strength
The high tensile strength of 800 N/mm² means that up to 50% fewer threaded rods are needed in comparison to other systems.

Installation without adhesive
The entire force transmission is via the fastener thread. Time-consuming, additional adhesive application is eliminated.

Individual lengths cut to size
After being cut to length individually the threaded rods can be inserted and directly countersunk using the special insertion sleeve.

WB-T

Technical information

Application

Reinforcement and timber to timber connection

Material

Fastener

- WB-T
  Carbon steel, zinc electroplated,
  Cr VI free coating

Tools and accessories

DWA-12-ZA-SET

- Drilling system for WB-T-16.
  2 Bit extensions each 1000 mm
  1 Drill bit 400 mm

DWA-15-ZA-SET

- Drilling system for WB-T-16.
  2 Bit extensions each 1000 mm
  1 Drill bit 400 mm

ZA1/2"-MK3

- Adapter for power drills with morse taper shank.

ZE-16-WB

- Insertion sleeve for counter-sinking WB-T-16.

ZE-20-WB

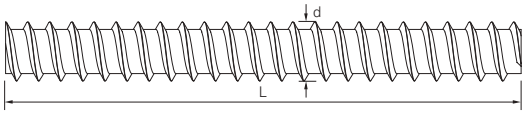
- Insertion sleeve for counter-sinking WB-T-20.

Recommendation for installation

Power tool
- 100 rpm to 400 rpm
- min. 200 Nm (under load)

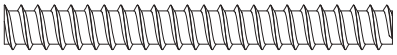
Tools and accessories can be found in chapter 12

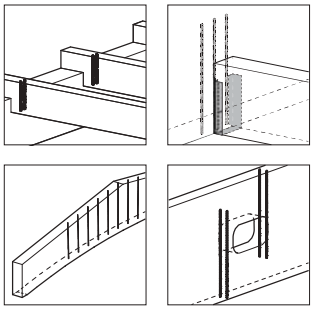
Order information



KL clamping length | **M** magazine loaded | **d** diameter | **L** Length | l_{ef} thread length | **t** thickness of wood | **All measures in mm**

		Order code **WB-T- 16,0x 3000**				
Product / Application	Approval	Type	d	L	l_{ef}	Application information
■ Carbon steel		WB-T-	16,0x	3000		
		WB-T-	20,0x	3000		





5

6

Application	Product code	Page
Timber to steel connection	**WS-T**	▸ 6.3

The economical WS system for multiple shear plane steel-timber connections

Convincing in its simplicity: The WS system consists of self-drilling dowels, a manual tool and a pneumatic frame setting tool and dimensioning references. The dowels are inserted in the timber and through the steel plates in a single, time-saving operation without pilot drilling. Up to 3 steel plates, each up to 5 mm thick, can be penetrated. The rear surface of the timber is not penetrated. High-quality steel-timber connections can be assembled using the WS System. The system offers excellent added value making it very interesting for small and medium-sized enterprises.

The impressive performance of the WS self drilling dowels

Advantages:

- numerous applications
- simple, reliable calculation
- easy to use with no pre-drilling of steel or timbers
- exact fit without hole clearance
- durable, high load-bearing connections
- aesthetically pleasing countersunk and no break-through fastening
- high fire resistance
- powerful insertion tools for factory and on-site work
- CE mark thanks to EN 14592 conformance

Flexible working with the manual setting tool

The powerful manual setting tool CF-WS/M with dowel guidance enables work to be performed flexibly in prefabrication operations and on the construction site.

Greater cost-effectiveness due to shorter working process

Producing trusses has been a complicated process to date. The new WS System reduces the procedure to a few operating steps:

1. fitting the steel plate
2. aligning and fixing it in position
3. inserting the dowel

Form-fitting direct fastening results in maximum fitting accuracy!

Ergonomic, efficient working with the frame setting tool

The pneumatically supported frame setting tool CF/WS-P is particularly useful for larger scale applications. Depending on the particular assembly, up to 150 WS self-drilling dowels can be inserted per hour.

WS-T

Technical information

Application

Timber to steel connection

Material

Fastener

- WS-T
  Carbon steel, zinc electroplated,
  Cr VI free coating

Drill point and lead thread section

- Special carbon steel, plated

Tools and accessories

CF-WS/P

- Pneumatic setting tool for the fast and economic installation of WS fasteners.

CF-WS/M

- Stand-up setting tool for the installation of WS fasteners.

ZA1/4"-CF-WS/M

- Magnetic bit holder.

T40-70-HEX1/4"

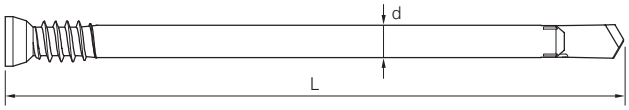
- Insert bit for T40 drive.

ZL-WS

- Setting gauge for the installation of WS fasteners in horizontal direction.

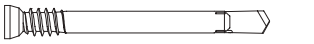
6

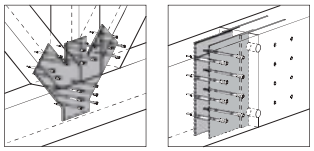
Order information

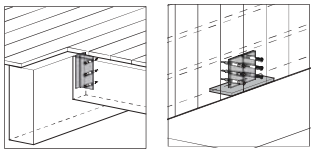


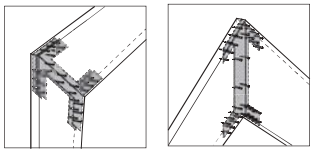
KL clamping length | **M** magazine loaded | **d** diameter | **L** Length | $\mathbf{l}_{ef}$ thread length | **t** thickness of wood | **All measures in mm**

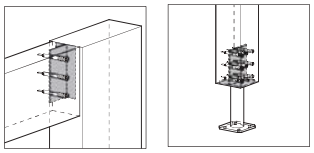
Product / Application	Approval	Order code WS-T- 7,0x 73 Type	d	L	t	Application information
■ Carbon steel		WS-T-	7,0x	73	**80**	
		WS-T-	7,0x	93	**100**	
		WS-T-	7,0x	113	**120**	
		WS-T-	7,0x	133	**140**	
		WS-T-	7,0x	153	**160**	
		WS-T-	7,0x	173	**180**	
		WS-T-	7,0x	193	**200**	
		WS-T-	7,0x	213	**220**	
	CE 10 EN14592	WS-T-	7,0x	233	**240**	Drilling capacity: only S235! One sheet: max. 10 mm thick Two or three sheets: each max. 5 mm thick

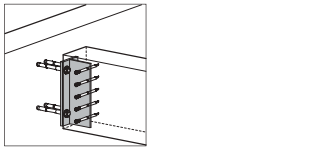


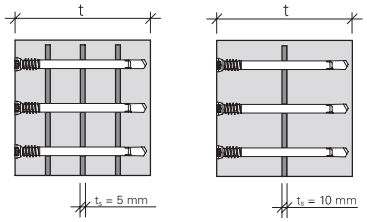












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7

Application	Product code	Page
Timber to timber connection and steel to timber connection	**WFD-T**	▸ 7.3
Timber to timber connection	**WFO-T**	▸ 7.6
Timber to timber connection	**WFR-T**	▸ 7.8

WFD, WFO, WFR: timber construction screws for timber to timber and timber to steel connections

The self-tapping timber screws WFD, WFO and WFR can be used to fix timber members, wood-pased panels and steel parts to timber. WFD and WFO are primarily used in timber constructions such as fitting rafters, roofing and timber house construction. Smaller WFR's are useful for fixing wood-based panels to sub-frames; e.g. shear walls. Various applications can be realised with the comprehensive range of WF system. The European Technical Approval enables a reliable design.

The impressive performance of the WF partial threaded fasteners

Advantages:

- knurl reduces the insertion torque, making the fasteners particularly easy to use.

- European Technical Approval ETA-12/0373

The WFO timber construction screw with internal drive

- T40 – T50 internal drives
- rapid insertion thanks to the coarse thread
- flat head increases pull-through capacity of the head

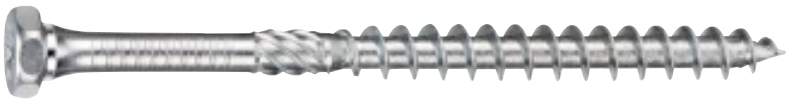
The WFD timber construction screw with dual drive

- Combined internal and external drives T30/H12 – T40/H15
- internal drive for countersinking
- no danger of skidding with the external hexagon drive
- washers available to increase pull-through capacity of the head

The double-start threaded WFR for rapid installation

- T20 – T30 internal drive
- 50% faster insertion thanks to the double-start thread
- countersunk head
- bites with minimal pressure
- milling recess prevents splitting of the wood

WFD-T



Technical information

Application

Timber to timber connection and steel to timber connection

Material

Fastener

- WFD-T
  Carbon steel, zinc electroplated

Tools and accessories

BO1055

- Power drill.

EW12

- Socket hexagon head.

EW15

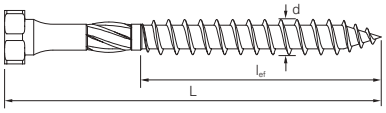
- Socket hexagon head.

EW17

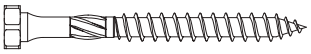
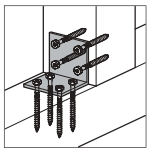
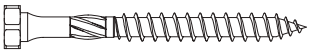
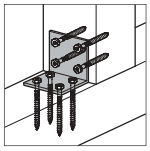
- Socket hexagon head.

7

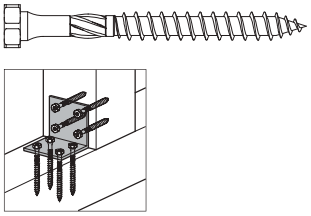
Order information



KL clamping length | **M** magazine loaded | **d** diameter | **L** Length | $\mathbf{l_{ef}}$ thread length | **t** thickness of wood | **All measures in mm**

		Order code				
		WFD-T-H12-	**8,0x**	**40**		
Product / Application	Approval	Type	d	L	l_{ef}	Application information
■ Carbon steel  		WFD-T-H12-	8,0x	40	**28**	
■ Carbon steel  	CE 13 ETA-12/0373	WFD-T-H12-	8,0x	50	**35**	
		WFD-T-H12-	8,0x	60	**45**	
		WFD-T-H12-	8,0x	70	**49**	
		WFD-T-H12-	8,0x	80	**54**	
		WFD-T-H12-	8,0x	100	**65**	
		WFD-T-H12-	8,0x	120	**84**	
		WFD-T-H12-	8,0x	140	**84**	
		WFD-T-H12-	8,0x	160	**100**	
		WFD-T-H12-	8,0x	180	**100**	
		WFD-T-H12-	8,0x	200	**100**	
		WFD-T-H12-	8,0x	220	**100**	
		WFD-T-H12-	8,0x	240	**100**	
		WFD-T-H12-	8,0x	260	**100**	
		WFD-T-H12-	8,0x	280	**100**	
		WFD-T-H12-	8,0x	300	**100**	
		WFD-T-H12-	8,0x	320	**100**	
		WFD-T-H12-	8,0x	340	**100**	
		WFD-T-H12-	8,0x	360	**100**	
		WFD-T-H12-	8,0x	380	**100**	
		WFD-T-H12-	8,0x	400	**100**	

7

Product / Application	Approval	Order code Type	d	L	l_{ef}	Application information
		WFD-T-H15-	**10,0x**	**60**		
■ Carbon steel		WFD-T-H15-	10,0x	60	**45**	
		WFD-T-H15-	10,0x	70	**49**	
		WFD-T-H15-	10,0x	80	**54**	
		WFD-T-H15-	10,0x	100	**65**	
		WFD-T-H15-	10,0x	120	**84**	
		WFD-T-H15-	10,0x	140	**108**	
		WFD-T-H15-	10,0x	160	**108**	
		WFD-T-H15-	10,0x	180	**108**	
	CE 13 ETA-12/0373	WFD-T-H15-	10,0x	200	**125**	
		WFD-T-H15-	10,0x	220	**125**	
		WFD-T-H15-	10,0x	240	**125**	
		WFD-T-H15-	10,0x	260	**125**	
		WFD-T-H15-	10,0x	280	**125**	
		WFD-T-H15-	10,0x	300	**125**	
		WFD-T-H15-	10,0x	320	**125**	
		WFD-T-H15-	10,0x	340	**125**	
		WFD-T-H15-	10,0x	360	**125**	
		WFD-T-H15-	10,0x	380	**125**	
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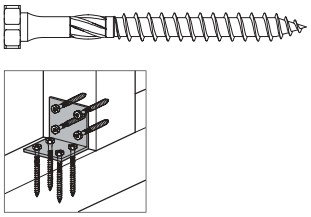
■ Carbon steel		WFD-T-H17-	12,0x	60	**48**	
		WFD-T-H17-	12,0x	80	**58**	
		WFD-T-H17-	12,0x	100	**70**	
		WFD-T-H17-	12,0x	120	**84**	
		WFD-T-H17-	12,0x	140	**100**	
		WFD-T-H17-	12,0x	160	**100**	
		WFD-T-H17-	12,0x	180	**125**	
		WFD-T-H17-	12,0x	200	**125**	
	CE 14 EN14592	WFD-T-H17-	12,0x	220	**125**	
		WFD-T-H17-	12,0x	240	**144**	
		WFD-T-H17-	12,0x	260	**144**	
		WFD-T-H17-	12,0x	280	**144**	
		WFD-T-H17-	12,0x	300	**144**	
		WFD-T-H17-	12,0x	320	**144**	
		WFD-T-H17-	12,0x	340	**144**	
		WFD-T-H17-	12,0x	360	**144**	
		WFD-T-H17-	12,0x	380	**144**	

7

WFO-T

Technical information

Application

Timber to timber connection

Material

Fastener

- WFO-T
  Carbon steel, zinc electroplated

Tools and accessories

BO1055

- Power drill.

T40-25-HEX1/4“

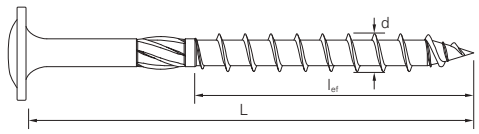
- Insert bit for T40.

T50-36-HEX5/16“

- Insert bit for T50.

7

Order information



KL clamping length | **M** magazine loaded | **d** diameter | **L** Length | $\mathbf{l_{ef}}$ thread length | **t** thickness of wood | **All measures in mm**

Product / Application	Approval	Order code WFO-T-S20- 8,0x 80 Type	d	L	l_{ef}	Application information
■ Carbon steel		WFO-T-S20-	8,0x	80	**54**	
		WFO-T-S20-	8,0x	100	**54**	
		WFO-T-S20-	8,0x	120	**54**	
		WFO-T-S20-	8,0x	140	**84**	
		WFO-T-S20-	8,0x	160	**84**	
		WFO-T-S20-	8,0x	180	**100**	
		WFO-T-S20-	8,0x	200	**100**	
		WFO-T-S20-	8,0x	220	**100**	
	CE 13 ETA-12/0373	WFO-T-S20-	8,0x	240	**100**	
		WFO-T-S20-	8,0x	260	**100**	
		WFO-T-S20-	8,0x	280	**100**	
		WFO-T-S20-	8,0x	300	**100**	
		WFO-T-S20-	8,0x	320	**100**	
		WFO-T-S20-	8,0x	340	**100**	
		WFO-T-S20-	8,0x	360	**100**	
		WFO-T-S20-	8,0x	380	**100**	
		WFO-T-S20-	8,0x	400	**100**	
■ Carbon steel		WFO-T-S25-	10,0x	100	**60**	
		WFO-T-S25-	10,0x	120	**60**	
		WFO-T-S25-	10,0x	140	**60**	
		WFO-T-S25-	10,0x	160	**100**	
		WFO-T-S25-	10,0x	180	**100**	
		WFO-T-S25-	10,0x	200	**100**	
		WFO-T-S25-	10,0x	220	**100**	
	CE 13 ETA-12/0373	WFO-T-S25-	10,0x	240	**100**	
		WFO-T-S25-	10,0x	260	**100**	
		WFO-T-S25-	10,0x	280	**100**	
		WFO-T-S25-	10,0x	300	**100**	
		WFO-T-S25-	10,0x	320	**100**	
		WFO-T-S25-	10,0x	340	**100**	
		WFO-T-S25-	10,0x	360	**100**	
		WFO-T-S25-	10,0x	380	**100**	
		WFO-T-S25-	10,0x	400	**100**	

WFR-T

Technical information

Application

Timber to timber connection

Material

Fastener

- WFR-T
  Carbon steel, zinc electroplated

Tools and accessories

BO1055

- Power drill.

T20-25-HEX1/4“

- Insert bit for T20.

T25-25-HEX1/4“

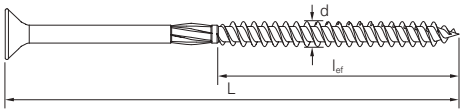
- Insert bit for T25.

T30-25-HEX1/4“

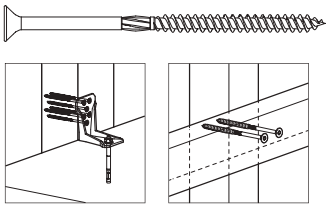
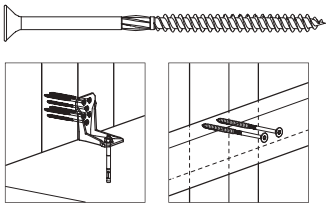
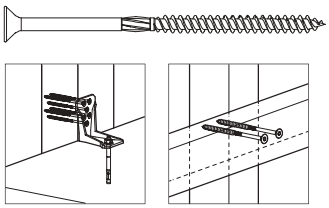
- Insert bit for T30.

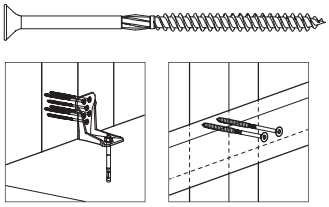
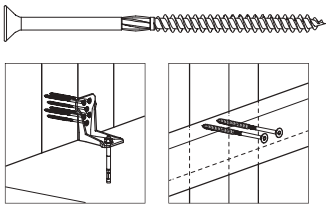
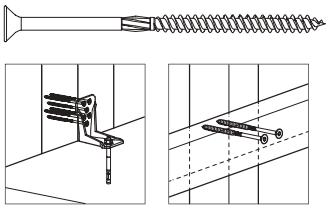
7

Order information

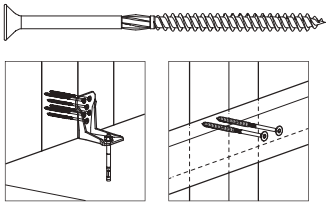


KL clamping length | **M** magazine loaded | **d** diameter | **L** Length | $\mathbf{l_{ef}}$ thread length | **t** thickness of wood | **All measures in mm**

Product / Application	Approval	Order code **WFR-T-T20-** **4,0x** **20** Type	d	L	l_{ef}	Application information
■ Carbon steel 		WFR-T-T20-	4,0x	20		
■ Carbon steel 	CE 13 ETA-12/0373	WFR-T-T20-	4,0x	25	**20**	
		WFR-T-T20-	4,0x	30	**17**	
		WFR-T-T20-	4,0x	35	**20**	
		WFR-T-T20-	4,0x	40	**25**	
		WFR-T-T20-	4,0x	45	**25**	
		WFR-T-T20-	4,0x	50	**30**	
		WFR-T-T20-	4,0x	60	**35**	
		WFR-T-T20-	4,0x	70	**35**	
■ Carbon steel 		WFR-T-T20-	4,5x	20		

Product / Application	Approval	Order code WFR-T-T20- 4,5x 25 Type	d	L	l_{ef}	Application information
■ Carbon steel 	CE 13 ETA-12/0373	WFR-T-T20-	4,5x	25	**19**	
		WFR-T-T20-	4,5x	30	**19**	
		WFR-T-T20-	4,5x	35	**19**	
		WFR-T-T20-	4,5x	40	**24**	
		WFR-T-T20-	4,5x	45	**24**	
		WFR-T-T20-	4,5x	50	**29**	
		WFR-T-T20-	4,5x	60	**34**	
		WFR-T-T20-	4,5x	70	**39**	
		WFR-T-T20-	4,5x	80	**44**	
■ Carbon steel 		WFR-T-T25-	5,0x	20		
		WFR-T-T25-	5,0x	25		
		WFR-T-T25-	5,0x	30	**19**	
		WFR-T-T25-	5,0x	35	**19**	
■ Carbon steel 	CE 13 ETA-12/0373	WFR-T-T25-	5,0x	40	**22**	
		WFR-T-T25-	5,0x	50	**27**	
		WFR-T-T25-	5,0x	60	**32**	
		WFR-T-T25-	5,0x	70	**37**	
		WFR-T-T25-	5,0x	80	**47**	
		WFR-T-T25-	5,0x	90	**47**	
		WFR-T-T25-	5,0x	100	**55**	
		WFR-T-T25-	5,0x	110	**65**	
		WFR-T-T25-	5,0x	120	**65**	

7

Product / Application	Approval	Order code **WFR-T-T30-** Type	**6,0x** d	**50** L	l_{ef}	Application information
■ Carbon steel		WFR-T-T30-	6,0x	50	**29**	
		WFR-T-T30-	6,0x	60	**34**	
		WFR-T-T30-	6,0x	70	**39**	
		WFR-T-T30-	6,0x	80	**48**	
		WFR-T-T30-	6,0x	90	**48**	
		WFR-T-T30-	6,0x	100	**54**	
		WFR-T-T30-	6,0x	110	**54**	
		WFR-T-T30-	6,0x	120	**64**	
		WFR-T-T30-	6,0x	140	**64**	
	CE 13 ETA-12/0373	WFR-T-T30-	6,0x	130	**64**	
		WFR-T-T30-	6,0x	150	**64**	
		WFR-T-T30-	6,0x	160	**64**	
		WFR-T-T30-	6,0x	180	**64**	
		WFR-T-T30-	6,0x	200	**64**	
		WFR-T-T30-	6,0x	220	**64**	
		WFR-T-T30-	6,0x	240	**64**	
		WFR-T-T30-	6,0x	260	**64**	
		WFR-T-T30-	6,0x	280	**64**	
		WFR-T-T30-	6,0x	300	**64**	

8

Application	Product code	Page
Timber-concrete composite construction	**VB**	▸ **8.3**

The VB system for timber-concrete composite constructions in renovation and new-build timber floors

Timber-concrete composite is a field-proven construction system in which a thin concrete slab is rigidly attached to a timber purlin. When buildings are being renovated, existing ceilings can be ideally preserved by using the VB timber-concrete composite system. Load-bearing capacity is increased, sound insulation and fire safety requirements are optimally met.
The existing body of the structure continues to be utilised. Complicated, expensive demolition is unnecessary. Economies of up to 40% can be achieved compared to conventional solutions.

The impressive performance of the VB timber-concrete composite fasteners

Advantages:

- tested and field-proven system
- savings of up to 40%
- retaining the existing structure
- high load-bearing capacity and stiffness with low attachment height
- optimum sound insulation and fire safety
- rooms below can be used during the work
- design software ensures reliable planning
- ergonomic, rapid insertion with visual monitoring
- powerful setting tool
- European Technical Approval ETA-13/0699

8

Intelligent system software

The design program is an integral part of the SFS intec VB ttimber-concrete composite system. All the necessary calculations are performed on the basis of your individual parameters and you can then comfortably print out the precise installation plan and verifiable structural engineering calculations.

Personal support

Our specialists have years of experience and extensive knowledge, allowing them to offer you genuine system support.

The attractive solution for renovation and new-build alike

In renovation work it is often sensible, if not imperative, to reinforce existing ceilings. The VB timber-concrete composite system avoids the need to tear down existing timber ceilings or construct new concrete structures. The valuable building structure is retained. The VB system can also hold its own in new-builds, where it offers a genuinely alternative system. The aesthetic appeal of a timber ceiling is married to the structural physical advantage of concrete, creating a reliable and innovative ceiling structure.

VB fasteners and setting tool

VB fasteners are available in two sizes. They are inserted without pre-drilling via the Torx drive while maintaining an upright posture – eliminating backache – using the special system tool directly into the beams. The setting tool is equipped with a special depth stop to ensure correct insertion. The system components are perfectly coordinated and have already proved their qualities millions of times in practical use.

VB

Technical information

Application

Timber-concrete composite construction

Material

Fastener

- VB
  Carbon steel, tempered, browned

Tools and accessories

CF-VB/L

- Stand-up setting tool for the installation of VB fasteners.

V40-15VB

- Insert bit for external T40 drive.

ZA1/4“-E6,3

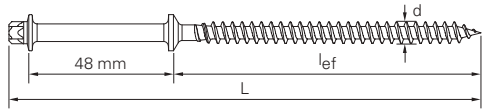
- Drive bar.

ZA1/4"

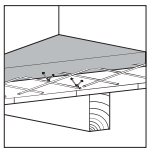
- Drive bar.

8

Order information



KL clamping length | **M** magazine loaded | **d** diameter | **L** length | l_{ef} thread length | **t** thickness of wood | **All measures in mm**

Product / Application	Approval	Order code **VB-48-** Type	**7,5x** d	l_{ef}	Application information
■ Carbon steel	CE 13 ETA-13/0699	VB-48-	7,5x	**100**	
		VB-48-	7,5x	**165**	
					

8

9

Application	Product code	Page
Fastening of insulation system on roof and facade	**TWIN UD**	▸ **9.3**

The tried and tested Twin UD for efficient façade and roof top insulation

The Twin UD system has proved its worth in the market place for over twenty years as the ideal fixing for roof top insulation and rear ventilated facades on timber substructures.

The new, re-engineered double threaded Twin UD offers planners and installers decisive advantages. Façade and roof top insulation in both new-build and renovation work is now safe, quicker and easier in design and execution. The Twin UD offers efficient processing and high energy efficiency. The counter batten is connected directly to the substructure in only one workstep with double threaded Twin UD fasteners.

The impressive performance of the Twin UD double threaded fasteners

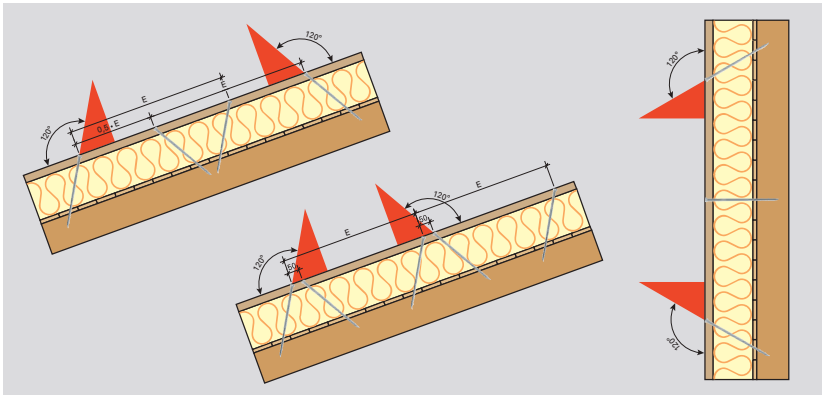
Advantages:

- proven secure solution
- design software
- optimally adapted fastener, developed for this specific application
- high resistance to tension and compression thanks to the double threading
- suitable for insulation layers of up to 300 mm thickness
- Minimal thermal bridges through continuous insulation layer
- European Technical Approval ETA-12/0038

The new, fully optimised Twin UD

Revolutionary new design features now make the system even more efficient on roofs and walls:

- the new tip minimises the danger of splitting the timber
- optimised double-thread with the same pitch enables adjustment of the battens
- knurl reduces insertion moment
- maximum performance thanks to the matched thread diameters
- complete range from 170 mm to 480 mm length



TWIN UD

Technical information

Application

Fastening of insulation system on roof and facade

Material

Fastener

- TWIN UD
  Carbon steel, Durocoat® coated

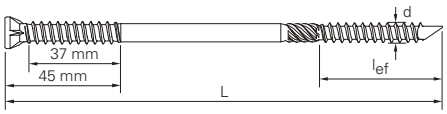
Tools and accessories

BO1055

- Power drill.

