
**Steel for the reinforcement of
concrete —**

**Part 2:
Ribbed bars**

Aciers pour l'armature du béton —

Partie 2: Barres à verrous
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ISO 6935-2:2015

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](http://www.iso.org/standards/foreword-supplementary-information)

The committee responsible for this document is ISO/TC 17, *Steel*, Subcommittee SC 16, *Steels for the reinforcement and prestressing of concrete*.

This third edition cancels and replaces the second edition (ISO 6935-2:2007), which has been technically revised. The main changes are in [Table 4](#), [Table 5](#), [Table 6](#), [9.1](#), [9.2](#) (new), [11.1](#) and [12.2](#).

ISO 6935 consists of the following parts, under the general title *Steel for the reinforcement of concrete*:

- *Part 1: Plain bars*
- *Part 2: Ribbed bars*
- *Part 3: Welded fabric*

Steel for the reinforcement of concrete —

Part 2: Ribbed bars

1 Scope

This part of ISO 6935 specifies technical requirements for ribbed bars to be used as reinforcement in concrete.

This part of ISO 6935 is applicable to steel delivered in the form of bars, coils and de-coiled products. It includes both weldable and non-weldable steels.

The production process is at the discretion of the manufacturer.

It is not applicable to ribbed bars produced from finished products, such as plates and railway rails.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 404, *Steel and steel products — General technical delivery requirements*

ISO/TR 9769, *Steel and iron — Review of available methods of analysis*

ISO 10144, *Certification scheme for steel bars and wires for the reinforcement of concrete structures*

ISO 14284, *Steel and iron — Sampling and preparation of samples for the determination of chemical composition*

ISO 15630-1, *Steel for the reinforcement and prestressing of concrete — Test methods — Part 1: Reinforcing bars, wire rod and wire*

3 Symbols

The symbols used in this part of ISO 6935 are listed in [Table 1](#).

Table 1 — Symbols

Symbol	Unit	Description	Reference
a	mm	Rib height	4.10, Clause 6
A	%	Percentage elongation after fracture	8.1, 9.1
A_{gt}	%	Percentage total elongation at maximum force	8.1, 9.1
S_0	mm ²	Nominal cross-sectional area	Clause 5, 9.1
c	mm	Rib spacing	4.11, Clause 6
d	mm	Nominal diameter of the bar	Clause 5, Clause 6, 9.1, 9.2, 9.3, Clause 10, 11.2,
Σf_i	mm	Ribless perimeter	4.12, Clause 6
f_k	—	Required characteristic value	12.2, 12.3.2.3
f_R	—	Relative rib area	4.9, Clause 6
k, k'	—	Indices	12.3.2.3.1
m_n	—	Mean value of n individual values	12.3.2.3.1
n	—	Number of individual values	12.3.2.3.1
R_{eH}	MPa ^a	Upper yield strength	8.1
R_m	MPa ^a	Tensile strength	8.1
$R_{p0,2}$	MPa ^a	0,2 % proof strength, non-proportional extension	8.1
s_n	—	Standard deviation for n individual values	12.3.2.3.1
x_i	—	Individual value	12.3.2.3.1
α	Degree	Transverse-rib flank inclination	4.14, Clause 6
β	Degree	Transverse-rib inclination ISO 6935-2:2015	4.15, Clause 6
^a	1 MPa = 1 N/mm ² https://standards.iteh.ai/catalog/standards/sist/65cc8de7-c884-420c-b39c-41f4350ea3be/iso-6935-2-2015		

4 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1 cast analysis

chemical analysis representative of the cast determined by the manufacturer in accordance with its own procedures

[SOURCE: ISO 16020:2005, 2.4.3, modified.]

4.2 conformity assessment scheme

conformity assessment system related to specific objects of conformity assessment, to which the same specified requirements, specific rules and procedures apply

Note 1 to entry: Conformity assessment schemes may be operated at an international, national or sub-national level.

