

GERMAN INSTITUTE FOR BUILDING TECHNOLOGY
statutory body

10829 Berlin, April 4,
2007 Kolonnenstraße 30 L
Telephone: 030 78730-258
Fax: 030 78730-320
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**Allgemeine bauaufsichtliche Zulassung
(national technical approval)**

Approval number:

Z-14.4-532

Applicant:

EJOT Baubefestigungen GmbH
In der Stockwiese 35
57334 Bad Laasphe

Object of approval:

Solar fastener for fastening solar installations

Valid until:

April 30, 2012

The construction product mentioned above is hereby granted the 'national technical approval'.

This 'national technical approval' comprises seven pages and four Appendices.



I. GENERAL PROVISIONS

- 1 The *allgemeine bauaufsichtliche Zulassung* ('national technical approval') is considered as proof of the fitness for use or application of the approval object for the purpose of the regional building regulations.
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II. SPECIAL CONDITIONS

1 Definition of the construction product and intended use

The approval object is thread forming screws with welded-on threaded pins made of corrosion-resistant steel (solar fastener) for the planned force-transferring connection of attachment parts (in particular elevations or support profiles of solar installations) with substructures made of steel or wood. Thereby, the solar fastener is screwed through the top flanges of profiled sheets made of steel or aluminium (see Appendix 1).

This allgemeine bauaufsichtliche Zulassung ('national technical approval') regulates the connections made with the solar fasteners for predominantly static loads.

2 Conditions for the building product

2.1 Characteristics and composition

2.1.1 Dimensions

The information in Appendix 1 applies.

2.1.2 Materials

The solar fasteners are manufactured from the steel grade 1.4301. The following requirements apply for the materials of the profiled sheets:

$R_m \geq 390 \text{ N / mm}^2$ for profiled sheets made of steel and

$R_m \geq 195 \text{ N / mm}^2$ for profiled sheets made of aluminium.

If the solar fastener JZ3-SB-8.0 x L is used, the substructure must consist of the steel grades S235 according to DIN EN 10025-2:2005-04 or S280GD or S320GD according to DIN EN 10326:2004-09.

The use of the solar fasteners JA3-SB-8.0 x L and JA3-SB-10.0 x L is intended for a substructure made of softwood with minimum strength class C24 according to DIN 1052:2004-08.

2.1.3 Corrosion protection

The solar fasteners are resistant to corrosion and therefore do not require any further corrosion protection.

2.2 Marking

The package of the solar fasteners or the enclosed packing slip must be marked by the manufacturer with the conformity mark Ü (Ü-mark) in accordance with the decrees for conformity marking of the States of the Federal Republic of Germany. The marking is only allowed if the conditions given in clause 2.3 are satisfied.

Every package shall have an additional label with information about the factory (factory code), the description, the geometry and the material of the solar fastener.

2.3 Verification of conformity

2.3.1 Proof of conformity of the construction product manufactured according to this national technical approval shall be delivered by means of a certificate of conformity issued for each manufacturing plant and based on factory production control and continuous external monitoring including initial-type testing of the solar fasteners in accordance with the following provisions.

The manufacturer of the solar fasteners shall involve an accredited certification body and an accredited monitoring body for the granting of the certificate of conformity and for the external monitoring including the related product inspections.

The certification body shall submit a copy of the relevant certificate of conformity to the Deutsches Institut für Bautechnik for information.

For the scope, way and frequency of the factory production control and the external monitoring, the approval principles of the Deutsches Institut für Bautechnik for the “verification of conformity for screws in lightweight metal construction” (see issue 6/1999 of “DIBt Mitteilungen”) apply accordingly.

2.3.2 Factory production control

Every manufacturing plant shall setup a factory production control system and perform factory production control. Factory production control means the continuous monitoring of the production to be performed by the manufacturer by means of which the latter ensures that the construction products produced by him are in conformity with this national technical approval.