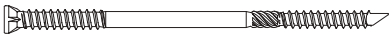
9

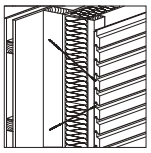
Order information

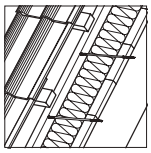


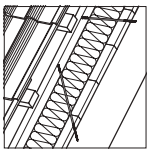
KL clamping length | **M** magazine loaded | **d** diameter | **L** length | $\mathbf{l_{ef}}$ thread length | **t** thickness of wood | **All measures in mm**

		Order code				
		TWIN UD-	**7,5x**	**170**		
Product / Application	Approval	Type	d	L	l_{ef}	Application information
■ Carbon steel		TWIN UD-	7,5x	170	**47,5**	
		TWIN UD-	7,5x	190	**73,5**	
		TWIN UD-	7,5x	210	**97**	
		TWIN UD-	7,5x	230	**97**	
		TWIN UD-	7,5x	250	**97**	
	CE 12 ETA-12/0038	TWIN UD-	7,5x	270	**97**	
		TWIN UD-	7,5x	300	**97**	
		TWIN UD-	7,5x	330	**97**	
		TWIN UD-	7,5x	360	**97**	
		TWIN UD-	7,5x	400	**97**	
		TWIN UD-	7,5x	440	**97**	
		TWIN UD-	7,5x	480	**97**	
						Bit and gauge in each box









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10

Application	Product code	Page
Fastening of timber on metal profile	**SCS**	▸ **10.3**

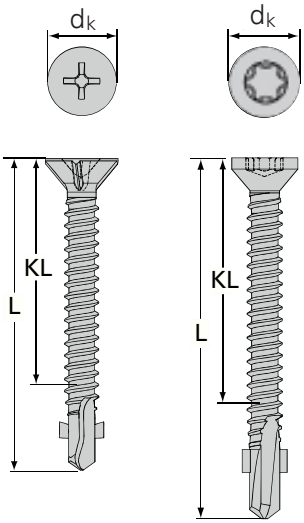
The SCS system for long-lasting outdoor fixing of timber to metal profiles

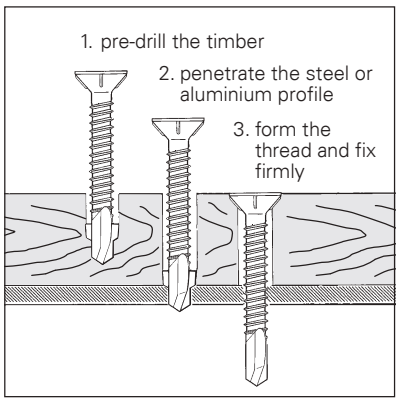
SCS winged self drilling fasteners are used to fix planks, boards and decking to steel and aluminium substructures. Rapid installation is ensured because the fastener penetrates first the timber and then the metal in a single operation. Metal thicknesses of up to 5 mm can be handled self-drilling and -tapping, providing optimum fixing every time. The countersunk head finishes flush in both hard and soft wood and as the fasteners are stainless steel there is no discolouration.

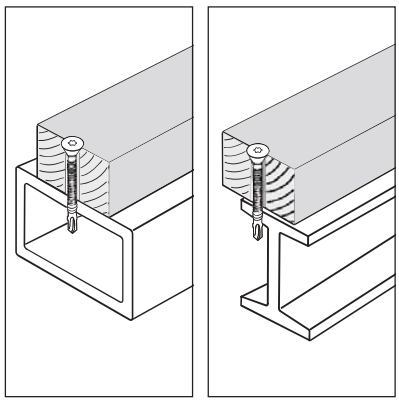
The impressive performance of SCS winged self drilling fastener

Advantages:

- rapid, secure installation
- fixing timber to metal substructures in one step
- countersunk heads enable efficient anchorage in both hard- and softwoods
- excellent corrosion resistance
- hardened, zinc-plated fastener drill tips
- increased diameter of the timber drilling means reduced problems through shrinking and swelling of the timber
- stainless steel will not discolour the wood

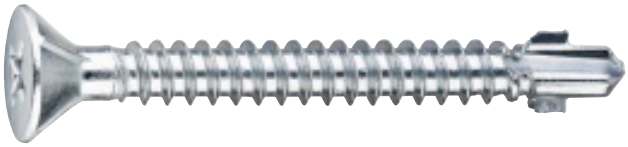






10

SCS



Technical information

Application

Fastening of timber on metal profile

Material

Fastener

- SCS
  Austenitic stainless steel

Drill point and lead thread section

- Carbon steel, hardened, plated

Tools and accessories

DI650

- Power screwdriver for manual installation of fasteners.

H2-90-HEX1/4"

- Insert bit for H2 drive.

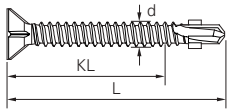
T30-90-HEX1/4"

- Insert bit for T30 drive.

Z661-WT

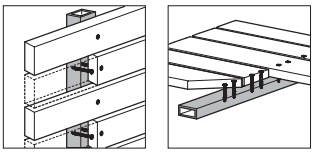
- Depth locator sleeve fo WT system.

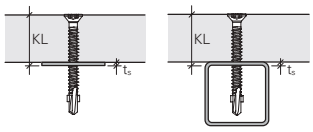
Order information



KL clamping length | **M** magazine loaded | **d** diameter | **L** length | l_{ef} thread length | **t** thickness of wood | **All measures in mm**

Product / Application	Approval	Order code **SCS3/25-7982/PH2- 4,8x 42** Type	d	L	KL	Application information
● Stainless steel		SCS3/25-7982/PH2-	4,8x	42	**25**	
		SCS3/55-7982/PH2-	4,8x	72	**55**	
		SCS5/34-D10/T30-	5,5x	55	**34**	
		SCS5/54-D10/T30-	5,5x	75	**54**	





t_s	Aluminium	Carbon steel S235
SCS3	2 mm to 3 mm	1 mm to 3 mm
SCS5	3 mm to 5 mm	2 mm to 5 mm

Keep the thicknesses t_s given in the table and do not exceed the clamping length KL (total thickness of timber and metal)

10

11

Application	Product code	Page
Principles of design	**WT**	▸ **11.3**
Principles of design	**WR**	▸ **11.9**
Connecting main and secondary timber beams	**WT / WR**	▸ **11.15**
Joining timber rafters	**WT**	▸ **11.23**
Connection of purlins to main trusses	**WT / WR**	▸ **11.29**
Dowelled purlins	**WT / WR**	▸ **11.35**
Lateral compression reinfor-cements	**WT / WR**	▸ **11.41**
Simplified fire protection rating	**WT / WR / WB**	▸ **11.47**
Load-carrying capacity	**WS**	▸ **11.49**
Timber to Timber and Steel to Timber Connections	**WF**	▸ **11.51**

SFS intec

EN 1995-1-1

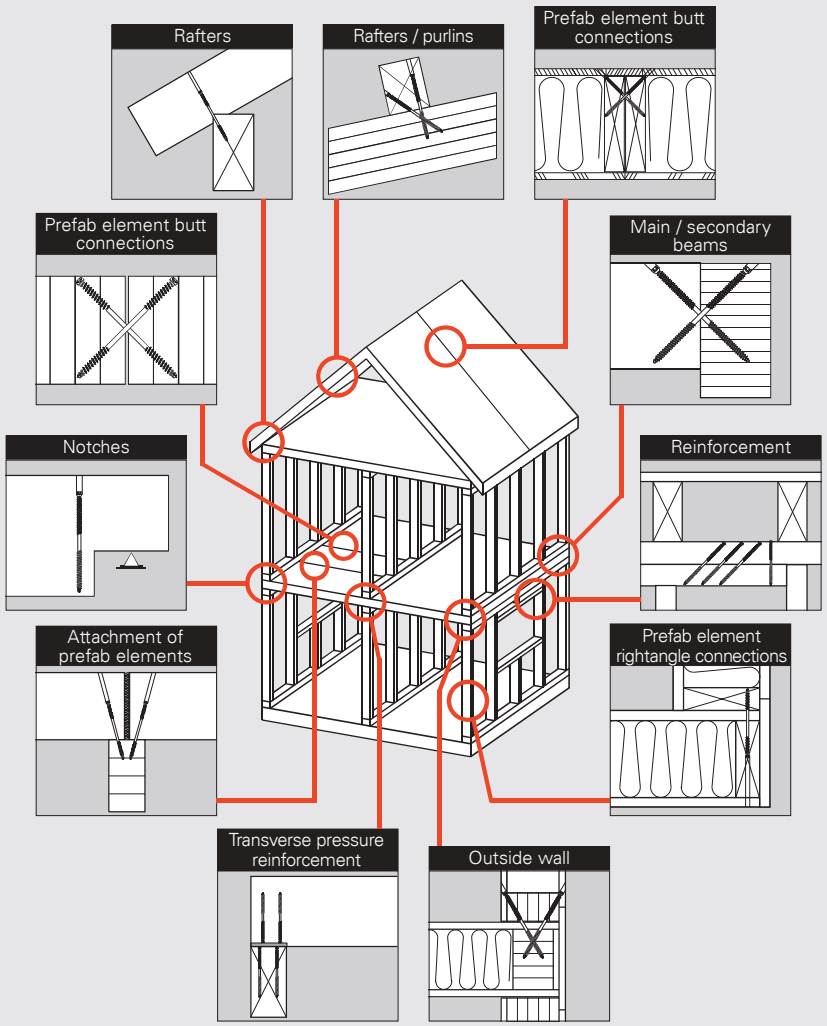
WT fastening system by SFS intec

Principles of design – WT System

WT

WT

Data sheet
Nr. 01 3.04



Convincing advantages

- high load-bearing capacity
- easy installation
- countersunk setting possible
- high fire resistance
- rapid assembly without pilot drilling
- transmission of shearing and vertical forces
- concealed fixing
- ETA-12/0063

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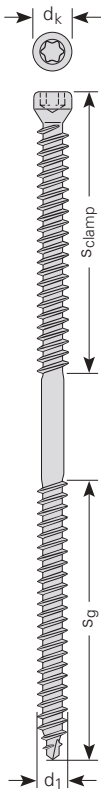


Load-bearing capacity values WT-T ETA-12/0063

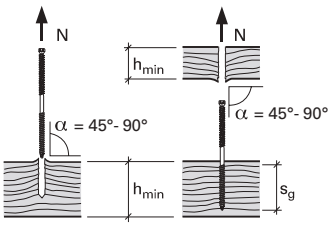
Calculation values for the characteristic bulk density values

Table 1

Solid timber, cross-laminated timber	C	24	30
Glulam timber	GL	24c	28c / 24h
Gross density ρ_k [kg/m³]		**350**	**380**

Pull-out resistance from 45° to 90° in dependancy of wood density

Table 2



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

$\gamma_M = 1{,}3$

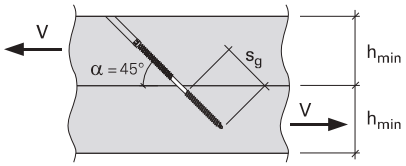
γ_M (GL) = 1,25

						Gross density ρ_k [kg/m³]	**350**	**380**
WT-S/T-6,5 xL [mm]	65	s_g [mm]	28	h_{min} [mm]	35	Pull-out resistance from timber $F_{N,Rk}$ [kN]	2,35	2,51
	90		40		50		3,35	3,58
	130		55		70		4,61	4,93
WT-T-6,5 xL [mm]	160		65		85		5,45	5,82
	190		80		100		6,71	7,16
	220		95		115		7,97	8,51

						Gross density ρ_k [kg/m³]	**350**	**380**
WT-T-8,2xL [mm]	160	s_g [mm]	65	h_{min} [mm]	85	Pull-out resistance from timber $F_{N,Rk}$ [kN]	7,12	7,60
	190		80		100		8,76	9,35
	220		95		115		10,40	11,11
	245		107		125		11,71	12,51
	275		122		140		13,36	14,26
	300		135		155		14,78	15,78
	330		135		170		14,78	15,78

Shearing connection, half thread length per structural component

Table 3



NB: if fasteners are inserted at an angle from one side, forces can only be absorbed from **one** side (cf. sketch)

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

$\gamma_M = 1{,}3$

γ_M (GL) = 1,25

						Gross density ρ_k [kg/m³]	**350**	**380**
WT-S/T-6,5 xL [mm]	65	s_g [mm]	28	h_{min} [mm]	25	Pull-out resistance from timber $F_{v,Rk}$ [kN]	1,66	1,77
	90		40		35		2,37	2,53
	130		55		50		3,26	3,48
WT-T-6,5 xL [mm]	160		65		60		3,85	4,12
	190		80		70		4,74	5,07
	220		95		80		5,63	6,02

						Gross density ρ_k [kg/m³]	**350**	**380**
WT-T-8,2xL [mm]	160	s_g [mm]	65	h_{min} [mm]	60	Pull-out resistance from timber $F_{v,Rk}$ [kN]	5,03	5,37
	190		80		70		6,19	6,61
	220		95		80		7,35	7,85
	245		107		90		8,28	8,85
	275		122		100		9,44	10,09
	300		135		110		10,45	11,16
	330		135		120		10,45	11,16

Remarks

s_g = s_{clamp} = relevant thread length **h_{min} = minimum height of structural component**

- Values apply to connections where half of each fastener is in each structural component.
- Connection geometry as shown in the drawings must be complied with.
- Calculation of design values as shown in the box to the left of the tables.
- **All calculations must be verified and signed off by the planner in charge before the work is performed.**

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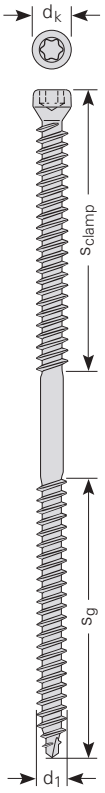
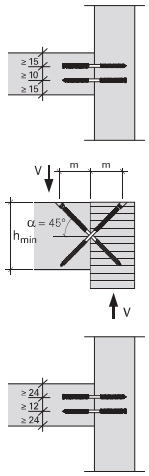
Load-bearing capacity values WT-T ETA-12/0063

Joining main/secondary purlins

Table 4





$$F_{v,Rd} = \min\left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}};\ \frac{F_{2,Rk}}{\gamma_{M2}}\right)$$

$\gamma_{M1} = 1{,}3$ $\gamma_{M2} = 1{,}1$
γ_{M1} (GL) = 1,25

								Gross density ρ_k [kg/m³]	350	380
WT-S/T-6,5 xL [mm]	*	s_g [mm]	*	h_{min} [mm]	*	m [mm]	*	Pull-out resistance from timber $F_{1,Rk}$ [kN]	*	*
	*		*		*		*		*	*
	130		55		110		55		5,91	6,31
WT-T-6,5 xL [mm]	160		65		130		65		7,09	7,57
	190		80		150		75		8,87	9,47
	220		95		170		85		10,65	11,37
								Buckling of fastener $F_{2,Rk}$ [kN]	9,66	9,87

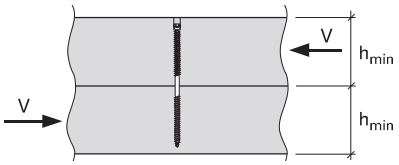
* Condition for edge spacings not met

							Gross density ρ_k [kg/m³]	350	380
WT-T-8,2xL [mm]	160	s_g [mm]	65	h_{min} [mm]	130	m [mm]	Pull-out resistance from timber $F_{1,Rk}$ [kN]	9,26	9,89
	190		80		150			11,58	12,37
	220		95		170			13,90	14,85
	245		107		190			15,76	16,83
	275		122		210			18,08	19,31
	300		135		230			20,09	21,46
	330		135		250			20,09	21,46
							Buckling of fastener $F_{2,Rk}$ [kN]	16,78	17,10

The main purlin must have an adequate trunnion bearing and be torsional load-bearing. Transverse tensile stress must be verified separately.

Shearing joint, half thread length per structural component

Table 5



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

$\gamma_M = 1{,}3$
γ_M (GL) = 1,25

						Gross density ρ_k [kg/m³]	350	380
WT-S-6,5 xL [mm]	65	s_g [mm]	28	h_{min} [mm]	35	Shearing resistance from timber $F_{v,Rk}$ [kN]	2,08	2,18
	90		40		50		2,33	2,45
	130		55		70		2,65	2,79
WT-T-6,5 xL [mm]	65		28		35		2,21	2,39
	90		40		50		2,85	2,99
	130		55		70		3,16	3,33
	160		65		85		3,37	3,55
	190		80		100		3,69	3,89
	220		95		115		4,00	4,19

WT-T-8,2xL [mm]	160	s_g [mm]	65	h_{min} [mm]	85	Shearing resistance from timber $F_{v,Rk}$ [kN]	4,53	4,77
	190		80		100		4,94	5,20
	220		95		115		5,35	5,64
	245		107		125		5,50	5,73
	275		122		140		5,50	5,73
	300		135		155		5,50	5,73
	330		135		170		5,50	5,73

Force-grain angle: α = 90°

Remarks

s_g = s_{clamp} = relevant thread length **h_{min} = minimum height of structural component**

- Transverse tensile stress must be verified separately.
- Values apply to connections where half of each fastener is in each structural component.
- Connection geometry as shown in the drawings must be complied with.
- Calculation of design values as shown in the box to the left of the tables.
- **All calculations must be verified and signed off by the planner in charge before the work is performed.**

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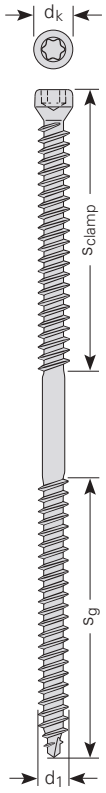
Load-bearing capacity values WT-T ETA-12/0063

Edge and intermediate spacings

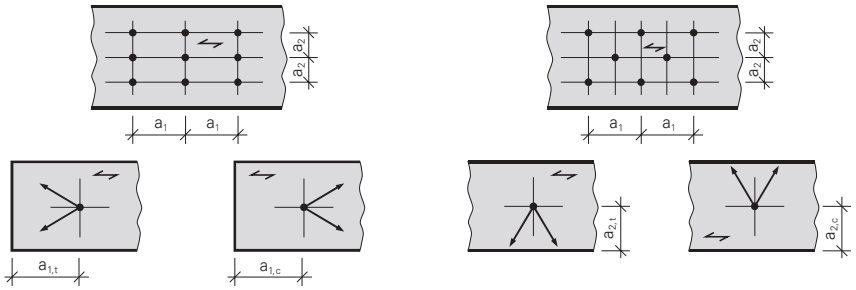
Table 6



			Axial		Shearing			
			d_1	mm		0°	45°	90°
WT-S/T-6,5xL	parallel with grain	a_1	5	33	(4+cosα) × d	33	31	26
	at right angles to grain	a_2	5	33	4 × d	26	26	26
		$a_{2,red.}$*	2,5	16				
	end grain under load	$a_{1,t}$			80 mm	80	80	80
	end grain not under load	$a_{1,c}$	5	33	$0° \le \alpha \le 30°$ 4 × d	26	-	-
					$30° < \alpha \le 90°$ (1+6sinα) × d	-	34	46
	edge under load	$a_{2,t}$			max. [(2+2sinα) × d; 3d]	20	22	26
	edge not under load	$a_{2,c}$		**15**	3 × d	20	20	20
WT-T-8,2xL	parallel with grain	a_1	5	40	(4+cosα) × d	40	38	32
	at right angles to grain	a_2	5	40	4 × d	32	32	32
		$a_{2,red.}$*	2,5	20				
	end grain under load	$a_{1,t}$			80 mm	80	80	80
	end grain not under load	$a_{1,c}$	5	40	$0° \le \alpha \le 30°$ 4 × d	32	-	-
					$30° < \alpha \le 90°$ (1+6sinα) × d	-	42	56
	edge under load	$a_{2,t}$			max. [(2+2sinα) × d; 3d]	24	27	32
	edge not under load	$a_{2,c}$	3	**24**	3 × d	24	24	24

* only possible if $a_1 \ge 10 \cdot d_1$

α = force-grain angle / values in mm



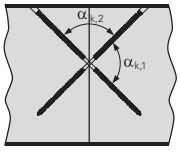
Intermediate spacings with crossed pairs of fasteners

Table 7

			$\alpha_{k,i}$ =Angle of intersection ($0° \le \alpha_{k,i} \le 90°$)						
			90°	75°	60°	45°	30°	15°	0°
WT-S/T-6,5xL	parallel with grain	a_1	16	19	22	24	27	30	33
	at right angles to grain	a_2	16	19	22	24	27	30	33
		$a_{2,red.}$*	10	10	11	12	14	15	16
WT-T-8,2xL	parallel with grain	a_1	20	23	27	30	33	37	40
	at right angles to grain	a_2	20	23	27	30	33	37	40
		$a_{2,red.}$*	12	12	13	15	17	18	20

* only possible if $a_1 \ge 10 \cdot d_1$

Values not stated here can be found in Table 6 / values in mm



Remarks

Pilot drilling diameter: **WT-S/T-6,5 = 4 mm**
WT-T-8,2 = 5 mm

- Required minimum timber thicknesses must be taken into account.
- **All calculations must be verified and signed off by the planner in charge before the work is performed.**

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WT fastening system

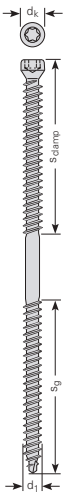
A comprehensive range offering high value added for timber/timber joints

Fastener range

WT-S-6,5 x L
Material: stainless steel A2 (1,4567)
Surface finish: Durocoat
Thread Dia.: 6.5 mm

WT-T-6,5 x L
Material: carbon steel
Surface finish: Durocoat
Thread Dia.: 6.5 mm

WT-T-8,2 x L
Material: carbon steel
Surface finish: Durocoat
Thread Dia. 8.2 mm (s_g)
and Dia. 8.9 mm (s_{clamp})



WT-S-6,5 x L / WT-T-6,5 x L / WT-T-8,2 x L fastener range

Type		Material S = stainless steel A2 T = carbon steel		Diameter d_1 [mm]		Length [mm]	s_g [mm]	s_{clamp} [mm]	d_k [mm]	Bit
WT	-	S	-	6,5	x	65	28	28	8.0	T30
WT	-	S	-	6,5	x	90	40	40	8.0	T30
WT	-	S	-	6,5	x	130	55	55	8.0	T30
WT	-	T	-	6,5	x	65	28	28	8.0	T30
WT	-	T	-	6,5	x	90	40	40	8.0	T30
WT	-	T	-	6,5	x	130	55	55	8.0	T30
WT	-	T	-	6,5	x	160	65	65	8.0	T30
WT	-	T	-	6,5	x	190	80	80	8.0	T30
WT	-	T	-	6,5	x	220	95	95	8.0	T30
WT	-	T	-	8,2	x	160	65	65	10.0	T40
WT	-	T	-	8,2	x	190	80	80	10.0	T40
WT	-	T	-	8,2	x	220	95	95	10.0	T40
WT	-	T	-	8,2	x	245	107	107	10.0	T40
WT	-	T	-	8,2	x	275	122	122	10.0	T40
WT	-	T	-	8,2	x	300	135	135	10.0	T40
WT	-	T	-	8,2	x	330	135	135	10.0	T40

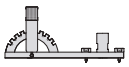
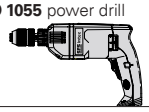
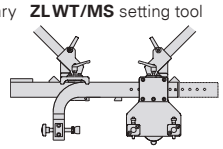
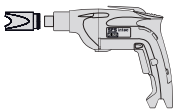
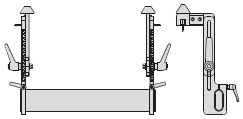
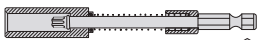
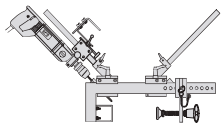
Installation aids

We offer appropriate accessories, from simple universal templates to special tools for individual applications. Our consultants will be pleased to assist you in making the right choice.

Principles of calculation

Detailed planning documentation catering for a very wide range of applications ensures easy, reliable calculation. For special applications our structural timberwork consultants will be pleased to assist you in selecting the most efficient and cost-effective fastening method.

Setting tools and accessories (selection)

Application	Tools and accessories	Fastener	Tools and accessories
Main/secondary purlins, dowelled purlins, prefabricated building, etc.	**ZL WT/U** universal template 	WT-T-8,2 x L WT-**S**/T-6,5 x L	**BO 1055** power drill 
Main/secondary purlins	**ZL WT/MS** setting tool 	WT-**S**/T-6,5 x L L max.: 130 mm	**DI 650** power drill 
Main/ secondary purlins	**ZL WT/S** purlin support 	WT-T-8,2 x L WT-**S**/T-6,5 x L	**WT-T40/D10** adapter **WT-T30** adapter 
Coupling purlins	**ZL WT** setting tool 	WT-T-8,2 x L WT-**S**/T-6,5 x L	Bit T40, length 70, 152, 200, 350, 520 mm Bit T30, length 70, 200, 350 mm

More information

If you have any questions about fastening technology, just call us. We'll be pleased to advise you!

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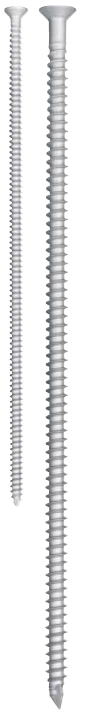
WR fastening system by SFS intec

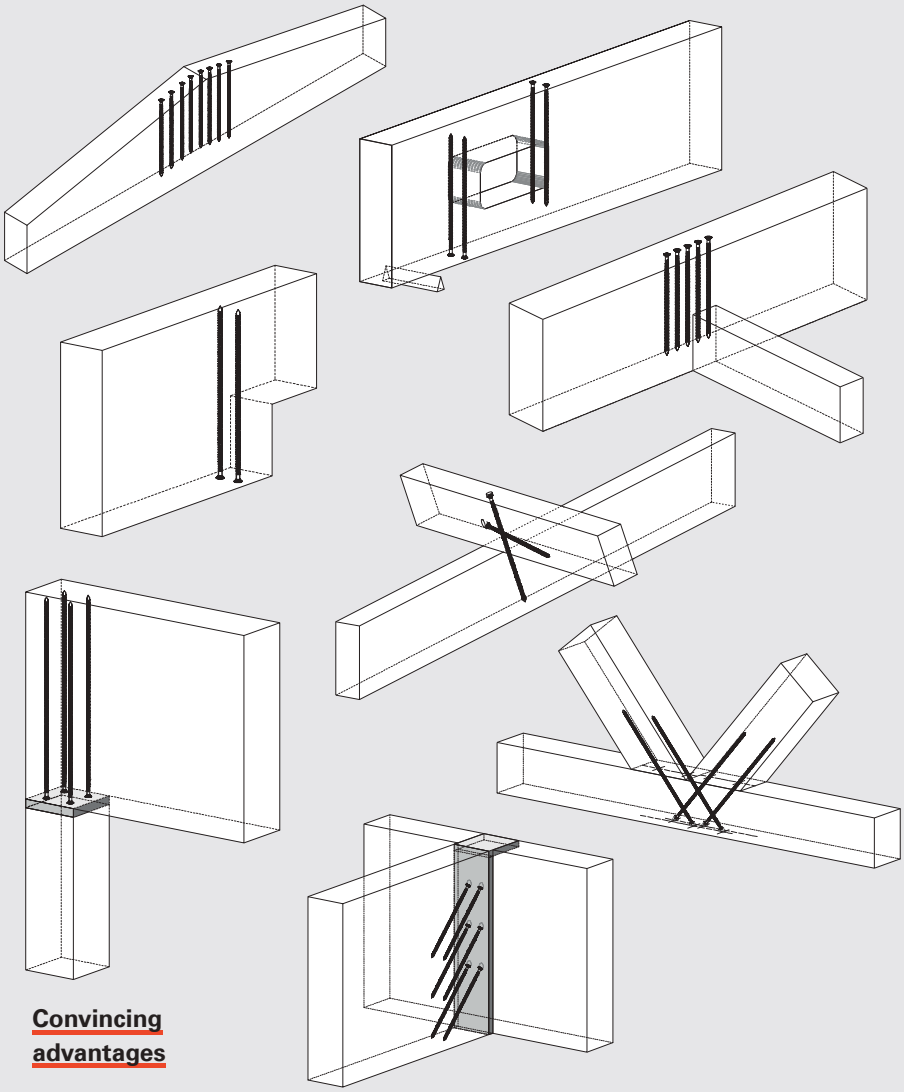
Principles of design – WR System

WR

WR



Data sheet
Nr. 01 3.05



Convincing advantages

- high load-bearing capacity
- easy installation
- steel/timber connections
- high fire resistance
- rapid assembly without pilot drilling
- transmission of shearing and vertical forces
- ETA-12/0062

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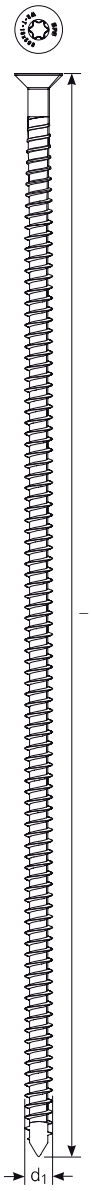
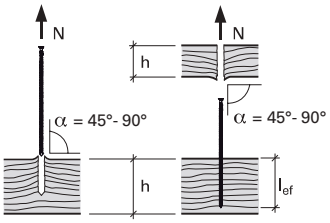
Load-bearing capacity values WR-T ETA-12/0062



Calculation values for the characteristic bulk density values Table 1

Solid timber, cross-laminated timber C	24	30			
Glulam timber GL	24c	28c / 24h	32c / 28h	36c / 32h	36h
Gross density ρ_k [kg/m³]	**350**	**380**	**410**	**430**	**450**

Pull-out resistance from 45° to 90° in dependancy of wood density Table 2



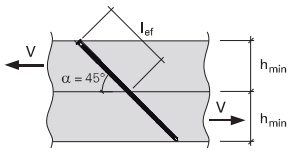
$$F_{N,Rd} = \min\left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}};\ \frac{F_{2,Rk}}{\gamma_{M2}}\right)$$

