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मानक

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“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

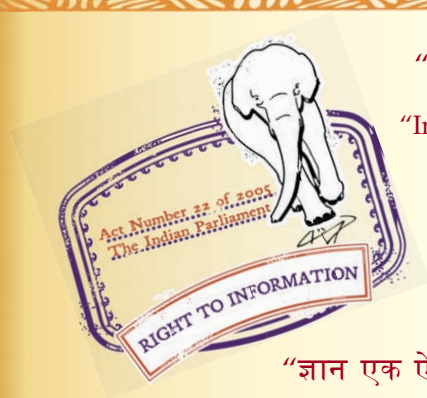
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

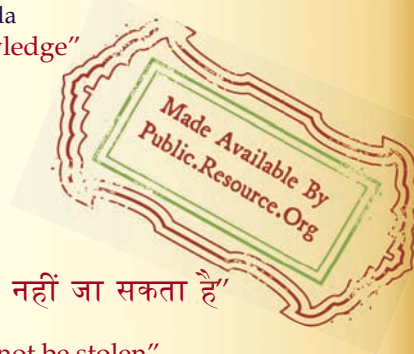
IS 6603 (2001): Stainless Steel Bars and Flats [MTD 16:
Alloy Steels and Forgings]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक
स्टेनलेस स्टील की छड़ें और फ्लैट्स — विशिष्टि
(पहला पुनरीक्षण)

Indian Standard
STAINLESS STEEL BARS AND FLATS —
SPECIFICATION
(*First Revision*)

ICS 77.140.20

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Alloy Steels and Forgings Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1972. While reviewing this standard in the light of experience gained in its usage, committee felt that the standard should be revised to bring it in line with the present national and international practices in the field. The grades of stainless steels and their designations have been aligned and rationalized with the present industry needs and practices.

While preparing this standard assistance has been derived from the following standards:

ISO/DIS 683/XIII Heat treated steels, alloy steels and free cutting steels — Part 13: Wrought stainless steels. International Organization for Standardization.

BS 970 : Part 4 : 1970 Stainless, heat resisting and valve steels. British Standards Institution.

AISI steel products manual, stainless and heat resisting steels.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

STAINLESS STEEL BARS AND FLATS — SPECIFICATION

(First Revision)

1 SCOPE

This standard covers requirements for non-precipitation hardening wrought stainless steels in the form of bars and flats for applications in which the corrosion resistance at room temperature and normal pressure is essential.

2 REFERENCES

The following Indian Standards contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	Title
1499 : 1977	Method for Charpy impact test (U-notch) for metals (<i>first revision</i>)
1500 : 1983	Method for Brinell hardness test for metallic materials (<i>second revision</i>)
1501 (Part 1) : 1984	Method for Vickers hardness test for metallic materials : Part 1 HV 5 to HV 100 (<i>second revision</i>)
1586 : 1988	Methods for Rockwell hardness test for metallic material (scales A-B-C-D-E-F-G-H-K) (<i>second revision</i>)
1599 : 1985	Method for bend test (<i>second revision</i>)
1608 : 1995	Mechanical testing of metals — Tensile testing (<i>second revision</i>)
1762 (Part 1) : 1974	Code for designation of steels : Part 1 Based on letter symbols (<i>first revision</i>)
1956 (Part 3) : 1975	Glossary of terms relating to iron and steel : Part 3 Hot-rolled steel products (excluding sheet and strip) (<i>first revision</i>)
2049 : 1978	Colour code for the identification of wrought steels for general engineering purposes (<i>first revision</i>)
3711 : 1990	Method for selection and

IS No.

Title

preparation of samples and test pieces for mechanical tests for wrought steel

8910 : 1978

General technical delivery requirements for steel and steel products

10461

Resistance to intergranular corrosion of austenitic stainless steels — Method for determination:

(Part 1) : 1994 Corrosion test in nitric acid medium by measurement of loss in mass (Huey test) (*first revision*)

(Part 2) : 1994 Corrosion test in a sulphuric acid/copper sulphate medium in the presence of copper turnings (monypenny strauss test) (*first revision*)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 1956 (Part 3) shall apply.