The results of the factory production control must be recorded and evaluated. The records must contain at least the following information:

- designation of the construction product and the initial material and the components
- type of the control or inspection
- date of manufacture and date of testing the construction product or the initial material or the components
- results of the controls and tests and comparison with the requirements deposited at the Deutsches Institut für Bautechnik
- signature of the person responsible for the factory production control

The records must be kept for at least five years and submitted to the monitoring body involved in the external monitoring. They must be submitted to the Deutsches Institut für Bautechnik and the responsible supreme building authority on request.

In the case of unsatisfactory test results, the manufacturer must immediately take the necessary measures to rectify the defect. Construction products not meeting the requirements must be handled in such a way that mix-ups with faultless products are ruled out. After rectification of the defect – insofar as technically possible and required as proof that the defect has been rectified – the corresponding test must be repeated immediately.

2.3.3 External monitoring

The factory production control performed in every manufacturing plant must be checked regularly, at least once per year, by external monitoring.

In the course of the external monitoring, an initial-type testing of the solar fasteners must be performed and random sampling testing must be performed.

The sampling and testing are the responsibility of the accredited body.

The results of the certification and external monitoring must be kept for at least five years. The certification body and/or the monitoring body must submit them to the Deutsches Institut für Bautechnik and the responsible supreme building authority on request.



3 Provisions for design and dimensioning

3.1 Design

If the solar fasteners are loaded crosswise to the profiled sheets, the profiled sheets must be fastened to the substructure at the same height in the neighbouring troughs (see Figure 1). These fastening elements must be designed so that the shear forces are transferred from the solar fasteners to the substructure. In the case of shear forces from the solar fasteners in the longitudinal direction of the profiled sheets, more remote connections of the corresponding profiled sheet with the substructure are also permitted to be included for the load transfer.

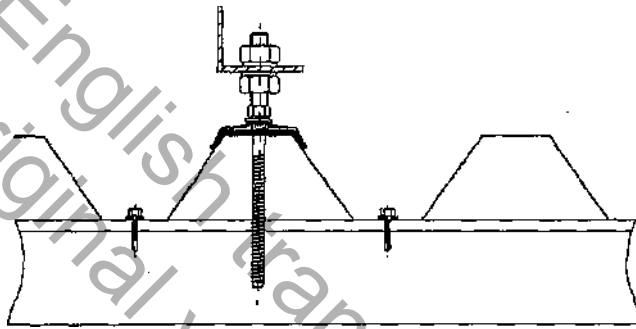


Figure 1

3.2 Dimensioning

3.2.1 General

The verification concept stated in DIN 18800-1:1990-11 applies.

3.2.2 Characteristic values of the load-bearing capacity

3.2.2.1 Characteristic values of the tensile and compressive strength $N_{R,k}$

Solar fastener JZ3-SB-8.0 x L:

Table 1

	Thickness of the substructure [mm]			
	1.5	2.00	3.00	≥ 4
$N_{R,k}$ [kN]	2.20	3.40	5.80	6.80

For intermediate values of the thickness of the substructure, $N_{R,k}$ for the smaller component thickness must be selected.

In the case of thin-walled ($t \leq 2.00$ mm), non-symmetrical substructures (e.g. B, C or Z profiles), the characteristic load-bearing values $N_{R,k}$ must be reduced by 30%.

Solar fastener JA3-SB-8.Q x L:

$$N_{R,k} = 0.0686 \cdot k_{mod} \cdot l_{ef} \quad [\text{kN/mm}]$$

$$\text{with } l_{ef} \geq 32 \text{ mm and } l_{ef} \leq 0.6 \cdot L$$

or according to Appendix 2, Table 4

l_{ef} effective screw-in length in the wood substructure

k_{mod} modification factor according to DIN 1052:2004-08, Appendix F

L length of the screw according to Appendix 1



Solar fastener JA3-SB-10.0 x L:

$$N_{R,k} = 0.0858 k_{mod} l_{ef} \quad [\text{kN/mm}]$$

with $l_{ef} \geq 40 \text{ mm}$ and $l_{ef} \leq 0.6 L$

or according to Appendix 2, Table 4

In the case of compression load, the solar fasteners must also be examined for buckling.