$\gamma_{M1} = 1{,}3$ $\gamma_{M2} = 1{,}3$
γ_{M1} (GL) = 1,25

	Gross density ρ_k [kg/m³]				**350**	**380**	**410**	**430**	**450**
WR-T-9xL [mm]	250	l_{ef} [mm]	125	Pull-out resistance from timber $F_{1,Rk}$ [kN]	14,4	15,4	16,3	17,0	17,6
	300		150		17,3	18,5	19,6	20,4	21,1
	350		175		20,2	21,5	22,9	23,8	24,6
	400		200		23,0	24,6	26,1	27,2	28,2
	450		225		25,9	27,7	29,4	30,6	31,7
	500		250		28,8	30,8	32,7	34,0	35,2
	Tensile failure of fastener $F_{2,Rk}$ [kN]				35,9				

	Gross density ρ_k [kg/m³]				**350**	**380**	**410**	**430**	**450**
WR-T-13xL [mm]	400	l_{ef} [mm]	200	Pull-out resistance from timber $F_{1,Rk}$ [kN]	33,5	35,8	38,1	39,5	41,0
	500		250		41,9	44,8	47,6	49,4	51,3
	600		300		50,3	53,7	57,1	59,3	61,5
	700		350		58,7	62,7	66,6	69,2	71,8
	800		400		67,1	71,6	76,1	79,1	82,0
	900		450		75,5	80,6	85,6	89,0	92,3
	1000		500		83,9	89,6	95,2	98,9	102,5
	Tensile failure of fastener $F_{2,Rk}$ [kN]				58,4				

Shearing connection, half thread length per structural component Table 3



NB: if fasteners are inserted at an angle from one side, forces can only be absorbed from **one** side (cf. sketch)

$$F_{v,Rd} = \min\left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}};\ \frac{F_{2,Rk}}{\gamma_{M2}}\right)$$

$\gamma_{M1} = 1{,}3$ $\gamma_{M2} = 1{,}3$
γ_{M1} (GL) = 1,25

	Gross density ρ_k [kg/m³]					**350**	**380**	**410**	**430**	**450**
WR-T-9xL [mm]	250	l_{ef} [mm]	125	h_{min} [mm]	95	10,2	10,9	11,6	12,0	12,4
	300		150		113	12,2	13,0	13,9	14,4	14,9
	350		175		131	14,3	15,2	16,2	16,8	17,4
	400		200		148	16,3	17,4	18,5	19,2	19,9
	450		225		166	18,3	19,6	20,8	21,6	22,4
	500		250		184	20,4	21,7	23,1	24,0	24,9
	Tensile failure of fastener $F_{2,Rk}$ [kN]					25,4				

	Gross density ρ_k [kg/m³]					**350**	**380**	**410**	**430**	**450**
WR-T-13xL [mm]	400	l_{ef} [mm]	200	h_{min} [mm]	152	23,7	25,3	26,9	28,0	29,0
	500		250		188	29,6	31,7	33,6	35,0	36,2
	600		300		223	35,6	38,0	40,4	41,9	43,5
	700		350		258	41,5	44,3	47,1	48,9	50,7
	800		400		294	47,4	50,7	53,8	55,9	58,0
	900		450		329	53,4	57,0	60,6	62,9	65,2
	1000		500		365	59,3	63,3	67,3	69,9	72,5
	Tensile failure of fastener $F_{2,Rk}$ [kN]					41,3				

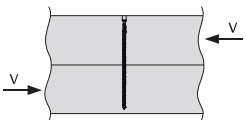
Remarks **l_{ef} = actual thread length in structural component** **h_{min} = minimum height of structural component**

- Values apply to connections where half of each fastener is in each structural component.
- Connection geometry as shown in the drawings must be complied with.
- Calculation of design values as shown in the box to the left of the tables.
- **All calculations must be verified and signed off by the planner in charge before the work is performed.**

Load-bearing capacity values WR-T ETA-12/0062

Shearing joint, half thread length per structural component

Table 4



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

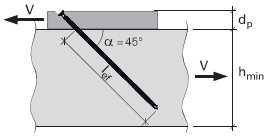
$\gamma_M = 1,3$ γ_M (GL) = 1,25

Gross density ρ_k [kg/m³]		350	380	410	430	450
WR-T-9	Shearing $F_{V,Rk}$ [kN]	4,9	5,1	5,3	5,4	5,5
WR-T-13		12,1	12,6	13,1	13,4	13,7

Force-grain angle: α = 90°

Shearing connection with steel plate

Table 5



Insertion depth:
the entire surface of the head must rest in the borehole in the steel plate

$$F_{v,Rd} = \min \left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}} ; \frac{F_{2,Rk}}{\gamma_{M2}} \right)$$

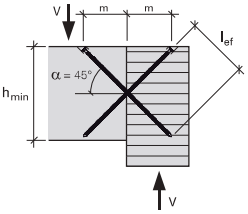
$\gamma_{M1} = 1,3$ $\gamma_{M2} = 1,3$
γ_{M1} (GL) = 1,25

							Gross density ρ_k [kg/m³]	350	380	410	430	450
WR-T-13xL [mm]	400	l_{ef} [mm]	380	h_{min} [mm]	280	Pull-out resistance from timber $F_{1,Rk}$ [kN]		45,1	48,1	51,1	53,1	55,1
	500		480		350			56,9	60,8	64,6	67,1	69,6
	600		580		420			68,8	73,5	78,1	81,1	84,1
	700		680		490			80,6	86,1	91,5	95,1	98,6
	800		780		570			92,5	98,8	105,0	109,1	113,1
	900		880		640			104,4	111,4	118,4	123,0	127,6
	1000		980		710			116,2	124,1	131,9	137,0	142,1
							Tensile failure of fastener $F_{2,Rk}$ [kN]	41,3				

d_p = steel plate thickness (net cross-section ≥ 5 mm) – without precise verification
NB: steel/timber connections should only be planned and carried out by skilled specialist firms!

Joining main/secondary purlins

Table 6



$$F_{v,Rd} = \min \left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}} ; \frac{F_{2,Rk}}{\gamma_{M2}} \right)$$

$\gamma_{M1} = 1,3$ $\gamma_{M2} = 1,1$
γ_{M1} (GL) = 1,25

								Gross density ρ_k [kg/m³]	350	380	410	430	450
WR-T-9xL [mm]	250	l_{ef} [mm]	105	h_{min} [mm]	191	m [mm]	95	Pull-out resistance from timber $F_{1,Rk}$ [kN]	17,1	18,3	19,4	20,2	20,9
	300		130		226		113		21,2	22,6	24,0	25,0	25,9
	350		155		261		131		25,3	27,0	28,7	29,8	30,9
	400		180		297		148		29,3	31,3	33,3	34,6	35,9
	450		205		332		166		33,4	35,7	37,9	39,4	40,8
	500		230		368		184		37,5	40,0	42,5	44,2	45,8
								Buckling of fastener $F_{2,Rk}$ [kN]	20,2	20,7	21,1	21,3	21,5

								Gross density ρ_k [kg/m³]	350	380	410	430	450
WR-T-13xL [mm]	400	l_{ef} [mm]	180	h_{min} [mm]	297	m [mm]	148	Pull-out resistance from timber $F_{1,Rk}$ [kN]	42,7	45,6	48,4	50,3	52,2
	500		230		368		184		54,5	58,3	61,9	64,3	66,7
	600		280		438		219		66,4	70,9	75,4	78,3	81,2
	700		330		509		254		78,3	83,6	88,8	92,3	95,7
	800		380		580		290		90,1	96,3	102,3	106,3	110,2
	900		430		650		325		102,0	108,9	115,7	120,2	124,7
	1000		480		721		361		113,8	121,6	129,2	134,2	139,2
								Buckling of fastener $F_{2,Rk}$ [kN]	44,5	45,3	46,1	46,6	47,0

The main purlin must have an adequate trunnion bearing and be torsional load-bearing.
Transverse tensile stress must be verified separately.

Remarks

l_{ef} = actual thread length in structural component **h_{min} = minimum height of structural component**

- Values $F_{1,Rk}$ apply to the relevant anchoring length l_{ef} of the thread.
- Connection geometry as shown in the drawings must be complied with.
- Calculation of design values as shown in the box to the left of the tables.
- **All calculations must be verified and signed off by the planner in charge before the work is performed.**

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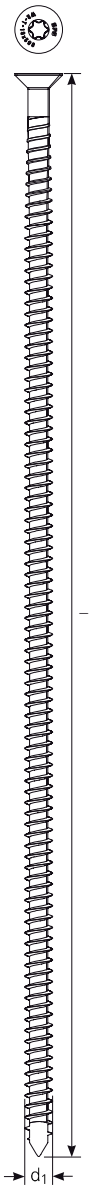
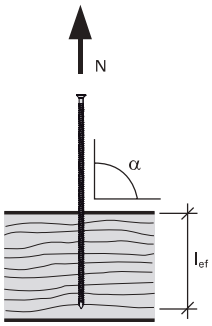
Load-bearing capacity values WR-T ETA-12/0062

Axial load-bearing capacity (tensile/compression)

Table 7





Strength class C 24, GL 24c — Gross density ρ_k = **350** kg/m³

		Grain angle α [°]	0°	15°	30°	45°	60°	75°	90°
WR-T-9	l_{ef} [mm]	50	1,7	3,1	4,4	5,8			
		100	3,5	6,1	8,8	11,5			
		150	5,2	9,2	13,2	17,3			
		200	6,9	12,3	17,7	23,0			
		250	8,6	15,4	22,1	28,8			
		300	10,4	18,4	26,5	34,6			
		350	12,1	21,5	30,9	40,3			
		400	13,8	24,6	35,3	46,1			
		450	15,6	27,6	39,7	51,8			
		500	17,3	30,7	44,2	57,6			
	Pull-out resistance from timber $F_{1,Rk}$ [kN]								
	Tensile failure of fastener $F_{2,Rk}$ [kN]		35,9						
	Buckling of fastener $F_{3,Rk}$ [kN]		12,8	13,4	13,9	14,3	14,7	15,0	15,4

		Grain angle α [°]	0°	15°	30°	45°	60°	75°	90°
WR-T-13	l_{ef} [mm]	100	5,0	8,9	12,9	16,8			
		200	10,1	17,9	25,7	33,5			
		300	15,1	26,8	38,6	50,3			
		400	20,1	35,8	51,4	67,1			
		500	25,2	44,7	64,3	83,9			
		600	30,2	53,7	77,1	100,6			
		700	35,2	62,6	90,0	117,4			
		800	40,2	71,6	102,9	134,2			
		900	45,3	80,5	115,7	150,9			
		1000	50,3	89,4	128,6	167,7			
	Pull-out resistance from timber $F_{1,Rk}$ [kN]								
	Tensile failure of fastener $F_{2,Rk}$ [kN]		58,4						
	Buckling of fastener $F_{3,Rk}$ [kN]		28,4	29,6	30,6	31,4	32,2	32,9	33,5

Strength class C 30, GL 24h, GL 28c — Gross density ρ_k = **380** kg/m³

		Grain angle α [°]	0°	15°	30°	45°	60°	75°	90°
WR-T-9	l_{ef} [mm]	50	1,8	3,3	4,7	6,2			
		100	3,7	6,6	9,4	12,3			
		150	5,5	9,8	14,1	18,5			
		200	7,4	13,1	18,9	24,6			
		250	9,2	16,4	23,6	30,8			
		300	11,1	19,7	28,3	36,9			
		350	12,9	23,0	33,0	43,1			
		400	14,8	26,2	37,7	49,2			
		450	16,6	29,5	42,4	55,4			
		500	18,5	32,8	47,2	61,5			
	Pull-out resistance from timber $F_{1,Rk}$ [kN]								
	Tensile failure of fastener $F_{2,Rk}$ [kN]		35,9						
	Buckling of fastener $F_{3,Rk}$ [kN]		13,1	13,7	14,2	14,6	15,0	15,3	15,7

		Grain angle α [°]	0°	15°	30°	45°	60°	75°	90°
WR-T-13	l_{ef} [mm]	100	5,4	9,6	13,7	17,9			
		200	10,7	19,1	27,5	35,8			
		300	16,1	28,7	41,2	53,7			
		400	21,5	38,2	54,9	71,6			
		500	26,9	47,8	68,7	89,6			
		600	32,2	57,3	82,4	107,5			
		700	37,6	66,9	96,1	125,4			
		800	43,0	76,4	109,9	143,3			
		900	48,4	86,0	123,6	161,2			
		1000	53,7	95,5	137,3	179,1			
	Pull-out resistance from timber $F_{1,Rk}$ [kN]								
	Tensile failure of fastener $F_{2,Rk}$ [kN]		58,4						
	Buckling of fastener $F_{3,Rk}$ [kN]		29,0	30,2	31,2	32,0	32,8	33,5	34,1

Tensile load-bearing strength:

$$F_{ax,Rd} = \min\left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}};\ \frac{F_{2,Rk}}{\gamma_{M2}}\right)$$

Compression load-bearing strength:

$$F_{ax,Rd} = \min\left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}};\ \frac{F_{3,Rk}}{\gamma_{M3}}\right)$$

$\gamma_{M1} = 1,3$ $\gamma_{M2} = 1,3$
$\gamma_{M3} = 1,1$
γ_{M1} (GL) = 1,25

Remarks

- Values $F_{1,Rk}$ apply to the relevant anchoring length l_{ef} of the thread.
- Intermediate values for grain angle and anchoring length of the thread can be interpolated linearly.
- Calculation of design values as shown in the box to the left of the tables.
- **All calculations must be verified and signed off by the planner in charge before the work is performed.**

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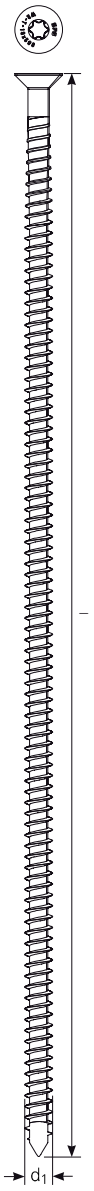


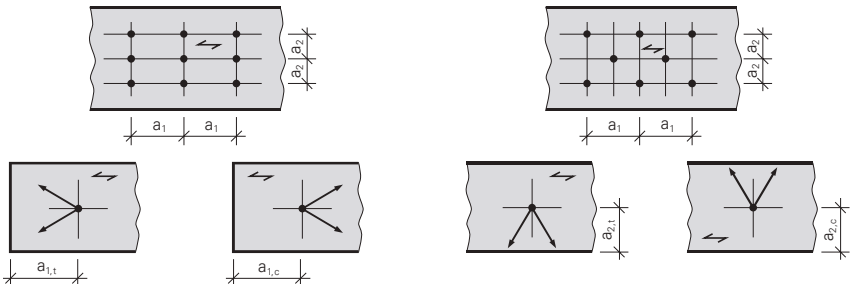
Load-bearing capacity values WR-T ETA-12/0062

Edge and intermediate spacings

Table 8

			Axial		Shearing				
			d_1	mm			0°	45°	90°
WR-T-9xL	parallel with grain	a_1	5	45	$(4+\cos\alpha) \times d$		45	42	36
	at right angles to grain	a_2	5	45	$4 \times d$		36	36	36
	end grain under load	$a_{1,t}$			80 mm		80	80	80
	end grain not under load	$a_{1,c}$	5	45	$0° \le \alpha \le 30°$	$4 \times d$	36	-	-
					$30° < \alpha \le 90°$	$(1+6\sin\alpha) \times d$	-	47	63
	edge under load	$a_{2,t}$			max. $[(2+2\sin\alpha) \times d; 3d]$		27	31	36
	edge not under load	$a_{2,c}$	3	**27**	$3 \times d$		27	27	27
WR-T-13xL	parallel with grain	a_1	5	65	$(4+\cos\alpha) \times d$		65	61	52
	at right angles to grain	a_2	5	65	$4 \times d$		52	52	52
	end grain under load	$a_{1,t}$			$7 \times d$		91	91	91
	end grain not under load	$a_{1,c}$	5	65	$0° \le \alpha \le 30°$	$4 \times d$	52	-	-
					$30° < \alpha \le 90°$	$(1+6\sin\alpha) \times d$	-	68	91
	edge under load	$a_{2,t}$			max. $[(2+2\sin\alpha) \times d; 3d]$		39	44	52
	edge not under load	$a_{2,c}$	3	**39**	$3 \times d$		39	39	39

α = force-grain angle / values in mm

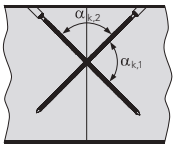


Intermediate spacings with crossed pairs of fasteners

Table 9

			$\alpha_{k,i}$ = Angle of intersection ($0° \le \alpha_{k,i} \le 90°$)						
			90°	75°	60°	45°	30°	15°	0°
WR-T-9xL	parallel with grain	a_1	23	26	30	34	38	41	45
	at right angles to grain	a_2	23	26	30	34	38	41	45
WR-T-13xL	parallel with grain	a_1	33	38	43	49	54	60	65
	at right angles to grain	a_2	33	38	43	49	54	60	65

Values not stated here can be found in Table 8, values in mm



Remarks

Pilot drilling diameter: **WR-T-9 = 5 mm**
WR-T-13 = 8 mm

– Required minimum timber thicknesses must be taken into account.
– **All calculations must be verified and signed off by the planner in charge before the work is performed.**

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WR fastening system

A comprehensive range offering high value for joints and reinforcements

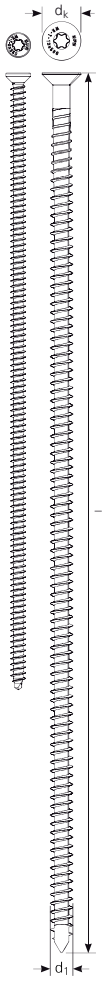
Fastener range

WR-T-9 x L

Material:	carbon steel
Surface finish:	Durocoat
Thread Dia.:	9 mm
Point:	drilling point
Drive:	T40

WR-T-13 x L

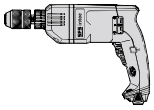
Material:	carbon steel
Surface finish:	Durocoat
Thread Dia.:	13 mm
Point:	half-point
Drive:	T50



WR-T-9 x L / WR-T-13 x L fastener range

Type	Material T = carbon steel	Diameter d_1 [mm]	Length [mm]	d_k [mm]	Bit
WR -	T	- 9	x 250	14	T40
WR -	T	- 9	x 300	14	T40
WR -	T	- 9	x 350	14	T40
WR -	T	- 9	x 400	14	T40
WR -	T	- 9	x 450	14	T40
WR -	T	- 9	x 500	14	T40
WR -	T	- 13	x 400	22	T50
WR -	T	- 13	x 500	22	T50
WR -	T	- 13	x 600	22	T50
WR -	T	- 13	x 700	22	T50
WR -	T	- 13	x 800	22	T50
WR -	T	- 13	x 900	22	T50
WR -	T	- 13	x 1000	22	T50

Setting tools and accessories

Fastener	Tools	Accessories
WR-T-9 x L	**BO 1055** power drill 	Bit T40, length 25, 35, 70 mm
WR-T-13 x L	Recommended tools (not included in range) Milwaukee **B4-32** BOSCH **GBM 23-2/32-4** Protool **DRP 32-4**	Bit T50, length 36 mm length 50 mm with recessed square socket 1/2" Adapter ZA 1/2" - MK3

Principles of calculation

Detailed planning documentation catering for a very wide range of applications ensures easy, reliable calculation. For special applications our structural timberwork consultants will be pleased to assist you in selecting the most efficient and cost-effective fastening method.

More information

If you have any questions about fastening technology, just call us. We'll be pleased to advise you

In the event that any differences exist between the original German data sheet text and versions translated into other languages, the original German text is the only valid version.

All calculations must be verified and signed off by the planner in charge before the work is performed. The user is responsible for compliance with the statutory provisions.

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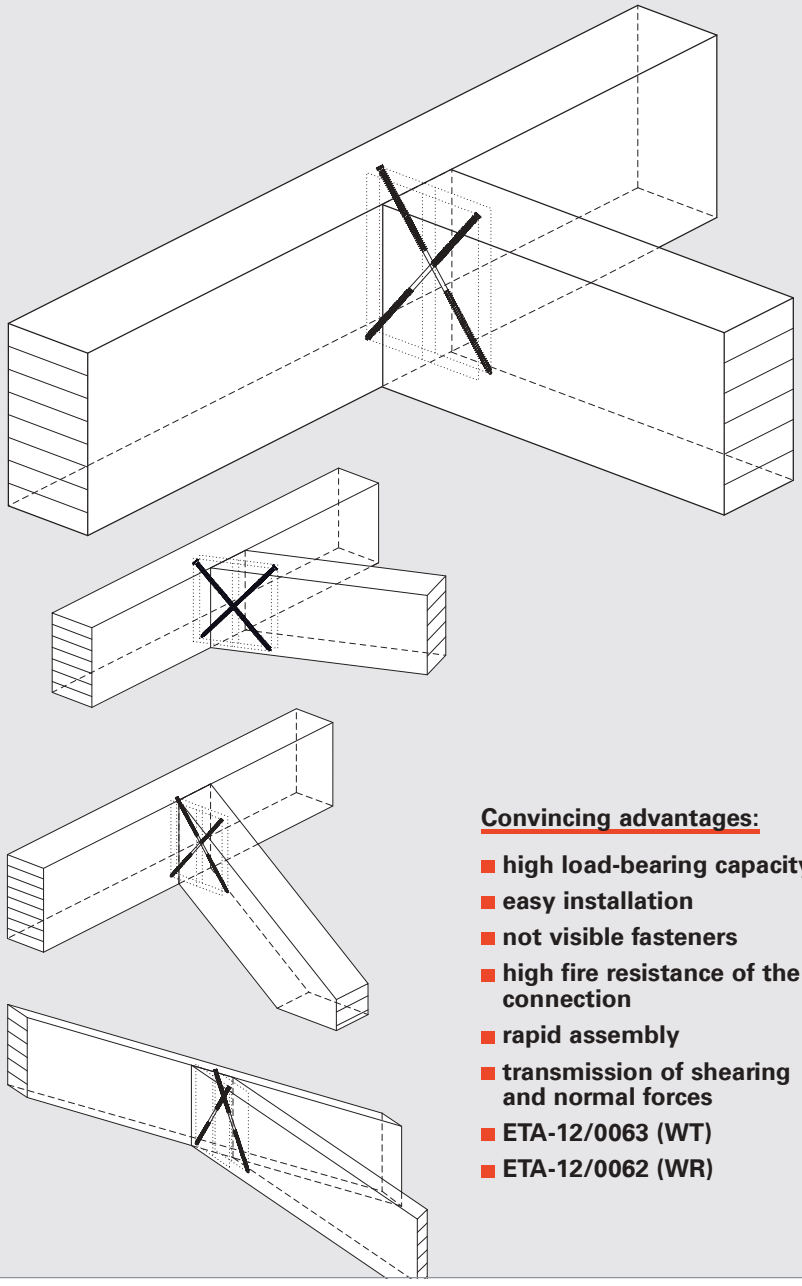
EN 1995-1-1

Connecting main and secondary timber beams

WT
WR

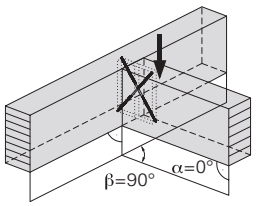
Data sheet
No. 02 3.05



Convincing advantages:

- high load-bearing capacity
- easy installation
- not visible fasteners
- high fire resistance of the connection
- rapid assembly
- transmission of shearing and normal forces
- ETA-12/0063 (WT)
- ETA-12/0062 (WR)

Right-angle connection



Characteristic gross density for calculations

Solid timber, cross-lamiated timber	C	24	30
Glulam timber	GL	24c	28c / 24h
Gross density ρ_k [kg/m³]		**350**	**380**

System WT	Fastener length [mm]	Minimum dimensions [mm] b_{HT}	Minimum dimensions [mm] $h_{HT} = h_{NT}$	Installation dim. [mm] m	b_{NT} [mm]* 1 pair	2 pairs	3 pairs		1 pair 350	1 pair 380	2 pairs 350	2 pairs 380	3 pairs 350	3 pairs 380
									Gross density ρ_k [kg/m³]					
WT-S/T-6,5 x L	130	60	110	55	40	80	110		5,9	6,3	11,0	11,8	15,9	17,0
WT-T-6,5 x L	160	70	130	65	40	80	110	$F_{1,Rk}$ [kN]	7,1	7,6	13,2	14,1	19,1	20,4
	190	80	150	75	40	80	110		8,9	9,5	16,6	17,7	23,8	25,5
	220	90	170	85	40	80	110		10,6	11,4	19,9	21,2	28,6	30,6
								$F_{2,Rk\,(6,5)}$	9,7	9,9	19,3	19,7	29,0	29,6
WT-T-8,2 x L	160	70	130	65	60	100	140		9,3	9,9	17,3	18,5	24,9	26,6
	190	80	150	75	60	100	140		11,6	12,4	21,6	23,1	31,1	33,2
	220	90	170	85	60	100	140		13,9	14,8	25,9	27,7	37,4	39,9
	245	100	190	95	60	100	140	$F_{1,Rk}$ [kN]	15,8	16,8	29,4	31,4	42,4	45,2
	275	110	210	105	60	100	140		18,1	19,3	33,7	36,0	48,6	51,9
	300	120	230	115	60	100	140		20,1	21,5	37,5	40,0	54,0	57,7
	330	130	250	125	60	100	140		20,1	21,5	37,5	40,0	54,0	57,7
								$F_{2,Rk\,(8,2)}$	16,8	17,1	33,6	34,2	50,3	51,3

* Figures are rounded

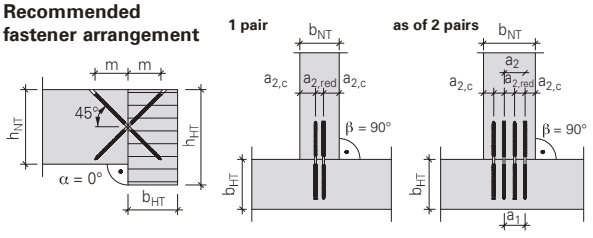
$F_{1,Rk}$ [kN] = Pull-out resistance from timber
$F_{2,Rk\,(Ø)}$ [kN] = Buckling values of the fastener

System WR	Fastener length [mm]	Minimum dimensions [mm] b_{HT}	Minimum dimensions [mm] $h_{HT} = h_{NT}$	Installation dim. [mm] m	b_{NT} [mm]* 1 pair	2 pairs	3 pairs		1 pair 350	1 pair 380	2 pairs 350	2 pairs 380	3 pairs 350	3 pairs 380
									Gross density ρ_k [kg/m³]					
WR-T-9,0 x L	250	100	191	95	70	115	160		17,1	18,3	31,9	34,1	46,0	49,1
	300	118	226	113	70	115	160		21,2	22,6	39,5	42,2	56,9	60,8
	350	136	261	131	70	115	160		25,3	27,0	47,1	50,3	67,9	72,5
	400	153	297	148	70	115	160	$F_{1,Rk}$ [kN]	29,3	31,3	54,7	58,4	78,8	84,2
	450	171	332	166	70	115	160		33,4	35,7	62,3	66,6	89,8	95,9
	500	189	368	184	70	115	160		37,5	40,0	69,9	74,7	100,7	107,6
								$F_{2,Rk(9,0)}$	20,2	20,7	40,5	41,3	60,7	62,0
WR-T-13,0 x L	400	153	297	148	100	165	230		42,7	45,6	79,7	85,1	114,7	122,5
	500	189	368	184	100	165	230		54,5	58,3	101,8	108,7	146,6	156,6
	600	224	438	219	100	165	230		66,4	70,9	123,9	132,3	178,5	190,6
	700	259	509	254	100	165	230	$F_{1,Rk}$ [kN]	78,3	83,6	146,0	156,0	210,4	224,7
	800	295	580	290	100	165	230		90,1	96,3	168,2	179,6	242,2	258,7
	900	330	650	325	100	165	230		102,0	108,9	190,3	203,2	274,1	292,8
	1000	366	721	361	100	165	230		113,8	121,6	212,4	226,9	306,0	326,8
								$F_{2,Rk\,(13,0)}$	44,5	45,3	88,9	90,6	133,4	136,0

* Figures are rounded

$F_{1,Rk}$ [kN] = Pull-out resistance from timber
$F_{2,Rk\,(Ø)}$ [kN] = Buckling values of the fastener

Recommended fastener arrangement



Minimum spacing

Spacing [mm]	WT-S/T-6,5 x L	WT-T-8,2 x L	WR-T-9 x L	WR-T-13 x L
a_1	33	40	45	65
a_2	33	40	45	65
$a_{2,c}$	15	24	27	39
$a_{2,red*}$	10	12	-	-

* only possible if $a_1 \geq 10 \cdot d_1$

General remarks

- Design values are calculated as shown in the adjoining box.
- Characteristic load-bearing capacity $F_{v,Rk}$ is applicable to C24 and C30 or GL24c, GL24h and GL28c.
- load bearing capacity $F_{v,Rk}$ can be increased by the factor f = (existing ρk / ρk of the choosen material)^{0,8} ≤ 1,40 for higher strength class.
- Half of each fastener must be in each structural component.
- Lateral tensile force must be demonstrated separately.
- The main beam must have adequate fork support and be able to withstand torsion.
- The load-bearing values stated apply only to vertical shearing force (cf. drawing at top right on this page); load-bearing capacities of the connection differ for stresses in other directions.

$$F_{v,Rd} = \min\left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}};\ \frac{F_{2,Rk}}{\gamma_{M2}}\right)$$

$\gamma_{M1} = 1,3$ $\gamma_{M2} = 1,1$
γ_{M1} (GL) = 1,25

All calculations must be verified and signed off by the planner in charge before the work is performed.

