

Approval body for construction products
and types of construction

Bautechnisches Prüfamt

An institution established by the Federal and
Laender Governments



European Technical Assessment

ETA-13/0210
of 18 October 2023

English translation prepared by DIBt - Original version in German language

General Part

Technical Assessment Body issuing the
European Technical Assessment:

Deutsches Institut für Bautechnik

Trade name of the construction product

Fastening screws for sandwich panels Zebra Piasta and
FABA

Product family
to which the construction product belongs

Fastening screws for sandwichpanels

Manufacturer

Adolf Würth GmbH & Co. KG
74650 Künzelsau
DEUTSCHLAND

Manufacturing plant

Plants of Adolf Würth GmbH & Co. KG

This European Technical Assessment
contains

17 pages including 13 annexes which form an integral
part of this assessment

This European Technical Assessment is
issued in accordance with Regulation (EU)
No 305/2011, on the basis of

330047-01-0602

This version replaces

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Specific part

1 Technical description of the product

The fastening screws are self-drilling or self-tapping screws made of austenitic stainless steel or carbon steel with anticorrosion coating (listed in Table 1). The fastening screws are completed with sealing washers consisting of metal washer and EPDM-seal.

Table 1 – Fastening screws for sandwich panels

Product		Product-code	Components		Anx.
ZEBRA Piasta Ø 5,5 x L	hexagon head, washer ≥ Ø16	SCR-DBIT-SANDW-WSH16-(RUS)-5,5 X L	Steel	Steel	4
ZEBRA Piasta Ø 5,5 x L	hexagon head, washer ≥ Ø19	SCR-DBIT-SANDW-WSH19-(RUS)-5,5 X L	Steel	Steel	5
ZEBRA Piasta Ø 5,5 x L	hexagon head, washer ≥ Ø22	SCR-DBIT-SANDW-WSH22-(RUS)-5,5 X L	Steel	Steel	6
ZEBRA Piasta Ø 5,5 x L	hexagon head long drill bit washer ≥ Ø16	SCR-DBITL-SANDW-WSH16-(RUS)-5,5 X L	Steel	Steel	7
ZEBRA Piasta Ø 5,5 x L	hexagon head long drill bit washer ≥ Ø19	SCR-DBITL-SANDW-WSH19-(RUS)-5,5 X L	Steel	Steel	8
ZEBRA Piasta Ø 5,5 x L	hexagon head long drill bit washer ≥ Ø22	SCR-DBITL-SANDW-WSH22-(RUS)-5,5 X L	Steel	Steel	9
ZEBRA Piasta Ø 6,0 x L	hexagon head, washer ≥ Ø19	SCR-DBITR-SANDW-WO-WSH19-(RUS)-6,0 X L SCR-NEEDTIP-SANDW-WO-WSH19(RUS)-6,0 X L	Steel	Timber	10
ZEBRA Piasta Ø 6,3 – K x L ZEBRA Piasta plus Ø 6,3 – K x L	hexagon head washer ≥ Ø16	SCR-DBIT-WSH16-WS3/8-(RUS)-6,3 X L SCR-DBIT-PLUS-WSH16-WS3/8-(RUS)-6,3 X L	Steel	Steel	11
FABA Typ BZ A2 6,3 x L	hexagon head washer ≥ Ø16	SCR-BZ-WSH16-A2-WS3/8-(A2K)-6,3 x L	Steel	Steel	12
FABA Typ A A2 6,5 x L	hexagon head washer ≥ Ø16	SCR-A-WSH16-A2-WS3/8-(A2K)-6,5 x L	Steel	Timber	13

2 Specification of the intended use in accordance with the applicable European Assessment Document

The fastening screws are intended to be used for fastening sandwich panels to metal or timber substructures. The sandwich panel can either be used as wall or roof cladding or as load bearing wall and roof element. The intended use comprises fastening screws and connections for indoor and outdoor applications. Fastening screws which are intended to be used in external environments with ≥ C2 corrosion according to the standard EN ISO 12944-2 are made of stainless steel. Furthermore the intended use comprises connections with predominantly static loads (e. g. wind loads, dead loads). The fastening screws are not intended for re-use.

The performances given in Section 3 are only valid if the fastening screws are used in compliance with the specifications and conditions given in Annex (1-13).

The verification and assessment methods on which this European Technical Assessment is based lead to the assumption of a working life of the fastening screws of at least 25 years. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

3 Performance of the product and references to the methods used for its assessment

3.1 Mechanical resistance and stability (BWR 1)

Essential characteristic	Performance
Shear Resistance of the Connection	see Annexes to this ETA
Tension Resistance of the Connection	see Annexes to this ETA
Design Resistance in case of combined Tension and Shear Forces (interaction)	see Annexes to this ETA
Check of Bending Capacity in case of constraining forces due to temperature	see Annexes to this ETA
Durability	see Annexes to this ETA

3.2 Safety in case of fire (BWR 2)

Essential characteristic	Performance
Reaction to fire	Performance Class A1

4 Assessment and verification of constancy of performance (AVCP) system applied, with reference to its legal base

In accordance with EAD No. 330047-01-0602, the applicable European legal act is: Commission Decision 1998/214/EC, amended by 2001/596/EC.