Note 2 to entry: Certification, i.e. third party attestation related to products, processes, systems or persons, is applicable to all objects of conformity assessment except for conformity assessment bodies themselves, to which accreditation is applicable.

4.3 characteristic value

value having a prescribed probability of not being attained in a hypothetical unlimited test series

Note 1 to entry: equivalent to “fractile”, which is defined in ISO 3534-1:2006.

Note 2 to entry: a nominal value is used as the characteristic value in some circumstances.

[SOURCE: ISO 16020:2005, 2.4.10, modified – added Note 2.]

4.4

core

part of the cross-section of the bar not containing either ribs or indentations

[SOURCE: ISO 16020:2005, 2.2.5, modified.]

4.5

ductility class

classification of the ductility properties of reinforcing steels based on the value of the ratio of tensile strength to yield strength, as well as the elongation measured either as A_{gt} or as A

Note 1 to entry: see [Table 6](#).

4.6

longitudinal rib

uniform continuous rib parallel to the axis of the bar

[SOURCE: ISO 16020:2005, 2.2.7.1, modified.]

4.7

S_0

nominal cross-sectional area

cross-sectional area equivalent to the area of a circular plain bar of the nominal diameter

[SOURCE: ISO 16020:2005, 2.2.15, modified.]

4.8

product analysis

chemical analysis carried out on the product

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[SOURCE: ISO 16020:2005, 2.4.4]

4.9

relative rib area

f_R

area of the projections of all transverse ribs within a defined length on a plane perpendicular to the longitudinal axis of the bar, divided by this length and the nominal circumference

[SOURCE: ISO 16020:2005, 2.2.11, modified.]

4.10

rib height

a

distance from the highest point on the rib to the surface of the core, to be measured perpendicular to the axis of the bar

Note 1 to entry: see [Figure 2](#).

[SOURCE: ISO 16020:2005, 2.2.12, modified.]

4.11

rib spacing

c

distance between the centres of two consecutive transverse ribs measured parallel to the axis of the bar

Note 1 to entry: see [Figure 1](#).

[SOURCE: ISO 16020:2005, 2.2.10, modified.]

4.12

ribless perimeter

Σf_i
sum of the distances along the surface of the core between the end of the transverse ribs of adjacent rows measured as the projection on a plane perpendicular to the axis of the bar

[SOURCE: ISO 16020:2005, 2.2.13, modified.]

4.13

transverse rib

rib at an angle, either perpendicular or oblique, to the longitudinal axis of the bar

[SOURCE: ISO 16020:2005, 2.2.7.2, modified.]

4.14

transverse-rib flank inclination

α
angle between the flank of a transverse rib and the core surface of a bar measured perpendicular to the longitudinal axis of the transverse rib

Note 1 to entry: see [Figure 2](#).

[SOURCE: ISO 16020:2005, 2.2.9, modified.]

4.15

transverse-rib inclination

β
angle between the rib and the longitudinal axis of the bar

Note 1 to entry: see [Figures 1, 3](#) and [4](#).

[SOURCE: ISO 16020:2005, 2.2.8, modified.]

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5 Dimensions, mass per unit length and permissible deviations

Dimensions, mass per unit length and permissible deviations are given in [Table 2](#). By agreement between the manufacturer and purchaser, ribbed bars whose nominal diameters are other than those shown in [Table 2](#) may be used. A list of options for agreement between the manufacturer and purchaser is provided in [Annex B](#).

Table 2 — Dimensions, mass per unit length and permissible deviations

Nominal bar diameter ^a <i>d</i> mm	Nominal cross-sectional area ^b <i>S</i> ₀ mm ²	Mass per unit length	
		Nominal ^c kg/m	Permissible deviation ^d %
6	28,3	0,222	±8
8	50,3	0,395	±8
10	78,5	0,617	±6
12	113	0,888	±6
14	154	1,21	±5
16	201	1,58	±5
20	314	2,47	±5
25	491	3,85	±4
28	616	4,84	±4
32	804	6,31	±4
40	1 257	9,86	±4
50	1 964	15,42	±4

^a Diameters larger than 50 mm should be agreed between the manufacturer and purchaser. The permissible deviation on mass for such bars shall be ±4 %.