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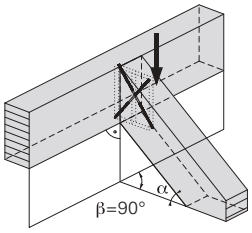
Inclined connection in the vertical plane



Characteristic gross density for calculations

Solid timber, cross-lamiated timber	C	24	30
Glulam timber	GL	24c	28c / 24h
Gross density ρ_k [kg/m³]		**350**	**380**

System WT	Fastener length [mm]	Minimum dimensions [mm] h_{HT}	b_{HT}	h_{NT}	b_{NT}	Installation dim. [mm] m_{HT}	m_{NT}	Angle of incline, secondary beam α [°]	Gross density ρ_k [kg/m³] 350	380	350	380	350	380	350	380	350	380
									10°		20°		30°		40°		45°	
WT-S/T-6,5 x L	130	(L + 20) · 0,707 + m_{NT} · tan(α)	60	(L + 20) · 0,707 · cos(α) + $a_{2,c}$	40	m_{NT} · (1 + tan(α))	55	$F_{1,Rk}$ (α) [kN]	5,0	5,3	4,1	4,3	3,1	3,4	2,2	2,4	1,8	1,9
WT-T-6,5 x L	160		70		40		65		6,0	6,4	4,9	5,2	3,8	4,0	2,7	2,9	2,1	2,3
	190		80		40		75		7,5	8,0	6,1	6,5	4,7	5,1	3,4	3,6	2,7	2,8
	220		90		40		85		9,0	9,6	7,3	7,8	5,7	6,1	4,0	4,3	3,2	3,4
								$F_{2,Rk}$ (6,5)	9,5	9,7	9,3	9,5	9,0	9,2	8,8	9,0	8,6	8,8
WT-T-8,2 x L	160		70		60		65	$F_{1,Rk}$ (α) [kN]	7,8	8,3	6,4	6,8	4,9	5,3	3,5	3,7	2,8	3,0
	190		80		60		75		9,8	10,4	8,0	8,5	6,2	6,6	4,4	4,7	3,5	3,7
	220		90		60		85		11,7	12,5	9,6	10,2	7,4	7,9	5,3	5,6	4,2	4,5
	245		100		60		95		13,3	14,2	10,9	11,6	8,4	9,0	6,0	6,4	4,7	5,0
	275		110		60		105		15,3	16,3	12,5	13,3	9,6	10,3	6,8	7,3	5,4	5,8
	300		120		60		115		17,0	18,1	13,8	14,8	10,7	11,4	7,6	8,1	6,0	6,4
	330		130		60		125		17,0	18,1	13,8	14,8	10,7	11,4	7,6	8,1	6,0	6,4
								$F_{2,Rk(8,2)}$	16,5	16,8	16,1	16,5	15,8	16,1	15,4	15,7	15,2	15,5

α = Angle of incline, secondary beam

$F_{1,Rk}$ (α) [kN] = Pull-out resistance from timber
$F_{2,Rk}$ (Ø) [kN] = Buckling values of the fastener

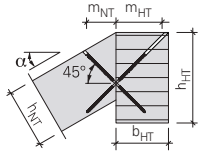
System WR	Fastener length [mm]	Minimum dimensions [mm] h_{HT}	b_{HT}	h_{NT}	b_{NT}	Installation dim. [mm] m_{HT}	m_{NT}	Angle of incline, secondary beam α [°]	Gross density ρ_k [kg/m³] 350	380	350	380	350	380	350	380	350	380
									10°		20°		30°		40°		45°	
WR-T-9,0 x L	250	(L + 20) · 0,707 + m_{NT} · tan(α)	100	(L + 20) · 0,707 · cos(α) + $a_{2,c}$	70	m_{NT} · (1 + tan(α))	95	$F_{1,Rk}$ (α) [kN]	14,4	15,4	11,8	12,6	9,1	9,7	6,5	6,9	5,1	5,5
	300		118		70		113		17,9	19,1	14,6	15,6	11,3	12,1	8,0	8,5	6,4	6,8
	350		136		70		131		21,3	22,8	17,4	18,6	13,5	14,4	9,5	10,2	7,6	8,1
	400		153		70		148		24,8	26,4	20,2	21,6	15,6	16,7	11,1	11,8	8,8	9,4
	450		171		70		166		28,2	30,1	23,0	24,6	17,8	19,0	12,6	13,5	10,0	10,7
	500		189		70		184		31,6	33,8	25,8	27,6	20,0	21,3	14,2	15,1	11,2	12,0
								$F_{2,Rk}$ (9,0)	20,6	20,3	20,1	19,8	19,7	19,3	19,1	18,8	18,8	18,5
WR-T-13,0 x L	400		153		100		148	$F_{1,Rk}$ (α) [kN]	36,0	38,5	29,4	31,4	22,8	24,3	16,1	17,2	12,8	13,7
	500		189		100		184		46,1	49,2	37,6	40,1	29,1	31,1	20,6	22,0	16,4	17,5
	600		224		100		219		56,1	59,9	45,7	48,9	35,4	37,8	25,1	26,8	19,9	21,3
	700		259		100		254		66,1	70,6	53,9	57,6	41,7	44,6	29,6	31,6	23,5	25,1
	800		295		100		290		76,1	81,3	62,1	66,3	48,1	51,3	34,0	36,4	27,0	28,9
	900		330		100		325		86,1	92,0	70,3	75,0	54,4	58,1	38,5	41,1	30,6	32,7
	1000		366		100		361		96,1	102,7	78,4	83,8	60,7	64,8	43,0	45,9	34,2	36,5
								$F_{2,Rk}$ (13,0)	43,7	44,5	42,8	43,7	41,8	42,7	40,7	41,6	40,2	41,0

α = Angle of incline, secondary beam

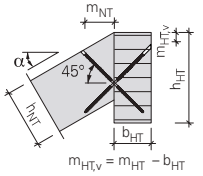
$F_{1,Rk}$ (α) [kN] = Pull-out resistance from timber
$F_{2,Rk}$ (Ø) [kN] = Buckling values of the fastener

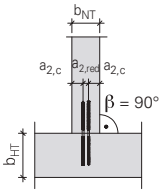
Recommended fastener arrangement

Figur 1: $m_{HT} < b_{HT}$



Figur 2: $m_{HT} > b_{HT}$





Minimum spacing

Spacing [mm]	WT-S/T-6,5 x L	WT-T-8,2 x L	WR-T-9 x L	WR-T-13 x L
a_1	33	40	45	65
a_2	33	40	45	65
$a_{2,c}$	15	24	27	39
$a_{2,red*}$	10	12	-	-

* only possible if $a_1 \geq 10 \cdot d_1$

General remarks

- Design values are calculated as shown in the adjoining box.
- Half of each fastener must be in each structural component.
- Values shown in the table are for one pair of fasteners. For multiple pairs, the table values $F_{1,Rk}$ (α) must be multiplied by the factor n_{ef} = (the number of pairs)^0,9 and table value $F_{2,Rk}$ must be multiplied by the number of pairs.
- The minimum heights of the main and secondary beams depend on angle of incline α of the secondary beam and must be defined in each case.
- Appropriate action must be taken to ensure adherence to the insertion angle (assembly angle) and the connection geometry.
- In the case of intermediate values of angle of incline α of the secondary beam, linear interpolations may be made.
- The main beam must have adequate fork support and be able to withstand torsion.

$$F_{v,Rd} = \min\left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}};\ \frac{F_{2,Rk}}{\gamma_{M2}}\right)$$

$\gamma_{M1} = 1,3$ $\gamma_{M2} = 1,1$
γ_{M1} (GL) = 1,25

All calculations must be verified and signed off by the planner in charge before the work is performed.

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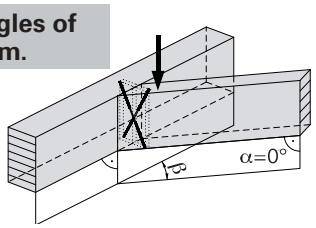
Inclined connection in the horizontal plane for connection angles of 30°– 75°. Fastener arrangement at right angles to the main beam.



Characteristic gross density for calculations

Solid timber, cross-lamiated timber	C	24	30
Glulam timber	GL	24c	28c / 24h
Gross density ρ_k [kg/m³]		**350**	**380**

System WT	Fastener length [mm]	Minimum dimensions [mm] b_{HT}	b_{NT}	$h_{HT} = h_{NT}$	Installation dim. [mm] m	Angle of incline, secondary beam β [°]	Gross density ρ_k [kg/m³] 350 30°	45°	60°	75°	380 30°	45°	60°	75°
WT-S/T-6,5xL	130	60	$(a_{2,c} + a_{2,red}) \cdot \sin(\beta) + m \cdot \cos(\beta)$	110	55	$F_{1,Rk}(\beta)$ [kN]	5,9				6,3			
WT-T-6,5xL	160	70		130	65		7,1				7,6			
	190	80		150	75		8,9				9,5			
	220	90		170	85		10,6				11,4			
						$F_{2,Rk(6,5)}$	10,1	9,9	9,8	9,7	10,3	10,1	10,0	9,9
WT-T- 8,2xL	160	70		130	65	$F_{1,Rk}(\beta)$ [kN]	9,3				9,9			
	190	80		150	75		11,6				12,4			
	220	90		170	85		13,6				14,8			
	245	100		190	95		15,8				16,8			
	275	110		210	105		18,1				19,3			
	300	120		230	115		20,1				21,5			
	330	130		250	125		20,1				21,5			
						$F_{2,Rk(8,2)}$	17,4	17,2	17,0	16,8	17,7	17,5	17,3	17,2

β = angle of incline of the secundary purlin

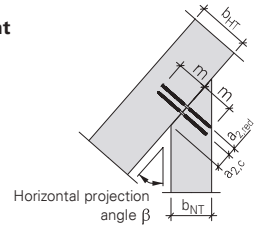
$F_{1,Rk}$ [kN] = Pull-out resistance from timber
$F_{2,Rk(Ø)}$ [kN] = Buckling values of the fastener

System WR	Fastener length [mm]	Minimum dimensions [mm] b_{HT}	b_{NT}	$h_{HT} = h_{NT}$	Installation dim. [mm] m	Angle of incline, secondary beam β [°]	Gross density ρ_k [kg/m³] 350 30°	45°	60°	75°	380 30°	45°	60°	75°
WR-T-9,0xL	250	100	$(a_{2,c} + a_{2,red}) \cdot \sin(\beta) + m \cdot \cos(\beta)$	191	95	$F_{1,Rk}(\beta)$ [kN]	17,1				18,3			
	300	118		226	113		21,2				22,6			
	350	136		261	131		25,3				27,0			
	400	153		297	148		29,3				31,3			
	450	171		332	166		33,4				35,7			
	500	189		368	184		37,5				40,0			
						$F_{2,Rk(6,5)}$	21,1	20,8	20,5	20,3	21,5	21,2	20,9	20,7
WR-T-13,0xL	400	153		297	148	$F_{1,Rk}(\beta)$ [kN]	42,7				45,6			
	500	189		368	184		54,5				58,3			
	600	224		438	219		66,4				70,9			
	700	259		509	254		78,3				83,6			
	800	295		580	290		90,1				96,3			
	900	330		650	325		102,0				108,9			
	1000	366		721	361		113,8				121,6			
						$F_{2,Rk(8,2)}$	46,2	45,6	45,0	44,6	47,0	46,4	45,8	45,5

β = angle of incline of the secundary purlin

$F_{1,Rk}$ [kN] = Pull-out resistance from timber
$F_{2,Rk(Ø)}$ [kN] = Buckling values of the fastener

Recommended fastener arrangement



Minimum spacing

Spacing [mm]	WT-S/T-6,5 x L	WT-T-8,2 x L	WR-T-9 x L	WR-T-13 x L
a_1	33	40	45	65
a_2	33	40	45	65
$a_{2,c}$	15	24	27	39
$a_{2,red*}$	10	12	-	-

* only possible if $a_1 \geq 10 \cdot d_1$

Supplementary remarks

- The main beam must have adequate fork support and be able to withstand torsion.
- Values shown in the table are for one pair of fasteners. For multiple pairs, the table values $F_{1,Rk}$ (α) must be multiplied by the factor n_{ef} = (the number of pairs)^0,9 and table value $F_{2,Rk}$ must be multiplied by the number of pairs.
- The minimum width of the secondary purlin depends on horizontal projection angle β and must be defined in each case.
- Appropriate action must be taken to ensure adherence to the insertion angle (assembly angle) and the connection geometry.
- In the case of intermediate values of horizontal projection angle β, linear interpolations may be made.
- Load-bearing values are applicable to the total effective length of each thread section.

$$F_{v,Rd} = \min\left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}}; \frac{F_{2,Rk}}{\gamma_{M2}}\right)$$

$\gamma_{M1} = 1,3$ $\gamma_{M2} = 1,1$
γ_{M1} (GL) = 1,25

All calculations must be verified and signed off by the planner in charge before the work is performed.

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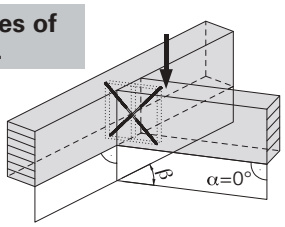
Inclined connection in the horizontal plane for connection angles of 30°– 75°. Fastener arrangement parallel to the secondary beam.



Characteristic gross density for calculations

Solid timber, cross-lamiated timber	C	24	30
Glulam timber	GL	24c	28c / 24h
Gross density ρ_k [kg/m³]		**350**	**380**

System WT	Fastener length [mm]	Minimum dimensions [mm] b_{NT}	b_{HT}	$h_{HT} = h_{NT}$	Installation dim. [mm] m	Angle of incline, secondary beam β [°]	Gross density ρ_k [kg/m³] 350 30°	45°	60°	75°	380 30°	45°	60°	75°
WT-S/T-6,5xL	130	40	m · sin(β)	110	55	$F_{1,Rk}$ (β) [kN]	5,9				6,3			
WT-T-6,5xL	160	40		130	65		7,1				7,6			
	190	40		150	75		8,9				9,5			
	220	40		170	85		10,6				11,4			
						$F_{2,Rk(6,5)}$	9,7				9,9			
WT-T- 8,2xL	160	60		130	65	$F_{1,Rk}$ (β) [kN]	9,3				9,9			
	190	60		150	75		11,6				12,4			
	220	60		170	85		13,9				14,8			
	245	60		190	95		15,8				16,8			
	275	60		210	105		18,1				19,3			
	300	60		230	115		20,1				21,5			
	330	60		250	125		20,1				21,5			
						$F_{2,Rk(8,2)}$	16,8				17,1			

β = angle of incline of the secundary purlin

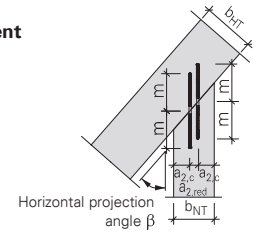
$F_{1,Rk}$ [kN] = Pull-out resistance from timber
$F_{2,Rk(Ø)}$ [kN] = Buckling values of the fastener

System WR	Fastener length [mm]	Minimum dimensions [mm] b_{NT}	b_{HT}	$h_{HT} = h_{NT}$	Installation dim. [mm] m	Angle of incline, secondary beam β [°]	Gross density ρ_k [kg/m³] 350 30°	45°	60°	75°	380 30°	45°	60°	75°
WR-T-9,0xL	250	70	m · sin(β)	191	95	$F_{1,Rk}$ (β) [kN]	17,1				18,3			
	300	70		226	113		21,2				22,6			
	350	70		261	131		25,3				27,0			
	400	70		297	148		29,3				31,3			
	450	70		332	166		33,4				35,7			
	500	70		368	184		37,5				40,0			
						$F_{2,Rk(6,5)}$	20,2				20,7			
WR-T-13,0xL	400	100		297	148	$F_{1,Rk}$ (β) [kN]	42,7				45,6			
	500	100		368	184		54,5				58,3			
	600	100		438	219		66,4				70,9			
	700	100		509	254		78,3				83,6			
	800	100		580	290		90,1				96,3			
	900	100		650	325		102,0				108,9			
	1000	100		721	361		113,8				121,6			
						$F_{2,Rk(8,2)}$	44,5				45,3			

β = angle of incline of the secundary purlin

$F_{1,Rk}$ [kN] = Pull-out resistance from timber
$F_{2,Rk(Ø)}$ [kN] = Buckling values of the fastener

Recommended fastener arrangement



Minimum spacing

Spacing [mm]	WT-S/T-6,5 x L	WT-T-8,2 x L	WR-T-9 x L	WR-T-13 x L
a_1	33	40	45	65
a_2	33	40	45	65
$a_{2,c}$	15	24	27	39
$a_{2,red}$*	10	12	-	-

* only possible if $a_1 \geq 10 \cdot d_1$

Supplementary remarks

- The main beam must have adequate fork support and be able to withstand torsion.
- Values shown in the table are for one pair of fasteners. For multiple pairs, the table values $F_{1,Rk}$ (α) must be multiplied by the factor n_{ef} = (the number of pairs)^0,9 and table value $F_{2,Rk}$ must be multiplied by the number of pairs.
- Appropriate action must be taken to ensure adherence to the insertion angle (assembly angle) and the connection geometry.
- In the case of intermediate values of horizontal projection angle β, linear interpolations may be made.
- Load-bearing values are applicable to the total effective length of each thread section.

$$F_{v,Rd} = \min\left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}};\ \frac{F_{2,Rk}}{\gamma_{M2}}\right)$$

$\gamma_{M1} = 1,3$ $\gamma_{M2} = 1,1$
γ_{M1} (GL) = 1,25

All calculations must be verified and signed off by the planner in charge before the work is performed.

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WT fastening system

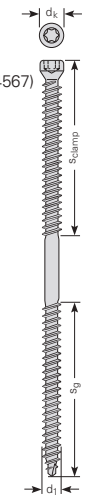
An extensive range with high added value for timber/timber connections

Fastener range:

WT-S-6,5 x L
Material: stainless steel A2 (1,4567)
Surface: waxed
Thread-Ø: 6,5 mm

WT-T-6,5 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 6,5 mm

WT-T-8,2 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 8,2 mm (s_g)
and Ø 8,9 mm (s_{clamp})



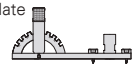
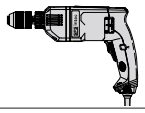
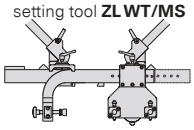
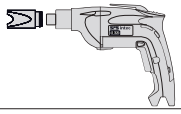
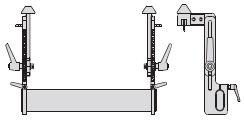
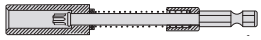
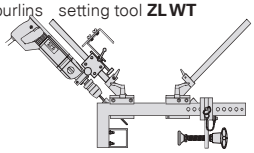
Fastener range WT-S-6,5 x L / WT-T-6,5 x L / WT-T-8,2 x L

Type		Material (S = stainless A2, T = carbon steel)		Thread-Ø d_1 [mm]		Length [mm]	s_g [mm]	s_{clamp} [mm]	d_k [mm]	Bit
WT	-	S	-	6,5	x	65	28	28	8,0	T30
WT	-	S	-	6,5	x	90	40	40	8,0	T30
WT	-	S	-	6,5	x	130	55	55	8,0	T30
WT	-	T	-	6,5	x	65	28	28	8,0	T30
WT	-	T	-	6,5	x	90	40	40	8,0	T30
WT	-	T	-	6,5	x	130	55	55	8,0	T30
WT	-	T	-	6,5	x	160	65	65	8,0	T30
WT	-	T	-	6,5	x	190	80	80	8,0	T30
WT	-	T	-	6,5	x	220	95	95	8,0	T30
WT	-	T	-	8,2	x	160	65	65	10,0	T40
WT	-	T	-	8,2	x	190	80	80	10,0	T40
WT	-	T	-	8,2	x	220	95	95	10,0	T40
WT	-	T	-	8,2	x	245	107	107	10,0	T40
WT	-	T	-	8,2	x	275	122	122	10,0	T40
WT	-	T	-	8,2	x	300	135	135	10,0	T40
WT	-	T	-	8,2	x	330	135	135	10,0	T40

Installation aids
We offer the appropriate accessories, from the simple, universal gauge to special appliances for specific applications. Our technical consultants will be pleased to help you make the right choice.

Principles of calculation
Detailed planning documentation cateringfor a very wide range of applications ensures easy, reliable calculation. For special applications our structural timberwork consultants will be pleased to assist you in selecting the most efficient and cost-effective fastening method.

Setting tools and accessories (extract)

Application	Tools and accessories	Fastener	Tools and accessories
Main/secondary purlins, dowelled purlins, prefabricated building,, etc.	universal **ZL WT/U** template 	WT-S/T-6,5 x L WT-T-8,2 x L	power drill **BO 1055** 
Main/secondary purlins	setting tool **ZL WT/MS** 	WT-S/T-6,5 x L L max.: 130 mm	power drill **DI 650** 
Main/secondary purlins	purlin support **ZL WT/S** 	WT-S/T-6,5 x L WT-T-8,2 x L	adapter **WT-T40/D10** adapter **WT-T30** 
Coupling purlins	setting tool **ZL WT** 	WT-S/T-6,5 x L WT-T-8,2 x L	Bit T30, length 70, 200, 350 mm Bit T40, length 70, 152, 200, 350, 520 mm

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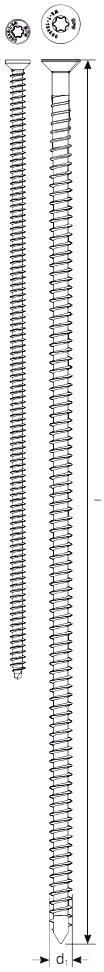
WR fastening system

An extensive range for high-performance connections and reinforcements

Fastener range:

WR-T-9 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 9 mm
Point: drilling point
Drive: T40

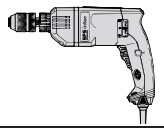
WR-T-13 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 13 mm
Point: half-point
Drive: T50



WR-T-9 x L						
Typ	Material Carbon steel		Thread-Ø d_1 [mm]		Length l [mm]	
WR	- T	-	9	x	250	
WR	- T	-	9	x	300	
WR	- T	-	9	x	350	
WR	- T	-	9	x	400	
WR	- T	-	9	x	450	
WR	- T	-	9	x	500	

WR-T-13 x L						
Typ	Material Carbon steel		Thread-Ø d_1 [mm]		Length l [mm]	
WR	- T	-	13	x	400	
WR	- T	-	13	x	500	
WR	- T	-	13	x	600	
WR	- T	-	13	x	700	
WR	- T	-	13	x	800	
WR	- T	-	13	x	900	
WR	- T	-	13	x	1000	

Setting tools and accessories

Fastener	Accessories	Fastener	Tools
WR-T-9 x L	Bit T40 Length 25, 35 and 70 mm	WR-T-9 x L	Drilling tool **BO 1055** 
WR-T-13 x L	Bit T50 Length 36 mm Length 50 mm with recessed square socket $^1/_2$" Adapter ZA $^1/_2$" - MK3	WR-T-13 x L	Recommended tools (not included in range) BOSCH **GBM 23-2/32-4** Milwaukee **B4-32** Protool **DRP 32-4**

Principles of calculation

Detailed planning documentation cateringfor a very wide range of applications ensures easy, reliable calculation. For special applications our structural timberwork consultants will be pleased to assist you in selecting the most efficient and cost-effective fastening method

More information:
If you have any questions about fastening technology, just call us. We'll be pleased to advise you!

In the event that any differences exist between the original German data sheet text and versions translated into other languages, the original German text is the only valid version.

All calculations must be verified and signed off by the planner in charge before the work is performed. The user is responsible for compliance with the statutory provisions.

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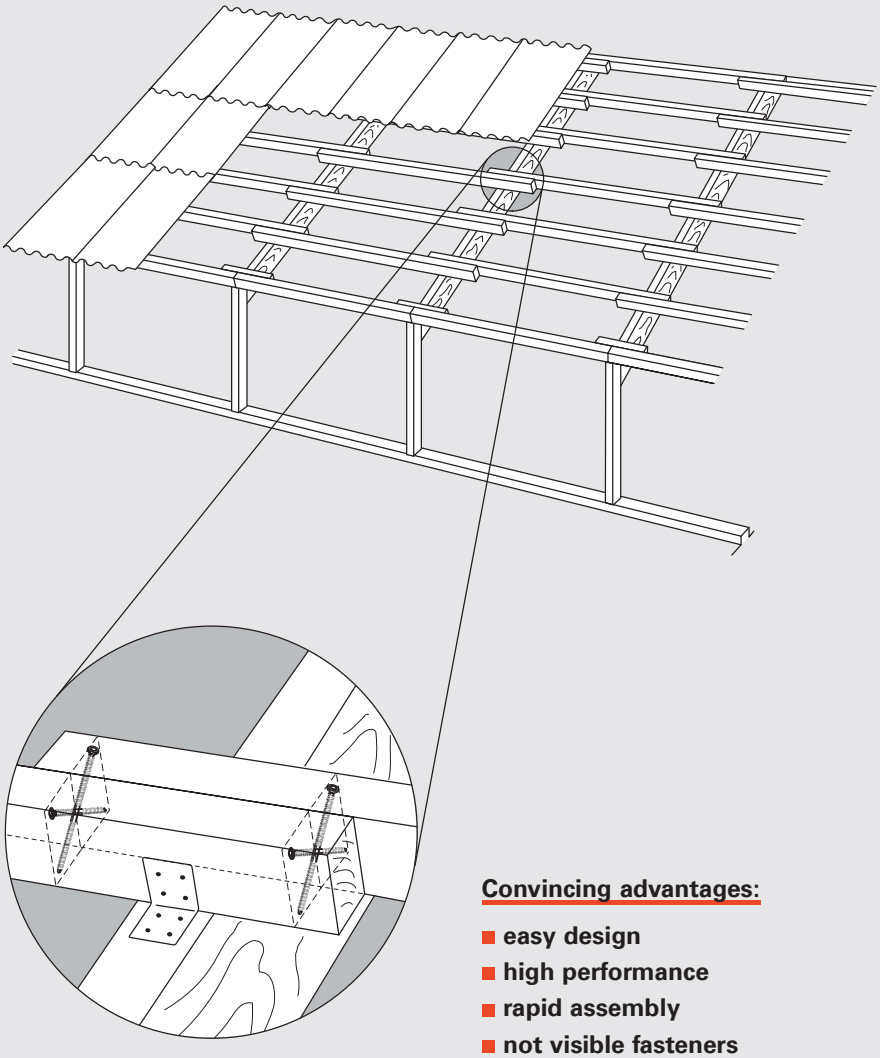
Joining timber rafters

WT

WT



Convincing advantages:

- easy design
- high performance
- rapid assembly
- not visible fasteners
- no predrill
- no retightening
- ETA-12/0063

Data sheet
No. 03 3.03

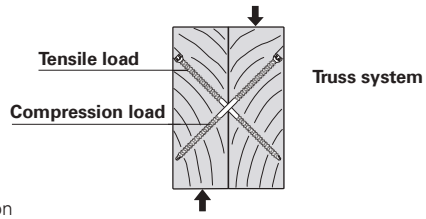
General information

Function

SFS intec's WT fastening system facilitates the secure, structurally ideal and convenient connection of linked rafters. New standards are set for durable and inherently stable joints in timber structural elements in the process.

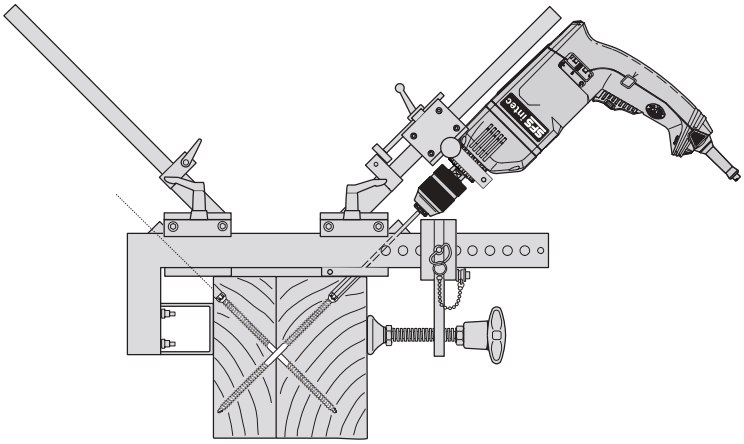
Functional principle

The special geometry of the WT-T-6.5/8.2 x L fastener enables the truss structure to be taken into account. By setting it at an angle of 45°, for example, the forces are differentiated into a «tensile element» and a «compression element». Only the axial tensile and compression forces are therefore assigned to the connecting elements. Another advantage of the cruciform arrangement of the fasteners is the stabilisation of the cross section of the rafters joined in this way in the event of deformation due to shrinkage or swelling. This is also referred to as a locking action, since the cross section reinforced by the fasteners cannot shrink and deform at will.
A setting device, the ZL WT, has also been developed for this system solution to ensure the optimum fit of the fasteners.