The system to be applied is: 2+

5 Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

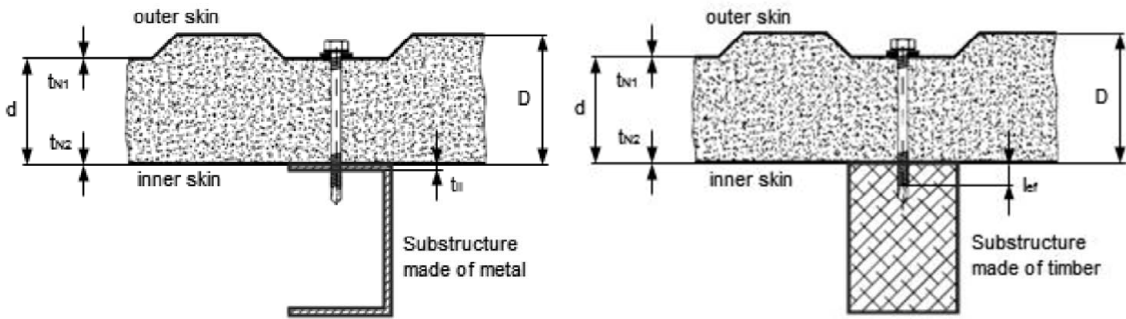
Technical details necessary for the implementation of the AVCP system are laid down in the control plan deposited with Deutsches Institut für Bautechnik.

Issued in Berlin on 18 October 2023 by Deutsches Institut für Bautechnik

BD Dr.-Ing. Ronald Schwuchow
Head of Section

beglaubigt:
Hahn

Examples of execution of a connection



Terms for materials

Fastener	Material of the fastening screw
Washer	Material of the sealing washer
Component I	Material of the sandwich panel (outer skin and inner skin)
Component II	Material of the substructure

Terms for dimensions

D, d	Total thickness of component I
t_{N1}	Thickness of the outer skin of component I
t_{N2}	Thickness of the inner skin of component I
t_{II}	Thickness of component II made of metal
l_{ef}	Effective screw-in length in component II made of timber (without drill point)
d_{dp}	Pre-drill diameter of component I and component II

Terms for performances

$V_{R,k}$	Characteristic value of shear resistance of the connection
$N_{R,k}$	Characteristic value of tension resistance of the connection
$V_{R,I,k}$	Characteristic value of shear resistance of metal member or sheeting
$N_{R,I,k}$	Characteristic value of tension resistance (pull-through) of metal member or sheeting
$N_{R,II,k}$	Characteristic value of tension resistance (pull-out) of the substructure
u	Maximum allowed head displacement of the fastening screw

Additionally for timber substructure the following terms are used:

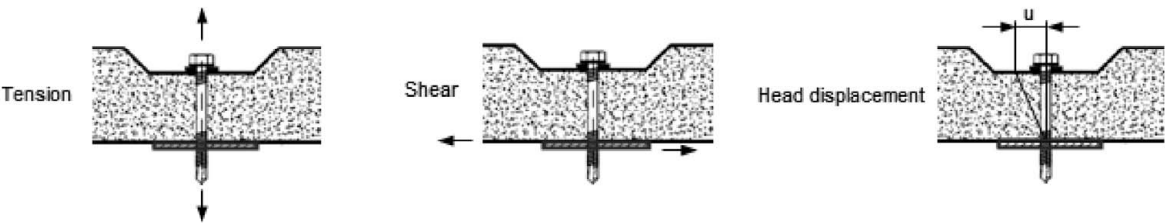
$M_{y,Rk}$	Characteristic value of yield moment
$f_{ax,k}$	Characteristic value of withdrawal strength

Used terms in the Annexes

Fastening screws for sandwich panels

Annex 1

Types of connection and occurred loadings



Determination of Design Values

The design value of tension and shear resistance has to be determined as follows:

$$N_{R,d} = \frac{N_{R,k}}{\gamma_M}$$

$$V_{R,d} = \frac{V_{R,k}}{\gamma_M}$$

The characteristic values $N_{R,k}$ and $V_{R,k}$ are given in the Annexes. For intermediate dimension of metal member or sheeting or substructure the characteristic value of the thinner dimension is used.

The recommended partial safety factor $\gamma_M = 1,33$ is used, provided no partial safety factor is given in national regulations or national Annexes to Eurocode 3.

For asymmetric metal substructures with thickness $t_{II} < 5$ mm (for instance Z- or C-shaped profiles), the characteristic value $N_{R,k}$ given in the Annexes has to be reduced to 70%.

In case of combined tension and shear forces the following interaction equation is taken into account:

$$\frac{N_{S,d}}{N_{R,d}} + \frac{V_{S,d}}{V_{R,d}} \leq 1,0$$

$N_{S,d}$ and $V_{S,d}$ indicate the design values of applied tension and shear forces.

Head displacement

The head displacement of the fastening screw as a result of thermal expansion of the outer skin of the sandwich panel may not exceed the maximum allowed head displacement of the fastening screw.

Installation conditions

The installation is carried out according to the manufacturer's instructions.

The fastening screws are screwed-in with electric screw driver. The use of impact wrenches is not allowed.

The fastening screws are fixed rectangular to the surface of the metal member or sheeting.

The metal member or sheeting and substructure are in contact to each other. The use of compression resistant thermal insulation strips up to a thickness of 3 mm is allowed.

Basics for the design

Fastening screws for sandwich panels

Annex 2

Timber substructures

Characteristic values of tension and shear resistance of the connection for other k_{mod} or p_k as indicated in the Annexes can be determined as follows:

$$N_{R,k} = \min \left\{ \begin{array}{l} N_{R,I,k} \\ F_{ax,Rk} \cdot k_{mod} \end{array} \right.$$

$$V_{R,k} = \min \left\{ \begin{array}{l} V_{R,I,k} \\ F_{v,Rk} \cdot k_{mod} \end{array} \right.$$

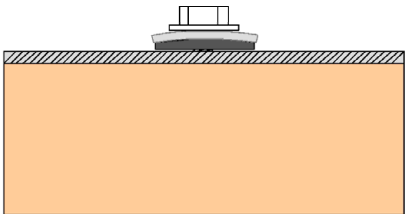
The characteristic values $N_{R,I,k}$ and $V_{R,I,k}$ are given in the corresponding Annex of the fastening screw.

$F_{ax,Rk}$ indicates the characteristic value of tension resistance of timber substructure. The value has to be determined according to EN 1995-1-1:2004 + A1:2008, equation (8.40a) with $f_{ax,k}$ given in the corresponding Annex of the fastening screw.