^b $S_0 = 0,785 4 \times d^2$

^c Mass per unit length = $7,85 \times 10^{-3} \times S_0$.

^d Permissible deviation refers to a single bar. ISO 6935-2:2015

The delivery length is subject to agreement between the manufacturer and purchaser.

NOTE Common delivery lengths of straight bars are 6 m, 9 m, 12 m and 18 m.

Unless otherwise agreed, the permissible deviation on delivery lengths from rolling mill shall be ${}^{+100}_0$ mm.

6 Requirements for ribs

Ribbed bars shall have transverse ribs. Longitudinal ribs may be present or not.

There shall be at least two rows of transverse ribs equally distributed around the perimeter of the bar. The transverse ribs within each row shall be distributed uniformly over the entire length of the bar, except in the area of marking.

Ribs shall conform to the requirements in [Table 3](#).

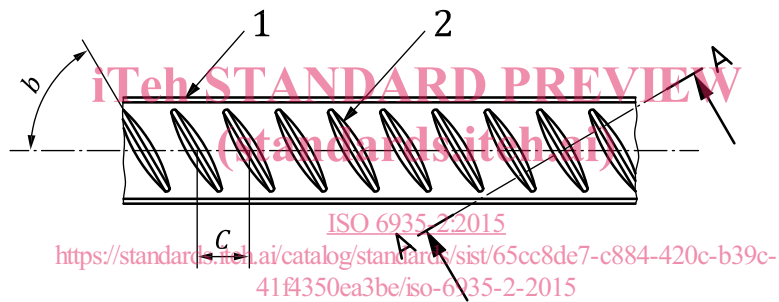
Table 3 — Requirements for transverse ribs

	Nominal bar diameter <i>d</i> mm	Ribs of uniform height	Crescent-shaped ribs
Rib height, <i>a</i> Minimum	All	0,05 <i>d</i>	0,065 <i>d</i>
Rib spacing, <i>c</i> Range	6 ≤ <i>d</i> < 10 <i>d</i> > 10	0,5 <i>d</i> ≤ <i>c</i> ≤ 0,7 <i>d</i> 0,5 <i>d</i> ≤ <i>c</i> ≤ 0,7 <i>d</i>	0,5 <i>d</i> ≤ <i>c</i> ≤ 1,0 <i>d</i> 0,5 <i>d</i> ≤ <i>c</i> ≤ 0,8 <i>d</i>
Transverse-rib inclination, β	All	35° ≤ β ≤ 90°	35° ≤ β ≤ 75°
Transverse-rib flank inclination, α	All	α ≥ 45°	α ≥ 45°
Ribless perimeter, Σf_i Maximum	All		0,25 <i>d</i> π

Requirements for rib parameters may be specified by the relative rib area, or by agreement between the manufacturer and purchaser. Measurement of rib parameters shall be performed in accordance with ISO 15630-1.

Dimensions defining the rib geometry in Table 3 are shown in Figures 1 to 4.

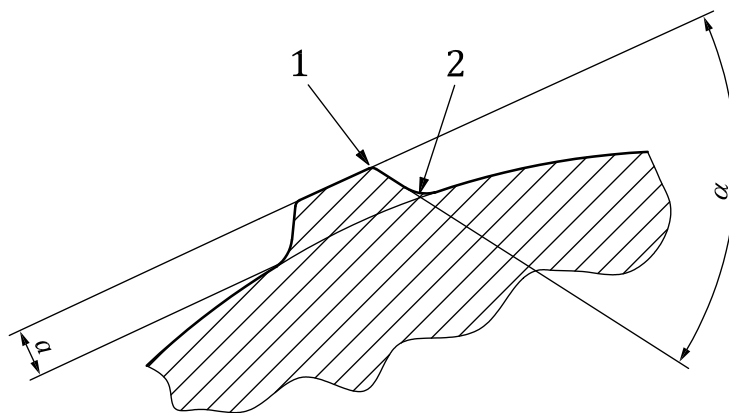
When longitudinal ribs are present, their height shall not exceed 0,15*d*.