This guarantees:

- accurate setting of the fasteners at 45° to the surface
- maintenance of the correct installation position
- safe and convenient insertion due to stable lightweight design



Recommendations

- The choice of fasteners depends on the cross sections of the rafters being joined.
- The number of fasteners is determined by the coupling forces.
- The maximum clamping capacity of the setting device is 320 mm. Larger clamping capacities for special cross sections on request.

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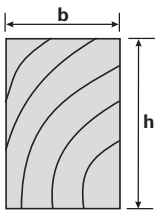
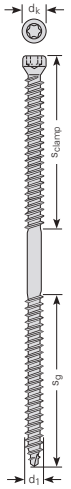
Design proposal

Defining the fastener

Fastener length **L** (in mm) depends on width **b** (7 cm-16 cm) and height **h** (14 cm-24 cm) of the smaller rafter cross section.
The corresponding fastener lengths **L** are listed as a function of rafter dimensions in the adjoining table.





b [cm] / h [cm]	7	8	9	10	12	14	16
14	160	160	160	160	160	160	160
16	160	190	190	190	190	190	190
18	160	190	220	220	220	220	220
20	160	190	220	245	245	245	245
22	160	190	220	245	275	275	275
24	160	190	220	245	300	300	300
26	160	190	220	245	300	330	330
28	160	190	220	245	300	330	330

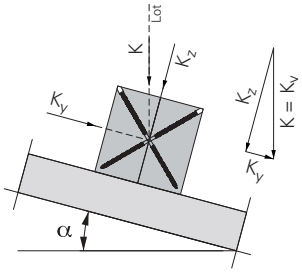
Design

In the case of **only vertical** external loading, e.g. inherent load, snow load, the coupling force acts vertically ($K = K_y$).
In each case one of the following must be verified.

$$\frac{K_d}{F_{K,Rd}} \leq 1 \quad \text{or}$$

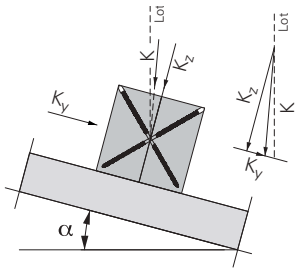
$$\frac{K_{z,d}}{\cos(\alpha) \cdot F_{K,Rd}} \leq 1 \quad \text{or}$$

$$\frac{K_{y,d}}{\sin(\alpha) \cdot F_{K,Rd}} \leq 1$$



In the case of **non-vertical** external loading, also combinations with wind loads, the coupling force does not act vertically.
Components K_z and K_y must be established and the following verified.

$$\frac{K_{z,d} + K_{y,d}}{(\cos(\alpha) + \sin(\alpha)) \cdot F_{K,Rd}} \leq 1$$



K_d	Design value of coupling force
$K_{z,d}$	Design value of coupling force at right angles to the roof surface
$K_{y,d}$	Design value of the coupling force parallel to the roof surface
$F_{K,Rd}$	Design value of the coupling force resistance (see table on page 4)
α	Roof pitch angle

Calculation tables

System WT	Roof pitch α [°]	Gross density ρ_k = 350 kg/m³													
		1 pair	2 pairs	1 pair	2 pairs	1 pair	2 pairs	1 pair	2 pairs	1 pair	2 pairs	1 pair	2 pairs	1 pair	2 pairs
		0°		10°		15°		20°		25°		30°		90°	
WT - T - 6,5 x 160	$F_{1,Rk}$ (α) [kN]	7,1	13,2	6,1	11,4	5,8	10,8	5,5	10,3	5,3	10,0	5,2	9,7	7,1	13,2
WT - T - 6,5 x 190		8,9	16,6	7,7	14,3	7,2	13,5	6,9	12,9	6,7	12,5	6,5	12,1	8,9	16,6
WT - T - 6,5 x 220		10,6	19,9	9,2	17,2	8,7	16,2	8,3	15,5	8,0	15,0	7,8	14,5	10,6	19,9
	$F_{2,Rk}$ (6,5)	9,7	16,4	8,3	14,2	7,9	13,4	7,5	12,8	7,3	12,4	7,1	12,0	9,7	16,4
WT - T - 8,2 x 160	$F_{1,Rk}$ (α) [kN]	9,3	17,3	8,0	14,9	7,6	14,1	7,2	13,5	7,0	13,0	6,8	12,6	9,3	17,3
WT - T - 8,2 x 190		11,6	21,6	10,0	18,7	9,5	17,6	9,0	16,9	8,7	16,3	8,5	15,8	11,6	21,6
WT - T - 8,2 x 220		13,9	25,9	12,0	22,4	11,4	21,2	10,8	20,2	10,5	19,5	10,2	19,0	13,9	25,9
WT - T - 8,2 x 245		15,8	29,4	13,6	25,4	12,9	24,0	12,3	22,9	11,9	22,1	11,5	21,5	15,8	29,4
WT - T - 8,2 x 275		18,1	33,7	15,6	29,1	14,8	27,6	14,1	26,3	13,6	25,4	13,2	24,7	18,1	33,7
WT - T - 8,2 x 300		20,1	37,5	17,3	32,4	16,4	30,6	15,7	29,3	15,1	28,2	14,7	27,5	20,1	37,5
WT - T - 8,2 x 330		20,1	37,5	17,3	32,4	16,4	30,6	15,7	29,3	15,1	28,2	14,7	27,5	20,1	37,5
	$F_{2,Rk}$ (8,2)	16,8	28,5	14,5	24,6	13,7	23,3	13,1	22,3	12,6	21,5	12,3	20,9	16,8	28,5

System WT	Roof pitch α [°]	Gross density ρ_k = 380 kg/m³													
		1 pair	2 pairs	1 pair	2 pairs	1 pair	2 pairs	1 pair	2 pairs	1 pair	2 pairs	1 pair	2 pairs	1 pair	2 pairs
		0°		10°		15°		20°		25°		30°		90°	
WT - T - 6,5 x 160	$F_{1,Rk}$ (α) [kN]	7,6	14,1	6,5	12,2	6,2	11,5	5,9	11,0	5,7	10,6	5,5	10,3	7,6	14,1
WT - T - 6,5 x 190		9,5	17,7	8,2	15,3	7,7	14,4	7,4	13,8	7,1	13,3	6,9	12,9	9,5	17,7
WT - T - 6,5 x 220		11,4	21,2	9,8	18,3	9,3	17,3	8,9	16,6	8,6	16,0	8,3	15,5	11,4	21,2
	$F_{2,Rk}$ (6,5)	9,9	16,8	8,5	14,5	8,1	13,7	7,7	13,1	7,4	12,6	7,2	12,3	9,9	16,8
WT - T - 8,2 x 160	$F_{1,Rk}$ (α) [kN]	9,9	18,5	8,5	15,9	8,1	15,1	7,7	14,4	7,4	13,9	7,2	13,5	9,9	18,5
WT - T - 8,2 x 190		12,4	23,1	10,7	19,9	10,1	18,8	9,6	18,0	9,3	17,4	9,1	16,9	12,4	23,1
WT - T - 8,2 x 220		14,8	27,7	12,8	23,9	12,1	22,6	11,6	21,6	11,2	20,8	10,9	20,3	14,8	27,7
WT - T - 8,2 x 245		16,8	31,4	14,5	27,1	13,7	25,6	13,1	24,5	12,7	23,6	12,3	23,0	16,8	31,4
WT - T - 8,2 x 275		19,3	36,0	16,7	31,1	15,8	29,4	15,1	28,1	14,5	27,1	14,1	26,4	19,3	36,0
WT - T - 8,2 x 300		21,5	40,0	18,5	34,6	17,5	32,7	16,7	31,2	16,1	30,1	15,7	29,3	21,5	40,0
WT - T - 8,2 x 330		21,5	40,0	18,5	34,6	17,5	32,7	16,7	31,2	16,1	30,1	15,7	29,3	21,5	40,0
	$F_{2,Rk}$ (8,2)	17,1	29,1	14,8	25,1	14,0	23,7	13,3	22,7	12,9	21,9	12,5	21,3	17,1	29,1

Half of the fastener must be in each of the two structural components.

$F_{1,Rk(\alpha)}$ [kN] = characteristic pull-out resistance from timber as a function of roof pitch

$F_{2,Rk\ (Ø)}$ [kN] = Buckling values of the fastener

$$F_{1,Rk}(\alpha) = \frac{\sqrt{2} \cdot n_{ef} \cdot F_{ax,Rk}}{\cos(\alpha) + \sin(\alpha)}$$

$$F_{2,Rk}(\alpha) = \frac{\sqrt{2} \cdot n_{ef} \cdot F_{Ki,Rk}}{\cos(\alpha) + \sin(\alpha)}$$

$$F_{K,Rd} = \min \left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}} ; \frac{F_{2,Rk}}{\gamma_{M2}} \right)$$

$\gamma_{M1} = 1,3 \qquad \gamma_{M2} = 1,1$

γ_{M1} (GL) = 1,25

11

Basic information on the design aid

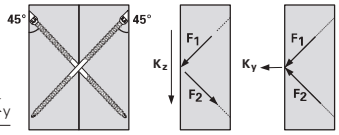
The basic principles of calculation in the foregoing design aid are explained below.
This information can also be used to calculate coupling points with other roof pitch angles.

Screw forces

K_y, K_z: coupling force in the y and z directions
F_1, F_2: resulting forces in the screws

The screw forces are the product of:

$$F_1 = \frac{K_z + K_y}{\sqrt{2}} \text{ (positive tension, negative compression) } F_2 = \frac{K_z - K_y}{\sqrt{2}}$$

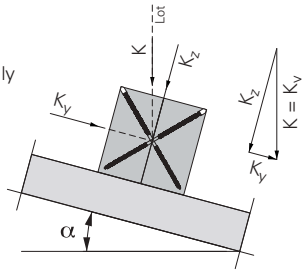


Screw 1 is always decisive, i.e. the maximum loading of the coupling point is reached when the tensile force in screw 1 is equal to its load-bearing capacity.

Verification

$$\frac{F_{1,d}}{n_{ef} \cdot F_{Rd}} \leq 1 \quad \text{with } F_{Rd} = \frac{k_{mod} \cdot F_{Rk}}{\gamma_M} \quad \text{oder} \quad \frac{K_{z,d} + K_{y,d}}{\sqrt{2} \cdot n_{ef} \cdot F_{Rd}} \leq 1$$

In the event that a combination of loads arising from loads acting only vertically is applicable, i.e. K acts vertically, the following applie
$K_z = K \cdot \cos(\alpha)$
$K_y = K \cdot \sin(\alpha)$



Proofs for this instance can therefore also be written as follows

$$K_d \cdot \frac{\cos(\alpha) + \sin(\alpha)}{\sqrt{2} \cdot n_{ef} \cdot F_{Rd}} \leq 1$$

The following values are listed in the load-bearing capacity tables

$$F_{1,Rk} = \frac{\sqrt{2} \cdot n_{ef} \cdot F_{ax,Rk}}{\cos(\alpha) + \sin(\alpha)}$$

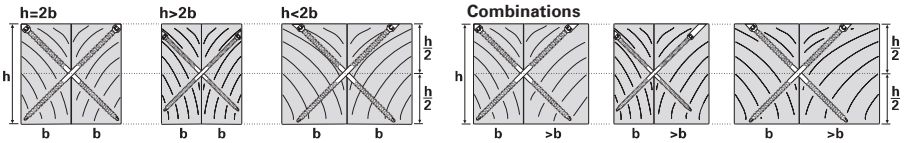
The verification equation in the case of vertical loading is therefore as follows

$$\frac{K_d}{F_{K,Rd}} \leq 1 \quad \text{with } F_{K,Rd} = \text{see table page 4}$$

$n_{ef} = n^{0,9}$ factor for taking the effectiveness of the fasteners into account
$n_{ef} = 1,0$ for a pair of screws
$n_{ef} = 1,87$ for two pairs of screws
$n_{ef} = 2,69$ for three pairs of screws
$F_{ax,Rk}$ characteristic pull-out resistance (see table page 6)

Arrangement

The screws are always arranged to that they cross at half rafter height in the shearing plane between the two rafters.



Remarks

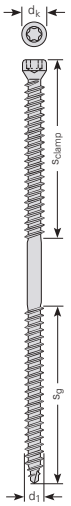
- Longitudinal forces in linked rafters (e.g. in roof structures) cannot be transferred with this coupling point layout.
- Appropriate action must be taken to ensure that the angle of insertion is maintained.
- **All calculations must be verified and signed off by the planner in charge before the work is performed.**

5/6

11

WT fastening system

High performance for lateral tensile reinforcement



Solid timber, cross laminated timber	C	24	30
Glulam timber	GL	24c	28c/24h
Gross density ρ_k [kg/m³]		**350**	**380**

Fastener range:

WT-T-6,5 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 6,5 mm

WT-T-8,2 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 8,2 mm (s_g)
and Ø 8,9 mm (s_{clamp})

Fastener range WT-T-6,5 x L / WT-T-8,2 x L

Type	Material T = carbon steel	Thread-Ø d_1 [mm]	Length [mm]	s_g [mm]	s_{clamp} [mm]	d_k [mm]	Bit	Gross density ρ_k [kg/m³]		
									350	**380**
WT	- T -	6,5 x	160	65	65	8,0	T30	$F_{ax,Rk}$ [kN]	5,0	5,4
WT	- T -	6,5 x	190	80	80	8,0	T30		6,3	6,7
WT	- T -	6,5 x	220	95	95	8,0	T30		7,5	8,0
WT	- T -	8,2 x	160	65	65	10,0	T40	$F_{ax,Rk}$ [kN]	6,5	7,0
WT	- T -	8,2 x	190	80	80	10,0	T40		8,2	8,7
WT	- T -	8,2 x	220	95	95	10,0	T40		9,8	10,5
WT	- T -	8,2 x	245	107	107	10,0	T40		11,1	11,9
WT	- T -	8,2 x	275	122	122	10,0	T40		12,8	13,7
WT	- T -	8,2 x	300	135	135	10,0	T40		14,2	15,2
WT	- T -	8,2 x	330	135	135	10,0	T40		14,2	15,2

$F_{ax,Rk}$ [kN] = Pull-out resistance from timber

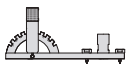
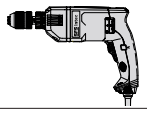
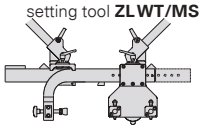
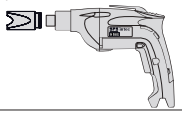
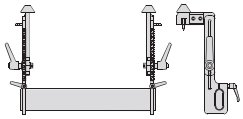
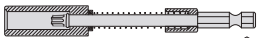
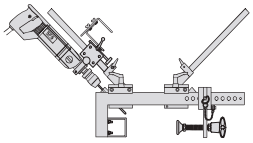
Installation aids
We offer the appropriate accessories, from the simple, universal gauge to special appliances for specific applications. Our technical consultants will be pleased to help you make the right choice.

Principles of calculation

Detailed planning documentation cateringfor a very wide range of applications ensures easy, reliable calculation. For special applications our structural timberwork consultants will be pleased to assist you in selecting the most efficient and cost-effective fastening method.

More information:
If you have any questions about fastening technology, just call us. We'll be pleased to advise you!

Setting tools and accessories (extract)

Application	Tools and accessories	Fastener	Tools and accessories
Main/secondary purlins, dowelled purlins, prefabricated building,, etc.	universal **ZL WT/U** template 	WT-**S**/T-6,5 x L WT-T-8,2 x L	power drill **BO 1055** 
Main/secondary purlins	setting tool **ZL WT/MS** 	WT-**S**/T-6,5 x L L max.: 130 mm	power drill **DI 650** 
Main/secondary purlins	purlin support **ZL WT/S** 	WT-**S**/T-6,5 x L WT-T-8,2 x L	adapter **WT-T40/D10** adapter **WT-T30** 
Coupling purlins	setting tool **ZL WT** 	WT-**S**/T-6,5 x L WT-T-8,2 x L	Bit T30, length 70, 200, 350 mm Bit T40, length 70, 152, 200, 350, 520 mm

In the event that any differences exist between the original German data sheet text and versions translated into other languages, the original German text is the only valid version.

All calculations must be verified and signed off by the planner in charge before the work is performed. The user is responsible for compliance with the statutory provisions.

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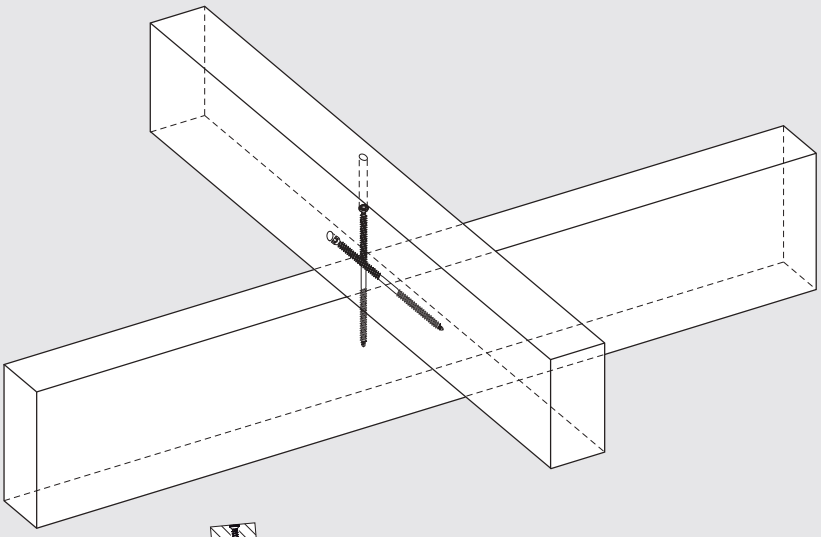
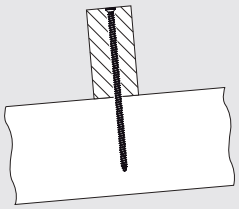
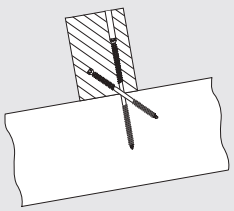
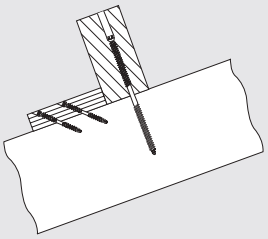
Connection of purlins to main trusses

WT
WR

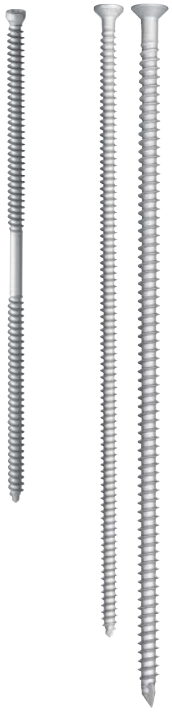








WT WR



Convincing advantages:

- easy installation
- rapid assembly
- not visible fasteners
- high fire resistance of the connection
- easy design
- ETA-12/0063 (WT)
- ETA-12/0062 (WR)

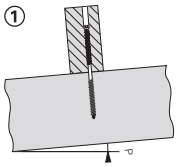
Data sheet No. 04 3.05

11

Proposed dimensions

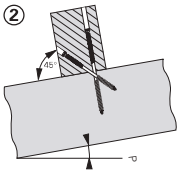
Types of arrangement

Fastener arrangement 1



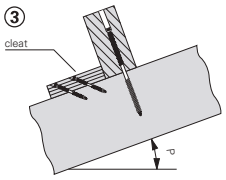
Suitable for shallow pitched roofs (P ≈0°to 5°), depending on loading. In the absence of upwardloads, the WT/WR fastener can also be inserted eccentrically to improve load-bearing capacity against tilting.

Fastener arrangement 2



Suitable for moderately pitchedroofs (P ≈5°to 15°), depending onloading. In the absence of upwardloads, the WT/WR fastener insertedstraight can also be inserted eccen-trically to improve load-bearing capacity against tilting.

Fastener arrangement 3



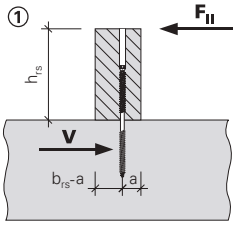
Suitable for steeply pitched roofs (P ≈10°), depending on loading. Inthe absence of upward loads, the WT/WR fastener can also be inserted eccentri-cally to improve load-bearing capacity against tilting.

Dimensions

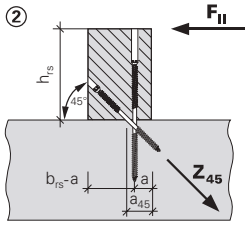
For calculating the rafter-supporting purlins, the loads must first be converted into components F_{II} and F_D respectively F_Z parallel and perpendicular to the roof surface.
Calculation of the purlins consists of two parts.

1) Stress parallel to roof surface (F_{II})

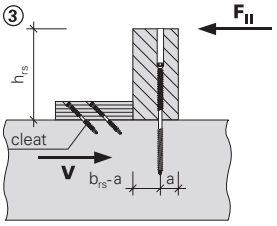
In the first part, shearing is demonstrated as a function of the arrangement of the WT/WR fastener.



$V = F_{II}$



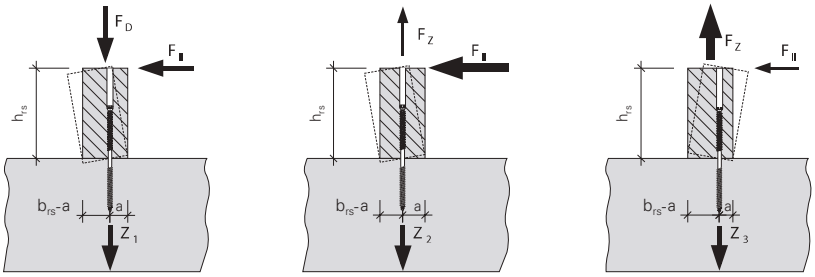
$Z_{45} = F_{II} \cdot \sqrt{2}$



$V = F_{II}$
Calculation of the cleat attachment for shearing force V according to WT/WR Data sheet No. 01

2) Stress perpendicular to roof surface (F_D / F_Z)

In the second part, the most unfavourable loading of the WT/WR fastener inserted straight must be calculated irrespective of fastener arrangement 1 to 3.



Tensile force 1 $$Z_1 = \frac{3}{2 \cdot (b_{rs} - a)} \cdot \left[F_{II} \cdot h_{rs} - F_D \cdot \left(\frac{b_{rs}}{6} + \frac{a}{3} \right) \right]$$

Tensile force 2 $$Z_2 = \frac{3}{2 \cdot (b_{rs} - a)} \cdot \left[F_{II} \cdot h_{rs} - F_Z \cdot \left(\frac{b_{rs}}{2} - a \right) \right] + F_Z$$

Tensile force 3 $$Z_3 = \frac{3}{2 \cdot a} \cdot \left[-F_{II} \cdot h_{rs} + F_Z \cdot \left(\frac{b_{rs}}{2} - a \right) \right] + F_Z$$

The highest of these 3 tensile forces is relevant for the loading of the WT/WR fastener:
Max. tensile force: Z= max (Z_1, Z_2, Z_3)

Required number of fasteners

① $n^{0,9} \geq \sqrt{\left[\frac{Z_d}{F_{ax,Rd}}\right]^2 + \left[\frac{V_d}{R_{v,Rd}}\right]^2}$

② $n_{45}^{0,9} \geq \frac{Z_{45,d}}{F_{ax,Rk}}$ $\quad n^{0,9} \geq \frac{Z_d}{F_{ax,Rk}}$

③ $n^{0,9} \geq \frac{Z_d}{F_{ax,Rk}}$

Calculating design values

WT-T

$F_{ax,Rd} = \frac{F_{ax,Rk} \cdot k_{mod}}{\gamma_{M1}}$

$F_{v,Rd} = \frac{F_{v,Rk} \cdot k_{mod}}{\gamma_{M1}}$

$\gamma_{M1} = 1,3 \quad \gamma_{M1}(GL) = 1,25$

WR-T

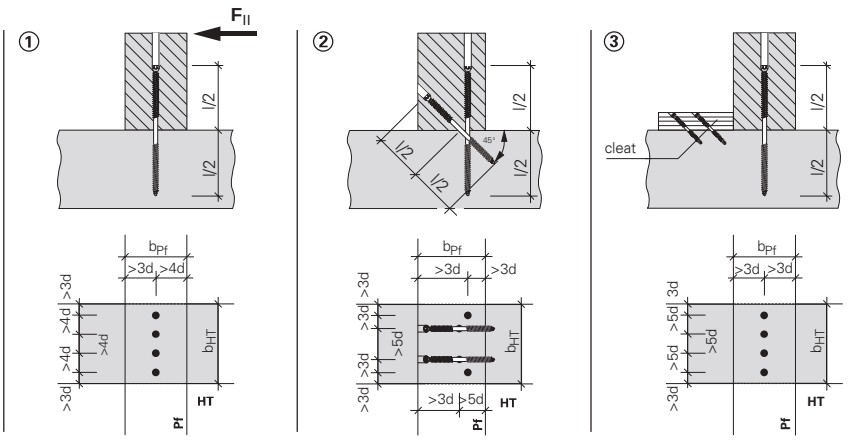
$F_{ax,Rd} = \min\left(\frac{F_{ax,Rk} \cdot k_{mod}}{\gamma_{M1}}; \frac{F_{tens,Rk}}{\gamma_{M2}}\right)$

$F_{v,Rd} = \frac{F_{v,Rk} \cdot k_{mod}}{\gamma_{M1}}$

$\gamma_{M1} = 1,3 \quad \gamma_{M2} = 1,3$
$\gamma_{M1}(GL) = 1,25$

Anordnung Arrangement

When arranging the WT fasteners, the spacings and distances shown in the drawings must be adhered to.
The inclined WT fastener must be inserted at 45° to the main truss.
Fasteners must be inserted so that one threaded section is in each structural component.



Key

F_D	load acting vertically on roof surface
F_Z	lifting load acting vertically on roof surface
F_{II}	load acting parallel to roof surface
V	shearing force in fastener
Z_{45}	tensile force in fastener inserted at 45°
Z	tensile force in fastener inserted perpendicular to roof surface
V_d	calculation value of shearing force in fastener
$Z_{45,d}$	calculation value of tensile force in fastener inserted at 45°
Z_d	calculation value of tensile force in fastener inserted perpendicular to roof surface
$F_{ax,Rk}$	char. pull-out resistance of a fastener*
$F_{v,Rk}$	char. shearing resistance of a fastener*
$F_{tens,Rk}$	char. tensile load-bearing capacity of a fastener*
k_{mod}	Modification factor
γ_M	component safety factor, material
b_{Pf}	width of purlin
h_{Pf}	height of purlin
b_{HT}	width of main purlin
h_{HT}	height of main purlin
a	selected spacing or distance of the WT fastener
n	required number of WT/WR fasteners
n_{45}	required number of WT/WR fasteners inserted at 45°
d	nominal diameter of the WT/WR fasteners

*see table on next pages

All calculations must be verified and signed off by the engineer in charge of the project before the work is performed.

WT fastening system

A comprehensive range offering high added value for timber/timber connections

Fastener arrangement in planes
parallel to the secondary purlin

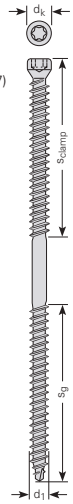
Solid timber, cross-laminated timber	C	24	30	24	30
Glulam timber	GL	24c	28c / 24h	24c	28c / 24h
Gross density ρ_k [kg/m³]		**350**	**380**	**350**	**380**

Fastener range:

WT-S-6,5 x L
Material: stainless steel A2 (1,4567)
Surface: waxed
Thread-Ø: 6,5 mm
Head-Ø: 8,0 mm
Drive: T30

WT-T-6,5 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 6,5 mm
Head-Ø: 8,0 mm
Drive: T30

WT-T-8,2 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 8,2 mm (s_g)
and Ø 8,9 mm (s_{clamp})
Head-Ø: 10,0 mm
Drive: T40



Fastener range WT-S-6,5 x L / WT-T-6,5 x L / WT-T-8,2 x L

Type	Material (S = Stainless steel A2, T = Carbon steel)	Thread-Ø d_1 [mm]	Length [mm]	s_g = s_{clamp} [mm]	h_{min} [mm]	$F_{ax,Rk}$ [kN]		$F_{v,Rk}$ [kN]*	
						350	**380**	**350**	**380**
WT-	S/T-	6,5x	65	28	28	2,3	2,5	2,5	2,6
WT-	S/T-	6,5x	90	40	40	3,4	3,6	3,0	3,2
WT-	S/T-	6,5x	130	55	55	4,6	4,9	3,3	3,5
WT-	T-	6,5x	160	65	65	5,5	5,8	3,6	3,7
WT-	T-	6,5x	190	80	80	6,7	7,2	3,9	4,1
WT-	T-	6,5x	220	95	95	8,0	8,5	4,2	4,4
WT-	T-	8,2x	160	65	65	7,1	7,6	4,8	5,0
WT-	T-	8,2x	190	80	80	8,8	9,4	5,2	5,5
WT-	T-	8,2x	220	95	95	10,4	11,1	5,6	5,9
WT-	T-	8,2x	245	107	107	11,7	12,5	5,9	6,3
WT-	T-	8,2x	275	122	122	13,4	14,3	6,0	6,3
WT-	T-	8,2x	300	135	135	14,8	15,8	6,0	6,3
WT-	T-	8,2x	330	135	135	14,8	15,8	6,0	6,3

* Shear values apply für WT-T fasteners
$F_{ax,Rk}$ [kN] = characteristic pull-out resistance of one fastener
$F_{v,Rk}$ [kN] = characteristic shearing resistance of one fastener
Resistance values only apply for full effective thread length engaged

Installation aids
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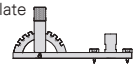
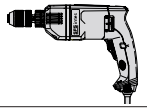
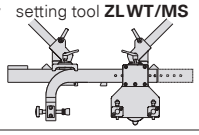
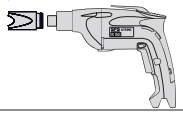
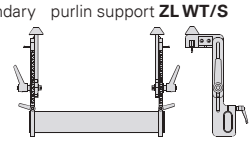
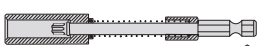
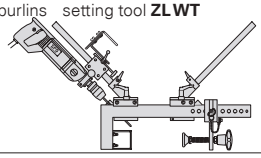
Principles of calculation

Detailed planning documentation cateringfor a very wide range of applications ensures easy, reliable calculation. For special applications our structural timberwork consultants will be pleased to assist you in selecting the most efficient and cost-effective fastening method.