Characteristic value of the compressive strength for buckling:

$$N_{R,k} = 1.1 (K \cdot N_{pl,d})$$

$K \cdot N_{pl,d}$ see Appendices 3 and 4, Tables 5 to 7

The smaller value for $N_{R,k}$ is decisive.

3.2.2.2 Characteristic values of the shear resistance $V_{R,k}$

$$V_{R,k} = \min \left\{ \frac{F_{L,k} \cdot L1}{(L1+L2)}, \frac{M_{pl,k}}{L2} \right\}$$

L1 and L2, see Appendix 1

Table 2 values for $F_{L,k}$ in kN

Profiled sheets made of steel with $R_m \geq 390 \text{ N/mm}^2$			Profiled sheets made of aluminium with $R_m \geq 195 \text{ N/mm}^2$		
$t_N = 0.40 \text{ mm}$	$t_N = 0.55$	$t_N \geq 0.63 \text{ mm}$	$t_N = 0.50 \text{ mm}$	$t_N = 0.60 \text{ mm}$	$t_N \geq 0.70 \text{ mm}$
0.64	1.63	1.86	0.53	0.82	1.11

t_N – nominal sheet thickness of the profiled sheets

$M_{pl,k} = 33.35 \text{ Nm}$ for solar fastener JZ3-SB-8.0 x L

$M_{pl,k} = 40.66 \text{ Nm}$ for solar fasteners JA3-SB-8.0 x L and JA3-SB-10.0 x L

3.2.3 Design values of the load-bearing capacity

The following applies for the calculation of the load-bearing capacity design values from the characteristic values:

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

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

With $\gamma_M = 1,33$

3.2.4 Combined load of tensile or compression forces and shear forces

In the case of combined load due to the design values of the acting tensile forces N and shear forces V, no reduction is required. In the case of simultaneous compression and shear forces, the following simplified buckling resistance equation must also be made:

$$\frac{N}{K \cdot N_{pl,d}} + \frac{V \cdot L2}{M_{pl,d}} \leq 1,0$$

$K \cdot N_{pl,d}$ see Appendices 3 and 4, Tables 5 to 7

$$M_{pl,d} = M_{pl,k} / \gamma_M \quad \gamma_M = 1,1$$

$M_{pl,d} = 30,3 \text{ Nm}$ for solar fasteners JA3-SB-8.0 x L

$M_{pl,d} = 37,0 \text{ Nm}$ for solar fasteners JA3-SB-8.0 x L and JA3-SB-10.0 x L



4 Provisions for construction

The solar fasteners shall be mounted exclusively in accordance with the manufacturer information. The manufacturer gives the installation instructions to the company performing the work.

Connections with solar fasteners according to clause 1 must only be made by companies who have the necessary experience for this unless there is instruction of the installation personnel by specialists from companies experienced in this field.

It must be ensured during the installation that no contact corrosion can occur.

The use of impact screwdrivers is not permitted.

The solar fasteners must be installed at right angles to the component surface in order to ensure correct load bearing and if necessary rain-proof connection.

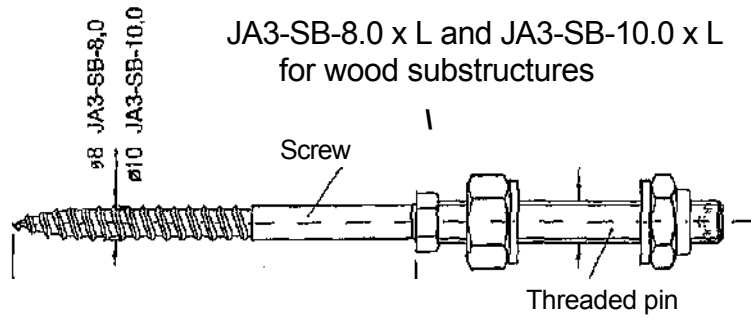
The profiled sheets and the substructure must be predrilled according to the information in Table 3.

