SBD

SELF-DRILLING DOWEL

CE
EN 14592

TAPERED TIP

The new tapered self-perforating tip minimises insertion times in timber-to-metal connection systems and guarantees applications in hard-to-reach positions (reduced application force).

GREATER STRENGTH

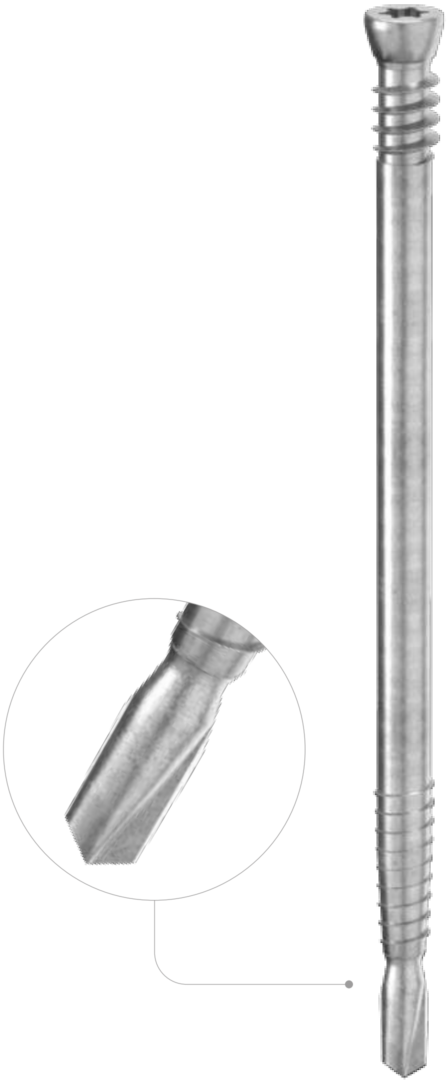
Higher shear strengths than the previous version.
The 7.5 mm diameter ensures higher shear strengths than other solutions on the market and enables optimisation of the number of fasteners.

DOUBLE THREAD

The thread close to the tip (b_1) facilitates screwing. The longer under-head thread (b_2) allows quick and precise closing of the joint.

CYLINDRICAL HEAD

It allows the dowel to penetrate beyond the surface of the timber substrate. It ensures an optimal appearance and meets fire-strength requisites.



MY PROJECT SOFTWARE | VIDEO | BIT INCLUDED

DIAMETER [mm]	3,5 — 7,5 — 8
LENGTH [mm]	25 — 95 – 235 — 240
SERVICE CLASS	SC1 SC2
ATMOSPHERIC CORROSIVITY	C1 C2
WOOD CORROSIVITY	T1 T2
MATERIAL	Zn ELECTRO PLATED electrogalvanized carbon steel

VIDEO

Scan the QR Code and watch the video on our YouTube channel

FIELDS OF USE

Self-drilling system for concealed timber-to. steel joints.
It can be used with screw guns running at 600-2100 rpm, minimum applied force 25 kg, with:

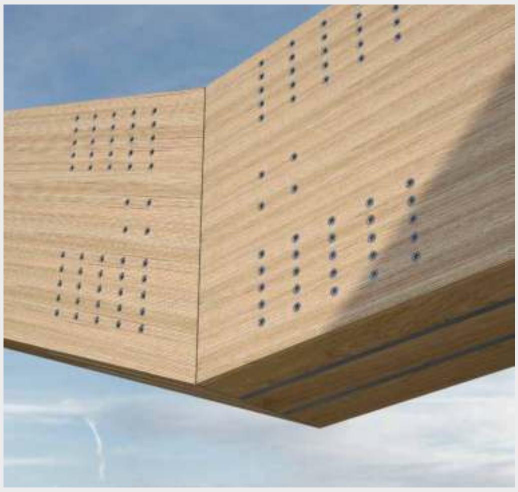
- steel S235 ≤ 10.0 mm
- steel S275 ≤ 10.0 mm
- steel S355 ≤ 10.0 mm
- ALUMINI, ALUMIDI and ALUMAXI brackets

MOMENT RESTORING

It restores shear and moment forces in concealed centreline joints of large beams.

