

# INTERNATIONAL STANDARD

**ISO**  
**6934-5**

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## Steel for the prestressing of concrete —

### Part 5:

Hot-rolled steel bars with or without subsequent processing

*Acier pour armatures de précontrainte —*

*Partie 5: Barres en acier laminées à chaud avec ou sans transformation ultérieure*



Reference number  
ISO 6934-5:1991(E)

## 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 6934-5 was prepared by Technical Committee ISO/TC 17, *Steel*, Sub-Committee SC 16, *Steels for the reinforcement and prestressing of concrete*.

ISO 6934 consists of the following parts, under the general title *Steel for the prestressing of concrete*:

- *Part 1: General requirements*
- *Part 2: Cold-drawn wire*
- *Part 3: Quenched and tempered wire*
- *Part 4: Strand*
- *Part 5: Hot-rolled steel bars with or without subsequent processing*

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# Steel for the prestressing of concrete —

## Part 5:

### Hot-rolled steel bars with or without subsequent processing

#### 1 Scope

This part of ISO 6934 specifies requirements for round high tensile steel bars. The bars may be supplied either hot-rolled or in a hot-rolled and processed condition, according to the general requirements specified in ISO 6934-1. The surface may be plain or ribbed.

The bars are delivered in straight lengths.

#### 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 6934. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 6934 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 6934-1:1991, *Steel for the prestressing of concrete — Part 1: General requirements.*

ISO 10065:1990, *Steel bars for reinforcement of concrete — Bend and rebend tests.*

#### 3 Definitions

For the purposes of this part of ISO 6934, the definitions given in ISO 6934-1 apply.

#### 4 Conditions of manufacture

##### 4.1 Steel

The bars shall be manufactured from steel in accordance with ISO 6934-1.

The steel shall be hot rolled into bars and, if required, subsequently processed to give the specified mechanical properties.

Longitudinal cracks which do not impair the specified properties of the bar shall not be considered as defects.

##### 4.2 Welds

There shall be no welds or other joints in the bar supplied to the purchaser.

##### 4.3 Threads

Where the bars have threaded ends, the threads shall be cold rolled to a profile agreed upon by the purchaser and manufacturer.

#### 5 Surface configuration

The surface configuration may be either plain or ribbed.

In the case of ribbed bars, the ribs shall be transversal with a relatively uniform spacing not greater than  $0,8 \times$  nominal diameter of the bar. This condition applies to continuous or discontinuous helical ribs. The ribs may be formed as threads.

The minimum value for the specific projected rib area,  $A_r$ , shall be 0,048 for all diameters and is calculated using the formula

$$A_r = \frac{k \times a_r \times \sin \beta}{\pi \times d_{\text{nom}} \times c}$$

where

- $k$  is the number of rib rows;
- $a_r$  is the area of the longitudinal section of one rib;
- $\beta$  is the rib inclination, relative to the axis of the bar;
- $d_{\text{nom}}$  is the nominal diameter of the bar;
- $c$  is the rib spacing.

## 6 Properties

### 6.1 Dimensions, masses and strength

Required properties and data for information of hot rolled bars are given in table 1.

No single test result shall be less than 95 % of the characteristic value specified in table 1.

### 6.2 Elongation and ductibility

The characteristic percentage total elongation at maximum force,  $A_{gt}$ , shall be not less than 3,5 %.

If agreed between the purchaser and manufacturer, the bars shall withstand a bend test according to ISO 10065 without fractures or cracks visible to the unaided eye.

The mandrel diameter and angle of bend is subject to agreement between the purchaser and manufacturer.

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Table 1 — Dimensions, mass and tensile properties of hot-rolled bars

Nominal diameter mm	Nominal tensile strength <sup>1)</sup> N/mm <sup>2</sup>	Nominal 0,1 % proof stress <sup>2)</sup> N/mm <sup>2</sup>	Nominal cross-sectional area <sup>2)</sup> mm <sup>2</sup>	Mass per length		Characteristic	
				Reference kg/m	Permissible deviation %	maximum force kN	0,1 % proof force kN
15	1 030	835	176,7	1,39	+4 -4	185	145
17			227,0	1,78		235	190
20			314,0	2,47		325	260
23			415,5	3,26		430	340
26			530,9	4,17		545	445
32			804,2	6,31		830	670
36			1 018,0	7,99		1 050	850
40			1 257,0	9,86		1 295	1 050
15	1 080	930	176,7	1,39	+4 -4	190	165
17			227,0	1,78		245	210
20			314,0	2,47		340	290
23			415,5	3,26		450	385
26			530,9	4,17		575	495
32			804,2	6,31		870	750
36			1 018,0	7,99		1 100	945
40			1 257,0	9,86		1 360	1 170
15	1 180	930	176,7	1,39	+4 -4	210	165
17			227,0	1,78		270	210
20			314,0	2,47		370	290
23			415,5	3,26		490	385
26			530,9	4,17		625	495
32			804,2	6,31		950	750
36			1 018,0	7,99		1 200	945
40			1 257,0	9,86		1 485	1 170
15	1 230	1 080	176,7	1,39	+4 -4	215	190
17			227,0	1,78		280	245
20			314,0	2,47		385	340
23			415,5	3,26		510	450
26			530,9	4,17		655	575
32			804,2	6,31		990	870
36			1 018,0	7,99		1 250	1 100
40			1 257,0	9,86		1 545	1 360

1) The nominal tensile strength is for designation purposes only.  
2) The nominal 0,1 % proof strength and nominal cross-sectional area are for information only.

### 6.3 Relaxation

The relaxation at 1 000 h at an initial force of 70 % of the characteristic maximum force specified in table 1 shall be not more than 4,0 % for all bars.

If requested by the purchaser, the relaxation at 60 % and 80 % of the characteristic maximum force specified in table 1 shall be provided. The maximum relaxation values shall then be 1,5 % and 6,0 % respectively.

### 6.4 Fatigue

If agreed between the purchaser and manufacturer, the bars shall withstand, without failure,  $2 \times 10^6$  cy-

cles of stress fluctuating down from a maximum stress of 70 % of the nominal tensile strength. The stress range shall be 245 N/mm<sup>2</sup> for plain bars, and 195 N/mm<sup>2</sup> for ribbed bars.

### 7 Designation

The bars shall be ordered in accordance with ISO 6934-1, and be designated as follows:

- ISO 6934-5;
- the word "bar";
- nominal diameter, in millimetres;

d) nominal tensile strength, in newtons per square millimetre;

e) letter referring to bar surface (see ISO 6934-1):

P: Plain

R: Ribbed.

#### EXAMPLE

Ribbed bar with nominal diameter 32 mm and nominal tensile strength 1 230 N/mm<sup>2</sup> is designated:

ISO 6934-5 - bar - 32 - 1 230 - R

#### 8 Delivery conditions

Delivery conditions shall be in accordance with ISO 6934-1 and, in addition, the manufacturer shall provide adequate protection against damage to threaded ends.

The bar may be covered with a layer of scale.

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