

DEUTSCHES INSTITUT FÜR BAUTECHNIK

(German Institute for Civil Engineering)

10829 Berlin, 21. November 2005
Kolonnenstraße 30L
Phone: 030 78730-314
Fax: 030 78730-320
Ref No.: I 11-1.1.1-17/05

National Technical Approval

Approval number:

Z-1.1-58

Applicant:

Stahlwerk Annahütte
Max Aicher GmbH & Co. KG
83404 Hammerau

Generic type of construction product:

Concrete reinforcing steel bar BSt 500 S (B) with
thread ribs
Nominal diameter: 12 to 32 mm

Valid until:

31 December 2009

The aforementioned construction product is herewith generally approved by the Deutsches Institut für Bautechnik in accordance with German building legislation.

This National Technical Approval comprises five pages and two annexes.

Important Notice

This approval is the translation of a document originally prepared in the German language which has not been verified and officially authorized by the "Deutsches Institut für Bautechnik" (German Institute for Civil Engineering). In case of doubt in respect to the wording and/or interpretation of this approval, the original German version of this document shall prevail exclusively. Therefore no liability is assumed for translation errors or inaccuracies.

* This National Technical Approval supersedes the National Technical Approval dated 4 September 2000, validity extended vide notification dated 26 September 2005.
The first National Technical Approval of the aforementioned construction product was issued on 2 June 1986.

I. GENERAL PROVISIONS

1. This National Technical Approval attests to the usability and applicability of the aforementioned construction product in accordance with German federal state building regulations.
2. This National Technical Approval does not replace the permits, licences and certificates required by German law for the execution of construction projects.
3. This National Technical Approval is granted without prejudice to third party rights, in particular private property rights.
4. Irrespective of further provisions laid down in the "Specific Provisions" section, the manufacturer and supplier of the aforementioned construction product shall provide users and appliers of the construction product with copies of the National Technical Approval and inform them that the National Technical Approval must be available at the construction site. On request, copies of the National technical Approval shall be submitted to all authorities involved.
5. Reproduction of this National Technical Approval shall be in full. However, partial reproduction can be made with the written consent of the Deutsches Institut für Bautechnik. Texts and drawings of advertising brochures shall not contradict the National Technical Approval. Translations of the National Technical Approval shall include the note "Translation from the German original text not certified by Deutsches Institut für Bautechnik".
6. This National Technical Approval is not granted irrevocably. The provisions of the National Technical Approval may be subsequently amended or modified, particularly if made necessary as a result of new technical developments.

II. SPECIFIC PROVISIONS

1 Definition of product and intended use

1.1 Definition of the construction product

- (1) This National Technical Approval applies to concrete reinforcing steel bars BSt 500 with thread ribs, hot rolled and heat-treated by utilizing the rolling heat.
- (2) The cross section is nearly circular. The nominal diameters are 12, 14, 16, 20, 25, 28 and 32 mm.
- (3) Two rib rows are rolled onto the bar surface to form a single left-hand thread (see Annex 1).
- (4) BSt 500 S with thread ribs may be coupled or anchored in any cross section using approved connecting and anchoring devices.
- (5) According to DIN 1045:1988-07 or DIN 1045-1:2001-07, it may be used without restrictions for the reinforcement of reinforced concrete under static loading, in the same way as concrete reinforcing bars BSt 500 S according to DIN 488:1984-09.
- (6) If designed in accordance with DIN 1045-1:2001-07, BSt 500 S (B) may be classified as a high-ductile concrete reinforcing bar, class B, according to DIN 1045-1, Table 11.

2 Provisions for bar anchors AWM 1100

2.1 Characteristics and composition

2.1.1 Surface design and cross section

- (1) Nominal weight, nominal cross section and rib geometry must comply with the specifications given in Annex 1.
- (2) The limit values resulting from the tolerances apply to the individual sample and are defined as the 5% fractile of one production batch.
- (3) The mean cross section may not be smaller than the nominal cross section.
- (4) The cross section is determined by weighing and calculating the volume of the samples. Thereby, the apparent density is assumed to be 7.85 g/cm^3 .