4 SUPPLY OF MATERIAL

4.1 General requirements for the supply of material shall be in accordance with IS 8910.

4.2 Steels covered by this standard shall be ordered and delivered on any one of the following basis:

- a) Chemical composition, or
- b) Chemical composition and hardness in the heat-treated condition, or
- c) Chemical composition and mechanical properties in the heat-treated or cold-drawn condition.

5 MANUFACTURE

5.1 Unless agreed otherwise in order, the processes used in making the steel and the product are left to the discretion of the manufacturer. When so desired, the purchaser shall be informed of the steel making process.

5.2 Bars and flats shall be produced by rolling, hammering, pressing or extruding either from ingots or from continuously cast slabs/blooms. In case of

bars and flats rolled/forged from ingots, adequate top and bottom discards shall be given to eliminate pipe, harmful segregations and other injurious defects.

Bars and flats when made from continuously cast blooms/slabs shall be given reduction of at least 6 : 1.

5.3 For bars for machining, surface defects up to 80 percent of machining allowance shall be permitted. For hot finished bars and flats, all visible surface defects shall be removed by grinding provided the maximum depth of grinding at any one point does not exceed 10 percent of the thickness provided the underweight tolerance is not exceeded.

6 FREEDOM FROM DEFECTS

Bars and flats shall be free from harmful internal and surface defects.

7 CHEMICAL COMPOSITION

7.1 The ladle analysis of steel shall be as given in Table 1. The analysis of steel shall be carried out by any established instrumental/chemical method as agreed to between the purchaser and the manufacturer. The referee method shall also be as agreed to between the purchaser and the manufacturer.

7.2 Check Analysis

Check analysis shall be carried out in the finished product. Permissible variation in case of check analysis on the limits specified in Table 1 shall be as given in Table 2.

7.3 Elements not specified in Table 1 shall not be added to the steel except where agreed to, other than for the purpose of finishing the heat and shall not exceed the following limits:

Constituent	Percent, Max	
	Ferritic Martensitic Steels	Austenitic Steels
Titanium	—	0.10
Niobium	—	0.20
Molybdenum	0.30	0.70
Copper	0.30	0.50

8 HEAT TREATMENT

8.1 Steels may be supplied in the annealed, hardened and tempered, or softened condition.

8.2 Recommended heat treatment for the steels covered in this standard is given in Annex A.

9 MECHANICAL PROPERTIES

9.1 If required, the tensile properties in the

various conditions shall conform to those given in Tables 3 to 8.

9.2 The tensile test shall be carried out in accordance with IS 1608.

9.3 If required, the bend test shall be carried out in accordance with IS 1599. When the dimensions permit, test piece 230 mm long and 32 mm square with edges rounded off, shall be machined lengthwise from each test sample and bent cold by direct pressure round a mandrel of diameter appropriate to the class of steel as shown in Table 3.

9.4 Hardness shall be determined in accordance with IS 1500, IS 1501 (Part 1), and IS 1586.

9.5 If required by agreement between the purchaser and the supplier Charpy impact test shall be carried out in accordance with IS 1499.

10 SAMPLING

10.1 For product analysis, the selection of samples shall be carried out in accordance with IS 3711.

10.2 Sampling for Mechanical Tests

10.2.1 Unless otherwise specified, for the purpose of mechanical test, one sample shall be tested from each cast and heat treatment, cold-drawn or cold-rolled batch of the same thickness.

10.2.2 If the product is continuously heat-treated, the sampling for mechanical tests shall be as agreed to between the purchaser and the manufacturer.

10.2.3 Test pieces for mechanical tests shall be taken in the longitudinal direction of the product in accordance with Fig. 1.