$F_{v,Rk}$ indicates the characteristic shear resistance of timber substructure. The value has to be determined according to EN 1995-1-1:2004 + A1:2008, equation (8.9) with $M_{y,Rk}$ given in the corresponding Annex of the fastening screw.

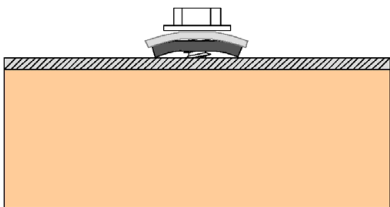
Examples of execution of a connection

Correct execution:

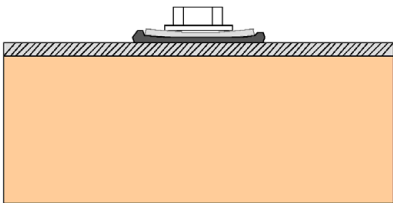


Incorrect execution:

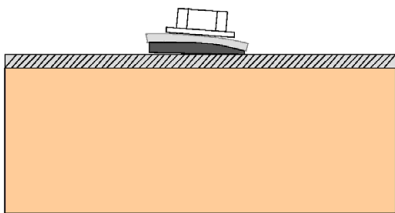
Too weak:



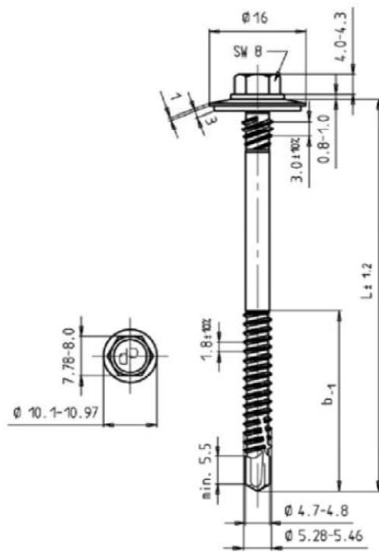
Too strong:



Not straight:



Specific notes to the Annexes	
Fastening screws for sandwich panels	Annex 3



Materials

Fastener: Stainless steel A2, A4 or A5 – EN ISO 3506
Washer: Stainless steel A2, A4 or A5 – EN ISO 3506 with vulcanized EPDM

Component I: S280GD to S550GD - EN 10346

Component II: S235 to S355 - EN 10025-1
S280GD to S550GD - EN 10346
HX300LAD to HX460LAD - EN 10346

Drilling-capacity $\Sigma(t_i) \leq 6.50$ mm

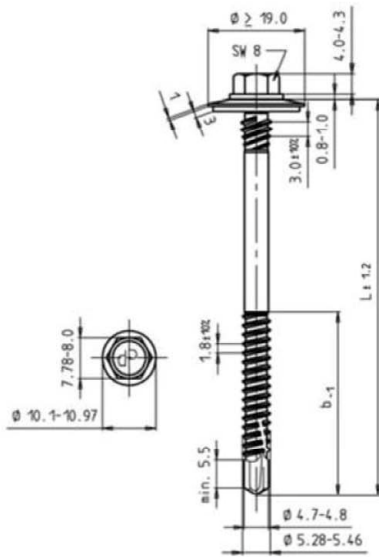
Timber substructures

		Component II t II [mm]								
		1,50	1,75	2,00	2,50	3,00	3,50	4,00	5,00	6,00
Component I	t _{N2} [mm] V _{R,k} [kN]	0,40	0,67	0,67	0,67	0,67	0,67	0,67	0,67	0,67
		0,50	1,08	1,08	1,08	1,08	1,08	1,08	1,08	1,08
		0,55	1,30	1,30	1,30	1,40	1,40	1,40	1,40	-
		0,63	1,52	1,52	1,60	1,70	1,80	2,00	2,00	-
		0,75	1,84	1,84	1,90	2,10	2,30	2,60	2,60	-
		0,88	2,52	2,52	2,70	2,90	3,10	3,40	3,40	-
		1,00	3,20	3,20	3,50	3,70	3,90	4,20	4,20	-
	t _{N1} [mm] N _{R,k} [kN]	0,40	1,05	1,05	1,05	1,05	1,05	1,05	1,05	1,05
		0,50	1,63	1,63	1,63	1,63	1,63	1,63	1,63	1,63
		0,55	1,82	1,82	1,82	1,82	1,82	1,82	1,82	-
		0,63	1,82	2,11	2,11	2,11	2,11	2,11	2,11	-
		0,75	1,82	2,32	2,57	2,57	2,57	2,57	2,57	-
		0,88	1,82	2,32	2,81	3,05	3,05	3,05	3,05	-
		1,00	1,82	2,32	2,81	3,51	3,51	3,51	3,51	-
	N _{R,k,II}	1,82	2,32	2,81	3,85	4,89	5,96	7,02	8,19	10,0
D, d [mm] max. head displacement u [mm]	30	14,0	12,0	12,0	8,4	7,2	6,4	6,4	6,4	6,4
	40	17,5	15,0	15,0	10,4	9,2	7,6	7,6	7,6	7,6
	50	21,0	18,0	18,0	12,4	11,2	8,8	8,8	8,8	8,8
	60	24,5	21,0	21,0	13,6	12,8	10,8	10,8	10,8	10,8
	70	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0
	80	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0
	100	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0
	120	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0
	≥ 140	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0

Sandwich screw

ZEBRA Piasta Ø 5,5 x L
with hexagon head and sealing washer ≥ Ø16 mm

Annex 4



Materials

Fastener: Stainless steel A2, A4 or A5 – EN ISO 3506
Washer: Stainless steel A2, A4 or A5 – EN ISO 3506 with vulcanized EPDM