2.1.2 Mechanical-technological properties

The requirements for the mechanical-technological properties specified in Annex 2 shall be met.

2.1.3 Chemical composition

- (1) The provisions for BSt 500 S specified in DIN 488-7:1986-06 shall be met.
- (2) The chemical limit values used in production have been submitted to the approved body responsible for continuous surveillance (see 2.3.3) and the Deutsches Institut für Bautechnik.

2.2 Production and marking

2.2.1 Production

- (1) The parent material shall meet the requirements specified in section 2.1.3.
- (2) The threadbars shall be produced in technically straight lengths and shall be cut in standard lengths of 12 to 14 m or to customer specifications.

2.2.2 Marking

- (1) The strength class 500N/mm² of the concrete reinforcing bar is identifiable by the left hand thread ribs.
- (2) The manufacturer's mark consists of raised lines rolled onto the rib-free bar surface at a distance of 12 thread ribs. This line marking shall be repeated every meter.
- (3) The manufacturer shall affix the conformity marking (Ü-mark) on the delivery note of the construction product in accordance with the conformity marking regulations of the German federal states. The Ü-mark may only be affixed, if the requirements according to section 2.3 for the attestation of conformity are met.
- (4) Each dispatch unit shall be provided with a weather-resistant label showing the manufacturing plant, approval number, concrete reinforcement steel grade and conformity marking.

2.3 Attestation of Conformity

2.3.1 General

- (1) To attest the construction product's conformity with the provisions of this National Technical Approval a certificate of conformity shall be issued for each manufacturing plant based on factory production control and continuous surveillance including initial type-testing of the construction product in accordance with the following provisions.
- (2) The manufacturer of the construction product shall involve an approved certification body to issue the certificate of conformity and an approved inspection body to perform continuous surveillance including product inspection.
- (3) The certification body shall submit a copy of the issued certificate of conformity to the Deutsches Institut für Bautechnik.

2.3.2 Factory production control

- (1) Each manufacturing plant shall establish and implement a factory production control system. Factory production control entails the permanent internal control of production exercised by the manufacturer in order to ensure that the construction product produced by him is in conformity with the provisions of this National Technical Approval.
- (2) Factory production control shall be carried out as specified for concrete reinforcing steel bars BSt 500 S in DIN 488-6:1986-06.
- (3) The results of factory production control shall be recorded and evaluated. The records shall include at least the following information:

- Identification of the construction product or parent material and components
- Type of control or test
- Date of production and testing of the construction product or parent material or components
- Results of controls and tests and comparison with requirements, as applicable
- Signature of the person responsible for factory production control

- (4) The records shall be kept for at least five years and shall be submitted to the inspection body responsible for continuous surveillance. On request, these records shall be submitted to the Deutsches Institut für Bautechnik and the relevant supreme building control authority.
- (5) In case of unsatisfactory test results, the manufacturer shall take immediate measures to eliminate the deficiency. Construction products that do not comply with the requirements shall be handled such that they cannot be mistaken for products complying with the requirements. After elimination of the deficiency the respective test shall be immediately

repeated as far as is technically possible and necessary to verify that the deficiency has been eliminated.

2.3.3 Continuous surveillance

(1) Factory production control of each manufacturing plant shall be verified by continuous surveillance according to DIN 488-6:1986-06

(2) Continuous surveillance may include the taking of samples for audit testing. The respective approved body is responsible for sampling and testing.

(3) The results of certification and continuous surveillance shall be kept for at least five years. On request, they shall be submitted by the certification body or approved body to the Deutsches Institut für Bautechnik and the relevant supreme building control authority.