10.2.4 General conditions for selection and preparation of samples and test pieces shall be in accordance with IS 3711.

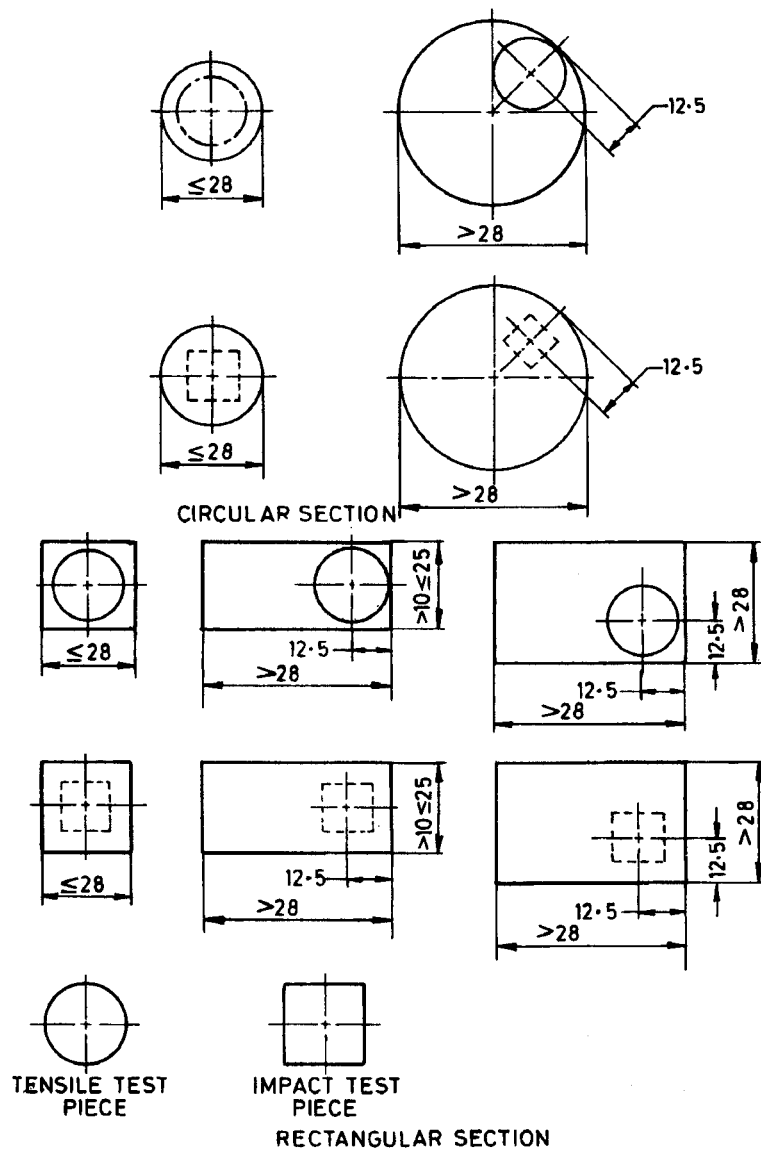
11 CONDITION OF SUPPLY

Bars and flats may be supplied either hot finished or cold finished in any one of the following conditions:

- Annealed,
- Softened,
- Hardened and tempered, and
- Cold finished.

12 DIMENSIONAL TOLERANCES

Dimensional tolerances for the bars and flats shall be as laid down in Tables 9 to 17.



All dimensions in millimetres.

FIG. 1 LOCATION OF THE TEST PIECES IN THE PRODUCTS TO BE DELIVERED

Table 1 Chemical Composition
(*Clauses 7.1, 7.2, 7.3 and 13.1*)