EXCEPTIONAL SPEED

The only dowel that drills a 5 mm thick S355 plate in 20 seconds (horizontal application with an applied force of 25 kg).
No self-drilling pin exceeds the application speed of the SBD with its new tip.

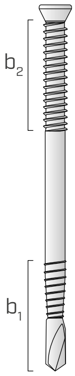


Fastening of Rothoblaas pillar-holder with internal knife plate F70.

Rigid "knee" joint with double internal plate (LVL).

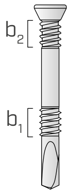
CODES AND DIMENSIONS

SBD L ≥ 95 mm



d_1 [mm]	CODE	L [mm]	b_1 [mm]	b_2 [mm]	pcs
7,5 TX 40	**SBDS7595**	95	40	10	50
	SBDS75115	115	40	10	50
	SBDS75135	135	40	10	50
	SBDS75155	155	40	20	50
	SBDS75175	175	40	40	50
	SBDS75195	195	40	40	50
	SBDS75215	215	40	40	50
	SBDS75235	235	40	40	50

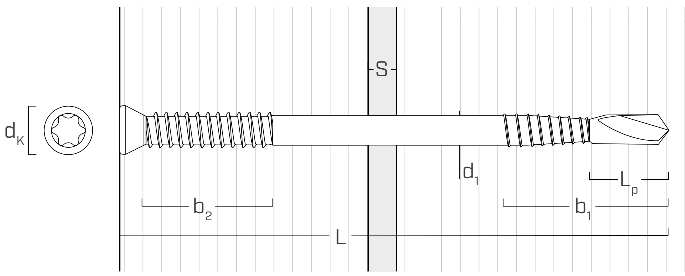
SBD L ≤ 75 mm



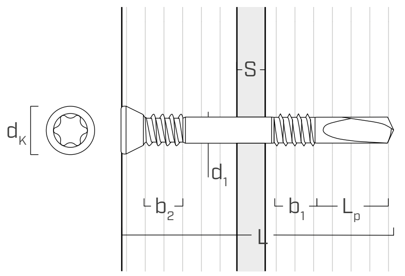
d_1 [mm]	CODE	L [mm]	b_1 [mm]	b_2 [mm]	pcs
7,5 TX 40	**SBD7555**	55	-	10	50
	SBD7575	75	30	10	50

GEOMETRY AND MECHANICAL CHARACTERISTICS

SBD L ≥ 95 mm



SBD L ≤ 75 mm

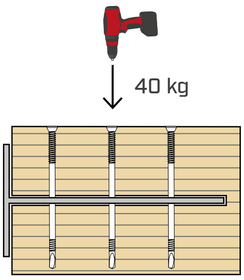


			SBD L ≥ 95 mm	SBD L ≤ 75 mm
Nominal diameter	d_1	[mm]	7,5	7,5
Head diameter	d_K	[mm]	11,00	11,00
Tip length	L_p	[mm]	20,0	24,0
Effective length	L_{eff}	[mm]	L-15,0	L-8,0
Characteristic yield moment	$M_{y,k}$	[Nm]	75,0	42,0

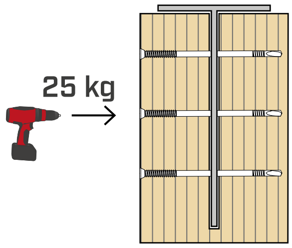
INSTALLATION | ALUMINIUM PLATE

plate	single plate [mm]
ALUMINI	6
ALUMIDI	6
ALUMAXI	10

It is suggested to have a milling in the wood equal to the thickness of the plate increased by at least 1 mm.



pressure to be applied	40 kg
recommended screwdriver	Mafell A 18M BL
recommended speed	1st gear (600-1000 rpm)

