

Reinforcing steel Reinforcing steel bars Dimensions and masses		DIN 488 Part 2																																	
Betonstahl; Betonstabstahl; Maße und Gewichte		Supersedes April 1972 edition.																																	
<p><i>In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.</i></p> <p>See Explanatory notes for connection with EURONORM 82 published by the European Coal and Steel Community, and with an international standard in preparation by the International Organization for Standardization (ISO).</p> <p>The DIN 488 series includes:</p> <p>DIN 488 Part 1 Reinforcing steel; grades, properties, marking DIN 488 Part 2 Reinforcing steel; reinforcing steel bars; dimensions and masses DIN 488 Part 3 Reinforcing steel; reinforcing steel bars; testing DIN 488 Part 4 Reinforcing steel; reinforcing steel fabric and wire; design, dimensions and masses DIN 488 Part 5 Reinforcing steel; reinforcing steel fabric and wire; testing DIN 488 Part 6 Reinforcing steel; quality control DIN 488 Part 7 Reinforcing steel; verification of weldability of reinforcing steel bars; test procedure and evaluation</p>																																			
<p>1 Field of application</p> <p>This standard specifies the dimensions and masses of ribbed reinforcing steel bars of grades BSt 420 S and BSt 500 S as specified in DIN 488 Part 1, with the nominal sizes given in table 1.</p> <p>The dimensions and masses of reinforcing steel fabric and wire are specified in DIN 488 Part 4.</p>																																			
<p>2 Concepts</p> <p>As specified in DIN 488 Part 1.</p>																																			
<p>3 Designation and ordering</p> <p>3.1 The specifications of DIN 488 Part 1 shall apply for the standard designation of reinforcing steel bars.</p> <p>3.2 When ordering, the quantity to be supplied and length of the bars required shall be stated in addition to the standard designation.</p> <p>Example of an order for 50 t for reinforcing steel bars complying with this standard, of grade BSt 500 S, nominal size 20, each bar 12 m long:</p> <p style="text-align: center;">50 t reinforcing steel bars DIN 488 – BSt 500 S – 20 × 12</p>																																			
<p>4 Dimensions, masses, permissible deviations</p> <p>4.1 Size, cross-sectional area, mass</p> <p>4.1.1 The nominal sizes that can be supplied and the nominal cross-sectional areas and nominal masses calculated from them are given in table 1 (columns 1 to 3).</p> <p>4.1.2 The cross-sectional area of the core of ribbed reinforcing bars shall be as circular as possible.</p>																																			
<p style="text-align: right;">4.2 Surface configuration</p> <p>4.2.1 General</p> <p>4.2.1.1 Bars of grade BSt 420 S shall have two opposing rows of oblique ribs running parallel to one another. Except in the case of cold twisted bars, the oblique ribs shall have different spacings on either half of the circumference (see figures 1 and 2).</p> <p>4.2.1.2 Bars of grade BSt 500 S shall have two opposing rows of oblique ribs, one row consisting of parallel oblique ribs and the other of ribs with alternating angles of inclination relative to the axis of the bar (see figures 3 and 4).</p>																																			
<p style="text-align: center;">Table 1. Size, cross-sectional area and mass (nominal values) of ribbed bars</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">1</th> <th style="width: 33%;">2</th> <th style="width: 33%;">3</th> </tr> <tr> <th>Nominal size d_s</th> <th>Nominal cross-sectional area¹⁾ A_s cm²</th> <th>Nominal mass²⁾ G kg/m</th> </tr> </thead> <tbody> <tr><td>6</td><td>0,283</td><td>0,222</td></tr> <tr><td>8</td><td>0,503</td><td>0,395</td></tr> <tr><td>10</td><td>0,785</td><td>0,617</td></tr> <tr><td>12</td><td>1,13</td><td>0,888</td></tr> <tr><td>14</td><td>1,54</td><td>1,21</td></tr> <tr><td>16</td><td>2,01</td><td>1,58</td></tr> <tr><td>20</td><td>3,14</td><td>2,47</td></tr> <tr><td>25</td><td>4,91</td><td>3,85</td></tr> <tr><td>28</td><td>6,16</td><td>4,83</td></tr> </tbody> </table> <p>1) See DIN 488 Part 1, September 1984 edition, table 1 (line 14 and footnote 8). 2) Calculated by taking the density as 7,85 kg/dm³.</p>			1	2	3	Nominal size d_s	Nominal cross-sectional area ¹⁾ A_s cm ²	Nominal mass ²⁾ G kg/m	6	0,283	0,222	8	0,503	0,395	10	0,785	0,617	12	1,13	0,888	14	1,54	1,21	16	2,01	1,58	20	3,14	2,47	25	4,91	3,85	28	6,16	4,83
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4.2.1.3 Non-twisted bars may be made with or without longitudinal ribs.