Steel Designation [Ref to IS 1762 (Part 1)]	Percent										
	C	Si	Mn	Ni	Cr	Mo	Ti	Nb	S Max	P Max	Others
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
X04Cr12	0.08 Max	1.0 Max	1.0 Max	—	11.5-13.5	—	—	—	0.030	0.040	—
X12Cr12	0.08-0.15	1.0 Max	1.0 Max	1.0 Max	11.5-13.5	—	—	—	0.030	0.040	—
X20Cr13	0.16-0.25	1.0 Max	1.0 Max	1.0 Max	12.0-14.0	—	—	—	0.030	0.040	—
X30Cr13	0.26-0.35	1.0 Max	1.0 Max	1.0 Max	12.0-14.0	—	—	—	0.030	0.040	—
X40Cr13	0.36-0.45	1.0 Max	1.0 Max	1.0 Max	12.0-14.0	—	—	—	0.030	0.040	—
X07Cr17	0.12 Max	1.0 Max	1.0 Max	0.50 Max	16.0-18.0	—	—	—	0.030	0.040	—
X15Cr16Ni2	0.10-0.20	1.0 Max	1.0 Max	1.25-2.50	15.0-17.0	—	—	—	0.030	0.045	—
X108Cr17Mo	0.95-1.20	1.0 Max	1.0 Max	0.50 Max	16.0-18.0	0.75 Max	—	—	0.030	0.045	—
X02Cr19Ni10	0.030 Max	1.0 Max	2.0 Max	8.0-12.0	17.0-20.0	—	—	—	0.030	0.045	—
X04Cr19Ni9	0.08 Max	1.0 Max	2.0 Max	8.0-10.5	17.5-20.0	—	—	—	0.030	0.045	—
X07Cr18Ni9	0.15 Max	1.0 Max	2.0 Max	8.0-10.0	17.0-19.0	—	—	—	0.030	0.045	—
X04Cr18Ni10Ti	0.08 Max	1.0 Max	2.0 Max	9.0-12.0	17.0-19.0	—	5C-0.80	—	0.030	0.045	—
X04Cr18Ni10Nb	0.08 Max	1.0 Max	2.0 Max	9.0-12.0	17.0-19.0	—	—	10C-1.0	0.030	0.045	—
X04Cr17Ni12Mo2	0.08 Max	1.0 Max	2.0 Max	10.0-14.0	16.0-18.0	2.0-3.0	—	—	0.030	0.045	—
X02Cr17Ni12Mo2	0.030 Max	1.0 Max	2.0 Max	10.5-14.0	16.0-18.0	2.0-3.0	—	—	0.030	0.045	—
X04Cr17Ni12Mo2Ti	0.080 Max	1.0 Max	2.0 Max	10.5-14.0	16.0-18.0	2.0-3.0	5C-0.8	—	0.030	0.045	—
X10Cr17Mn6Ni4N	0.20 Max	1.0 Max	4.0-8.0	3.5-5.5	16.0-18.0	—	—	—	0.030	0.060	(N 0.05-0.25)

NOTE — For free cutting varieties in first five grades, sulphur and selenium content shall be as agreed to between the purchaser and the manufacturer.

Table 2 Permissible Variation Between Specified Analysis and Product Analysis
(Clauses 7.2 and 13.1)

Element	Limit Shown in Table 1 for Contents in the Ladle Analysis Percent		Permissible Variation Percent ¹⁾
	Over	Up to and Including	
C	—	0.030	+ 0.005
	0.030	0.20	+ 0.01
	0.20	0.60	+ 0.02
	0.60	1.20	± 0.03
Si	—	1.0	+ 0.05
Mn	—	1.0	± 0.03
	1.0	3.0	± 0.04
	3.0	6.0	± 0.05
	6.0	8.0	± 0.06
Cr	10.0	15.0	± 0.15
	15.0	20.0	± 0.20
Mo	—	0.60	+ 0.03
	0.60	1.75	± 0.05
	1.75	3.0	± 0.10
Ni	—	1.0	+ 0.03
	1.0	5.0	± 0.07
	5.0	10.0	± 0.10
	10.0	14.0	± 0.15
Ti	—	0.8	+ 0.05
Nb	—	1.0	+ 0.05
S	—	0.030	+ 0.005
P	—	0.040	+ 0.005
	0.040	0.060	± 0.010
N	0.050	0.25	+ 0.02
			— 0.01

¹⁾ ± means that in one cast the deviations may occur over the upper value or under the lower value of the specified range in Table 1, but not both at the same time.

Table 3 Mechanical Properties of Ferritic Steels in the Annealed Condition
(Clauses 9.1, 9.3 and 13.2)

Steel Designation	Hardness HB <i>Max</i>	0.2 Percent Proof Stress <i>Min</i> MPa	Tensile Strength MPa	Elongation Percent, <i>Min</i>			Dia for Mandrel for Flat Products >0.5<3
				Bars >5<25 mm	Flat Products		
					>0.5<3 mm	>3<10 mm	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
X04Cr12	187	250	440-640	20	18	30	2 <i>t</i>
X07Cr17	192	250	440-640	16	17	18	2 <i>t</i>

NOTES

1 For these materials HRB or HV test may be used by agreement between the purchaser and the manufacturer, where it is not practicable to use the HB test.

2 The elongation values for bars are when measured over a gauge length of $L_0 = 5.65\sqrt{S_0}$.

3 DMA = diameter of the mandrel in the bend test.

t = thickness of the test piece.