3 Provisions for design and dimensioning

3.1 Design and dimensioning according to DIN 1045:1988-07

For the design in accordance with DIN 1045:1988-07, the same provisions shall apply as for concrete reinforcing steel bars BSt 500 S according to DIN 488:1984-09.

3.1.1 Predominantly static loading

(1) For 12 to 28 mm diameter bars BSt 500 S with thread ribs, DIN 1045:1988-07 shall apply.

(2) For 32 mm diameter bars, the specifications for bar bundles with diameters $d_{sv} = 32$ mm (cf. DIN 1045, section 18.11) shall apply.

3.1.2 Not predominantly static loading

(1) For 12 to 28 mm diameter bars BSt 500 S with thread ribs, the specifications of DIN 1045 shall apply without restrictions.

(2) For 32 mm diameter threadbars, the permissible stress amplitude is 100 N/mm^2 .

3.2 Design and dimensioning according to DIN 1045-1:2001-07

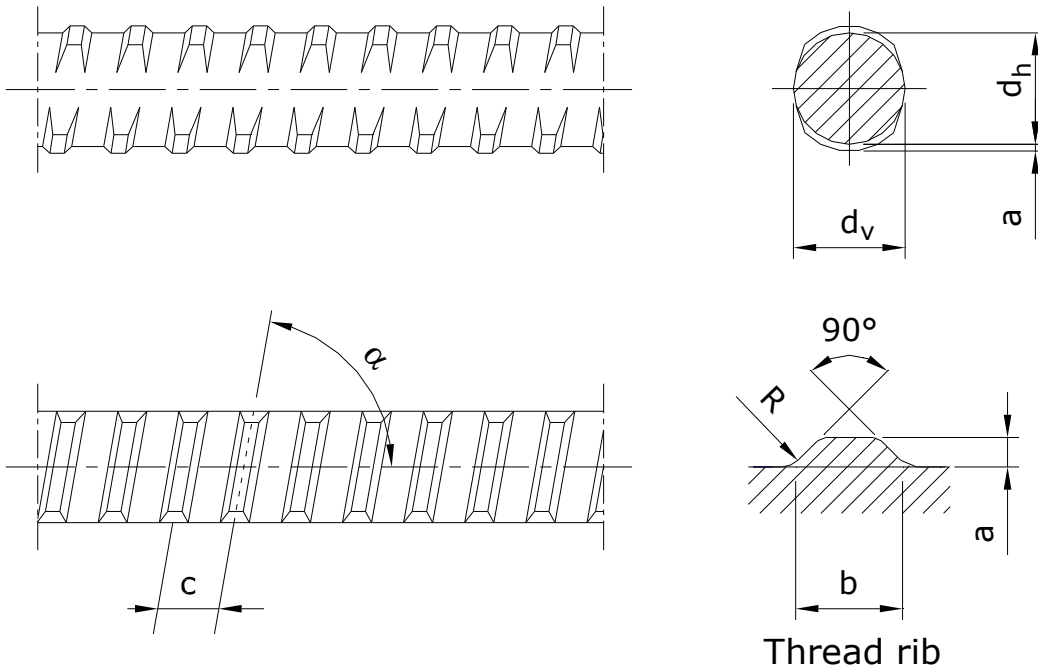
For the design according to DIN 1045-1:2001-07, BSt 500 S (B) may be classified as high-ductile concrete reinforcement steel (cf. Table 11 therein). The following 10% fractile values must be observed: Elongation at ultimate load $\epsilon_{uk} \geq 5\%$ and ratio $(f_t/f_y)_k \geq 1.08$.

4 Provisions for installation

For installation, either DIN 1045:1998-07 or DIN 1045-3:2001-07 shall apply.