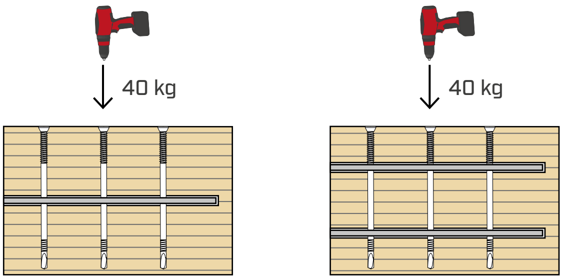


pressure to be applied	25 kg
recommended screwdriver	Mafell A 18M BL
recommended speed	1st gear (600-1000 rpm)

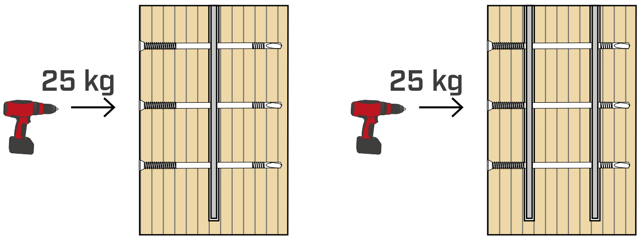
INSTALLATION | STEEL PLATE

plate	single plate [mm]	double plate [mm]
S235 steel	10	8
S275 steel	10	6
S355 steel	10	5

It is suggested to have a milling in the wood equal to the thickness of the plate increased by at least 1 mm.



pressure to be applied	40 kg
recommended screwdriver	Mafell A 18M BL
recommended speed	2nd gear (1000-1500 rpm)



pressure to be applied	25 kg
recommended screwdriver	Mafell A 18M BL
recommended speed	2nd gear (1500-2000 rpm)

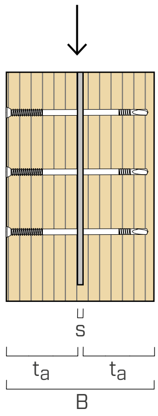
PLATE HARDNESS

The steel plate hardness can greatly vary the pull-through times of the dowels.
Hardness is in fact defined as the material's strength to drilling or shear.
In general, the harder the plate, the longer the drilling time.
The hardness of the plate does not always depend on the strength of the steel, it can vary from point to point and is strongly influenced by heat treatments: standardised plates have a medium to low hardness, while the hardening process gives the steel high hardnesses.

TIMBER-TO-METAL-TO-TIMBER STRUCTURAL VALUES

CHARACTERISTIC VALUES
EN 1995:2014

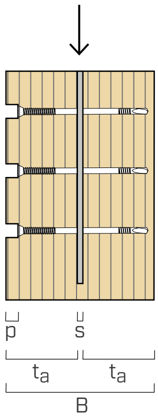
1 INTERNAL PLATE - DOWEL HEAD INSTALLATION DEPTH 0 mm



			7,5x55	7,5x75	7,5x95	7,5x115	7,5x135	7,5x155	7,5x175	7,5x195	7,5x215	7,5x235
beam width	B	[mm]	60	80	100	120	140	160	180	200	220	240
head insertion depth	p	[mm]	0	0	0	0	0	0	0	0	0	0
exterior wood	t_a	[mm]	27	37	47	57	67	77	87	97	107	117

$R_{v,k}$ [kN]	load-to-grain angle	0°	7,48	9,20	12,10	12,88	12,41	15,27	16,69	17,65	18,41	18,64
		30°	6,89	8,59	11,21	11,96	11,56	13,99	15,23	16,42	17,09	17,65
		45°	6,41	8,09	10,34	11,20	10,86	12,96	14,05	15,22	16,00	16,62
		60°	6,00	7,67	9,62	10,58	10,27	12,10	13,07	14,12	15,08	15,63
		90°	5,66	7,31	9,01	10,04	9,77	11,37	12,24	13,18	14,19	14,79