4.2.1.4 Cold twisted bars shall have a pitch equal to about $10 \cdot d_s$ to $12 \cdot d_s$ and shall have longitudinal ribs (see figures 2 and 4).

4.2.2 Oblique ribs

4.2.2.1 The oblique ribs shall be crescent-shaped in their longitudinal section and shall not merge into any longitudinal ribs present.

4.2.2.2 The flanks of the ribs shall be as steep as possible, with α not less than 45° , and radiused at the transition to the core of the bar (see figure 5).

4.2.2.3 Guideline values of the angle of inclination of the ribs to the bar axis, β , are given in figures 1 to 4.

4.2.2.4 The dimensions and spacings of the oblique ribs shall comply with the values given in table 2 (columns 2 to 9) (determined as specified in DIN 488 Part 3). The gap between opposing rib ends, e , shall be approximately:

$0,2 \cdot d_s$ for non-twisted bars with or without longitudinal ribs (measured at right angles to the bar axis; see figures 1 and 3), and

$0,3 \cdot d_s$ for cold twisted bars (measured at right angles to the longitudinal rib, see figures 2 and 4).

4.2.3 Longitudinal ribs

4.2.3.1 In the case of hot rolled bars, the height of any longitudinal ribs present, h_1 , shall not exceed a value of $0,1 \cdot d_s$ (see figure 6).

In the case of cold twisted bars, the height of the longitudinal ribs shall be $0,15 \cdot d_s$ maximum.

4.2.3.2 The crest width, b_1 , of the longitudinal ribs shall be approximately $0,1 \cdot d_s$.

4.2.4 Relative rib area

The values of relative rib area given in table 2 (column 10) are minimum values (determined as specified in DIN 488 Part 3).

Table 2. Dimensions and spacings of oblique ribs and relative rib area of ribbed bars (see also subclauses 4.2.2 and 4.2.3)

1	2	3	4	5	6	7	8	9	10
Nominal size d_s	Oblique ribs (guideline values)								Relative rib area $f_R^*)$
	Height		Crest width $b_s^1)$	Rib spacing ²⁾				Relative rib area	
	in the middle h_s	at the quarter points h_{sv}		BSt 420 S bar		BSt 500 S bar			
				non-twisted c_{s1}	cold twisted c_{s2}	non-twisted c_s	cold twisted c_s		
6	0,39	0,28	0,6	5,8	4,2	6,0	5,0	6,0	0,039
8	0,52	0,36	0,8	6,6	4,8	8,0	5,7	8,0	0,045
10	0,65	0,45	1,0	7,5	5,5	10,0	6,5	10,0	0,052
12	0,78	0,54	1,2	8,3	6,1	10,8	7,2	10,8	0,056
14	0,91	0,63	1,4	9,7	7,1	12,6	8,4	12,6	0,056
16	1,04	0,72	1,6	11,0	8,2	14,4	9,6	14,4	0,056
20	1,30	0,90	2,0	13,8	10,2	18,0	12,0	18,0	0,056
25	1,63	1,13	2,5	17,3	12,7	22,5	15,0	22,5	0,056
28	1,82	1,26	2,8	19,3	14,3	25,2	16,8	25,2	0,056

*) Dimensionless quantity.
1) Crest widths at mid-rib up to $0,2 \cdot d_s$ shall not give grounds for complaint.
2) Permissible deviation: $\pm 15\%$.

4.3 Length

Bars as specified in this standard shall normally be supplied in standard lengths of 12 to 15 m.