Component I: S280GD to S550GD - EN 10346

Component II: S235 to S355 - EN 10025-1
S280GD to S550GD - EN 10346
HX300LAD to HX460LAD - EN 10346

Drilling-capacity $\Sigma(t_i) \leq 6.50$ mm

Timber substructures

-

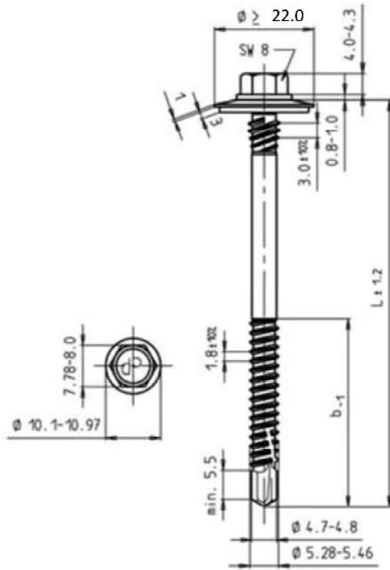
		Component II t_{II} [mm]								
		1,50	1,75	2,00	2,50	3,00	3,50	4,00	5,00	6,00
Component I	t_{N2} [mm] $V_{R,k}$ [kN]	0,40	0,67	0,67	0,67	0,67	0,67	0,67	0,67	0,67
		0,50	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,51
		0,55	1,68	1,68	1,68	1,68	1,68	1,73	1,73	-
		0,63	1,95	1,95	1,95	1,95	1,95	2,08	2,08	-
		0,75	2,36	2,36	2,36	2,36	2,36	2,60	2,60	-
		0,88	2,52	2,52	2,70	2,90	3,10	3,40	3,40	-
		1,00	3,20	3,20	3,50	3,70	3,90	4,20	4,20	-
	t_{N1} [mm] $N_{R,k}$ [kN]	0,40	1,59	1,59	1,59	1,59	1,59	1,59	1,59	1,59
		0,50	1,82	1,98	1,98	1,98	1,98	1,98	1,98	1,98
		0,55	1,82	2,18	2,18	2,18	2,18	2,18	2,18	-
		0,63	1,82	2,32	2,51	2,51	2,51	2,51	2,51	-
		0,75	1,82	2,32	2,81	3,85	3,98	3,98	3,98	-
		0,88	1,82	2,32	2,81	3,85	4,62	4,62	4,62	-
		1,00	1,82	2,32	2,81	3,85	4,89	5,25	5,25	-
	$N_{R,k,II}$	1,82	2,32	2,81	3,85	4,89	5,96	7,02	8,19	10,0
D, d [mm] max. head displacement u [mm]	30	14,0	12,0	12,0	8,4	7,2	6,4	6,4	6,4	6,4
	40	17,5	15,0	15,0	10,4	9,2	7,6	7,6	7,6	7,6
	50	21,0	18,0	18,0	12,4	11,2	8,8	8,8	8,8	8,8
	60	24,5	21,0	21,0	13,6	12,8	10,8	10,8	10,8	10,8
	70	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0
	80	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0
	100	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0
	120	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0
	≥ 140	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0

If component t_{N1} resp. t_{N2} is made of S320GD or S350GD the grey highlighted values may be increased by 8.2 %.

Sandwich screw

ZEBRA Piasta Ø 5,5 x L
with hexagon head and sealing washer $\geq \phi 19$ mm

Annex 5



Materials

Fastener: Stainless steel A2, A4 or A5 – EN ISO 3506
Washer: Stainless steel A2, A4 or A5 – EN ISO 3506 with vulcanized EPDM

Component I: S280GD to S550GD - EN 10346

Component II: S235 to S355 - EN 10025-1
S280GD to S550GD - EN 10346
HX300LAD to HX460LAD - EN 10346

Drilling-capacity $\Sigma(t_i) \leq 6.50$ mm

Timber substructures

no performance determined

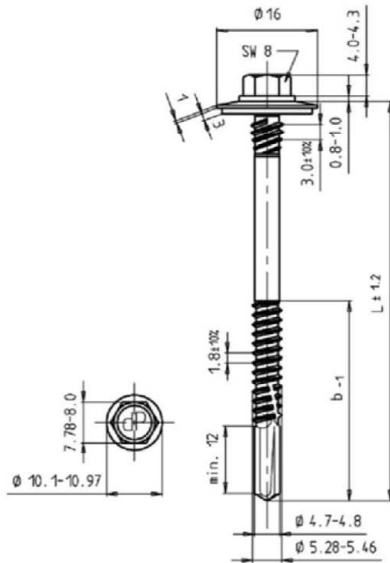
		Component II t II [mm]								
		1,50	1,75	2,00	2,50	3,00	3,50	4,00	5,00	6,00
Component I	t _{N2} [mm] V _{R,k} [kN]	0,40	0,67	0,67	0,67	0,67	0,67	0,67	0,67	0,67
		0,50	1,51	1,51	1,51	1,51	1,51	1,51	1,51	1,51
		0,55	1,68	1,68	1,68	1,68	1,68	1,73	1,73	-
		0,63	1,95	1,95	1,95	1,95	1,95	2,08	2,08	-
		0,75	2,36	2,36	2,36	2,36	2,36	2,60	2,60	-
		0,88	2,52	2,52	2,70	2,90	3,10	3,40	3,40	-
		1,00	3,20	3,20	3,50	3,70	3,90	4,20	4,20	-
	t _{N1} [mm] N _{R,k} [kN]	0,40	1,64	1,64	1,64	1,64	1,64	1,64	1,64	1,64
		0,50	1,82	2,12	2,12	2,12	2,12	2,12	2,12	2,12
		0,55	1,82	2,29	2,29	2,29	2,29	2,29	2,29	-
		0,63	1,82	2,32	2,56	2,56	2,56	2,56	2,56	-
		0,75	1,82	2,32	2,81	3,85	4,15	4,15	4,15	-
		0,88	1,82	2,32	2,81	3,85	4,62	5,02	5,02	-
		1,00	1,82	2,32	2,81	3,85	4,89	5,25	5,25	-
	N _{R,k,II}	1,82	2,32	2,81	3,85	4,89	5,96	7,02	8,19	10,0
D, d [mm] max. head displacement u [mm]	30	14,0	12,0	12,0	8,4	7,2	6,4	6,4	6,4	6,4
	40	17,5	15,0	15,0	10,4	9,2	7,6	7,6	7,6	7,6
	50	21,0	18,0	18,0	12,4	11,2	8,8	8,8	8,8	8,8
	60	24,5	21,0	21,0	13,6	12,8	10,8	10,8	10,8	10,8
	70	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0
	80	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0
	100	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0
	120	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0
	≥ 140	28,0	24,0	24,0	19,0	18,0	16,0	16,0	16,0	16,0