Table 3 Predrilling diameter in mm for profiled sheets and substructure

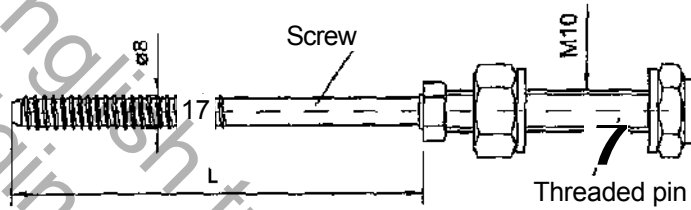
Solar fastener	Thickness of the substructure made of: [mm]					
	Steel				Wood	
	1,5 ... <5.0	5.0 ... <7.5	7.5 ... < 10	≥10	≥32	≥40
JZ3-SB-8.0 x L	6.8	7.0	7.2	7.4	-	-
JA3-SB-8.0 x L	-	-	-	-	5.5	5.5
JA3-SB-10.0xL	-	-	-	-	-	7.0

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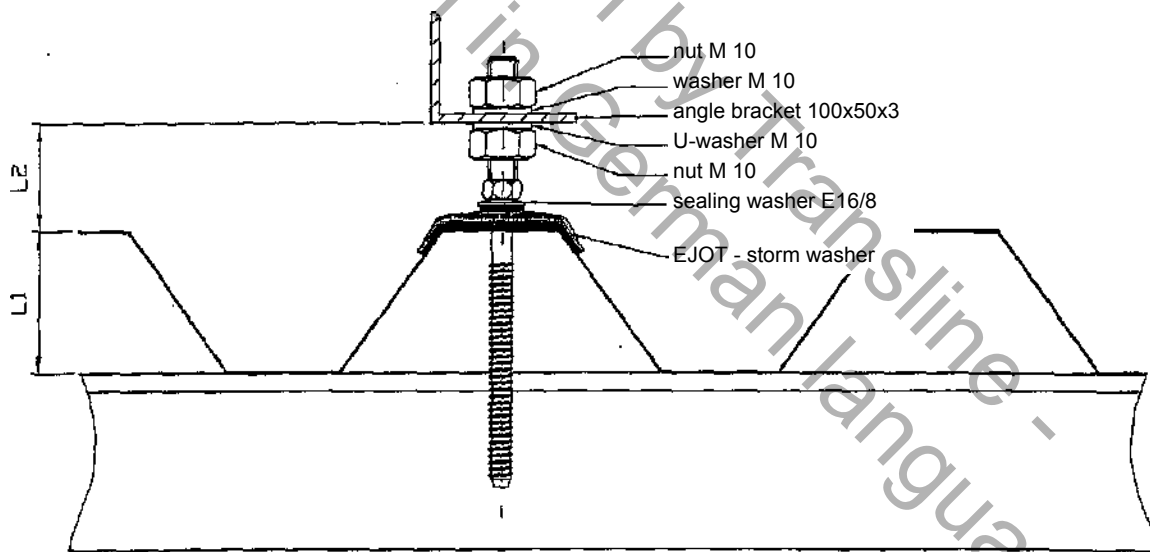




JZ3-SB-8.0 x L for substructures made of steel



Example for the use of the solar fastener JZ3-SB-8.0 for trapezoidal profiled sheets on a substructure made of steel



L1 – Distance between the top edge of the substructure which the solar fastener is screwed in to (this does not have to be the substructure for the profiled sheets and can be deeper) and profiled sheet top edge



EJOT

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in der Stockwiese 35
57334 Bad Laasphe

Solar fasteners: JZ3-SB-8.0 x L
JA3-SB-8.0 x L
JA3-SB-10.0 x L

Example for use

Appendix 1

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Table 4 Characteristic load-bearing values N_{RK} in kN in relation to extract for JA3-SB~8.0 x L and JA3-SB-10 x L made of softwood in the strength class C24, usage class 2