Key

- 1 longitudinal rib
- 2 transverse rib

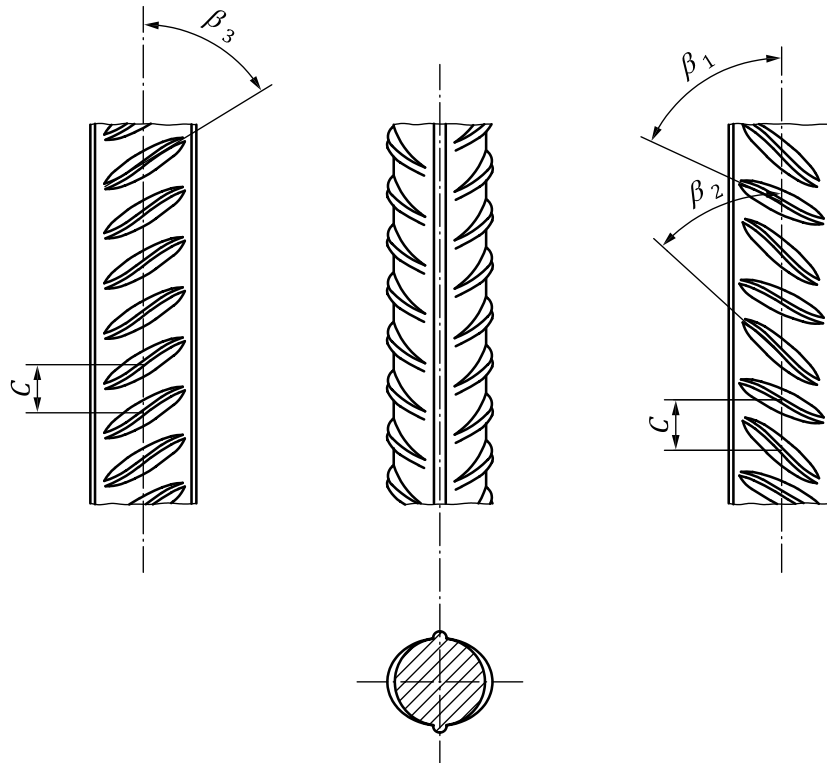
Figure 1 — Ribbed bar — Definitions of geometry



Key

- 1 Rib
- 2 rounded transition

Figure 2 — Rib flank inclination, α , and rib height, *a* — Section A-A from Figure 1



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 Figure 3 — Example of bar with varying rib inclinations to the longitudinal axis
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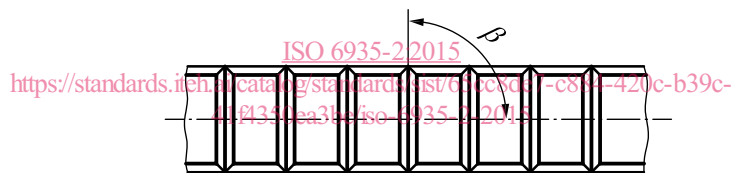


Figure 4 — Example of bar with transverse ribs of uniform height ($\beta = 90^\circ$)

7 Chemical composition

The chemical composition of the steel, as determined by cast analysis, shall conform to [Table 4](#).

Calculate the carbon equivalent, CEV, according to Formula (1):

$$\text{CEV} = C + \frac{\text{Mn}}{6} + \frac{(\text{Cr} + \text{V} + \text{Mo})}{5} + \frac{(\text{Cu} + \text{Ni})}{15} \quad (1)$$

where C, Mn, Cr, V, Mo, Cu and Ni are the mass fractions, expressed as percentages of the respective chemical elements of the steel.

The permissible deviation of the product analysis relative to the cast analysis as specified in [Table 4](#) is given in [Table 5](#).