If component t_{N1} resp. t_{N2} is made of S320GD or S350GD the grey highlighted values may be increased by 8.2 %.

Sandwich screw

ZEBRA Piasta Ø 5,5 x L
with hexagon head and sealing washer ≥ Ø22 mm

Annex 6



Materials

Fastener: Stainless steel A2, A4 or A5 – EN ISO 3506
Washer: Stainless steel A2, A4 or A5 – EN ISO 3506 with vulcanized EPDM

Component I: S280GD to S550GD - EN 10346

Component II: S235 to S355 - EN 10025-1
S280GD to S550GD - EN 10346
HX300LAD to HX460LAD - EN 10346

Drilling-capacity $\Sigma(t_i) \leq 11.25$ mm

Timber substructures

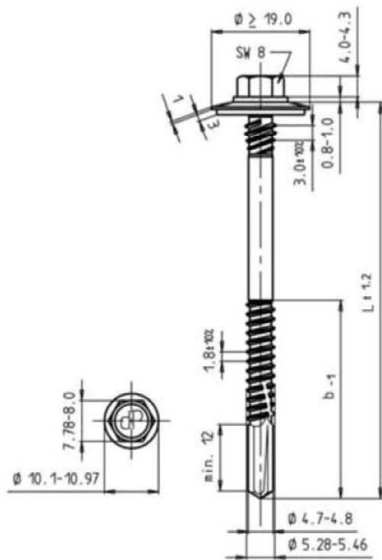
no performance determined

		Component II t II [mm]				
		4,00	5,00	6,00	8,00	10,0
Component I	t _{N2} [mm] V _{R,k} [kN]	0,40	0,94	0,94	0,94	0,94
		0,50	1,19	1,19	1,19	1,19
		0,55	1,40	1,40	1,40	1,40
		0,63	1,80	1,80	1,80	1,80
		0,75	2,40	2,40	2,40	2,40
		0,88	3,20	3,20	3,20	3,20
		1,00	4,00	4,00	4,00	4,00
	t _{N1} [mm] N _{R,k} [kN]	0,40	1,12	1,12	1,12	1,12
		0,50	1,63	1,63	1,63	1,63
		0,55	1,94	1,94	1,94	1,94
		0,63	2,43	2,43	2,43	2,43
		0,75	3,17	3,17	3,17	3,17
		0,88	3,49	3,49	3,49	3,49
		1,00	3,78	3,78	3,78	3,78
		N _{R,k,II}	5,19	6,54	7,88	10,0
D, d [mm] max. head displacement u [mm]	30	6,4	4,8	4,8	4,0	3,0
	40	7,6	5,6	5,6	4,8	4,0
	50	8,8	6,8	6,8	5,6	4,8
	60	10,8	8,8	8,8	7,2	5,6
	70	16,0	13,0	13,0	10,5	8,0
	80	16,0	13,0	13,0	10,5	8,0
	100	16,0	13,0	13,0	10,5	8,0
	120	16,0	13,0	13,0	10,5	8,0
	≥ 140	16,0	13,0	13,0	10,5	8,0

Sandwich screw

ZEBRA Piasta Ø 5,5 x L
with hexagon head, long drill bit and sealing washer ≥ Ø16

Annex 7



Materials

Fastener: Stainless steel A2, A4 or A5 – EN ISO 3506
Washer: Stainless steel A2, A4 or A5 – EN ISO 3506 with vulcanized EPDM

Component I: S280GD to S550GD - EN 10346

Component II: S235 to S355 - EN 10025-1
S280GD to S550GD - EN 10346
HX300LAD to HX460LAD - EN 10346

Drilling-capacity $\Sigma(t_i) \leq 11,25$ mm

Timber substructures

no performance determined

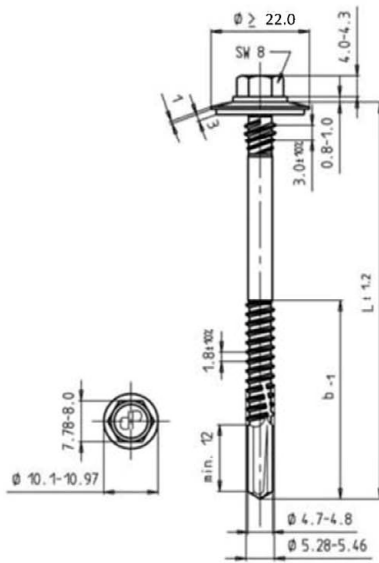
		Component II t II [mm]				
		4,00	5,00	6,00	8,00	10,0
Component I	t _{N2} [mm] V _{R,k} [kN]	0,40	0,94	0,94	0,94	0,94
		0,50	1,19	1,19	1,19	1,19
		0,55	1,40	1,40	1,40	1,40
		0,63	1,80	1,80	1,80	1,80
		0,75	2,40	2,40	2,40	2,40
		0,88	3,20	3,20	3,20	3,20
		1,00	4,00	4,00	4,00	4,00
	t _{N1} [mm] N _{R,k} [kN]	0,40	1,59	1,59	1,59	1,59
		0,50	1,98	1,98	1,98	1,98
		0,55	2,18	2,18	2,18	2,18
		0,63	2,51	2,51	2,51	2,51
		0,75	3,98	3,98	3,98	3,98
		0,88	4,62	4,62	4,62	4,62
		1,00	5,19	5,25	5,25	5,25
	N _{R,k,II}	5,19	6,54	7,88	10,0	10,0
D, d [mm] max. head displacement u [mm]	30	6,4	4,8	4,8	4,0	3,0
	40	7,6	5,6	5,6	4,8	4,0
	50	8,8	6,8	6,8	5,6	4,8
	60	10,8	8,8	8,8	7,2	5,6
	70	16,0	13,0	13,0	10,5	8,0
	80	16,0	13,0	13,0	10,5	8,0
	100	16,0	13,0	13,0	10,5	8,0
	120	16,0	13,0	13,0	10,5	8,0
	≥ 140	16,0	13,0	13,0	10,5	8,0