Table 4 Mechanical Properties of Martensitic Steels
(Clauses 9.1 and 13.2)

Steel Designation	Annealed Hardness <i>Max</i>	Hardened and Tempered		Elongation, <i>Min, Percent</i> $GL = 5.65 \sqrt{S_o}$		Charpy Impact Test ⁽¹⁾ (U Notch) Joules, <i>Min</i>
		0.2 percent Proof Stress <i>Min, MPa</i>	Tensile Strength MPa			
				Bars	Flats	
				>5-100 mm	> 30-30 mm	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
X12Cr12	212	410	590 to 780	16	16	60
X20Cr13	229	490	690 to 880	14	14	40
X30Cr13	235	590	780 to 980	11	11	—
X15Cr16Ni2	262	640	830 to 1 030	10	10	30

¹⁾ Values applicable only on bars or flats of > 15 and < 63 mm diameter or thickness.

Table 5 Hardness Values for Cutlery Steels
(Clauses 9.1 and 13.2)

Steel Designation	Annealed Hardness HB, Max	Quenched and Tempered Hardness, Min	
		HV	HRC
		(3)	(4)
(1)	(2)		
X30Cr13	241	500	49
X40Cr13	255	515	50
X108Cr17Mo	285	660	58

Table 6 Mechanical Properties in the Softened Condition
(Clauses 9.1 and 13.2)

Steel Designation	Hardness HB Max	0.2 Percent Proof Stress Min, MPa	Tensile Strength MPa	Elongation, Percent, Min GL = $5.65\sqrt{S_0}$		
				Bars	Flat Products	
				>5-100 mm	>0.5<3 mm	>3<30 mm
(1)	(2)	(3)	(4)	(5)	(6)	(7)
X02Cr19Ni10	192	180	440 to 650	40	38	40
X04Cr19Ni9	192	200	490 to 690	40	38	40
X07Cr18Ni9	192	210	490 to 690	40	38	40
X04Cr18Ni10Ti	192	210	490 to 690	35	33	35
X04Cr18Ni10Nb	192	210	490 to 690	35	33	35
X04Cr17Ni12Mo2	192	210	490 to 690	40	38	40
X02Cr17Ni12Mo2	192	200	440 to 640	40	38	40
X04Cr17Ni12Mo2Ti	192	220	490 to 690	35	33	35
X10Cr17Mn6Ni4N	217	300	640 to 830	40	38	40

NOTE — For thin materials the HRB or HV test may be used by agreement between the purchaser and the manufacturer where it is not practicable to use the HB test.

Table 7 Mechanical Properties of Austenitic Steel Bars in the Cold Drawn Condition
(Clauses 9.1 and 13.2)

Steel Designation	0.2 Percent Proof Stress Min, MPa	Tensile Strength Min, MPa	Elongation, Percent Min, GL = $5.65\sqrt{S_0}$	Applicable to Maximum Diameter, Thickness mm
(1)	(2)	(3)	(4)	(5)
X04Cr19Ni9	490	830	20	45
	740	1 030	15	25
	910	1 180	12	19
	960	1 270	12	12
X07Cr18Ni9	490	830	20	45
	740	1 030	15	25

13 RETESTS

13.1 Retest for Chemical Analysis

If the results of the chemical analysis do not conform to the requirements given in Tables 1 and 2, unless otherwise agreed to between the purchaser and the manufacturer, two new samples shall be taken from different pieces from the same cast. Should the two determinations satisfy the requirements the lot represented shall be accepted. If either of the samples fails, the material shall be taken as not complying with this standard.

13.2 Retests for Mechanical Properties

Should any of the original test pieces fail to satisfy that requirements of the mechanical test specified in

Tables 3 to 8, two further samples shall be selected for retest for each test which failed. The mechanical properties obtained from the test pieces prepared from the two additional test samples shall comply with the specified requirements. Should either of the retests fails to meet the specified requirements, the material shall be taken as not complying with this standard, except that the manufacturer may re-heat-treat (not more than twice) the material represented and resubmit it for testing.

14 CORROSION RESISTANCE

14.1 If required by the purchaser, the material shall be tested for corrosion resistance as per IS 10461 (Part 1) and IS 10461 (Part 2).