Screw-in depth l_{ef} in mm	Characteristic load-bearing values N_{RK} for the solar fastener JA3- SB 8,0 × L (d = 8) and JA3-SB-10,0 × L (d=10) depending on the accumulated load duration and the screw-in depth									
	Standard $k_{mod} = 0.6$ Longer than 10 years (usually intrinsic weight)		Long $k_{mod} = 0.7$ 6 months to 10 years		Medium $k_{mod} = 0.8$ 1 week to 6 months (usually snow)		Short $k_{mod} = 0.9$ Shorter than 1 week (usually wind)		Very short $k_{mod} = 1.1$ Shorter than 1 minute	
	d = 8.0	d = 10	d = 8.0	d = 10	d = 8.0	d = 10	d = 8.0	d = 10	d = 8.0	d = 10
32	1.32	-	1.54	-	1.76	-	1.98	-	2.42	-
40	1.65	2.06	1.92	2.40	2.20	2.74	2.47	3.09	3.02	3.77
45	1.85	2.32	2.16	2.70	2.47	3.09	2.78	3.47	3.40	4.25
48	1.98	2.47	2.31	2.88	2.63	3.29	2.96	3.70	3.62	4.53
50	2.06	2.57	2.40	3.00	2.74	3.43	3.09	3.86	3.77	4.72
56	2.31	2.88	2.69	3.36	3.07	3.84	3.46	4.32	4.23	5.28
60	2.47	3.09	2.88	3.60	3.29	4.12	3.70	4.63	4.53	5.66
64	2.63	3.29	3.07	3.84	3.51	4.39	3.95	4.94	4.83	6.04
70	2.88	3.60	3.36	4.20	3.84	4.80	4.32	5.40	5.28	6.60
72	2.96	3.70	3.46	4.32	3.95	4.94	4.45	5.56	5.43	6.79
80	3.29	4.12	3.84	4.80	4.39	5.49	4.94	6.17	6.04	7.55
85	3.50	4.37	4.08	5.10	4.67	5.83	5.25	6.56	6.41	8.02
88	3.62	4.53	4.23	5.28	4.83	6.04	5.43	6.79	6.64	8.30
90	3.70	4.63	4.32	5.40	4.94	6.17	5.56	6.95	6.79	8.49
96	3.95	4.94	4.61	5.76	5.27	6.59	5.93	7.41	7.24	9.06
100	4.12	5.15	4.80	6.00	5.49	6.86	6.17	7.72	7.55	9.43
104	4.28	5.35	4.99	6.24	5.71	7.13	6.42	8.03	7.85	9.81
110	4.53	5.66	5.28	6.60	6.04	7.55	6.79	8.49	8.30	10.38
112	4.61	5.76	5.38	6.72	6.15	7.68	6.92	8.64	8.45	10.57
120	4.94	6.17	5.76	7.20	6.59	8.23	7.41	9.26	9.06	11.32



<p>EJOT</p> <p>Baubefestigungen GmbH In der Stockwiese 35 57334 Bad Laasphe</p>	<p>Table 4</p> <p>Characteristic load-bearing values N in kN for JA3-SB-8.0 x L and JA3-SB-10xL</p>	<p>Appendix</p> <p>To the national technical approval Z-14,4-532 Dated April 4, 2007</p>
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Table 5 $\kappa \cdot N_{pl,d}$ for the solar fastener **JA3-SB-8.0 x L**

L ₁ in mm	L ₂ in mm							
	30	40	50	60	70	80	90	100
70	6.14	5.22	4.52	3.96	3.52	3.16	2.86	2.60
80	5.28	4.52	3.93	3.46	3.08	2.77	2.52	2.30
90	4.59	3.95	3.45	3.05	2.73	2.46	2.24	2.05
100	4.02	3.48	3.06	2.72	2.44	2.21	2.01	1.84
110	3.55	3.09	2.73	2.44	2.19	1.99	1.82	1.67
120	3.15	2.77	2.45	2.20	1.98	1.81	1.65	1.52
130	2.82	2.49	2.22	1.99	1.81	1.65	1.51	1.40
140	2.54	2.25	2.02	1.82	1.65	1.51	1.39	1.29
150	2.29	2.05	1.84	1.67	1.52	1.39	1.28	1.19
160	2.08	1.87	1.69	1.53	1.40	1.29	1.19	1.10
170	1.90	1.71	1.55	1.41	1.30	1.19	1.11	1.03
180	1.74	1.57	1.43	1.31	1.20	1.11	1.03	0.96
190	1.60	1.45	1.33	1.22	1.12	1.04	0.96	0.90
200	1.47	1.34	1.23	1.13	1.05	0.97	0.90	0.84