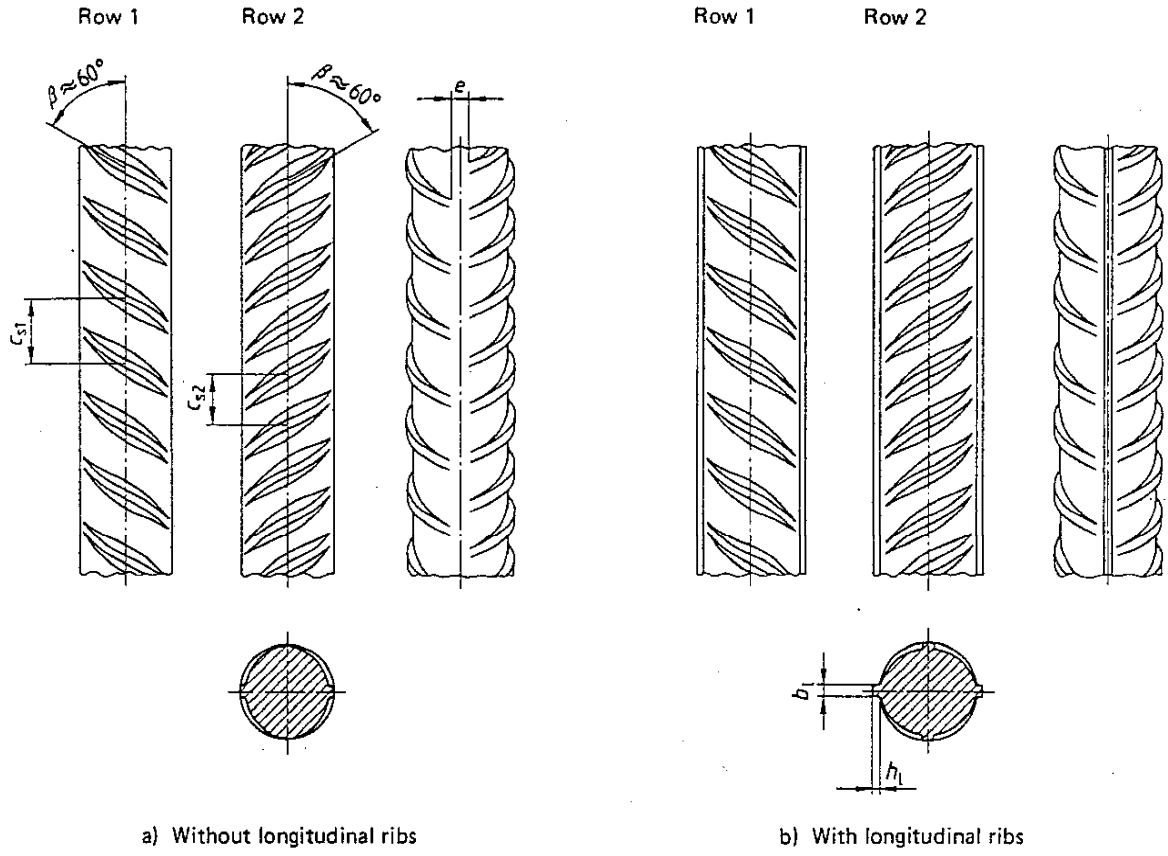


Figure 1. Non-twisted BSt 420 S bar, with and without longitudinal ribs

$$c_s^{1)} = \frac{\text{spacing of rib centres over one pitch}}{\text{number of rib spacings over one pitch}}$$

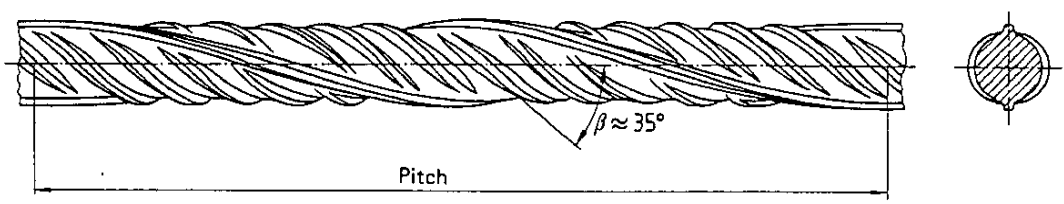


Figure 2. Cold twisted BSt 420 S bar

¹⁾ Not a measurable individual dimension.