1 INTERNAL PLATE - DOWEL HEAD INSTALLATION DEPTH 15 mm

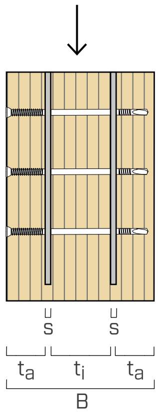


			7,5x55	7,5x75	7,5x95	7,5x115	7,5x135	7,5x155	7,5x175	7,5x195	7,5x215	7,5x235
beam width	B	[mm]	80	100	120	140	160	180	200	220	240	-
head insertion depth	p	[mm]	15	15	15	15	15	15	15	15	15	-
exterior wood	t_a	[mm]	37	47	57	67	77	87	97	107	117	-

$R_{v,k}$ [kN]	load-to-grain angle	0°	8,47	9,10	11,92	12,77	13,91	15,22	16,66	18,02	18,64	-
		30°	7,79	8,49	11,17	11,86	12,82	13,95	15,20	16,54	17,43	-
		45°	7,25	8,00	10,55	11,11	11,93	12,92	14,02	15,20	16,31	-
		60°	6,67	7,58	10,03	10,48	11,19	12,06	13,04	14,09	15,21	-
		90°	6,14	7,23	9,59	9,95	10,56	11,33	12,21	13,16	14,17	-

TIMBER-TO-METAL-TO-TIMBER STRUCTURAL VALUES

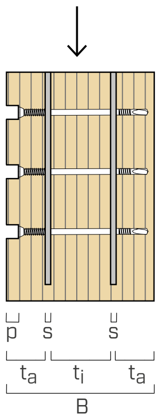
2 INTERNAL PLATES - DOWEL HEAD INSTALLATION DEPTH 0 mm



			7,5x55	7,5x75	7,5x95	7,5x115	7,5x135	7,5x155	7,5x175	7,5x195	7,5x215	7,5x235
beam width	**B**	[mm]	-	-	-	-	140	160	180	200	220	240
head insertion depth	**p**	[mm]	-	-	-	-	0	0	0	0	0	0
exterior wood	**t_a**	[mm]	-	-	-	-	45	50	55	60	70	75
interior wood	**t_i**	[mm]	-	-	-	-	38	48	58	68	68	78

$R_{v,k}$ [kN]	load-to-grain angle	**0°**	-	-	-	-	20,07	22,80	25,39	28,07	29,24	31,80
		30°	-	-	-	-	18,20	20,91	23,19	25,56	26,55	29,07
		45°	-	-	-	-	16,67	19,36	21,39	23,51	24,36	26,63
		60°	-	-	-	-	15,41	18,01	19,90	21,81	22,55	24,60
		90°	-	-	-	-	14,35	16,73	18,64	20,38	21,01	22,89

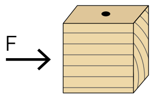
2 INTERNAL PLATES - DOWEL HEAD INSTALLATION DEPTH 10 mm



			7,5x55	7,5x75	7,5x95	7,5x115	7,5x135	7,5x155	7,5x175	7,5x195	7,5x215	7,5x235
beam width	**B**	[mm]	-	-	-	140	160	180	200	220	240	-
head insertion depth	**p**	[mm]	-	-	-	10	10	10	10	10	10	-
exterior wood	**t_a**	[mm]	-	-	-	50	55	60	75	80	85	-
interior wood	**t_i**	[mm]	-	-	-	28	45	50	65	70	75	-

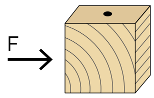
$R_{v,k}$ [kN]	load-to-grain angle	**0°**	-	-	-	16,56	20,07	23,22	25,65	28,89	30,50	-
		30°	-	-	-	15,07	18,20	21,29	23,14	26,32	27,78	-
		45°	-	-	-	13,86	16,67	19,53	21,11	24,05	25,50	-
		60°	-	-	-	12,85	15,41	18,01	19,43	22,10	23,62	-
		90°	-	-	-	12,00	14,35	16,73	18,01	20,46	22,02	-