14.1.1 The material may be suitably colour coded in accordance with IS 2049.

14.1.2 While ordering steel to this Indian Standard Annex B may be referred.

15 MARKING

15.1 Unless agreed otherwise, the material shall be identified as follows:

- Each bar and flat over 50 mm in diameter or width across flats shall be legibly stamped with the cast number and the type of steel; and
- Bars and flats up to and including 50 mm in diameter or width across flats shall be bundled

together and a tag attached bearing the cast number and the type of steel.

15.2 BIS Certification Marking

The material may also be marked with the Standard Mark.

15.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Table 8 Mechanical Properties of Austenitic Steel in the Cold-Rolled Condition

(Clauses 9.1 and 13.2)

Steel Designation	0.2 Percent Proof Stress, Min, MPa	Tensile Stress, Min, MPa	Elongation, Percent Min, GL = $5.65\sqrt{S_0}$		Applicable to Maximum Thickness mm
			0.5 mm Thick-ness	0.8 mm Thick-ness	
(1)	(2)	(3)	(4)	(5)	(6)
X04Cr19Ni9	490	830	12	12	2.8
	740	1 030	8	8	2.4
	910	1 180	7	7	1.8
	960	1 270	3	4	1.4
X07Cr18Ni9	490	830	12	12	2.8
	740	1 030	9	9	2.4
X10Cr17Mn6Ni4N	490	830	20	20	2.3
	740	1 030	10	10	2.9
	910	1 180	7	7	2.4
	960	1 270	4	5	2.3

Table 9 Permissible Variation in Size for Hot-Rolled Round and Square Bars
(Clause 12)

All dimensions in millimetres.

Nominal Size		Tolerance	
Over	Up to and Including	Permissible Variation	Out of Round or Out of Square Section
(1)	(2)	(3)	(4)
8	11	±0.15	0.23
11	16	±0.18	0.25
16	22	±0.20	0.30
22	25	±0.24	0.35
25	28	±0.25	0.40
28	31	±0.28	0.45
31	34	±0.30	0.50
34	38	±0.36	0.60
38	50	±0.40	0.60
50	64	+0.8 -0	0.80
64	89	+1.2 -0	0.80
89	114	+1.8 -0	1.20
114	139	+2.0 -0	1.50
139	165	+3.2 -0	1.80
165	200	+4.0 -0	2.00

NOTES

1 Out of round is the difference between the maximum and minimum diameters of the bars, measured at the same cross section. Out-of-square section is the difference in the two dimensions at the same cross-section of a square bar, each dimension being the distance between opposite faces.

2 Size tolerances for rounds in the size range of 6 to 8 mm, including and for rounds in the size range of 6 mm to approximately 16 mm, which are produced on rod mills in coils, are not shown here in the table.

3 Variations in size of coiled product made on rod mills are greater than size tolerances for product made on bar mills.

4 Squares in this size are not produced as hot rolled product.

Table 10 Permissible Variation in Size for Hot-Rolled Hexagon Bars
(Clause 12)

All dimensions in millimetres.

Nominal Size		Tolerances	
Over	Up to and Including	Permissible Variation	Maximum Differences in Three Measurements for Hexagons
(1)	(2)	(3)	(4)
6	12	± 0.18	0.28
12	25	± 0.25	0.4
25	38	± 0.5	0.6
38	50	± 0.8	0.8
50	64	± 1.2	1.2
64	89	± 1.6	1.6

Table 11 Permissible Variation in Size for Hot-Rolled Square Edge and Round Edge Flats
(Clause 12)

All dimensions in millimetres.

Specified Width		Thickness Tolerance						Tolerance
Over	Up to and Including	Over 3 Up to and Including 12 mm	Over 12 Up to and Including 25 mm	Over 25 Up to and Including 50 mm	Over 50 Up to and Including 100 mm	Over 100 Up to and Including 150 mm	Over 150 Up to and Including 200 mm	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
—	25	± 0.20	± 0.25	—	—	—	—	± 0.38
25	50	± 0.30	± 0.28	± 0.80	—	—	—	± 0.80
50	100	± 0.38	± 0.50	± 0.80	+ 1.60 - 0.80	+ 2.40 - 3.20	—	± 1.60
100	150	± 0.38	± 0.50	± 0.80	+ 1.60 - 0.80	+ 2.40 - 3.20	— - 1.60	± 2.40
150	200	± 0.40	± 0.60	± 0.80	+ 1.60 - 0.80	+ 2.40 - 3.20	+ 3.20 - 4.00	
200	250	± 0.50	± 0.80	± 0.80	+ 1.60 - 0.80	+ 2.40 - 3.20	+ 3.20 - 4.00	

Table 12 Permissible Variation in Size of Cold-Finished Round Bars
(Clause 12)

All dimensions in millimetres.

