UDC 669.14-427.5:691.714:693.544 June 1986

Reinforcing steel

Reinforcing steel fabric and wire
Design, dimensions and masses

DIN 488 Part 4

Betonstahl; Betonstahlmatten und Bewehrungsdraht; Aufbau, Maße und Gewichte

Supersedes April 1972 edition.

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.

The DIN 488 series includes:

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

Dimensions in mm

1 Field of application

This standard specifies requirements relating to

- the design of welded reinforcing steel fabric,
- the dimensions and masses of ribbed wires for the manufacture of welded reinforcing steel fabric of grade BSt 500 M, and of plain and indented reinforcing steel wire of grades BSt 500 G and BSt 500 P as specified in DIN 488 Part 1, with the nominal sizes given in tables 1 and 2.

See DIN 488 Part 2 for the dimensions and masses of reinforcing steel bars.

2 Concepts

See also DIN 488 Part 1.

2.1 Designated fabric

A designated fabric is one having specific dimensions and a standardized mesh arrangement determined by the manufacturer (see subclause 3.3.1 b)).

2.2 Scheduled fabric

A scheduled fabric is one whose mesh arrangement is specified by the purchaser within the framework of the designation (see subclause 3.3.1 b)).

The nominal values of wire pitch and wire size do not vary for a given fabric direction, although the peripheral regions may represent exceptions to this.

2.3 Detailed fabric

A detailed fabric is one whose mesh arrangement and dimensions are specified exclusively in a drawing.

3 Reinforcing steel fabric

3.1 Manufacture

BSt 500 M welded fabric (symbol IV M as specified in DIN 488 Part 1) shall be manufactured from cold reduced ribbed wires in nominal sizes from 4 to 12 mm. The wires shall be arranged as longitudinal wires and cross wires which shall be joined to one another at all cross-over points by resistance welding.

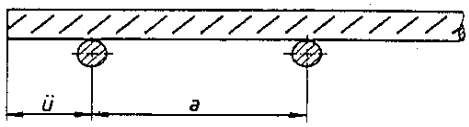

Figure 1. Pitch of longitudinal or cross wires and overhang of single wires

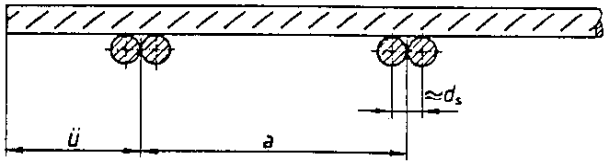

Figure 2. Pitch of longitudinal or cross wires and overhang of double wires

Continued on pages 2 to 6

3.2 Design

3.2.1 The longitudinal or cross wires shall either be

a) single wires (and/or)

b) double wires consisting of two wires of the same size lying close together.

Fabric sheets are allowed to contain double wires in only one direction.

3.2.2 The pitch of longitudinal or cross wires, a, is the centre-to-centre spacing of single wires or of the common principal axes of double wires (see figures 1 and 2).

3.2.3 The maximum pitch of the fabric wires, the size of a sheet of fabric to be welded and the maximum length of the overhangs shall be so chosen that adequate stiffness for storage, transportation and handling is assured.

3.2.4 The pitch module shall generally be 50 mm for longitudinal wires, and 25 mm for cross wires.

In the case of double wires, the pitch shall be not less than 100 mm.

3.2.5 The length of a sheet of fabric shall always be equal to the maximum wire length.

3.2.6 It is permitted for fabric to contain zones where the cross-sectional area of the steel is reduced (e.g. thinner wires, single wires used in double wire sheets). Similarly, regions with shorter wires may be provided.

3.2.7 The overhang, $\ddot{u}$ (see figures 1 and 2), shall not be less than 10 mm.

3.2.8 The ratio of the nominal sizes of wires that cross one another shall be

a) for single wires, $\frac{d_{s\,min}}{d_{s\,max}}$ not less than 0,57 if $d_{s\,max}$ does not exceed 8,5 mm, not less than 0,7 if $d_{s\,max}$ exceeds 8,5 mm;

b) for double wires, $\frac{d_{s\,double}}{d_{s\,single}}$ between o,7 and 1,25 mm.

If the cross wires act only as retaining wires (with large pitch), the values of the ratios indicated above may be lower.

3.2.9 A sheet of fabric from which not more than one cross-welded joint has been removed for testing shall not be considered defective.