If component t_{N1} resp. t_{N2} is made of S320GD or S350GD the grey highlighted values may be increased by 8.2 %.

Sandwich screw

ZEBRA Piasta Ø 5,5 x L
with hexagon head, long drill bit and sealing washer ≥ Ø19

Annex 8



Materials

Fastener: Stainless steel A2, A4 or A5 – EN ISO 3506
Washer: Stainless steel A2, A4 or A5 – EN ISO 3506 with vulcanized EPDM

Component I: S280GD to S550GD - EN 10346

Component II: S235 to S355 - EN 10025-1
S280GD to S550GD - EN 10346
HX300LAD to HX460LAD - EN 10346

Drilling-capacity $\Sigma(t_i) \leq 11.25$ mm

Timber substructures

no performance determined

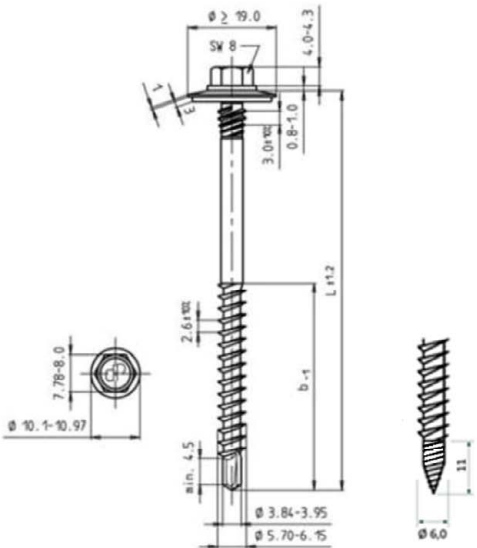
		Component II t II [mm]				
		4,00	5,00	6,00	8,00	10,0
Component I	t _{N2} [mm] V _{R,k} [kN]	0,40	0,94	0,94	0,94	0,94
		0,50	1,19	1,19	1,19	1,19
		0,55	1,40	1,40	1,40	1,40
		0,63	1,80	1,80	1,80	1,80
		0,75	2,40	2,40	2,40	2,40
		0,88	3,20	3,20	3,20	3,20
		1,00	4,00	4,00	4,00	4,00
	t _{N1} [mm] N _{R,k} [kN]	0,40	1,65	1,65	1,65	1,65
		0,50	1,98	1,98	1,98	1,98
		0,55	2,18	2,18	2,18	2,18
		0,63	2,51	2,51	2,51	2,51
		0,75	3,98	3,98	3,98	3,98
		0,88	4,62	4,62	4,62	4,62
		1,00	5,19	5,25	5,25	5,25
		N _{R,k,II}	5,19	6,54	7,88	10,0
D, d [mm] max. head displacement u [mm]	30	6,4	4,8	4,8	4,0	3,0
	40	7,6	5,6	5,6	4,8	4,0
	50	8,8	6,8	6,8	5,6	4,8
	60	10,8	8,8	8,8	7,2	5,6
	70	16,0	13,0	13,0	10,5	8,0
	80	16,0	13,0	13,0	10,5	8,0
	100	16,0	13,0	13,0	10,5	8,0
	120	16,0	13,0	13,0	10,5	8,0
	≥ 140	16,0	13,0	13,0	10,5	8,0

If component t_{N1} resp. t_{N2} is made of S320GD or S350GD the grey highlighted values may be increased by 8.2 %.

Sandwich screw

ZEBRA Piasta Ø 5,5 x L
with hexagon head, long drill bit and sealing washer ≥ Ø22