Dr.-Ing. Hartz

Shaping



Nominal diameter	Nominal weight	Nominal cross section	Core diameter		Thread ribs				
			d_h	d_v	Height	Width	Pitch	Incline	Radius
d_s mm	G Kg/m	A_s mm ²	d_h mm	d_v mm	a mm	b mm	c mm	α degree	R mm
12	0.89	113	11.6 ± 0.3	11.3 ± 0.5	0.9	3.7	7.0 ± 0.2	80.0	1.5
14	1.21	154	13.6 ± 0.3	13.3 ± 0.5	1.0	3.7	7.5 ± 0.2	81.0	1.5
16	1.58	201	15.7 ± 0.4	15.3 ± 0.5	1.0	3.8	8.0 ± 0.3	81.5	1.5
20	2.47	314	19.5 ± 0.4	19.1 ± 0.5	1.3	4.8	10.0 ± 0.3	81.5	2.0
25	3.85	491	24.4 ± 0.4	23.9 ± 0.5	1.6	5.9	12.5 ± 0.3	81.5	2.0
28	4.83	616	27.3 ± 0.4	26.8 ± 0.5	1.8	6.7	14.0 ± 0.3	81.5	2.5
32	6.31	804	31.2 ± 0.5	30.9 ± 0.6	2.0	7.6	16.0 ± 0.3	81.5	2.5



Stahlwerk Annahütte
Max Aicher GmbH & Co. KG
Hammerau
D-83404 Ainring

**Concrete reinforcing bar
with thread ribs
BSt 500 S
Ø 12 to 32 mm**

**Weight, cross section, rib
geometry and
tolerances**

Annex 1 of National Technical
Approval

No.: Z - 1.1 - 58

issued on 21 November 2005

Properties and requirements Concrete reinforcing steel bar BSt 500 S with thread ribs				Value p ¹⁾ [%]		
1	Nominal diameter	d_s	[mm]	12 14 16 20 25 28 32 ---		
2	Yield strength	R_e (rsp. f_{yk})	[Nmm ²]	500 5.0		
3	Tensile strength	R_m (rsp. F_{tk})	[Nmm ²]	550 5.0		
4	Ratio	R_m / R_e (rsp. $(f_t / f_y)_k$)		1.08 10.0		
5	Elongation at fracture	A_{10}	[%]	10.0 5.0		
6	Elongation at maximum load (calculated from $A_g + \frac{R_m}{E} \cdot 100\%$) ²⁾	A_{gt} (rsp. ϵ_{uk})	[%]	6.0 5.0		
7	Mandrel diameter for rebend test for nominal diameter d_s		[mm]	12.0..... $5 \cdot d_s$ 14.0 and 16.0..... $6 \cdot d_s$ 20.0 to 32.0..... $8 \cdot d_s$ 1.0 1.0 1.0		
8	Fatigue strength at a stress amplitude of $2 \cdot \sigma_A (N = 2 \cdot 10^6) = \sigma_o - \sigma_u$		[Nmm ²]	Straight free bars up to $\varnothing 28$ mm	215	10.0
9				Bars up to $\varnothing 28$ mm embedded in concrete, bent by $15 d_s$	170	10.0
10				Straight free bars $\varnothing 32$ mm	150	10.0
11	Welding suitability ³⁾			E, MAG, RA, RP		
<p>1) Fractile for a statistic probability of $W = 1 - \alpha = 0.90$ (one-side)</p> <p>2) $E \approx 205,000$ N/mm²</p> <p>3) E = Metal arc welding (111 = serial number for graphic representation according to DIN EN 24063) MAG = Metal active gas welding RA = Resistance flash-butt welding RP = Resistance spot welding</p>						
 <p>Stahlwerk Annahütte Max Aicher GmbH & Co. KG Hammerau D-83404 Ainring</p>		<p>Concrete reinforcing bar with thread ribs BSt 500 S $\varnothing 12$ to 32 mm</p> <p>Mechanical-technological properties</p>		<p>Annex 2 of National Technical Approval</p> <p>No.: Z - 1.1 - 58</p> <p>issued on 21 November 2005</p>		