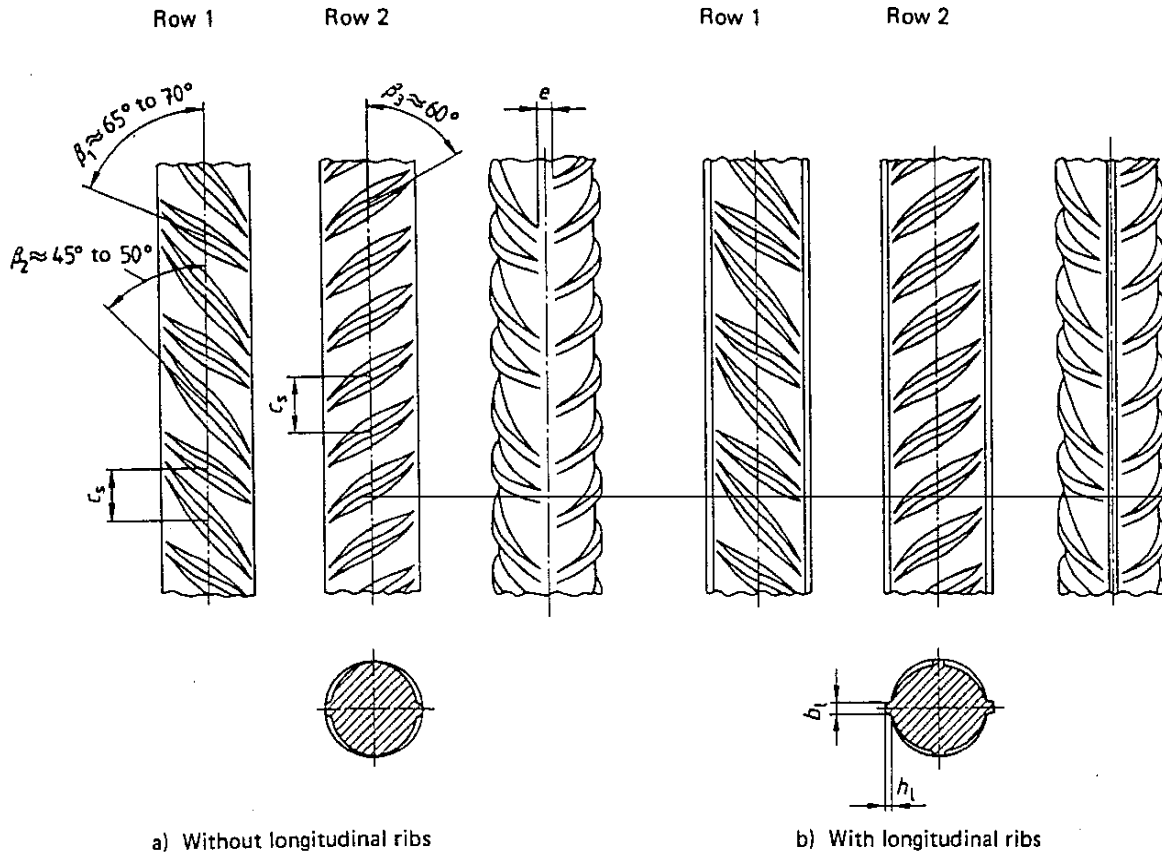


Figure 3. Non-twisted BSt 500 S bar, with and without longitudinal ribs

$$c_s^{1)} = \frac{\text{spacing of rib centres over one pitch}}{\text{number of rib spacings over one pitch}}$$

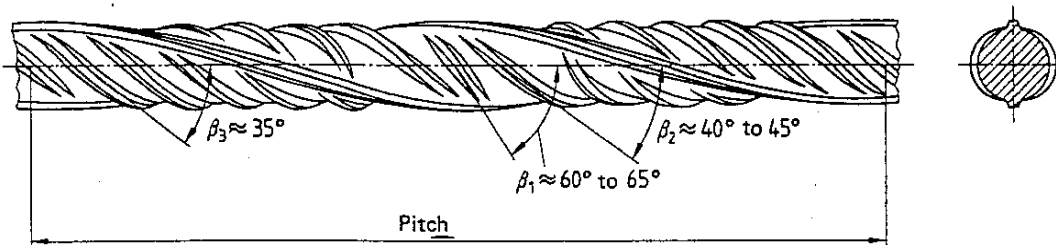


Figure 4. Cold twisted BSt 500 S bar

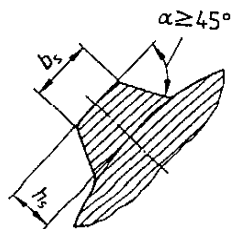


Figure 5. Cross section of oblique rib at mid-rib

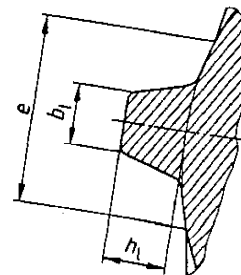


Figure 6. Cross section of longitudinal rib

2) Not a measurable individual dimension.

Standards referred to

- DIN 488 Part 1 Reinforcing steel; grades, properties, marking
DIN 488 Part 3 Reinforcing steel; reinforcing steel bars; testing
DIN 488 Part 4 Reinforcing steel; reinforcing steel fabric and wire; design, dimensions and masses

Previous editions

- DIN 488: 07.23, 05.32, 03.39;
DIN 488 Part 2: 04.72

Amendments

The following amendments have been made in comparison with the April 1972 edition (see also Explanatory notes).