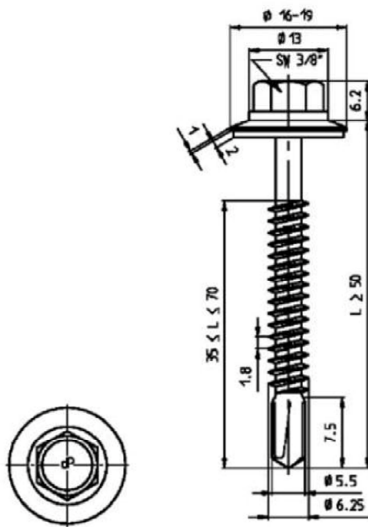
Annex 9

	<p>Materials</p> <p>Fastener: Stainless steel A2, A4 or A5 – EN ISO 3506 Washer: Stainless steel A2, A4 or A5 – EN ISO 3506 with vulcanized EPDM</p> <p>Component I: S280GD to S550GD - EN 10346 Component II: Structural timber – EN 14081</p> <p>Drilling-capacity $\Sigma(t_i) \leq 1.00$ mm</p> <p>Timber substructures</p> <p>$M_{y,Rk} =$ 7,676 Nm $f_{ax,k}$ 9,800 N/mm² for $l_{ef} \geq 30,0$ mm $f_{ax,k}$ 14,26 N/mm² for $l_{ef} \geq 45,0$ mm</p>
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		Component II l_{ef} [mm]								
		30	40	50	60	70	80	100	120	≥ 140
Component I	t_{N2} [mm] $V_{R,k}$ [kN]	0,40	0,65	0,65	0,65	0,65	0,65	0,65	0,65	0,65
		0,50	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
		0,55	1,07	1,07	1,07	1,07	1,07	1,07	1,07	1,07
		0,63	1,19	1,19	1,19	1,19	1,19	1,19	1,19	1,19
		0,75	1,61	1,61	1,61	1,61	1,61	1,61	1,61	1,61
		0,88	2,19	2,19	2,19	2,19	2,19	2,19	2,19	2,19
		1,00	2,77	2,77	2,77	2,77	2,77	2,77	2,77	2,77
	t_{N1} [mm] $N_{R,k}$ [kN]	0,40	1,59	1,59	1,59	1,59	1,59	1,59	1,59	1,59
		0,50	1,59	1,98	1,98	1,98	1,98	1,98	1,98	1,98
		0,55	1,59	2,12	2,18	2,18	2,18	2,18	2,18	2,18
		0,63	1,59	2,12	2,51	2,51	2,51	2,51	2,51	2,51
		0,75	1,59	2,12	3,85	3,98	3,98	3,98	3,98	3,98
		0,88	1,59	2,12	3,85	4,62	4,62	4,62	4,62	4,62
		1,00	1,59	2,12	3,85	4,62	5,25	5,25	5,25	5,25
		$N_{R,k,II}$	1,59	2,12	3,85	4,62	5,39	6,16	7,70	9,24
	D, d [mm] max. head displacement u [mm]	50	8,0							
		60	9,3							
		70	10,7							
		80	12,0							
		100	12,0							
		120	12,0							
		≥ 120	12,0							

If component t_{N1} resp. t_{N2} is made of S320GD or S350GD the grey highlighted values may be increased by 8.2 %.
The values listed above in dependence on the screw-in length l_{ef} are valid for $k_{mod} = 0,90$ and timber strength grade C24 ($\rho_a = 350$ kg/m³). For other combinations of k_{mod} and timber strength grades see Annex 3.

<p>Sandwich screw</p>	<p>Annex 10</p>
<p>ZEBRA Piasta Ø 6,0 x L with hexagon head and sealing washer $\geq \phi 19$ mm</p>	



Materials

Fastener: Stainless steel A2, A4 or A5 – EN ISO 3506
Washer: Stainless steel A2, A4 or A5 – EN ISO 3506 with vulcanized EPDM

Component I: S280GD to S550GD - EN 10346

Component II: S235 to S355 - EN 10025-1
S280GD to S550GD - EN 10346
HX300LAD to HX460LAD - EN 10346

Drilling-capacity $\Sigma(t_i) \leq 6.00$ mm

Timber substructures

no performance determined

		Component II t II [mm]					
		1,50	2,00	2,50	3,00	4,00	5,00
Component I	t _{N2} [mm] V _{R,k} [kN]	0,40	0,86	0,86	0,86	0,86	0,86
		0,50	1,35	1,35	1,35	1,35	1,35
		0,55	1,60	1,60	1,60	1,60	1,60
		0,63	2,00	2,00	2,00	2,00	2,00
		0,75	2,60	2,60	2,60	2,60	2,60
		0,88	3,20	3,50	3,50	3,50	3,50
		1,00	3,20	3,50	3,50	3,50	3,50
	t _{N1} [mm] N _{R,k} [kN]	0,40	1,59	1,59	1,59	1,59	1,59
		0,50	1,70	1,88	1,88	1,88	1,88
		0,55	1,70	2,00	2,00	2,00	2,00
		0,63	1,70	2,10	3,30	3,30	3,30
		0,75	1,70	2,10	3,35	3,80	3,80
		0,88	1,70	2,10	3,35	4,40	4,40
		1,00	1,70	2,10	3,35	4,60	4,90
	N _{R,k,II}	1,70	2,10	3,35	4,60	4,90	4,90
D, d [mm] max. head displacement u [mm]	30	12,0	8,0	8,0	8,0	5,0	5,0
	40	13,5	11,0	11,0	11,0	7,0	7,0
	50	15,0	15,0	15,0	15,0	11,0	9,0
	60	17,5	17,5	17,5	17,5	13,0	10,0
	70	20,0	20,0	20,0	20,0	15,0	10,5
	80	23,0	23,0	23,0	23,0	17,0	13,5
	100	23,0	23,0	23,0	23,0	17,0	13,5
	120	23,0	23,0	23,0	23,0	17,0	13,5
	≥ 140	23,0	23,0	23,0	23,0	17,0	13,5

If component t_{N1} resp. t_{N2} is made of S320GD or S350GD the grey highlighted values may be increased by 8.2 %.

Sandwich screw

ZEBRA Piasta Ø 6,3 x L, ZEBRA Piasta plus Ø 6,3 x L
with hexagon head and sealing washer ≥ Ø16 mm