Table 6 $\kappa \cdot N_{pl,d}$ for the solar fastener **JA3-SB-10 x L**

L ₁ in mm	L ₂ in mm							
	30	40	50	60	70	80	90	100
70	14.30	12.04	10.29	8.90	7.79	6.89	6.14	5.51
80	12.40	10.52	9.04	7.87	6.92	6.14	5.50	4.96
90	10.83	9.26	8.01	7.01	6.20	5.52	4.96	4.49
100	9.53	8.21	7.15	6.29	5.58	5.00	4.51	4.09
110	8.44	7.32	6.42	5.67	5.06	4.55	4.12	3.75
120	7.53	6.57	5.79	5.15	4.61	4.16	3.78	3.45
130	6.75	5.93	5.26	4.69	4.22	3.82	3.48	3.18
140	6.08	5.38	4.79	4.30	3.88	3.52	3.22	2.95
150	5.51	4.90	4.38	3.95	3.58	3.26	2.98	2.74
160	5.01	4.48	4.03	3.64	3.31	3.02	2.78	2.56
170	4.57	4.11	3.71	3.37	3.07	2.81	2.59	2.39
180	4.17	3.78	3.43	3.13	2.86	2.63	2.42	2.24
190	3.86	3.50	3.18	2.91	2.67	2.46	2.27	2.11
200	3.56	3.24	2.96	2.71	2.49	2.30	2.13	1.98

<p>EJOT Baubefestigungen GmbH In der Stockwiese 35 57334 Bad Laasphe</p>	<p>Table 5 $\kappa \cdot N_{pl,d}$ for the solar fastener JA3-SB-8.0 x L</p> <p>Table 6 $\kappa \cdot N_{pl,d}$ for the solar fastener JA3-SB-10.0 x L</p>	<p>Appendix 3 To the national technical approval Z-14.4-532 Dated April 4, 2007</p>
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Table 7 $\kappa \cdot N_{pl,d}$ in kN for the solar fastener JA3-SB-8.0xL

l_1 in mm	L_2 in mm							
	30	40	50	60	70	80	90	100.
70	8.32	7.15	6.22	5.47	4.86	4.36	3.94	3.58
80	7.27	6.27	5.47	4.83	4.30	3.87	3.50	3.19
90	6.39	5.53	4.85	4.30	3.84	3.46	3.14	2.87
100	5.65	4.92	4.33	3.85	3.45	3.12	2.84	2.60
110	5.02	4.37	3.87	3.47	3.12	2.83	2.58	2.37
120	4.49	3.95	3.51	3.14	2.84	2.58	2.36	2.17
130	4.03	3.57	3.19	2.86	2.59	2.36	2.17	2.00
140	3.64	3.24	2.90	2.62	2.38	2.18	2.00	1.85
150	3.30	2.95	2.66	2.41	2.19	2.01	1.85	1.71
160	3.01	2.70	2.44	2.22	2.03	1.86	1.72	1.59
170	2.75	2.48	2.25	2.05	1.88	1.73	1.60	1.49
180	2.53	2.27	2.08	1.90	1.75'	1.61	1.50	1.39
190	2.33	2.12	1.93	1.77	1.63	1.51	1.40	1.31
200	2.15	1.96	1.80	1.65	1.53	1.41	1.32	1.23



EJOT
Baubefestigungen GmbH
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Table 7
 $\kappa \cdot N_{pl,d}$ for the
solar fastener
JA3-SB-8.0 x L

Appendix 4
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