Setting tools and accessories (extract)

Application	Tools and accessories	Fastener	Tools and accessories
Main/secondary purlins, dowelled purlins, prefabricated building,, etc.	universal **ZL WT/U** template 	WT-S/T-6,5 x L WT-8,2 x L	power drill **BO 1055** 
Main/secondary purlins	setting tool **ZL WT/MS** 	WT-S/T-6,5 x L L max.: 130 mm	power drill **DI 650** 
Main/secondary purlins	purlin support **ZL WT/S** 	WT-S/T-6,5 x L WT-8,2 x L	adapter **WT-T40/D10** adapter **WT-T30** 
Coupling purlins	setting tool **ZL WT** 	WT-S/T-6,5 x L WT-8,2 x L	Bit T30, length 70, 200, 350 mm Bit T40, length 70, 152, 200, 350, 520 mm

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WR fastening system

Fastener arrangement in planes
parallel to the secondary purlin

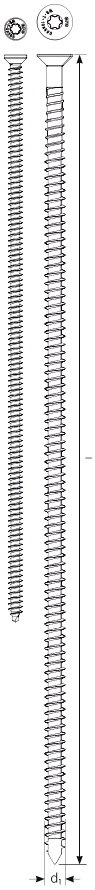
An extensive range for high-performance connections and reinforcements

Solid timber, cross-laminated timber	C	24	30
Glulam timber	GL	24c	28c / 24h
Goss density ρ_k [kg/m³]		**350**	**380**

Fastener range

WR-T-9 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 9 mm
Point: drilling point
Drive: T40

WR-T-13 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 13 mm
Point: half-point
Drive: T50



WR-T-9 x L

Typ	Material Carbon steel	Thread-Ø d_1 [mm]	Length l [mm]	l_{ef} (mm)	h_{min} (mm)	$F_{ax,Rk}$ [kN] 350	$F_{ax,Rk}$ [kN] 380
WR - T	-	9	x 250	125	145	14,4	15,4
WR - T	-	9	x 300	150	170	17,3	18,5
WR - T	-	9	x 350	175	195	20,2	21,5
WR - T	-	9	x 400	200	220	23,0	24,6
WR - T	-	9	x 450	225	245	25,9	27,7
WR - T	-	9	x 500	250	270	28,8	30,8
				$F_{v,Rk}$ [kN]		5,3	5,5
				$F_{tens,Rk}$ [kN]		35,9	

WR-T-13 x L

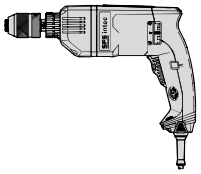
Typ	Material Carbon steel	Thread-Ø d_1 [mm]	Length l [mm]	l_{ef} (mm)	h_{min} (mm)	$F_{ax,Rk}$ [kN] 350	$F_{ax,Rk}$ [kN] 380
WR - T	-	13	x 400	200	220	33,5	35,8
WR - T	-	13	x 500	250	270	41,9	44,8
WR - T	-	13	x 600	300	320	50,3	53,7
WR - T	-	13	x 700	350	370	58,7	62,7
WR - T	-	13	x 800	400	420	67,1	71,6
WR - T	-	13	x 900	450	470	75,5	80,6
WR - T	-	13	x 1000	500	520	83,9	89,6
				$F_{v,Rk}$ [kN]		13,2	13,8
				$F_{tens,Rk}$ [kN]		58,4	

$F_{ax,Rk}$ [kN] = characteristic pull-out resistance of one fastener
$F_{v,Rk}$ [kN] = characteristic shearing resistance of one fastener
$F_{tens,Rk}$ [kN] = char. tensile load bearing-capacity of a fastener
Resistance values only apply for full effective thread length engaged l_{ef} = half thread length

Setting tools and accessories

Fastener	Accessories
WR-T-9 x L	Bit T40 Length 25, 35 and 70 mm
WR-T-13 x L	Bit T50 Length 36 mm
	Length 50 mm with recessed square socket 1/2"
	Adapter ZA 1/2" - MK3

Fastener	Accessories
WR-T-9 x L	Drilling tool **BO 1055**
WR-T-13 x L	Recommended tools (not included in range) BOSCH **GBM 23-2/32-4** Milwaukee **B4-32** Protool **DRP 32-4**



Principles of calculation

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More information:
If you have any questions about fastening technology, just call us. We'll be pleased to advise you!

In the event that any differences exist between the original German data sheet text and versions translated into other languages, the original German text is the only valid version.

All calculations must be verified and signed off by the planner in charge before the work is performed. The user is responsible for compliance with the statutory provisions.

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WT_WR_04_EDS_en_CH_Hgg_3.05_Purlin_Main_Trusses
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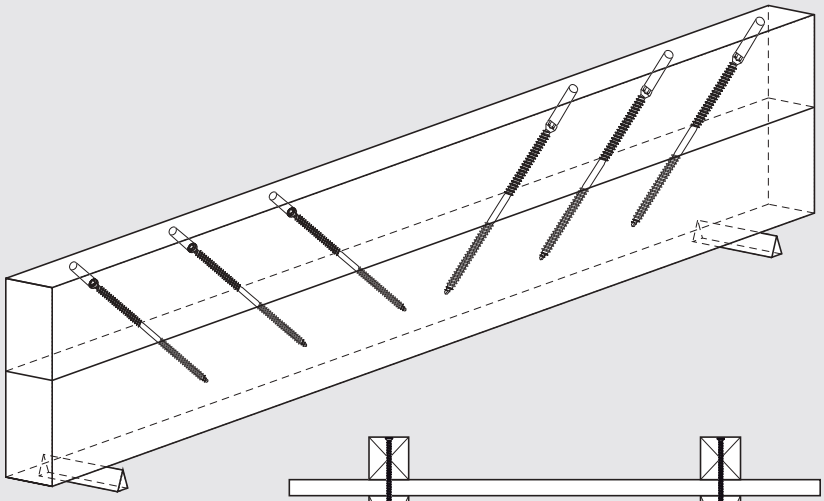
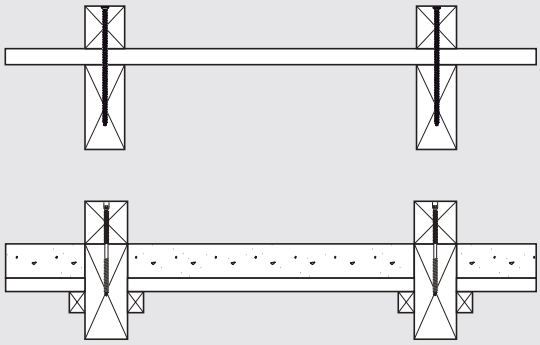
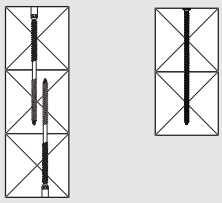
EN 1995-1-1

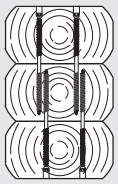
Dowelled purlins

WT
WR









Convincing advantages:

- easy design + installation
- rapid assembly
- not visible fasteners
- improved load-bearing capacity of existing structure
- dowelling with non load-bearing interlayer possible
- high fire resistance
- ETA-12/0063 (WT)
- ETA-12/0062 (WR)

WT WR

Data sheet
No. 05 3.03

11

Proposal of design

Cross-section values

The following calculation method is an approximate calculation for dowelled purlins derived from two to three identical cross-sections.

Coefficients of diminution		
Structure of the purlin	Moment of resistance β	Moment of inertia η
two-parts	0,85	0,65
three-parts	0,60	0,33

Source: SIA Standard 265

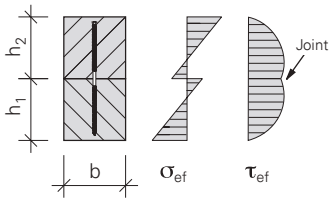
$h = h_i$

$h_{ges} = \Sigma h_i$

$W_{y,ef} = \beta \cdot W_{y,starr} = \beta \cdot h^2_{ges} \cdot b/6$

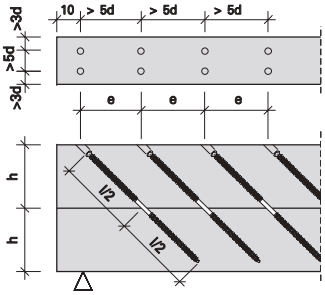
$I_{y,ef} = \eta \cdot I_{y,starr} = \eta \cdot h^3_{ges} \cdot b/12$

Stresses:



The coefficients of diminution take into account the flexibility of the fastener in the shearing joint.

Design



WT-T

$$F_{v,Rd} = \frac{F_{1,Rk} \cdot k_{mod}}{\gamma_M}$$

$\gamma_M = 1,3$
γ_M (GL)= 1,25

WR-T

$$F_{v,Rd} = \min \left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}} ; \frac{F_{2,Rk}}{\gamma_{M2}} \right)$$

$\gamma_{M1} = 1,3$ $\gamma_{M2} = 1,3$
γ_{M1} (GL)= 1,25

$$e \leq e_{erf} = \frac{2 \cdot h_{ges} \cdot F_{v,Rd}}{3 \cdot V_d}$$ 2-part cross-section

$$e \leq e_{erf} = \frac{3 \cdot h_{ges} \cdot F_{v,Rd}}{4 \cdot V_d}$$ 3-part cross-section

Dowelling is designed on the assumption of a rigid joint.

e	selected distance between fasteners
e_{erf}	required maximum distance between fasteners
$h = h_i$	height of a part cross-section $h_i > h_{min} = \frac{l}{(2 \cdot \sqrt{2})}$
h_{ges}	height of the total cross-section
l	length of selected fastener
V_d	calculated shearing force
$F_{v,Rd}$	characteristic shearing load-bearing capacity of a fastener (s. table on page 4 and 5)
$F_{1,Rk}$	Pull-out resistance from timber
$F_{2,Rk}$	Tensile load-bearing capacity of the fastener

Remarks

- The calculation process is an approximation, i.e. it is only suitable for preliminary design calculations.
- The fasteners must be arranged so that half their length is in each structural component.
- Spacing e can be adjusted in accordance with the shearing load curve.
- If there is a layer of board between the purlins, this can be regarded for simplicity's sake as having no structural effect. However, it must be ensured that there is no gap between the board and the purlins, so that the compression component can be absorbed without deformation.
- **All calculations must be verified and signed off by the planner in charge before the work is performed.**

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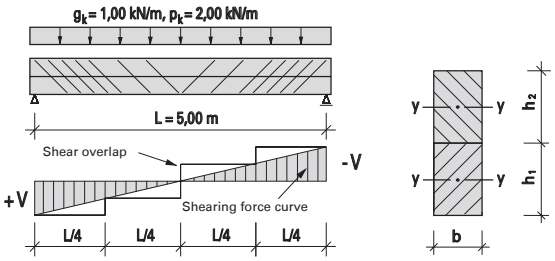
Sample

Given

NKL1;KLED short; k_{mod} = 0,9
span L = 5,00 m
cross-section 2-part, C24
b = 100 mm
h_1 = h_2 = 160 mm
load g_k = 1,00 kN/m
p_k = 2,00 kN/m



$\Rightarrow q_d = 1{,}35 \cdot 1{,}00 + 1{,}5 \cdot 2{,}00 = 4{,}35$ kN/m

Stress resultants

max. shearing force $V_d = \frac{q_d \cdot L}{2} = \frac{4{,}35 \cdot 5{,}00}{2} = 10{,}9$ kN

max. moment $M_d = \frac{q_d \cdot L^2}{8} = \frac{4{,}35 \cdot 5{,}00^2}{8} = 13{,}6$ kNm

Cross-section

moment of resistance $W_{y,ef} = \beta \cdot \frac{b \cdot (h_1+h_2)^2}{6} = 0{,}85 \cdot \frac{100 \cdot (160+160)^2}{6} = 1{,}45 \cdot 10^6$ mm³

moment of inertia $I_{y,ef} = \eta \cdot \frac{b \cdot (h_1+h_2)^3}{12} = 0{,}65 \cdot \frac{100 \cdot (160+160)^3}{12} = 177 \cdot 10^6$ mm⁴

Proofs

bending stress $\sigma_{ef,d} = \frac{M_d}{W_{y,ef}} = \frac{13{,}6 \cdot 10^6}{1{,}45 \cdot 10^6} = 9{,}4$ N/mm² < $\frac{0{,}9 \cdot 24}{1{,}3} = 16{,}6$ N/mm²

deflection $f_{ef} = \frac{5}{384} \cdot \frac{q_k \cdot L^4}{E \cdot I_{y,ef}} = \frac{5}{384} \cdot \frac{3{,}0 \cdot 5000^4}{10000 \cdot 177 \cdot 10^6} = 13{,}8$ mm < 16,7 = $\frac{L}{300}$

Choice of fastener

selected: WT-T-8,2 x 245

$F_{1,Rk}$ = 8,3 kN (according to table on page 4)

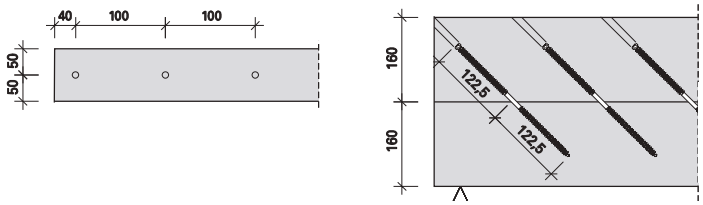
$F_{v,Rd} = \frac{8{,}3 \cdot 0{,}9}{1{,}3} = 5{,}7$ kN

h_{min} = 110 mm < 160 mm = h (required minimum height maintained)

$e_{erf} = \frac{2 \cdot F_{v,Rd} \cdot (h_1+h_2)}{3 \cdot V_d} = \frac{2 \cdot 5{,}7 \cdot (160+160)}{3 \cdot 10{,}9} = 112$ mm selected: e = 100 mm

in the two middle quarter zones: $e_{erf} = 2 \cdot 100 = 200$ mm

Arrangement



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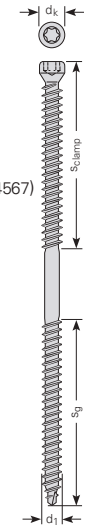
WT fastening system

High performance for lateral tensile reinforcement



Fastener range:

WT-S-6,5 x L
Material: stainless steel A2 (1,4567)
Surface: waxed
Thread-Ø: 6,5 mm

WT-T-6,5 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 6,5 mm

WT-T-8,2 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 8,2 mm (s_g)
and Ø 8,9 mm (s_{clamp})

Solid timber, cross laminated timber	C	24	30
Glulam timber	GL	24c	28c / 24h
Gross density ρ_k [kg/m³]		**350**	**380**

Fastener range WT-S-6,5 x L / WT-T-6,5 x L / WT-T-8,2 x L

Type	Material (S = Stainless steel A2, T = Carbon steel)	Thread-Ø d_1 [mm]	Length [mm]	s_g [mm]	s_{clamp} [mm]	d_k [mm]	Bit	Gross density ρ_k [kg/m³]	350	380
WT	- S/T-	6,5	x 65	28	28	8,0	T30	$F_{1,Rk}$ [kN]	1,7	1,8
WT	- S/T-	6,5	x 90	40	40	8,0	T30		2,4	2,5
WT	- S/T-	6,5	x 130	55	55	8,0	T30		3,3	3,5
WT	- T -	6,5	x 160	65	65	8,0	T30		3,9	4,1
WT	- T -	6,5	x 190	80	80	8,0	T30		4,7	5,1
WT	- T -	6,5	x 220	95	95	8,0	T30		5,6	6,0
WT	- T -	8,2	x 160	65	65	10,0	T40	$F_{1,Rk}$ [kN]	5,0	5,4
WT	- T -	8,2	x 190	80	80	10,0	T40		6,2	6,6
WT	- T -	8,2	x 220	95	95	10,0	T40		7,4	7,9
WT	- T -	8,2	x 245	107	107	10,0	T40		8,3	8,8
WT	- T -	8,2	x 275	122	122	10,0	T40		9,4	10,1
WT	- T -	8,2	x 300	135	135	10,0	T40		10,4	11,2
WT	- T -	8,2	x 330	135	135	10,0	T40		10,4	11,2

$F_{1,Rk}$ [kN] = Pull-out resistance from timber

Installation aids
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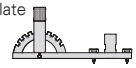
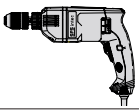
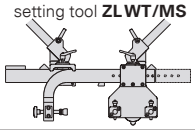
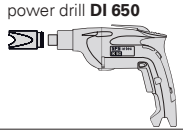
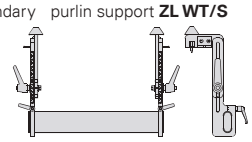
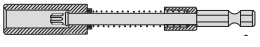
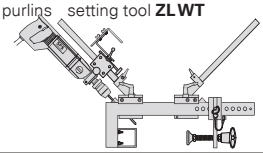
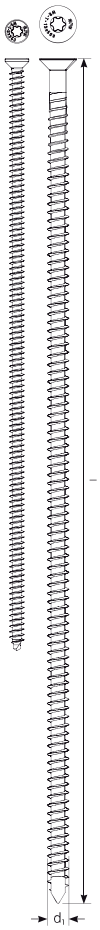
Setting tools and accessories (extract)

Application	Tools and accessories	Fastener	Tools and accessories
Main/secondary purlins, dowelled purlins, prefabricated building,, etc.	universal **ZL WT/U** template 	WT-S/T-6,5 x L WT-T-8,2 x L	power drill **BO 1055** 
Main/secondary purlins	setting tool **ZL WT/MS** 	WT-S/T-6,5 x L L max.: 130 mm	power drill **DI 650** 
Main/secondary purlins	purlin support **ZL WT/S** 	WT-S/T-6,5 x L WT-T-8,2 x L	adapter **WT-T40/D10** adapter **WT-T30** 
Coupling purlins	setting tool **ZL WT** 	WT-S/T-6,5 x L WT-T-8,2 x L	Bit T30, length 70, 200, 350 mm Bit T40, length 70, 152, 200, 350, 520 mm

11

WR fastening system

An extensive range for high-performance connections and reinforcemants



Fastener range

WR-T-9 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 9 mm
Point: drilling point
Drive: T40

WR-T-13 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 13 mm
Point: half-point
Drive: T50

Solid timber, cross laminated timber	C	24	30
Glulam timber	GL	24c	28c/24h
Gross density ρ_k [kg/m³]		**350**	**380**

WR-T-9 x L

Type	Material (Carbon steel)	Thread-Ø d_1 [mm]	Length l [mm]	Gross density ρ_k [kg/m³]	350	380
WR - T	- 9	x	250	$F_{1,Rk}$ [kN]	10,2	10,9
WR - T	- 9	x	300		12,2	13,0
WR - T	- 9	x	350		14,3	15,2
WR - T	- 9	x	400		16,3	17,4
WR - T	- 9	x	450		18,3	19,6
WR - T	- 9	x	500		20,4	21,7
				$F_{2,Rk}$ [kN]	25,4	

WR-T-13 x L

Type	Material (Carbon steel)	Thread-Ø d_1 [mm]	Length l [mm]	Gross density ρ_k [kg/m³]	350	380
WR - T	- 13	x	400	$F_{1,Rk}$ [kN]	23,7	25,3
WR - T	- 13	x	500		29,6	31,7
WR - T	- 13	x	600		35,6	38,0
WR - T	- 13	x	700		41,5	44,3
WR - T	- 13	x	800		47,4	50,7
WR - T	- 13	x	900		53,4	57,0
WR - T	- 13	x	1000		59,3	63,3
				$F_{2,Rk}$ [kN]	41,3	

$F_{1,Rk}$ [kN] = Pull-out resistance from timber
$F_{2,Rk}$ [kN] = Tensile load-bearing capacity of the fastener

Setting tools and accessories

Fastener	Accessories	Fastener	Accessories
WR-T-9 x L	Bit T40 Length 25, 35 and 70 mm	WR-T-9 x L	Drilling tool **BO 1055**
WR-T-13 x L	Bit T50 Length 36 mm Length 50 mm with recessed square socket 1/2" Adapter ZA 1/2" - MK3	WR-T-13 x L	Recommended tools (not included in range) BOSCH **GBM 23-2/32-4** Milwaukee **B4-32** Protool **DRP 32-4**

Principles of calculation

Detailed planning documentation cateringfor a very wide range of applications ensures easy, reliable calculation. For special applications our structural timberwork consultants will be pleased to assist you in selecting the most efficient and cost-effective fastening method

More information:
If you have any questions about fastening technology, just call us. We'll be pleased to advise you!

In the event that any differences exist between the original German data sheet text and versions translated into other languages, the original German text is the only valid version.

All calculations must be verified and signed off by the planner in charge before the work is performed. The user is responsible for compliance with the statutory provisions.

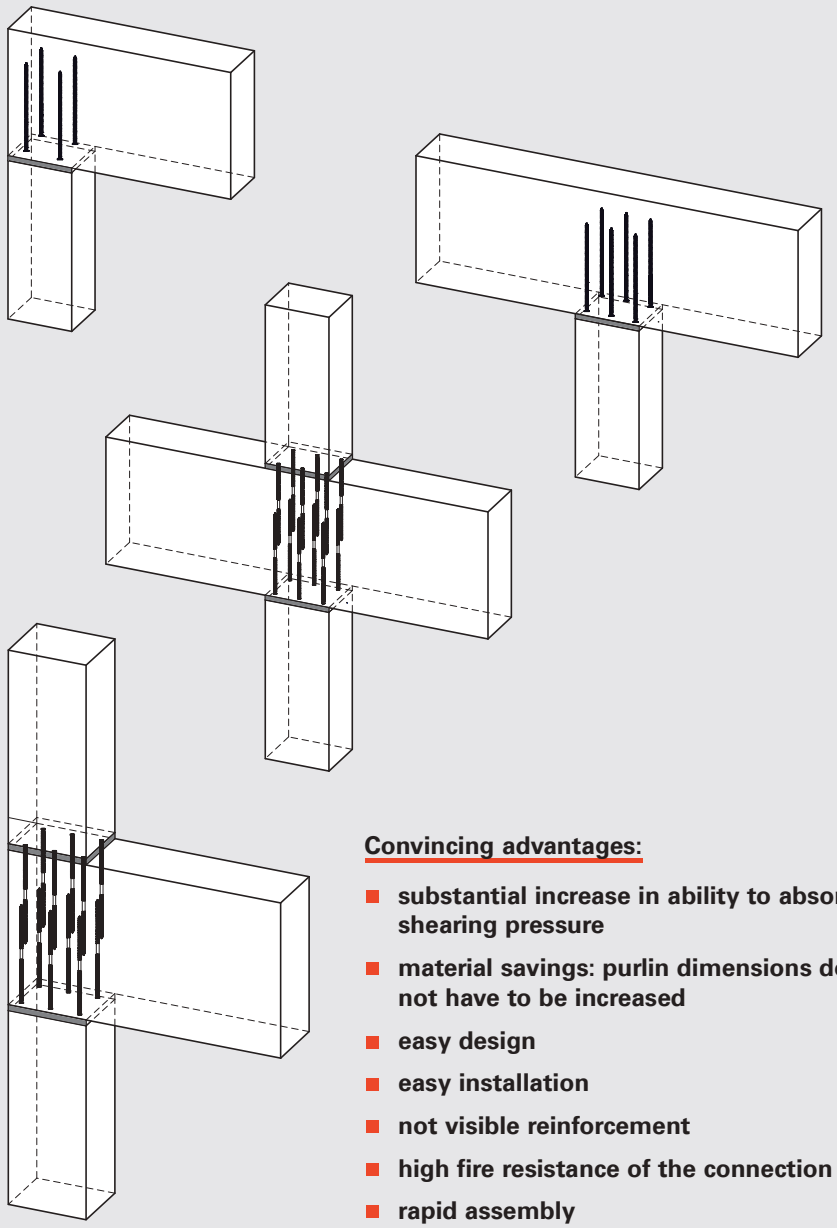
SFS intec

EN 1995-1-1

Lateral compression reinforcements

WT
WR

Data sheet
No. 09 3.04



Convincing advantages:

- substantial increase in ability to absorb shearing pressure
- material savings: purlin dimensions do not have to be increased
- easy design
- easy installation
- not visible reinforcement
- high fire resistance of the connection
- rapid assembly
- ETA-12/0063 (WT)

Load bearing capacity of the fastener

Characteristic gross density for calculations

Solid timber, cross-laminated timber	C	24	30
Glulam timber	GL	24c	28c / 24h
Gross density ρ_k [kg/m³]		**350**	**380**

System WT according to ETA 12/0063

Table 1

					Gross density ρ_k [kg/m³]	**350**	**380**
WT-S/T-6.5 xL [mm]	65	s_g [mm]	28	Load-bearing capacity compression fastener $F_{1,Rk}$ [kN]		4,3	4,5
	90		40			6,3	6,7
	130		55			8,8	9,4
WT-T-6.5 xL [mm]	160		65			10,5	11,2
	190		80			13,0	13,9
	220		95			15,5	16,5
	Buckling values of the fastener $F_{2,Rk}$* [kN]					7,3	7,5

					Gross density ρ_k [kg/m³]	**350**	**380**
WT-T-8.2 xL [mm]	160	s_g [mm]	65	Load-bearing capacity compression fastener $F_{1,Rk}$ [kN]		13,7	14,6
	190		80			16,9	18,1
	220		95			20,2	21,6
	245		107			22,9	24,4
	275		122			26,1	27,9
	300		135			29,0	31,0
	330		135			29,0	31,0
	Buckling values of the fastener $F_{2,Rk}$ [kN]					12,6	12,9

$$F_{ax,Rd} = \min \left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}} ; \frac{F_{2,Rk}}{\gamma_{M2}} \right)$$

$\gamma_{M1} = 1,3$ $\gamma_{M2} = 1,1$
γ_{M1} (GL) = 1,25

Values $F_{1,Rk}$ apply to the full effective length of each thread section excluding the screw head.

$s_g = s_{clamp}$ = given thread length

*Buckling values apply to the WT-T fastener

System WR according to ETA 12/0062

Table 2

			Gross density ρ_k [kg/m³]	**350**	**380**
WR-T-9xL [mm]	250	Load-bearing capacity compression fastener $F_{1,Rk}$ [kN]		26,5	28,3
	300			32,3	34,4
	350			38,0	40,6
	400			43,8	46,8
	450			49,5	52,9
	500			55,3	59,1
	Buckling values of the fastener $F_{2,Rk}$ [kN]			15,4	15,7

			Gross density ρ_k [kg/m³]	**350**	**380**
WR-T-13xL [mm]	400	Load-bearing capacity compression fastener $F_{1,Rk}$ [kN]		63,7	68,1
	500			80,5	86,0
	600			97,3	103,9
	700			114,0	121,8
	800			130,8	139,7
	900			147,6	157,6
	1000			164,3	175,5
	Buckling values of the fastener $F_{2,Rk}$ [kN]			33,5	34,1

$$F_{ax,Rd} = \min \left(\frac{F_{1,Rk} \cdot k_{mod}}{\gamma_{M1}} ; \frac{F_{2,Rk}}{\gamma_{M2}} \right)$$

$\gamma_{M1} = 1,3$ $\gamma_{M2} = 1,1$
γ_{M1} (GL) = 1,25

Values $F_{1,Rk}$ apply to the full effective length of the thread excluding the screw head.