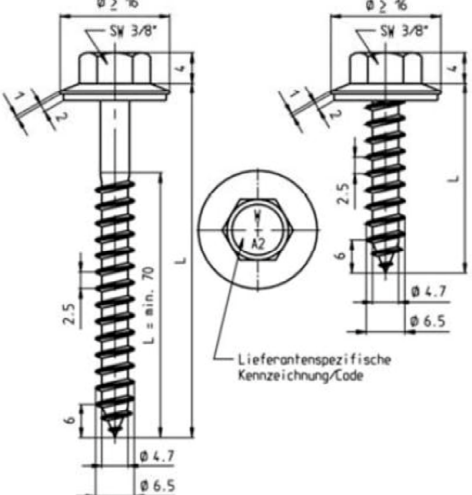
Annex 11

	<p>Materials</p> <p>Fastener: Stainless steel A2, A4 or A5 – EN ISO 3506 Washer: Stainless steel A2, A4 or A5 – EN ISO 3506 with vulcanized EPDM</p> <p>Component I: S280GD to S550GD - EN 10346 Component II: S235 to S355 - EN 10025-1 S280GD to S550GD - EN 10346 HX300LAD to HX460LAD - EN 10346</p> <p>Predrill diameter: see table below</p> <p>Timber substructures no performance determined</p>
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		Component II t II [mm]								
		1,50	2,00	2,50	3,00	4,00	5,00	6,00	7,00	≥ 10,0
Component I	t _{N2} [mm] V _{R,k} [kN]	0,40	0,86	0,86	0,86	0,86	0,86	0,86	0,86	0,86
		0,50	1,35	1,35	1,35	1,35	1,35	1,35	1,35	1,35
		0,55	1,60	1,60	1,60	1,60	1,60	1,60	1,60	1,60
		0,63	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
		0,75	2,60	2,60	2,60	2,60	2,60	2,60	2,60	2,60
		0,88	3,20	3,50	3,50	3,50	3,50	3,50	3,50	3,50
		1,00	3,20	3,50	3,50	3,50	3,50	3,50	3,50	3,50
	t _{N1} [mm] N _{R,k} [kN]	0,40	1,59	1,59	1,59	1,59	1,59	1,59	1,59	1,59
		0,50	1,88	1,88	1,88	1,88	1,88	1,88	1,88	1,88
		0,55	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
		0,63	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80
		0,75	3,60	3,60	3,60	3,60	3,60	3,60	3,60	3,60
		0,88	3,60	4,10	4,40	4,40	4,40	4,40	4,40	4,40
		1,00	3,60	4,10	4,45	4,80	4,90	4,90	4,90	4,90
	N _{R,k,II}	3,60	4,10	4,45	4,80	4,90	4,90	4,90	4,90	4,90
D, d [mm] max. head displacement u [mm]	30	12,0	5,0	5,0	5,0	4,0	4,0	4,0	4,0	4,0
	40	13,5	7,0	7,0	7,0	5,0	5,0	5,0	5,0	5,0
	50	15,0	9,0	9,0	9,0	6,0	6,0	6,0	6,0	6,0
	60	17,5	11,0	11,0	11,0	7,0	7,0	7,0	7,0	7,0
	70	20,0	13,0	13,0	13,0	8,0	8,0	8,0	8,0	8,0
	80	22,5	14,5	14,5	14,5	9,0	9,0	9,0	9,0	9,0
	100	22,5	14,5	14,5	14,5	9,0	9,0	9,0	9,0	9,0
	120	22,5	14,5	14,5	14,5	9,0	9,0	9,0	9,0	9,0
	≥ 140	22,5	14,5	14,5	14,5	9,0	9,0	9,0	9,0	9,0
d _{pd} [mm]	Ø 5,0	Ø 5,3					Ø 5,5	Ø 5,7		

If component t_{N1} resp. t_{N2} is made of S320GD or S350GD the grey highlighted values may be increased by 8.2 %.

Sandwich screw	Annex 12
FABA Typ BZ A2 6,3 x L with hexagon head and sealing washer ≥ Ø16 mm	

	<p><u>Materials</u></p> <p>Fastener: Stainless steel A2, A4 or A5 – EN ISO 3506 Washer: Stainless steel A2, A4 or A5 – EN ISO 3506 with vulcanized EPDM</p> <p>Component I: S280GD to S550GD - EN 10346 Component II: Structural timber – EN 14081</p> <p><u>Predrill diameter:</u> $d_{pd} = \varnothing 4,8 \text{ mm}$</p> <p><u>Timber substructures</u></p> <p>$M_{y,Rk} = 9,742 \text{ Nm}$ $f_{ax,k} = 8,575 \text{ N/mm}^2 \text{ for } l_{ef} \geq 45,0 \text{ mm}$</p>
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		Component II t II [mm]								
		30	40	50	60	70	80	100	120	≥ 140
Component I	t _{N2} [mm] V _{R,k} [kN]	0,40	0,77	0,77	0,77	0,77	0,77	0,77	0,77	0,77
		0,50	1,32	1,32	1,32	1,32	1,32	1,32	1,32	1,32
		0,55	1,60	1,60	1,60	1,60	1,60	1,60	1,60	1,60
		0,63	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
		0,75	2,40	2,40	2,40	2,40	2,40	2,40	2,40	2,40
		0,88	2,40	2,40	2,40	2,40	2,40	2,40	2,40	2,40
		1,00	2,40	2,40	2,40	2,40	2,40	2,40	2,40	2,40
	t _{N1} [mm] N _{R,k} [kN]	0,40	1,59	1,59	1,59	1,59	1,59	1,59	1,59	1,59
		0,50	1,88	1,88	1,88	1,88	1,88	1,88	1,88	1,88
		0,55	2,00	2,00	2,00	2,00	2,00	2,00	2,00	2,00
		0,63	2,20	2,20	2,20	2,20	2,20	2,20	2,20	2,20
		0,75	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80
		0,88	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80
		1,00	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80
	N _{R,k,II}	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80	2,80
max. head displacement u [mm]		-	5,0	5,5	7,0	11,0	15,0	15,0	15,0	15,0

If component t_{N1} resp. t_{N2} is made of S320GD or S350GD the grey highlighted values may be increased by 8.2 %.
The values listed above in dependence on the screw-in length l_{ef} are valid for $k_{mod} = 0,90$ and timber strength grade C24 ($\rho_a = 350 \text{ kg/m}^3$). For other combinations of k_{mod} and timber strength grades see Annex 3.

Sandwich screw	Annex 13
FABA Typ A A2 6,5 x L with hexagon head and sealing washer $\geq \varnothing 16 \text{ mm}$	