3.3 Designation and ordering

3.3.1 Standard designation

a) The general specifications given in DIN 488 Part 1, September 1984 edition, subclause 4.1 shall apply for the standard designation.

b) For fabric, the nominal dimensions for characterizing designated fabric and scheduled fabric (see subclauses 2.1 and 2.2) shall be given separately for the longitudinal and transverse directions by means of the following system:

longitudinal direction: $a_L \times d_{s1}/d_{s2} - n_{left}/n_{right}$;

transverse direction: $a_Q \times d_{s3}/d_{s4} - m_{start}/m_{finish}$;

where

a_L is the pitch of the longitudinal wires, in mm;

a_Q is the pitch of the cross wires, in mm;

d_{s1} is the size of the longitudinal wires in the inside region, in mm;

d_{s2} is the size of the peripheral longitudinal wires, in mm;

d_{s3} is the size of the cross wires in the inside region, in mm;

d_{s4} is the size of the peripheral cross wires, in mm;

(Double wires shall be designated additionally with the letter d appended to the size.)

n_{left}/n_{right} is the number of peripheral longitudinal wires respectively on the left or right relative to the fabrication direction;

m_{start}/m_{finish} is the number of peripheral cross wires at the start or finish of the sheet relative to the fabrication direction.

In the case of unsymmetrical configuration of the peripheral regions of the sheet and/or of the overhangs, it is necessary to observe for the purposes of the designation that in fabrication the longitudinal wires are on the underside and the cross wires on the upperside.

c) In the case of detailed fabrics (see subclause 2.3), the characterizing nominal sizes shall be given in the drawing.

d) Examples illustrating the standard designation

– Designation of a reinforcing steel fabric (designated fabric or scheduled fabric) of grade BSt 500 M, complying with this standard,

with a_L = 150 mm, d_{s1} = 7,5 mm, as double wire (d), d_{s2} = 7,5 mm, n_{left} = 3 wires, n_{right} = 3 wires, a_Q = 250 mm, d_{s3} = 7,0 mm, d_{s4} = 5,5 mm, m_{start} = 4 wires, m_{finish} = 4 wires:

Reinforcing steel fabric DIN 488 – BSt 500 M – 150 × 7,5d/7,5 – 3/3 – 250 × 7,0/5,5 – 4/4

If this standard designation is to be written in two lines, the following form shall be adopted:

Reinforcing steel fabric DIN 488 – BSt 500 M – 150 × 7,5d/7,5 – 3/3 –
250 × 7,0 /5,5 – 4/4

Note. For designated fabric, brief designations are widely used in practice. These consist of a code letter for the fabric type, plus indication of the cross-sectional area of the longitudinal wires of the sheet, in mm²/m. The relevant mesh arrangement can be seen from the tabulated data issued by the manufacturer.

– Designation of a BSt 500 M reinforcing steel fabric complying with this standard, detailed fabric (Z), drawing number 511:

Reinforcing steel fabric DIN 488 – BSt 500 M – Z 511

3.3.2 Designation to be used on ordering

a) When ordering reinforcing steel fabric, the standard designation as given in subclause 3.3.1 shall be supplemented by the following data:

– (data preceding the standard designation):
quantity ordered;

– (data following the standard designation):
other nominal dimensions characterizing designated fabric and scheduled fabric, separately for the longitudinal and transverse directions in two lines according to the following system:

longitudinal direction: $L - \ddot{u}_1/\ddot{u}_2$;

transverse direction: $B - \ddot{u}_3/\ddot{u}_4$;

where

L is the length of a sheet of fabric, in m;

B is the width of a sheet of fabric, in m;

$\ddot{u}_1/\ddot{u}_2$ are the overhangs of the longitudinal wires at the start or finish of the sheet, in mm;

$\ddot{u}_3/\ddot{u}_4$ are the overhangs of the cross wires left or right, in mm.

b) Example of an order for 48 sheets of reinforcing steel fabric having the standard designation as given in subclause 3.3.1 d), with L = 5,50 m, $\ddot{u}_1$ = 125 mm, $\ddot{u}_2$ = 125 mm, B = 2,45 m, $\ddot{u}_3$ = 25 mm and $\ddot{u}_4$ = 25 mm:

48 sheets of reinforcing steel fabric –
DIN 488 – BSt 500 M – 150 × 7,5d/7,5 – 3/3 – 5,50 – 125/125 –
250 × 7,0 /5,5 – 4/4 – 2,45 – 25/25

3.4 Dimensions and masses of wires and permissible deviations

3.4.1 Size, cross-sectional area, mass

The nominal sizes of wires and the nominal cross-sectional areas and nominal masses calculated from them are given in table 1 (columns 1 to 3).

3.4.2 Surface configuration

3.4.2.1 General

The wires used in the fabric shall have three rows of oblique ribs. One row of ribs shall be disposed in the opposite direction; the individual rib rows may be offset from one another (see figure 3).