MINIMUM DISTANCES FOR DOWELS SUBJECT TO SHEAR



α=0°

d_1	[mm]		7,5
a_1	[mm]	5·d	38
a_2	[mm]	3·d	23
$a_{3,t}$	[mm]	max(7·d ; 80 mm)	80
$a_{3,c}$	[mm]	max(3,5·d ; 40 mm)	40
$a_{4,t}$	[mm]	3·d	23
$a_{4,c}$	[mm]	3·d	23



α=90°

d_1	[mm]		7,5
a_1	[mm]	3·d	23
a_2	[mm]	3·d	23
$a_{3,t}$	[mm]	max(7·d ; 80 mm)	80
$a_{3,c}$	[mm]	max(3,5·d ; 40 mm)	40
$a_{4,t}$	[mm]	4·d	30
$a_{4,c}$	[mm]	3·d	23

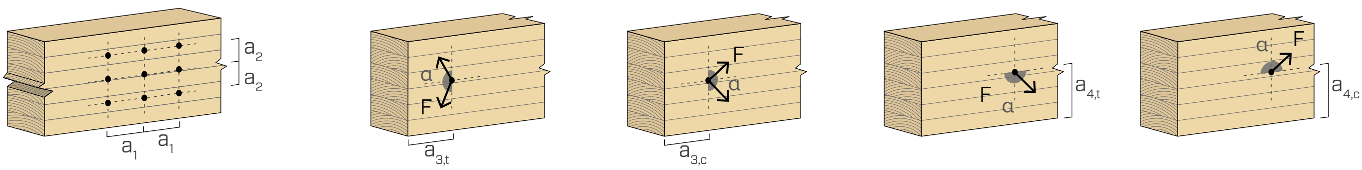
α = load-to-grain angle
d = d_1 = nominal dowel diamter

stressed end
-90° < α < 90°

unloaded end
90° < α < 270°

stressed edge
0° < α < 180°

unload edge
180° < α < 360°

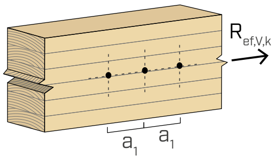


NOTES

- Minimum distances FOR CONNECTORS SUBJECTED TO SHEAR STRESS in accordance with EN 1995:2014.

EFFECTIVE NUMBER FOR SHEAR-STRESSED DOWELS

The load-bearing capacity of a connection made with several dowels, all of the same type and size, may be lower than the sum of the load-bearing capacities of the individual connection system.
For a row of n dowels arranged parallel to the direction of the grain (α = 0°) at a distance a_1, the characteristic effective load-bearing capacity is equal to:



$$R_{ef,V,k} = n_{ef} \cdot R_{V,k}$$

The n_{ef} value is given in the table below as a function of n and a_1.

		a_1(*) [mm]								
		40	**50**	**60**	**70**	**80**	**90**	**100**	**120**	**140**
n	**2**	1,49	1,58	1,65	1,72	1,78	1,83	1,88	1,97	2,00
	3	2,15	2,27	2,38	2,47	2,56	2,63	2,70	2,83	2,94
	4	2,79	2,95	3,08	3,21	3,31	3,41	3,50	3,67	3,81
	5	3,41	3,60	3,77	3,92	4,05	4,17	4,28	4,48	4,66
	6	4,01	4,24	4,44	4,62	4,77	4,92	5,05	5,28	5,49

(*) For intermediate a_1 values a linear interpolation is possible.

STRUCTURAL VALUES

GENERAL PRINCIPLES

- Characteristic values according to EN 1995:2014.
- Design values can be obtained from characteristic values as follows:

$$R_d = \frac{R_k \cdot k_{mod}}{\gamma_M}$$

The coefficients γ_M and k_{mod} should be taken according to the current regulations used for the calculation.

- Mechanical strength values and dowels geometry comply with CE marking according to EN 14592.
- The values provided are calculated using 5 mm thick plates and a 6 mm thick milled cut in the wood. Values are relative to a single SBD dowel.
- Dimensioning and verification of timber elements and steel plates must be carried out separately.
- The dowels must be positioned in accordance with the minimum distances.
- The effective length of SBD (L ≥ 95 mm) dowels takes into account the diameter reduction in the vicinity of the self-drilling tip.