General remarks:
– **All calculations must be verified and signed off by the planner in charge of the project before the work is performed.**

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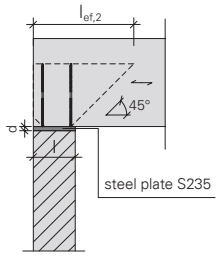
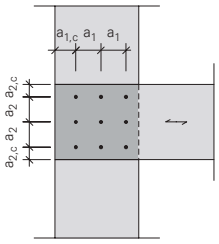
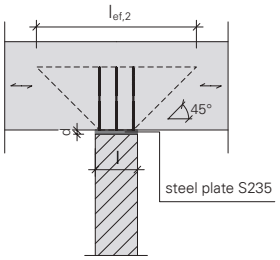
Proposal of design
Edge and intermediate spacing

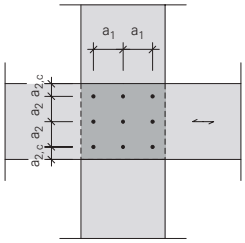
End supports





Central supports





			Axial			
			WT-S/T		WR-T	
		Ø	6,5	8,2	9	13
		d_1	[mm]			
parallel with the grain	a_1	5	33	40	45	65
at right angles to the grain	a_2	5	33	40	45	65
	$a_{2,red}$*	2,5	16	20	--	--
unstressed end-grain timber	$a_{1,c}$	5	33	40	45	65
unstressed edge	$a_{2,c}$	3	15	24	27	39

* only possible if $a_1 \geq 10 \times d_1$

S235 steel plate **proposed size**

$$\min d_{[mm]} = 2{,}70 \cdot \sqrt{F_{Rd\,[kN]}}$$

R_d = design load-bearing capacity of a fastener

General remarks:
- Connection geometries as shown in the drawings must be adhered to.
- Tables apply for angle $\alpha = 90°$ between the screw axis and the direction of the timber grain.
- The fastener heads must all lie completely flush with the timber surface.
- The fasteners must be inserted precisely perpendicular to the contact surface.
- No intermediate layer is permitted between the screw head and the steel plate.
- The load-bearing capacity of the connection is the product of the sum of fastener load-bearing capacities and the compressive force which can be absorbed by the bearing surface in terms of EN 1995-1-1 .
- Lateral compressive strain in the plane of the fastener point must be demonstrated in every case with $l_{ef,2}$ as shown in the drawing.

– **All calculations must be verified and signed off by the planner in charge of the project before the work is performed.**

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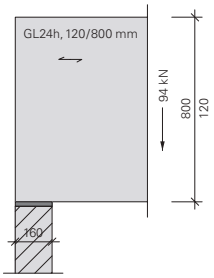
Example

Given

glulam beam, GL24h

beam width	b	=	120 mm
beam height	h	=	800 mm
cross section	$l_{ef,1}$	=	190 mm = (160 mm + 30 mm)
Part safety factors			
wood, GL	γ_M	=	1,25
steel	γ_M	=	1,1



Loading

reaction V_d = 94 kN (KLED middle)

k_{mod} = 0,8

Proof of the support pressure without reinforcement

lateral compression

$$\frac{\sigma_{c,90,d}}{k_{c,90} \cdot f_{c,90,d}} = \frac{94000\ N \cdot 1,25}{190\ mm \cdot 120\ mm \cdot 1,75 \cdot 0,8 \cdot 2,7\ \frac{N}{mm^2}} = 1,36 \geq 1,00$$

→ reinforcement necessary!

Reinforcement

Shearing pressure reinforcement with WT-T-8,2 x 332
(F_{Rd} = 12,9 kN/1,1 = 11,7 kN; buckling decisive)

load-bearing capacity bearing surface area

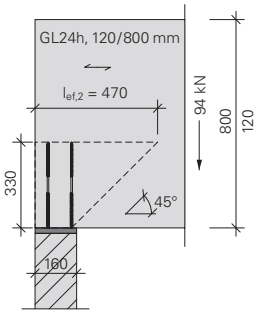
$$R_{c,90,d} = \frac{120\ mm \cdot 190\ mm \cdot 1,75 \cdot 0,8 \cdot 2,7\ \frac{N}{mm^2}}{1,25 \cdot 1000} = 68,9\ kN$$

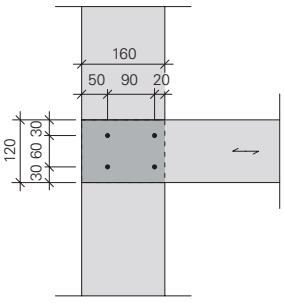
requ. number

$$n_{erf} = \frac{V_d - F_{c,90,d}}{F_{Rd}} = \frac{94\ kN - 68;9\ kN}{11,7\ kN} = 2,15 \rightarrow 4\ pcs.$$

spacing and distances

II to grain, one above the other	a_1	=	90 mm	>	40 mm ✔
II to grain, from edge	$a_{1,c}$	=	50 mm	>	40 mm ✔
L to grain, one above the other	a_2	=	60 mm	>	40 mm ✔
L to grain, from edge	$a_{2,c}$	=	30 mm	>	24 mm ✔





Proof in the plane of the fastener point

eff. length $l_{ef,2}$ = 50 mm + 90 mm + 330 mm = 470 mm

lateral compression

$$\frac{V_d}{l_{ef,2} \cdot b \cdot f_{c,90,d}} = \frac{94000\ N \cdot 1,25}{470\ mm \cdot 120\ mm \cdot 0,8 \cdot 2,7\ \frac{N}{mm^2}} = 0,96 \leq 1,00\ ✔$$

Steel plate

plate thickness $d = 2,70 \cdot \sqrt{F_{Rd}} = 2,70 \cdot \sqrt{11,7} = 9,2 \rightarrow 10$ mm

General remarks:
– **All calculations must be verified and signed off by the planner in charge of the project before the work is performed.**

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WT fastening system

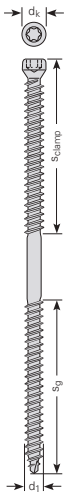
An extensive range with high added value for timber/timber connections

Fastener range:

WT-S-6,5 x L
Material: stainless steel A2 (1,4567)
Surface: waxed
Thread-Ø: 6,5 mm

WT-T-6,5 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 6,5 mm

WT-T-8,2 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 8,2 mm (s_g)
and Ø 8,9 mm (s_{clamp})



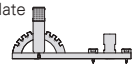
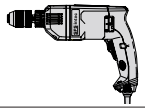
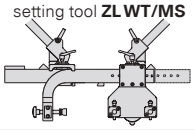
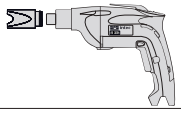
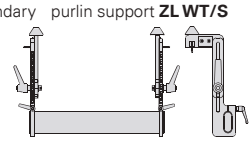
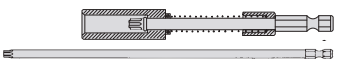
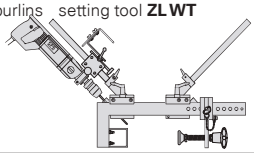
Fastener range WT-S-6,5 x L / WT-T-6,5 x L / WT-T-8,2 x L

Type	Material (S = stainless steel A2, T = carbon steel)	Thread-Ø d_1 [mm]	Length [mm]	s_g [mm]	s_{clamp} [mm]	d_k [mm]	Bit
WT -	S	- 6,5	x 65	28	28	8,0	T30
WT -	S	- 6,5	x 90	40	40	8,0	T30
WT -	S	- 6,5	x 130	55	55	8,0	T30
WT -	T	- 6,5	x 65	28	28	8,0	T30
WT -	T	- 6,5	x 90	40	40	8,0	T30
WT -	T	- 6,5	x 130	55	55	8,0	T30
WT -	T	- 6,5	x 160	65	65	8,0	T30
WT -	T	- 6,5	x 190	80	80	8,0	T30
WT -	T	- 6,5	x 220	95	95	8,0	T30
WT -	T	- 8,2	x 160	65	65	10,0	T40
WT -	T	- 8,2	x 190	80	80	10,0	T40
WT -	T	- 8,2	x 220	95	95	10,0	T40
WT -	T	- 8,2	x 245	107	107	10,0	T40
WT -	T	- 8,2	x 275	122	122	10,0	T40
WT -	T	- 8,2	x 300	135	135	10,0	T40
WT -	T	- 8,2	x 330	135	135	10,0	T40

Installation aids
We offer the appropriate accessories, from the simple, universal gauge to special appliances for specific applications. Our technical consultants will be pleased to help you make the right choice.

Principles of calculation
Detailed planning documentation cateringfor a very wide range of applications ensures easy, reliable calculation. For special applications our structural timberwork consultants will be pleased to assist you in selecting the most efficient and cost-effective fastening method.

Setting tools and accessories (extract)

Application	Tools and accessories	Fastener	Tools and accessories
Main/secondary purlins, dowelled purlins, prefabricated building, etc.	universal **ZL WT/U** template 	WT-S/T-6,5 x L WT-T-8,2 x L	power drill **BO 1055** 
Main/secondary purlins	setting tool **ZL WT/MS** 	WT-S/T-6,5 x L L max.: 130 mm	power drill **DI 650** 
Main/secondary purlins	purlin support **ZL WT/S** 	WT-S/T-6,5 x L WT-T-8,2 x L	adapter **WT-T40/D10** adapter **WT-T30** 
Coupling purlins	setting tool **ZL WT** 	WT-S/T-6,5 x L WT-T-8,2 x L	Bit T30, length 70, 200, 350 mm Bit T40, length 70, 152, 200, 350, 520 mm

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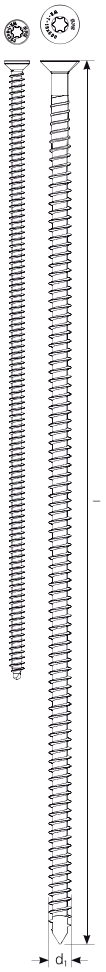
WR fastening system

An extensive range for high-performance connections and reinforcements

Fastener range

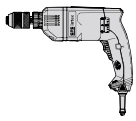
WR-T-9 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 9 mm
Point: drilling point
Drive: T40

WR-T-13 x L
Material: carbon steel
Surface: Durocoat
Thread-Ø: 13 mm
Point: half-point
Drive: T50



WR-T-9 x L						
Type	Material carbon steel		Thread-Ø d_1 [mm]		Length l [mm]	
WR	- T	-	9	x	250	
WR	- T	-	9	x	300	
WR	- T	-	9	x	350	
WR	- T	-	9	x	400	
WR	- T	-	9	x	450	
WR	- T	-	9	x	500	

WR-T-13 x L						
Type	Material carbon steel		Thread-Ø d_1 [mm]		Length l [mm]	
WR	- T	-	13	x	400	
WR	- T	-	13	x	500	
WR	- T	-	13	x	600	
WR	- T	-	13	x	700	
WR	- T	-	13	x	800	
WR	- T	-	13	x	900	
WR	- T	-	13	x	1000	

Setting tools and accessories	
Fastener	Accessories
WR-T-9 x L	Bit T40 lengths 25, 35 and 70 mm
WR-T-13 x L	Bit T50 Length 36 mm Length 50 mm with recessed square socket $^1/_2$" Adapter ZA $^1/_2$" - MK3
WR-T-9 x L	drilling tool **BO 1055** 
WR-T-13 x L	Recommended tools (not included in range) BOSCH **GBM 23-2/32-4** Milwaukee **B4-32** Protool **DRP 32-4**

Principles of calculation
Detailed planning documentation cateringfor a very wide range of applications ensures easy, reliable calculation. For special applications our structural timberwork consultants will be pleased to assist you in selecting the most efficient and cost-effective fastening method

More information:
If you have any questions about fastening technology, just call us. We'll be pleased to advise you!

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SFS intec

EN 1995-1-2

Simplified fire protection rating

conforming to EN 1995-1-2 for selected applications

WT
WR
WB

Data sheet No. 10 2.02

When the following edge spacing is complied with, fire protection verification is not relevant and therefore assumed without further verification. If load-bearing capacity at normal temperature is not fully utilised, the spacing stated below may be reduced (precise calculation required, e.g. as stated overleaf).

Preconditions

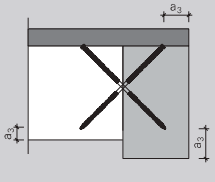
- Load-bearing capacity complies with normal state verification.
- The contact area between two members must be as close as possible or touching.
- Fasteners are protected against direct fire loads, i.e. the fastener head is insulated by a covering which provides effective fire protection per the requirements.
- If inserted from a side exposed to flames, the fastener must be countersunk at a spacing of a_3 and protected with a plug.
- The possibility of transverse stress must be accounted for in the design.

Spacing	Spacing in mm für **R30**											
	k_{mod} = 0,8						k_{mod} = 0,9					
	WT-S, WT-T		WR-T		WB-T		WT-S, WT-T		WR-T		WB-T	
	6,5xL	8,2xL	9xL	13xL	16xL	20xL	6,5xL	8,2xL	9xL	13xL	16xL	20xL
a_1	33	33	33	39*	64*	80*	34	34	34	39*	64*	80*
a_2	49	53	78	104*	144*	180*	50	54	79	104*	144*	180*
a_3	53	53	53	59*	84*	100*	54	54	54	59*	84*	100*

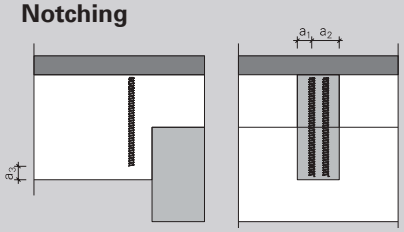
*Edge spacing on the basis of cold measurement applies.

Spacing	Spacing in mm für **R60**											
	k_{mod} = 0,8						k_{mod} = 0,9					
	WT-S, WT-T		WR-T		WB-T		WT-S, WT-T		WR-T		WB-T	
	6,5xL	8,2xL	9xL	13xL	16xL	20xL	6,5xL	8,2xL	9xL	13xL	16xL	20xL
a_1	61	61	61	61	64*	80*	63	63	63	63	64*	80*
a_2	77	81	106	126	144*	180*	79	83	108	128	144*	180*
a_3	81	81	81	81	84*	100*	83	83	83	83	84*	100*

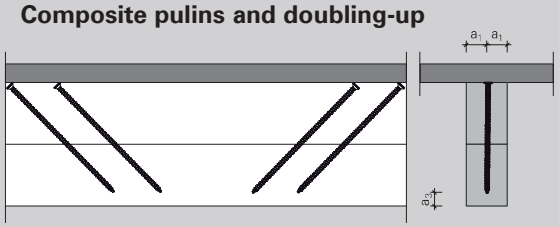
Joining main/secundary purlins, posts and rails



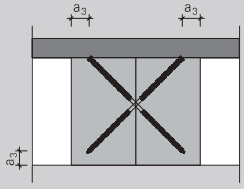
Notching



Composite pulins and doubling-up



Coupling purlins



Edge protected against burn-off by a covering which provides effective fire protection appropriate to requirements.

11

Simplified fire protection rating

conforming to EN 1995-1-2 for fire resistance category R30 / R60

Verification $E_{d,fi} \ / \ R_{d,t,fi} \leq 1,0$

Effects

$E_d = \gamma_G \cdot G_k \oplus \gamma_{Qk,1} \cdot Q_{k,1} \oplus \Sigma \gamma_{Qk,i} \cdot \psi_{o,i} \cdot Q_{k,i}$

$E_{d,fi} = \eta_{fi} \cdot E_d$

η_{fi} = 0,60 (Assumption for calculating edge spacing on page 1)
= 0,70 for Category E working loads (storage premises)

E_d effects for verification of load-bearing capacity in the normal state conforming to EN 1991-1

$E_{d,fi}$ effects for verification of load-bearing capacity in the event of fire

Resistance

$R_{d,t,fi} = \eta \cdot R_{0,2} \ / \ \gamma_{M,fi}$

$R_{0,2} = k_{fi} \cdot R_{0,05}$

$R_{0,05}$ characteristic value conforming to ETA-12/0063, ETA-12/0062, Z-9.1-777

k_{fi} = 1,05 conversion factor to 20%-fractile value

$\gamma_{M,fi}$ = 1,0 recommendation conforming to EN 1995-1-2 (2.3)

η = conversion factor for diminution of the fastener's extraction resistance in the event of fire conforming to EN 1995-1-2 (6.4)

$$\eta = \begin{bmatrix} 0 \\ \dfrac{0,44 \cdot a_1 - 0,264 \cdot t_{d,fi}}{0,2 \cdot t_{d,fi} + 5} \\ \dfrac{0,56 \cdot a_1 - 0,36 \cdot t_{d,fi} + 7,32}{0,2 \cdot t_{d,fi} + 23} \\ 1,0 \end{bmatrix}$$

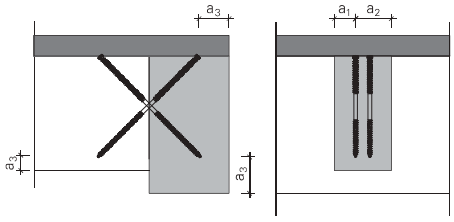
für

$a_1 \leq 0,6 \cdot t_{d,fi}$

$0,6 \cdot t_{d,fi} \leq a_1 \leq 0,8 \cdot t_{d,fi} + 5$

$0,8 \cdot t_{d,fi} + 5 \leq a_1 \leq t_{d,fi} + 28$

$a_1 \geq t_{d,fi} + 28$



$a_2 \geq a_1 + 40$ preconditions for this calculation approach
$a_3 \geq a_1 + 20$ according to EN 1995-1-2 (6.4)

$t_{d,fi}$ = required duration of fire resistance in min.
$t_{d,fi}$ must be increased by a factor of 1,25 if $a_1 \leq a_2 \leq a_1 + 40$

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SFS intec

EN 1995-1-1: 2004/A1

WS fastening system from SFS intec

Load-carrying capacity of WS-T-7

All calculations must be verified and signed off by the planner in charge of the project before the work is performed.

WS

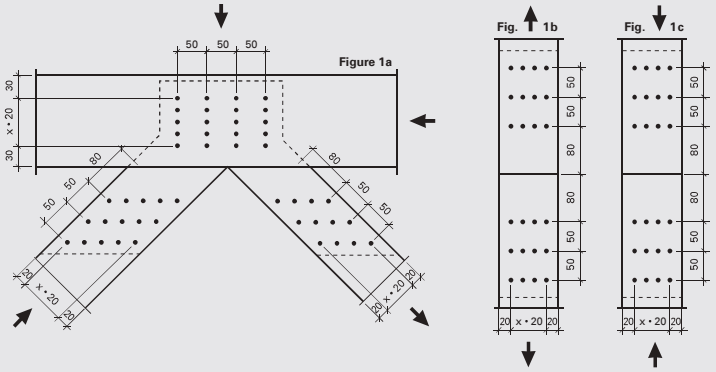
Data Sheet Nr. 02 3.01

In principle, design calculations are performed in accordance with EN 1995-1-1:2004/A1, section 8. A diameter d of 7 mm is used for this purpose. 19 mm must be deducted from external timber thickness t_1 on one side for the drill point and the remaining timber which is not penetrated.

Fastener arrangement: Table 1

minimum spacings and distances	spacings		end		edge	
	∥	⊥	loaded	unloaded	loaded	unloaded
	50 mm	20 mm	80 mm	80 mm[1)]	30 mm	20 mm

[1)] Depending on the angle α between the force and the direction of grain a reduction in accordance with EN 1995-1-1 is possible where applicable.



Characteristic load-carrying capacity R_k in kN per dowel

Preconditions for using tables 2, 3 and 4:

- Slot width t = 6 – 7 mm, 1 plate: t_{max} = 12 mm
- Steel plate thickness t_b = 5 mm, 1 plate: $t_{b,max}$ = 10 mm
- Steel plate quality S 235
- Fasteners perpendicular to grain
- Service class 1 or 2
- Glulam from softwood GL24h
- Compliance with spacings and distances (Table 1 and Figure 1)

The WS system is designed for steel plates (penetration thickness max. 3 × 5 mm or 1 × 10 mm) in S 235/St 37/FeE 235 quality. Higher steel strengths can result in failures during insertion in the absence of additional measures and should therefore only be used after consultation with us. In order to ensure optimum system security we recommend using exclusively SFS intec's WS setting tools. In manual setting, special attention must be paid to inserting the WS dowel right-angled.

If the arrangement of the steel plates or the steel plate thickness ($t_{b,min}$ = 3 mm) does not conform to the suggestions in tables 2 to 4, the design values R_d **per dowel** can be calculated in accordance with EN 1995-1-1:2004/A1, section 8. It must be noted that with an external timber thickness t_1 a deduction of 19 mm must be allowed for the drill point of the WS fastening system and the remaining unpenetrated timber.
Transmission of the forces in the steel plates must be demonstrated. With plate thicknesses 3 mm ≤ t_b ≤ 5 mm the embedment stress in the plate must be verified.

The tensile stresses in the net cross section must be demonstrated for the joints. This verification must be provided separately for the timber middle member with the pin forces induced here, and for the two timber side members.

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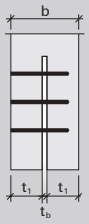
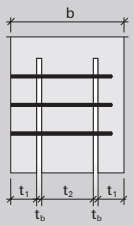
Figure 2



Characteristic load-carrying capacity R_k in kN **per dowel** in **double shear** connections — Table 2

fastener	WS-T	7×73	7×93	7×113	7×133	7×153	7×173	7×193	7×213	7×233
timber width	b in mm	80	100	120	140	160	180	200	220	240
side member	t_1 in mm	34	44	54	64	74	84	94	104	114
middle member	t_2 in mm	—	—	—	—	—	—	—	—	—
angle α between the force and the direction of grain	0°	7,15	8,41	9,51	10,6	11,3	11,7	11,7	11,7	11,7
	30°	6,54	7,80	8,74	9,88	10,5	11,1	11,1	11,1	11,1
	45°	6,04	7,29	8,10	9,11	9,84	10,4	10,6	10,6	10,6
	60°	5,62	6,87	7,58	8,47	9,29	9,80	10,1	10,1	10,1
	90°	5,27	6,52	7,13	7,93	8,82	9,28	9,71	9,71	9,71

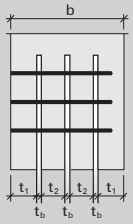
Figure 3



Characteristic load-carrying capacity R_k in kN **per dowel** in **fourfold shear** connections — Table 3

fastener	WS-T	7×73	7×93	7×113	7×133	7×153	7×173	7×193	7×213	7×233
timber width	b in mm	80	100	120	140	160	180	200	220	240
side member	t_1 in mm	—	—	—	40	40	55	65	65	75
middle member	t_2 in mm	—	—	—	48	68	58	58	78	78
angle α between the force and the direction of grain	0°	—	—	—	17,8	19,8	21,3	22,4	22,4	23,1
	30°	—	—	—	16,3	18,6	19,4	20,5	21,1	21,6
	45°	—	—	—	15,0	17,6	17,8	18,8	19,8	20,5
	60°	—	—	—	13,9	16,8	16,4	17,3	18,7	19,5
	90°	—	—	—	13,0	15,8	15,3	16,1	17,7	18,6

Figure 4



Characteristic load-carrying capacity R_k in kN **per dowel** in **sixfold shear** connections — Table 4

fastener	WS-T	7×73	7×93	7×113	7×133	7×153	7×173	7×193	7×213	7×233
timber width	b in mm	80	100	120	140	160	180	200	220	240
side member	t_1 in mm	—	—	—	—	—	39	39	43	53
middle member	t_2 in mm	—	—	—	—	—	42	52	58	58
angle α between the force and the direction of grain	0°	—	—	—	—	—	25,0	29,1	31,7	32,8
	30°	—	—	—	—	—	22,8	26,4	28,8	29,8
	45°	—	—	—	—	—	20,9	24,2	26,4	27,2
	60°	—	—	—	—	—	19,3	22,3	24,4	25,0
	90°	—	—	—	—	—	17,8	20,6	22,6	23,2

Characteristic values R_k apply to glulam GL24h. Characteristic values R_k can be multiplied by the following conversion factors for other strength classes:

strength class GL	24c	24h 28c	28h 32c	32h 36c	36h
ρ_k in kg/m³	350	380	410	430	450
conversion factor	0,93	1,00	1,04	1,06	1,09

In the case of several dowels n inserted in rows in the direction of the grain, the characteristic values per dowel R_k must be multiplied by the effective number n_{ef} in accordance with the adjoining table. Effective number n_{ef} is applicable for a spacing of 50 mm between the dowels in the direction of the grain.

Effective number of fasteners n_{ef}

	n	1	2	3	4	5
angle α between the force and the direction of grain	0°	1,00	1,61	2,31	3,00	3,66
	30°	1,00	1,74	2,54	3,33	4,11
	45°	1,00	1,80	2,66	3,50	4,33
	60°	1,00	1,87	2,77	3,67	4,55
	90°	1,00	2,00	3,00	4,00	5,00

The calculation of the design value R_d is performed in accordance with EN 1995-1-1:2004/A1, section 2:

$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_M}$$ with γ_M = 1,3 in accordance with EN 1995-1-1:2004/A1, Table 2.3

Joint slip
The slip modulus K_{ser} can be calculated in accordance with EN 1995-1-1:2004/A1, section 7.
Where necessary the National annex must be considered.

SFS intec AG / FasteningSystems / CH-9435 Heerbrugg / fs.heerbrugg@sfsintec.biz / www.sfsintec.biz

SFS intec
Turn ideas into reality.

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SFS intec

EN 1995-1-1

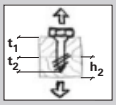
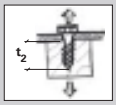
Timber to Timber and Steel to Timber Connections

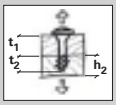
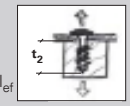
WF

WFD WFO WFR

Data Sheet
No. 01 1.02

Axial Capacity

WFD System	Fastener Length	Thread Length	Characteristic Withdrawal Capacity Timber to Timber Connection (Pull-through of the Head) 	Characteristic Withdrawal Capacity Steel to Timber Connection (Pull-out of the Thread) $t_2 \geq l_{ef}$ 
	l in mm	l_{ef} in mm		$R_{ax,k}$ in kN
WFD-T-H12-8xL	70	49	$R_{ax,k}$ = 2,10 kN if $t_2 \geq 32$ mm	4,27
$t_1 \geq 30$ mm	80	54		4,71
	100	65		5,67
	120	84		7,32
	140			
	160	100		8,72
	□			
	400			
WFD-T-H15-10xL	100	65	$R_{ax,k}$ = 3,76 kN if $t_2 \geq 40$ mm	6,37
$t_1 \geq 40$ mm	120	84		8,23
	140	108		10,58
	160			
	180			
	200	125		12,25
	□			
	400			
WFD-T-H17-12xL	120	84	minimum penetration lengths not kept	8,97
$t_1 \geq 80$ mm	140	100	$R_{ax,k}$ = 4,83 kN if $t_2 \geq 48$ mm and $h_2 \geq 80$ mm	10,68
	160			
	180	125		13,35
	200			
	220			
	240	144		15,38
	□			
	400			

WFO System	Fastener Length	Thread Length	Characteristic Withdrawal Capacity Timber to Timber Connection (Pull-through of the Head or Pull-out of the Thread) 	Characteristic Withdrawal Capacity Steel to Timber Connection (Pull-out of the Thread) $t_2 \geq l_{ef}$ 
	l in mm	l_{ef} in mm		$R_{ax,k}$ in kN
WFO-T-S20-8xL	80	54	$R_{ax,k}$ = 2,74 kN if $t_2 \geq 32$ mm	4,62
	100		Pull-out of the thread is decisive, see column on the right →	
$t_1 \geq 30$ mm	120			
	140	84	$R_{ax,k}$ = 7,04 kN if $t_2 \geq 84$ mm	7,19
	160			
	180	100		8,56
	□			
	400			
WFO-T-S25-10xL	100	60	Pull-out of the thread is decisive, see column on the right →	5,70
	120			
$t_1 \geq 40$ mm	140			
	160	100	Pull-out of the thread is decisive, see column on the right →	9,50
	□			
	400			

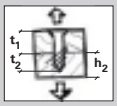
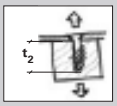
Entire fastener range see following pages.

According to EN 1995-1-1:2004 + AC:2006 + A1:2008 and ETA-12/0373.
True for solid timber with a characteristic density of 350 kg/m³ (C24) if the angle between fastener and grain is minimum 45° and maximum 90°. Reduce values between 0° and 45°!
Keep the minimum headside penetration length t_1 and the minimum pointside penetration length t_2 as well as when indicated the minimum member thickness h!
Keep the minimum distances to the unloaded edge $a_{4,c}$ (see lateral capacity)!

All calculations must be verified and signed off by the planner in charge before the work is performed.

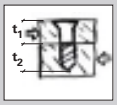
2/5

Axial Capacity

WFR System $t_1 \geq 24$ mm	Fastener Length	Thread Length	Characteristic Withdrawal Capacity Timber to Timber Connection (Pull-through of the Head) 	Charactieristic Withdrawal Capacity Steel to Timber Connection (Pull-out of the Thread) $t_2 \geq l_{ef}$ 
	l in mm	l_{ef} in mm		$R_{ax,k}$ in kN
WFR-T-T20-4xL	50	30	$R_{ax,k}$ = 1,09 kN if $t_2 \geq 24$ mm	1,72
	60	35		2,00
	70			
WFR-T-T20-4,5xL	50	29	$R_{ax,k}$ = 1,43 kN if $t_2 \geq 24$ mm	1,74
	60	34		2,03
	70	39		2,33
	80	44		2,63
WFR-T-T25-5xL	80	47	$R_{ax,k}$ = 1,46 kN if $t_2 \geq 24$ mm	3,20
	90			
	100	55		3,74
	110	65		4,42
	120			
WFR-T-T30-6xL	70	39	$R_{ax,k}$ = 2,10 kN if $t_2 \geq 27$ mm	3,04
	80	48		3,74
	90	48		
	100	54		4,21
	110	64		4,99
	□			
	300			

Entire fastener range see following pages. Keep the remarks on the bottom of page 2!