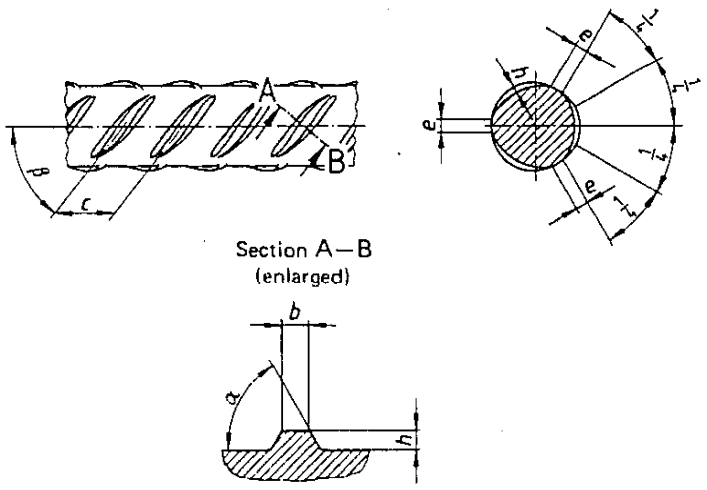

Figure 3. Surface configuration of ribbed wires of BSt 500 M fabric

Table 1. **Size, cross-sectional area and mass (nominal values) of wires for reinforcing steel fabric and reinforcing steel wire together with dimensions of oblique ribs and relative rib area for fabric**
(see also subclause 3.4.2 and 4.3)

1	2	3	4	5	6	7	8
			Oblique ribs (guideline values)				
			Height				
Nominal size d_s	Nominal cross-sectional area[1] A_s cm²	Nominal mass[2] G kg/m	in the middle h	at the quarter points $h_{1/4}$ $h_{3/4}$	Crest width b[3]	Rib spacing c[4]	Relative rib area f_R *)
4,0	0,126	0,099	0,30	0,24	$\sim 0{,}1 \cdot d_s$	4,0	0,036
4,5	0,159	0,125					
5,0	0,196	0,154	0,32	0,26			0,039
5,5	0,238	0,187	0,40	0,32		5,0	
6,0	0,283	0,222					
6,5	0,332	0,260	0,46	0,37			0,045
7,0	0,385	0,302					
7,5	0,442	0,347	0,55	0,44		6,0	
8,0	0,503	0,395					
8,5	0,567	0,445					
9,0	0,636	0,499	0,75	0,60		7,0	0,052
9,5	0,709	0,556					
10,0	0,785	0,617					
10,5	0,866	0,680					
11,0	0,950	0,746	0,97	0,77		8,4	0,056
11,5	1,039	0,815					
12,0	1,131	0,888					

*) Dimensionless quantity.
1) See DIN 488 Part 1, September 1984 edition, table 1 (line 14 and footnote 8).
2) Calculated taking the density as 7,85 kg/dm³.
3) Crest widths at mid-rib up to $0{,}2 \cdot d_s$ shall not give grounds for complaint.
4) Permissible deviation: ± 15 %.

3.4.2.2 Oblique ribs

Oblique ribs shall be crescent-shaped in their longitudinal section; the ends of the ribs shall merge smoothly into the surface of the wire.

The dimensions and spacings of ribs shall conform to the values given in table 1 (columns 4 to 7) (determined as specified in DIN 488 Part 3).

The rib flanks shall be as steep as possible, with α not less than 45° and shall be radiused at the transition to the core of the wire.

The angle of inclination of the ribs to the wire axis, β, shall be between 40 and 60°.

The aggregate of the non-ribbed portions, e, of the wire circumference shall not exceed $0{,}2 \cdot \pi \cdot d_s$.

3.4.2.3 Relative rib area

The values of relative rib area given in table 1 (column 8) are minimum values (determined as specified in DIN 488 Part 5).

4 Reinforcing steel wire

4.1 Manufacture and use

Wire of grades BSt 500 G and BSt 500 P shall be made from cold reduced steel in nominal sizes from 4 to 12 mm. See DIN 488 Part 1 for details of supply and use.

4.2 Designation and ordering

4.2.1 The specifications given in DIN 488 Part 1 shall apply for the standard designation of reinforcing steel wire.

4.2.2 When ordering, the standard designation shall be supplemented by the quantity of wire required and the form in which it is to be supplied (e.g. in coils).

Example of an order for 50 t of reinforcing steel wire complying with this standard, of grade BSt 500 P, nominal size 6,5, supplied in coils:

50 t reinforcing steel wire DIN 488 – BSt 500 P – 6,5 in coils

4.3 Dimensions, masses, permissible deviations

4.3.1 The nominal sizes which can be supplied and the cross-sectional areas and nominal masses calculated from them are specified in table 1 (columns 1 to 3).