- a) Grades BSt 22/34 GU and BSt 22/34 RU have been deleted; grade BSt 500 S has been included for the first time.
- b) Nominal sizes 18 and 22 (see table 1) have been deleted.
- c) The values of relative rib area and of height of oblique ribs (see table 2) have been amended.

Explanatory notes

This edition of DIN 488 Part 2 has been prepared in the context of the discussions on the revision of the technical delivery conditions for reinforcing steel by a joint committee of the *Normenausschuß Eisen und Stahl* (Iron and Steel Standards Committee) and the *Normenausschuß Bauwesen* (Building Standards Committee) (see also Explanatory notes in DIN 488 Part 1). The principal amendments compared with DIN 488 Part 2, April 1972 edition, and in relation to the international standards, either existing or in preparation, are described below. The international documents involved are

- EURONORM 82 Steel for the reinforcement of concrete with an improved bonding action; dimensions, mass, tolerances (February 1979 edition) and
- ISO/DP 6935/2 (currently the 5th draft proposal of September 1981, with document number ISO/TC 17/SC 16 N 211).

a) Field of application

Consistent with the agreements on classification into grades as specified in DIN 488 Part 1, the present standard lays down the requirements relating to dimensions, masses and surface configuration of obliquely ribbed bars of grades BSt 420 S and BSt 500 S. Grades BSt 22/34 GU (plain bars) and BSt 22/34 RU (transversely ribbed bars) dealt with in the previous edition are no longer included.

b) Nominal size

The nominal size range 6 to 28 applying up to now for grades BSt 42/50 RU and BSt 42/50 RK has been retained for the bar grades now included. Nominal sizes 18 and 22, which are not to be covered in the planned ISO Standard and are not referred to as preferred sizes in EURONORM 82, have been deleted (see table 1).

The scope of the international delivery conditions covers nominal sizes up to 50.

c) Nominal cross-sectional area

For reasons of structural safety the permissible negative deviation from the nominal cross-sectional area has been specified, as before, at 4% for the individual value (see DIN 488 Part 1, September 1984 edition, table 1, line 14). Definite values for the permissible positive deviation from the nominal cross-sectional area or from the nominal mass, as in fact contained in the draft of DIN 488 Part 2, September 1984 edition, have been dropped in this standard. Some of the processors and users were afraid that such specifications might alter the present standards of supply. In addition, the upper limits

given in the draft of DIN 488 Part 2 did not agree with those laid down in the international delivery conditions. For these reasons it was decided to retain the specifications unchanged in comparison with DIN 488 Part 2, April 1972 edition.

The international delivery conditions for reinforcing bars specify permissible deviations in cross-sectional area which are symmetrical to the nominal value (e.g. $\pm 8\%$ for nominal size 10); noticeably closer tolerances than these cannot be attained in the reinforcing bar production in Germany. The requirements specified in DIN 488 Part 1, according to which, on the one hand, a maximum lower deviation from the nominal cross-sectional area shall not exceed 4% and, on the other hand, the average cross-sectional area is to correspond at least to the nominal value, result in the nominal cross-sectional area, and hence also in the nominal mass being exceeded in the statistical mean of the batches supplied. Experience indicates that in the case of non-weighed material it should be reckoned that the average mass within a batch supplied (in kg/m) will exceed the nominal values specified in table 1, column 3 of this standard by 5% in the case of nominal size 6, by 3% in the case of nominal sizes 8 to 20 and by 2% in the case of nominal sizes 25 and 28.

d) Surface configuration

BSt 420 S and BSt 500 S bars are characterized by the specific arrangement of the ribs as apparent from figures 1 to 4 (see also subclause 4.2.1).

This surface configuration has also been adopted for the revised version of EURONORM 80. In the discussions on the ISO Standard it has not yet been possible to reach agreement on the identification of the steel grade by the type of ribs.

The values of relative rib area (see table 2, column 10) have been brought into line with the specifications in the international standards, i.e. reduced by about 13 to 19% as a function of the nominal size, in comparison with DIN 488 Part 2, April 1972 edition. In this connection it is to be borne in mind, however, that the new specifications involve minimum values, i.e. values that are valid in each individual case, and a reduction of the values of rib height (see table 2, columns 2 and 3). The identification of the non-twisted bar BSt 420 S by different rib spacings in the two rows is reflected in the different guideline values given for spacings c_{s1} and c_{s2} (see table 2, columns 5 and 6), the mean of the two values corresponding with the values given for BSt 500 S (see column 8). The values of rib spacing for cold twisted bars have remained unamended.

International Patent Classification

E 04 C 5/03