Lateral Capacity



			WFD			WFO		WFR			
		Diameter d in mm	**8**	**10**	**12**	**8**	**10**	**4**	**4,5**	**5**	**6**
The angle α of the load to the grain must be equal in both timber members (otherwise calculate for α = 90°).	α = 0°	Minimum penetration length t_{min} in mm	50	60	70	50	60	30	35	40	50
		Minimum distance to the unloaded edge $a_{4,c}$ in mm	24	30	36	24	30	12	14	15	18
		Characteristic load-carrying capacity $F_{v,Rk}$ in kN including rope effect	3,57	4,90	6,76	4,14	5,41	0,95	1,18	1,39	2,01
	α = 90°	Minimum penetration length t_{min} in mm	60	70	90	60	70	30	35	40	50
		Minimum distance to the loaded edge $a_{4,t}$ in mm	32	40	48	32	40	28	32	50	60
		Characteristic load-carrying capacity $F_{v,Rk}$ in kN including rope effect	3,06	4,23	5,80	3,71	4,74	0,95	1,18	1,39	2,01

Entire fastener range see following pages.

According to EN 1995-1-1:2004 + AC:2006 + A1:2008 and ETA-12/0373.
True for single shear connections in solid timber with a characteristic density of 350 kg/m³ (C24) if the fastener is set perpendicular to the grain.
Keep the required penetration length in each of the timber members! Thus the fastener must be at least twice as long as the minimum penetration length t_{min}!

All calculations must be verified and signed off by the planner in charge before the work is performed.

3/5

11

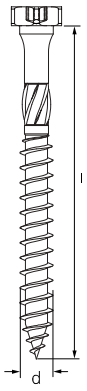
WF
Fastening System

A comprehensive range for timber to timber and steel to timber connections

WFD-T-H12-8 x L
Material: Carbon steel
Coating: zinc electroplating
Diameter: 8 mm
Drive: TORX® T30 / hex H12

WFD-T-H15-10 x L
Material: Carbon steel
Coating: zinc electroplating
Diameter: 10 mm
Drive: TORX® T40 / hex H15

WFD-T-H17-12 x L
Material: Carbon steel
Coating: zinc electroplating
Diameter: 12 mm
Drive: TORX® T40 / hex H17



Fastener Range

Type	Material T = carbon steel	Drive	Diameter d in mm	Length l in mm
WFD	T	H12	8	40
WFD	T	H12	8	50
WFD	T	H12	8	60
WFD	T	H12	8	70
WFD	T	H12	8	80
WFD	T	H12	8	100
WFD	T	H12	8	120
WFD	T	H12	8	140
WFD	T	H12	8	160
WFD	T	H12	8	180
WFD	T	H12	8	200
WFD	T	H12	8	220
WFD	T	H12	8	240
WFD	T	H12	8	260
WFD	T	H12	8	280
WFD	T	H12	8	300
WFD	T	H12	8	320
WFD	T	H12	8	340
WFD	T	H12	8	360
WFD	T	H12	8	380
WFD	T	H12	8	400

Fastener Range

Type	Material T = carbon steel	Drive	Diameter d in mm	Length l in mm
WFD	T	H15	10	60
WFD	T	H15	10	70
WFD	T	H15	10	80
WFD	T	H15	10	100
WFD	T	H15	10	120
WFD	T	H15	10	140
WFD	T	H15	10	160
WFD	T	H15	10	180
WFD	T	H15	10	200
WFD	T	H15	10	220
WFD	T	H15	10	240
WFD	T	H15	10	260
WFD	T	H15	10	280
WFD	T	H15	10	300
WFD	T	H15	10	320
WFD	T	H15	10	340
WFD	T	H15	10	360
WFD	T	H15	10	380
WFD	T	H15	10	400

Fastener Range

Type	Material T = carbon steel	Drive	Diameter d in mm	Length l in mm
WFD	T	H17	12	60
WFD	T	H17	12	80
WFD	T	H17	12	100
WFD	T	H17	12	120
WFD	T	H17	12	140
WFD	T	H17	12	160
WFD	T	H17	12	180
WFD	T	H17	12	200
WFD	T	H17	12	220
WFD	T	H17	12	240
WFD	T	H17	12	260
WFD	T	H17	12	280
WFD	T	H17	12	300
WFD	T	H17	12	320
WFD	T	H17	12	340
WFD	T	H17	12	360
WFD	T	H17	12	380

WFO-T-S20-8 x L
Material: Carbon steel
Coating: zinc electroplating
Diameter: 8 mm
Drive: TORX® T40

WFO-T-S25-10 x L
Material: Carbon steel
Coating: zinc electroplating
Diameter: 10 mm
Drive: TORX® T50

Fastener Range

Type	Material T = carbon steel	Drive	Diameter d in mm	Length l in mm
WFO	T	S20	8	80
WFO	T	S20	8	100
WFO	T	S20	8	120
WFO	T	S20	8	140
WFO	T	S20	8	160
WFO	T	S20	8	180
WFO	T	S20	8	200
WFO	T	S20	8	220
WFO	T	S20	8	240
WFO	T	S20	8	260
WFO	T	S20	8	280
WFO	T	S20	8	300
WFO	T	S20	8	320
WFO	T	S20	8	340
WFO	T	S20	8	360
WFO	T	S20	8	380
WFO	T	S20	8	400

Fastener Range

Type	Material T = carbon steel	Drive	Diameter d in mm	Length l in mm
WFO	T	S25	10	100
WFO	T	S25	10	120
WFO	T	S25	10	140
WFO	T	S25	10	160
WFO	T	S25	10	180
WFO	T	S25	10	200
WFO	T	S25	10	220
WFO	T	S25	10	240
WFO	T	S25	10	260
WFO	T	S25	10	280
WFO	T	S25	10	300
WFO	T	S25	10	320
WFO	T	S25	10	340
WFO	T	S25	10	360
WFO	T	S25	10	380
WFO	T	S25	10	400

WF
Fastening System

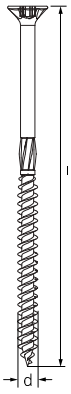
A comprehensive range for timber to timber and steel to timber connections

WFR-T-T20-4 x L
Material: Carbon steel
Coating: zinc electroplating
Diameter: 4 mm
Drive: TORX® T20

WFR-T-T20-4,5 x L
Material: Carbon steel
Coating: zinc electroplating
Diameter: 4,5 mm
Drive: TORX® T20

WFR-T-T25-5 x L
Material: Carbon steel
Coating: zinc electroplating
Diameter: 5 mm
Drive: TORX® T25

WFR-T-T30-6 x L
Material: Carbon steel
Coating: zinc electroplating
Diameter: 6 mm
Drive: TORX® T30



Fastener Range

Type	Material T = carbon steel	Drive	Diameter d in mm	Length l in mm
WFR	T	T20	4	20
WFR	T	T20	4	25
WFR	T	T20	4	30
WFR	T	T20	4	35
WFR	T	T20	4	40
WFR	T	T20	4	45
WFR	T	T20	4	50
WFR	T	T20	4	60
WFR	T	T20	4	70

Fastener Range

Type	Material T = carbon steel	Drive	Diameter d in mm	Length l in mm
WFR	T	T20	4,5	20
WFR	T	T20	4,5	25
WFR	T	T20	4,5	30
WFR	T	T20	4,5	35
WFR	T	T20	4,5	40
WFR	T	T20	4,5	45
WFR	T	T20	4,5	50
WFR	T	T20	4,5	60
WFR	T	T20	4,5	70
WFR	T	T20	4,5	80

Fastener Range

Type	Material T = carbon steel	Drive	Diameter d in mm	Length l in mm
WFR	T	T25	5	20
WFR	T	T25	5	25
WFR	T	T25	5	30
WFR	T	T25	5	35
WFR	T	T25	5	40
WFR	T	T25	5	50
WFR	T	T25	5	60
WFR	T	T25	5	70
WFR	T	T25	5	80
WFR	T	T25	5	90
WFR	T	T25	5	100
WFR	T	T25	5	110
WFR	T	T25	5	120

Fastener Range

Type	Material T = carbon steel	Drive	Diameter d in mm	Length l in mm
WFR	T	T30	6	50
WFR	T	T30	6	60
WFR	T	T30	6	70
WFR	T	T30	6	80
WFR	T	T30	6	90
WFR	T	T30	6	100
WFR	T	T30	6	110
WFR	T	T30	6	120
WFR	T	T30	6	130
WFR	T	T30	6	140
WFR	T	T30	6	150
WFR	T	T30	6	160
WFR	T	T30	6	180
WFR	T	T30	6	200
WFR	T	T30	6	220
WFR	T	T30	6	240
WFR	T	T30	6	260
WFR	T	T30	6	280
WFR	T	T30	6	300

All calculations have to be checked and approved by the responsible planner ahead of execution. The user is responsible to assure compliance with all applicable laws and regulations.

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SFS intec
Turn ideas into reality.

12

Application	Product code	Page
Timber to timber connection, reinforcement and steel to timber connection	**BO1055**	▸ 12.2
Main/Secondary beam connection	**ZL-WT/MS**	▸ 12.2
Self drilling and self tapping fasteners	**DI650**	▸ 12.3
Timber to steel connection	**CF-WS/P**	▸ 12.3
Timber to steel connection	**CF-WS/M**	▸ 12.4
Timber-concrete composite construction	**CF-VB/L**	▸ 12.4
Setting tools and accessories		▸ 12.5

BO1055

Application

Power drill.

Technical details

Power tool:	BO1055
Wattage:	1050 W
Max. revs:	530 rpm
Power supply:	230 V
Max. torque:	50 Nm
Overall length:	338 mm
Height:	225 mm
Weight:	2,3 kg

ZL-WT/MS

Application

Setting tool for the fast and economic installation of WT fasteners crosswise in main/secondary beam connections.

Technical details

Power tool:	BO1055
Wattage:	1050 W
Max. revs:	530 rpm
Power supply:	230 V
Max. torque:	50 Nm
Overall length:	950 mm
Height:	550 mm
Weight:	13,4 kg

DI650

Application

Lightweight power screwgun for installing self drilling and self tapping fasteners.

Technical details

Power tool:	DI650
Wattage:	650 W
Max. revs:	2000 rpm
Power supply:	110 V / 230 V
Max. torque:	20 Nm
Overall length:	290 mm
Weight:	1,6 kg

CF-WS/P

Application

Pneumatic setting tool for the fast and economic installation of WS fasteners.

Technical details

Wattage:	740 W
Max. revs:	2600 rpm
Power supply:	110 V / 230 V
Weight:	87,5 kg

CF-WS/M

Application

Stand-up setting tool for the installation of WS fasteners.

Technical details

Wattage:	740 W
Max. revs:	2600 rpm
Power supply:	110 V / 230 V
Overall length:	410 mm
Height:	790 mm
Weight:	7,6 kg

CF-VB/L

Application

Stand-up setting tool for the installation of VB fasteners.

Technical details

Wattage:	1100 W
Max. revs:	2800 rpm
Power supply:	230 V
Max. torque:	44 Nm
Overall length:	1008 mm
Height:	240 mm
Weight:	4,3 kg

Setting tools and accessories

	ZL-WT/U-COMPL	Universal setting gauge
	WT-T20	Attachment for T20 drive
	WT-T30	Attachment for T30 drive
	WT-T40/D10	Attachment for T40 drive
	Z661-WT	Depth locator sleeve for WT system
	ZL-WT/S	Hanger for mounting secondary beams
	ZL-WT-230V-COMPL	Setting tool for the fast and economic installation of WT fasteners crosswise in coupling purlins
	T50-55-IQUAD1/2“	Insert bit for T50 drive
	T50-36-HEX5/16“	Insert bit for T50 drive

	DWA-12-ZA-SET	Drilling system for WB-T-16
	DWA-12-M7	Spare drill bit for WB-T-16
	DWA-15-ZA-SET	Drilling system for WB-T-20
	DWA-15-M9	Spare drill bit for WB-T-20
	ZA1/2“-MK3	Adapter for power drills with Morse taper shank
	ZA1/2“-11/4“-7UNC	Adapter for power drills with UNC thread
	ZE-16-WB	Insertion sleeve for countersinking WB-T-16
	ZE-20-WB	Insertion sleeve for countersinking WB-T-20
	ZA1/4“-CF-WS/M	Magnetic bit holder
	T40-70-HEX1/4“	Insert bit for T40 drive
	ZL-WS	Setting gauge for the installation of WS fasteners in horizontal direction
	EW12	Socket hexagon head
	EW15	Socket hexagon head
	EW17	Socket hexagon head

	T40-25-HEX1/4“	Insert bit for T40 drive
	T20-25-HEX1/4“	Insert bit for T20 drive
	T25-25-HEX1/4“	Insert bit for T25 drive
	T30-25-HEX1/4“	Insert bit for T30 drive
	ZA1/4“	Drive Bar
	ZA1/4“-E6,3	Drive Bar
	V40-15VB	Insert bit for external T40 drive
	H2-90-HEX1/4“	Insert bit for H2 drive
	T30-90-HEX1/4“	Insert bit for T30 drive

12

Dependably well served:

Meeting your business needs - tailored solutions from SFS intec.

Partners who really understand you:
Experts for architectural exteriors.

The secure route to the right fastener solution:
Simple, efficient planning aids at every step of the project.

Always one step ahead:
An international network with local knowledge in every field.

Economy and security built in:
Complete systems for every application.

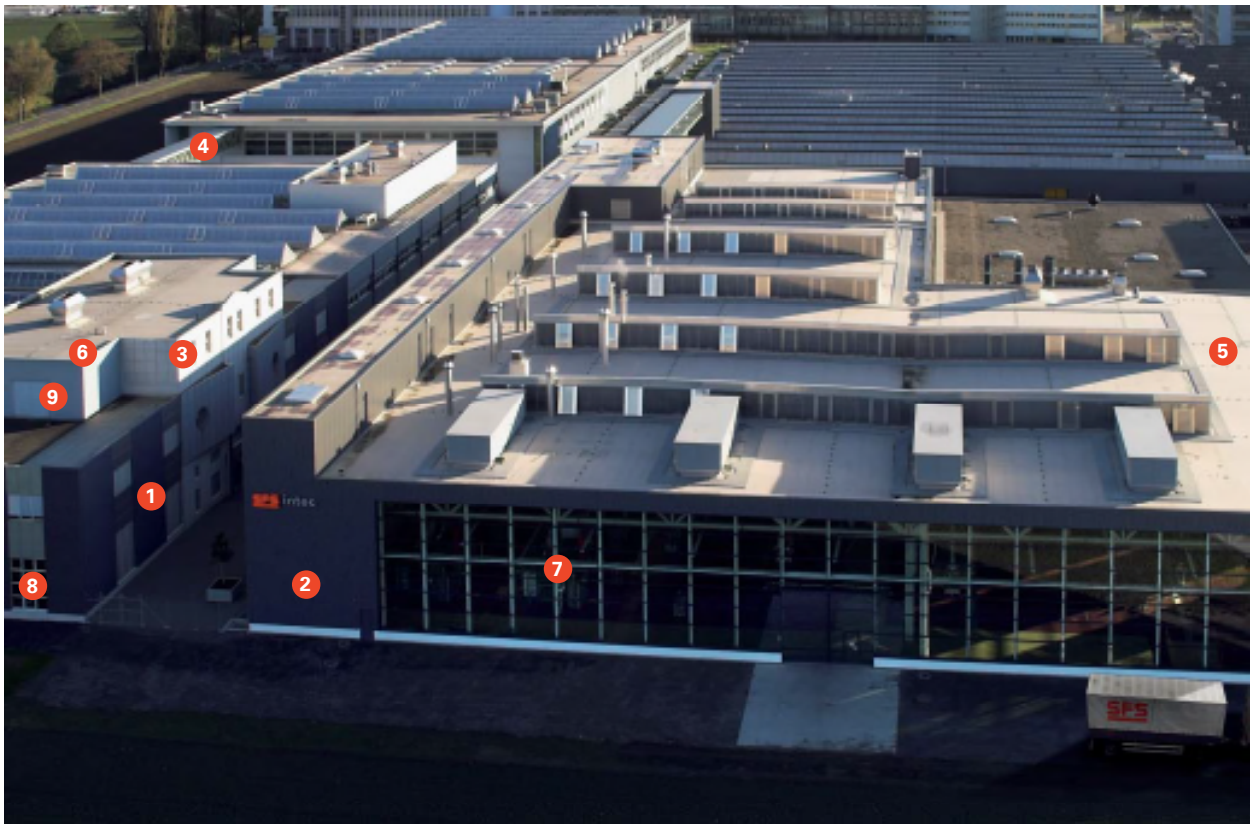
Quality you can depend on:
A network of quality-certified plants.

Reliable performance:
Tested in-house, confirmed on site.

The right fastening system every time:
Technical advice and support any time, anywhere.

More efficiency:
Optimised supply chain management.

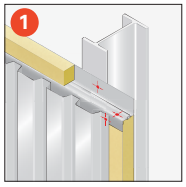
Partners who really understand you:
Experts for architectural exteriors.



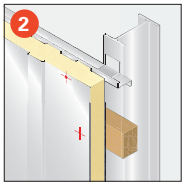
Comprehensive application knowledge from one Partner

For every aspect of architectural exteriors – from fixings to special hinges for doors and windows – SFS intec understands your business. We help make our global customer base more competitive.

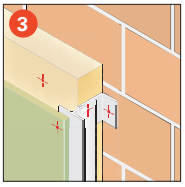
Experienced sector specialists tuned to the regional requirements of each individual market guarantee genuine local advice and support.



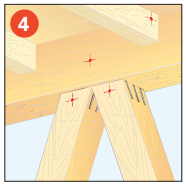
Fastening cassette systems



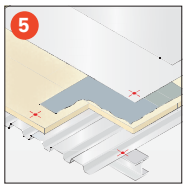
Fastening composite panels



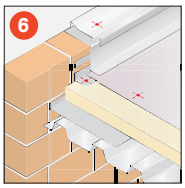
Ventilated curtain walling



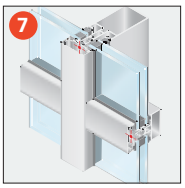
Structural timber and glulam beams



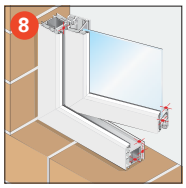
Fastening flat roofs



Perimeter zones



Post-and-rail joints



Fastening systems for doors and windows

Why not take advantage of our expertise:

- More than 50 years experience
- Technical application professionals available for on-site support
- Know-how database from research, development, manufacturing and application engineering

Hinge systems for doors and windows

The secure route to the right fastener solution:
Simple, efficient planning aids at every step of the project.

Choose the planning aids you need:

- User-friendly catalogues
- On-site or office advice
- Application technicians available by phone
- Product selector and project management aids at **www.sfsintec.biz**
- Twenty-four hour online e-shop ordering

Talking to the specialists in fastener and fixing technology

Whatever phase your project is at, SFS intec offers you the right planning aids to determine the appropriate fastener and the matching accessories.

Your specific application does not have to be mentioned in our catalogues. Whatever the job, our specialists can help you find the right system quickly and simply. Our solutions are carefully matched to the requirements since they are developed for each application particularly with an outstanding high load-bearing capacity.

Always one step ahead:
An international network with local knowledge in every field.

Tried and trusted technologies matched to your specific requirements

Somewhere in the world we will have already addressed the same tasks confronting you right now.

Our global team of experts is continuously working on new challenges which means our customers benefit from a massive pool of accumulated knowledge. So they are always one step ahead.

With your specific requirements in our hands, we exchange know-how among a vast international network of industry specialists, seeking out the right fastener solutions for you. Solutions to make your work easier and to help your business be more competitive.

The services that can improve your competitive edge:

- Local on-site support for overseas projects
- Years of experience on numerous international projects
- In-depth knowledge gained from our work with the world's leading OEM's
- People on site who speak your language, offering an international approach

Economy and security built in:
Complete systems covering every application.

SFS intec complete systems:
- Multi-functional fasteners
- Guaranteed long-life
- Simple and easy to use
- Intelligent installation tools enabling fast, efficient work

More than just fastener systems

We work hand-in-hand with planners and specifiers everyday on sites around the world. This is the driver behind our constantly evolving products and services. The diverse messages coming in from the market place are converted by our design and development specialists into profitable solutions for our customers.

SFS intec offers more than just fasteners to its customers. We provide intelligent drive systems and coatings that optimise the insertion torque. Design details that ensure every solution is perfectly fit for purpose. We also create and serve convenient tools for particular applications.

Quality you can depend on:
A network of quality-certified plants.

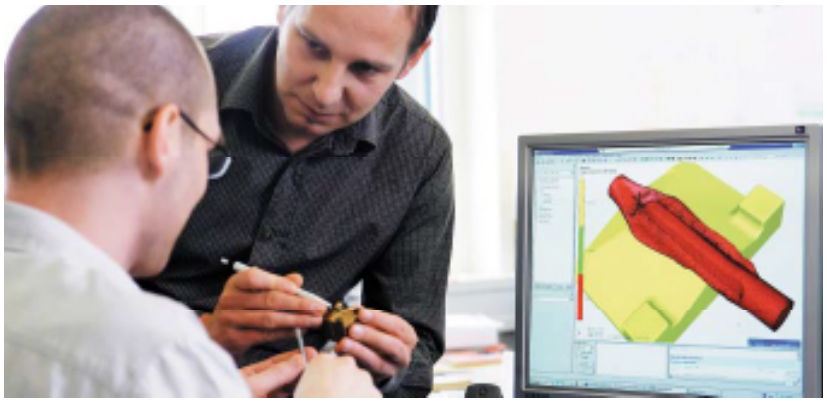
Assured quality – fast delivery

We never compromise when it comes to our application-optimised fasteners. Our trained specialists throughout the value-added chain are there to ensure quality in every aspect of our products and services.

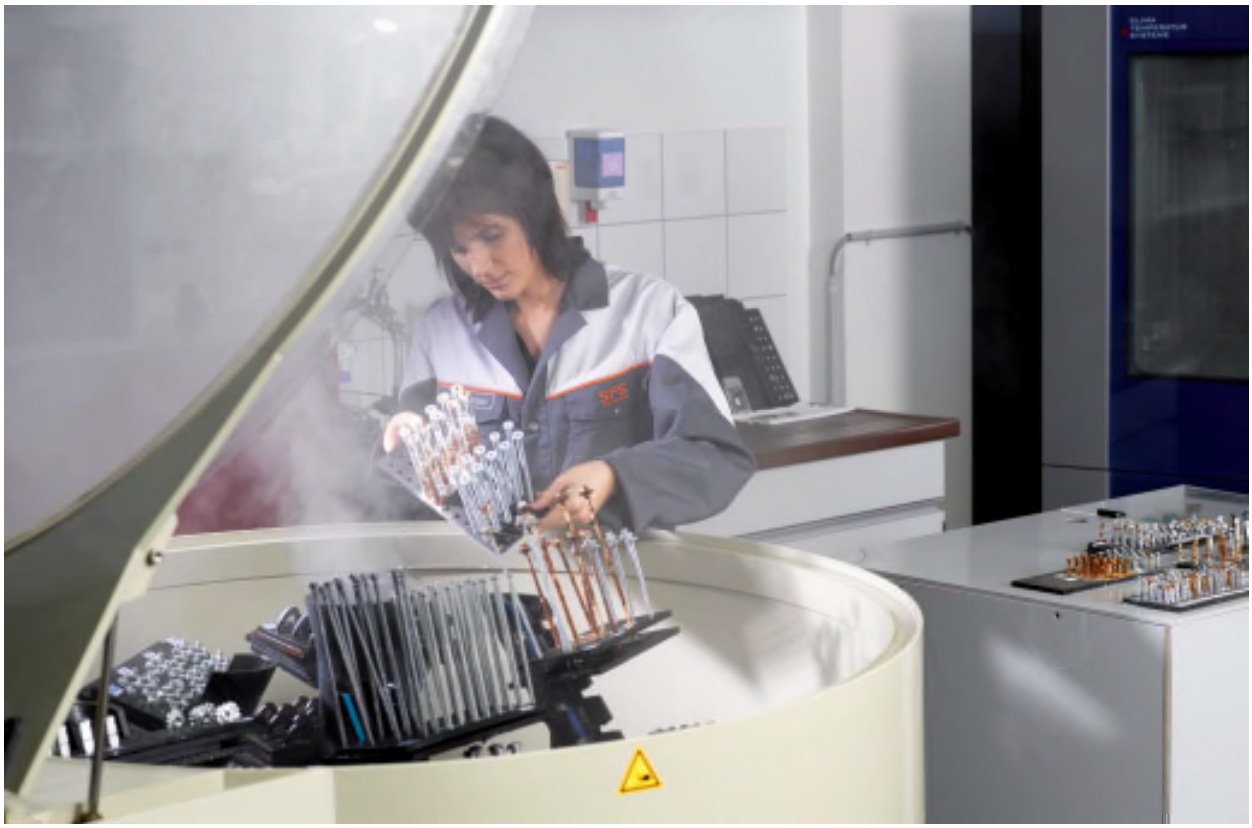
Every SFS intec site has its own accreditation to ISO 9001 quality management standard. Moreover, a complete network of manufacturing and logistics support centres means maximum product availability.

SFS intec business partners profit from:

- Certified quality from our own production centres
- Fast, efficient product availability from an international manufacturing and logistics network
- Flexible responses to individual needs that only the original manufacturer can truly provide



Reliable performance:
Tested in-house, confirmed on site.



SFS intec fastening systems are checked for:

- Long-term behaviour under static loading
- Corrosion resistance
- Ease-of-use and perfect functioning on site
- Fulfilment of approval authority requirements
- Continuous production controls

Fastening systems for tomorrow's needs

Are the fasteners up to the static loads? Is a long-term connection ensured? Or could heat treatment processes or surface treatments improve long-term behaviour? These are the questions confronting SFS intec specialists daily.

New solutions go through rigorous testing at our in-house laboratories including critical checks for the fulfilment of the latest requirements. Through a combination of in-house research and close collaboration with testing institutes, SFS intec is at the forefront of new concepts.

The right fastening system every time:
Technical advice and support anytime, anywhere.

Absolute fastener security

Increased safety requirements; economic, ergonomic and aesthetic considerations; meeting the releant directives and building control guidelines: these and other factors are becoming increasingly important in construction.

That's why choosing the right fastening system for each specific application is vital. We ensure specifiers, architects and installers have the advice and information needed to choose an appropriate system from the wide range of alternatives available.

Your support team is only a phone call away. Our website **www.sfsintec.biz** provides a wealth of information on optimum fastener technology. Draw on our years of experience in every aspect of fastening and fixing to put you in the driving seat for timber construction.

Services ensuring a secure build:

- Choosing the appropriate fastening system at the planning stage
- Comprehensive analysis of your needs including on-site tests
- Optimum supply chain management from plant to site
- On-site personnel training

More efficiency:
Optimised supply chain management.

Efficiency improvements all along the value-added chain:

- Simple, streamlined order processes and reduced storage costs
- Detailed analysis of the materials management process
- A range of process optimisation solutions
- Transparent information flow

Cutting the cost of materials management, optimising processes and enjoying completely trans parent information flow.
In today's complex economic environment with its ever-changing demands, the speed of response, accuracy and reliability of your business activities is crucial.

SFS intec can help you to meet these challenges and has developed a wide range of logistic support mechanisms to meet your business needs. These systems enable you to optimise your purchasing and materials management processes and to work simply and efficiently with us as your dedicated supply partner.

We offer a made-to-measure logistical solution tailored to your specific needs from simple solutions to specific problems. We will analyse your complete procurement, warehousing and despatch processes to suggest ways you can improve efficiency, enhance your sustainability objectives or cut costs.

Focused market activities for a wide range of industries:
Generating customer benefits as a joint corporate objective.

Automotive

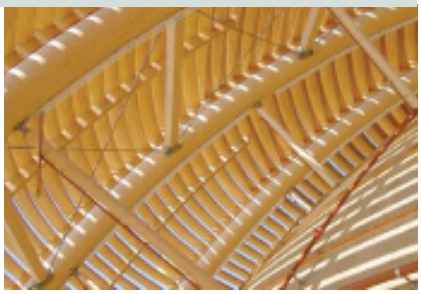
Development and production partner for precision cold formed components and special fasteners for suppliers to the automotive industry operating worldwide.

Industrial

Development and production partner for precision cold formed components and special fasteners for manufacturing companies in different field of activities.

Construction

Mechanical fastening and jointing systems as well as systems accessories for lightweight industrial construction, ventilated curtain walling, flat roofs and structural timberwork.



Construction

Mechanical fastening systems for door and window manufacturers and the transport industry, glass cladding systems and hinge systems for doors and windows.