4.3.2 Plain wire of grade BSt 500 G shall be manufactured with an as-drawn surface.

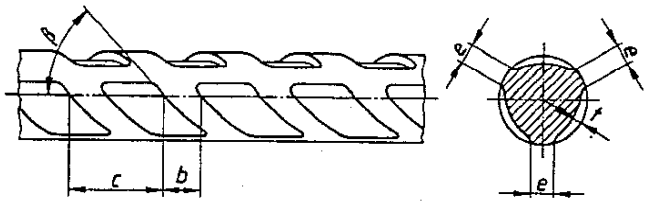

Figure 4. BSt 500 P intented wire

Table 2. **Indentation dimensions for BSt 500 P indented wire** (see figure 4)

1	2	3	4	5
Nominal size d_s	Indentation dimensions			
	Depth t ± 0,05[1)]	Width b ± 0,5[1)]	Spacing c ± 1,0[1)]	Aggregate of spaces between indentation rows Σe Maximum
4,0 4,5 5,0 5,5 6,0	0,20	2,00	6,0	2,5 2,8 3,1 3,5 3,8
6,5 7,0 7,5 8,0 8,5 9,0	0,25	2,50	7,0	4,1 4,4 4,7 5,0 5,3 5,7
9,5 10,0 10,5	0,35	2,75	8,0	6,0 6,3 6,6
11,0 11,5 12,0	0,40	3,00	9,0	6,9 7,2 7,5

[1)] Maximum permissible deviation in a particular case.

4.3.3 In the case of BSt 500 P indented wire, three rows of indentations distributed as uniformly as possible over the circumference and length shall be formed in the surface by rolling (see figure 4). The angle β between the raised parts of the indentations and the longitudinal axis of the wire shall be 40° to 60°.

The indentation dimensions are given in table 2 (determined as specified in DIN 488 Part 5).

4.4 Form on supply

4.4.1 Wire shall be generally supplied in coils.

4.4.2 Wire shall be marked in conformity with the specifications given in DIN 488 Part 1.

Standards referred to

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 5 Reinforcing steel; reinforcing steel fabric and wire; testing

Previous editions

DIN 488 Part 4: 04.72

Amendments

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

a) All specifications for non-welded fabric have been deleted.
b) Wire (previously designated as wire in coils) shall only be supplied with a plain or indented surface.
c) The classification into grades has been brought into line with DIN 488 Part 1.
d) Individual values of rib dimensions have been included and values of relative rib area of fabric have been amended.
e) The designations have been brought into line with present-day practice.

Explanatory notes

This edition of DIN 488 Part 4 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 of the *Normenausschuß Bauwesen* (Building Standards Committee).

The principal amendments compared with the April 1972 edition of this standard are described below.

a) Field of application

The requirements relating to the design, dimensions and permissible deviations of wires for reinforcing steel fabric and wire have been specified in line with the agreements on classification into grades for reinforcing steel complying with DIN 488 Part 1.

b) Reinforcing steel fabric

Non-welded fabric ceased many years ago to be manufactured in Germany and is therefore no longer specified in this revised edition of DIN 488 Part 4. Consistent with present-day demand, this edition deals only with welded fabric of grade BSt 500 M made from ribbed wires which are suited for use in conditions of dynamic (i.e. not predominantly static) loading.

The range of nominal sizes specified for wire has remained unchanged at 4 to 12, but the application of fabric using wire in nominal sizes 4,0 and 4,5 mm is subject to the restrictive provisions laid down in the application standards. Table 1 has been extended to include specific values of the individual dimensions of the fabric wire ribs so far dealt with in the *Laender* building regulations; these dimensions are related to the values of relative rib area which in turn have been brought into line with the specifications for reinforcing steel specified in DIN 488 Part 2. Mention should also be made of some further amendments to specifications relating to fabric design, e.g. values for overhangs (see subclause 3.2.7) and for the ratio of the nominal sizes of intersecting wires (see subclause 3.2.8). The designations (subclause 3.3) have been brought into line with present-day order and delivery practice. From the outcome of the discussions it appeared to be neither feasible nor necessary to make more far-reaching specifications on permissible deviations of form for fabric sheets; any special requirements with regard to accuracy to size shall be agreed, where required for the intended application, at the time of ordering.

c) Reinforcing steel wire

Clause 4 includes requirements relating to the dimensions and surface configuration of plain and indented wires of grades BSt 500 G and BSt 500 P in the nominal size range from 4 to 12. As regards the indentation dimensions for products of grade BSt 500 P, the values applicable to BSt 50/55 PK reinforcing steel bars specified in DIN 488 Part 1, April 1972 edition, have been adopted, the tolerances for depth t being amended.

International Patent Classification

E 04 C 5/03 E 04 C 5/04