NOTES

- For the calculation process a timber characteristic density ρ_k = 385 kg/m^3 has been considered.

For different ρ_k values, the strength on the table on the timber side can be converted by the $k_{dens,v}$ coefficient

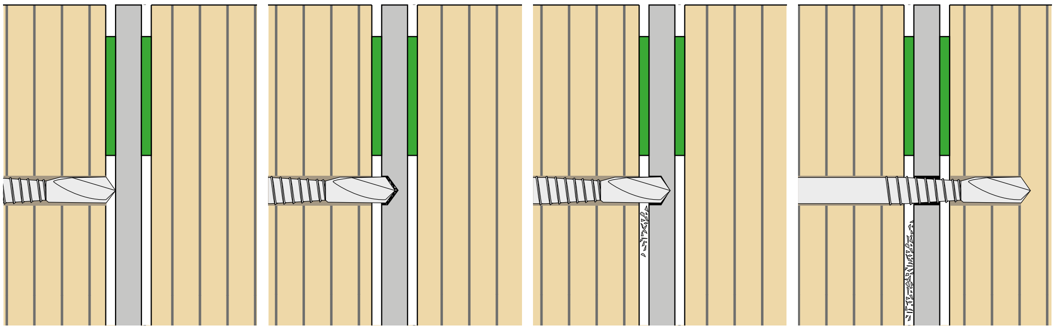
$$R'_{V,k} = k_{dens,v} \cdot R_{V,k}$$

ρ_k [kg/m^3]	350	380	**385**	405	425	430	440
C-GL	*C24*	*C30*	*GL24h*	*GL26h*	*GL28h*	*GL30h*	*GL32h*
$k_{dens,v}$	0,90	0,98	1,00	1,02	1,05	1,05	1,07

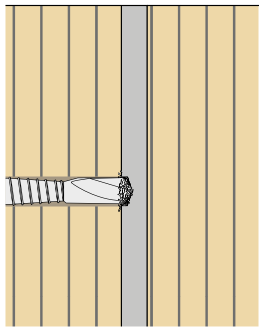
Strength values thus determined may differ, for higher safety standards, from those resulting from an exact calculation.

INSTALLATION

It is suggested to have **a milling in the wood equal to the thickness of the plate, increased by at least 1-2 mm**, placing SHIM spacers between the wood and the plate to centre it in the milling.
In this way, the steel residue from the drilling of the metal has an outlet to escape and does not obstruct the passage of the drill through the plate, thus avoiding overheating of the plate and timber and also preventing the generation of smoke during installation.



Cutter increased by 1 mm on each side.



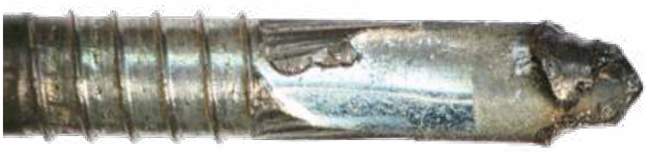
Shavings obstructing the holes in the steel during drilling (spacers not installed).

To avoid breakage of the tip at the moment of pin-plate contact, it is recommended to **reach the plate slowly, pushing with a lower force until the moment of impact and then increasing it to the recommended value** (40 kg for top-down applications and 25 kg for horizontal installations). Try to keep the dowel as perpendicular as possible to the surface of the timber and the plate.

Intact tip after correct installation of the dowel.

Broken (cut) tip due to excessive force during impact with metal.

If the steel plate is too hard, the dowel tip may shrink significantly or even melt. In this case, it is advisable to check the material certificates for any heat treatment or hardness tests performed. Try decreasing the force applied or alternatively changing the type of plate.



Tip melted during installation on a too hard plate without spacers between timber and plate.

Reduction of the tip when drilling the plate due to the high hardness of the plate.