Specified Size		Permissible Variation
Over	Up to and Including	
(1)	(2)	(3)
—	12	± 0.04
12	25	± 0.05
25	38	± 0.06
38	100	± 0.08

NOTE — Unless otherwise specified, size tolerances are over and under as shown in this table. When required, however, they may be specified all over and nothing under or all under and nothing over or any combination of over and under, provided the total spread in size tolerance for a specified size is not less than the total spread shown in this table.

Table 13 Permissible Variation in Size of Cold-Finished Hexagonal and Square Bars
(Clause 12)

All dimensions in millimetres.

Specified Size		Permissible Variation
Over	Up to and Including	
(1)	(2)	(3)
12	25	+ 0 - 0.10
25	50	+ 0 - 0.15
50	75	+ 0 - 0.20
75	—	+ 0 - 0.25

NOTES

1 When it is necessary to heat-treat or heat-treat and pickle after cold-finishing, the size tolerances are double of those shown in this table.

2 When it is necessary to heat-treat and pickle after cold-finishing, the size tolerances are double of those shown in this table.

Table 14 Permissible Variation in Width and Thickness of Cold-Finished Flat Bars
(Clause 12)

All dimensions in millimetres.

Width		Permissible Variation in Width	
Over	Up to and Including	For the Thickness 6 mm and Under	For Thicknesses Over 6 mm
10	25	± 0.10	± 0.05
25	50	± 0.15	± 0.08
50	75	± 0.20	± 0.10
75	112	± 0.25	± 0.13

Thickness		Permissible Variation in Thickness
Over	Up to and Including	
3	25	± 0.05
25	50	± 0.08
50	75	± 0.10
75	112	± 0.13

NOTE — When it is necessary to heat-treat and pickle after cold-finishing, the size tolerances are double of those shown in this table.

Table 15 Permissible Variation in Lengths of Hot-Finished or Cold-Finished Bars in Fixed Lengths
(Clause 12)

All dimensions in millimetres.

Specified Size of Rounds, Squares, Hexagonal and Width of Flats		Permissible Variation in Length	
Over	Up to and Including	Up to and Including 3 600	Over 3 600 Up to and Including 7 500
—	50	+ 12 — 0	+ 20 — 0
50	100	+ 20 — 0	+ 25 — 0
100	150	+ 25 — 0	+ 30 — 0
150	225	+ 30 — 0	+ 38 — 0
225	300	+ 38 — 0	+ 50 — 0

Table 16 Permissible Variation in Length of Hot-Finished or Cold-Finished Bars Machine Cut to Fixed Lengths After Machine Straightening

(Clause 12)

All dimensions in millimetres.

Specified Size of Rounds, Squares, Hexagons and Width of Flats		Permissible Variation in Length	
Over	Up to and Including	Up to and Including 3 600	Over 3 600 Up to and Including 7 500
(1)	(2)	(3)	(4)
—	75	+ 3 — 0	+ 4 — 0
75	150	+ 4 — 0	+ 6 — 0
150	225	+ 6 — 0	+ 8 — 0
225	300	+ 8 — 0	+ 12 — 0

Table 17 Permissible Variation in Straightness of Machine Straightened Hot-Finished or Cold-Finished Bars

(Clause 12)

Hot-Finished	Cold-Finished
3 mm in any metre length	1.5 mm in any metre length

ANNEX A
(Clause 8.2)

RECOMMENDED HEAT-TREATMENT FOR STAINLESS STEELS

<i>Steel Designation</i>	<i>Symbol¹⁾</i>	<i>Annealing/ Softening</i>	<i>Quenching Media²⁾</i>	<i>Symbol</i>	<i>Hardening Temperature</i>	<i>Quenching Media</i>	<i>Tempering Temperature</i>
		°C			°C		°C
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ferritic Steels							
C04Cr12	A	750 to 800	f,a	—	—	—	—
X07Cr17	A	750 to 850	a,w	—	—	—	—
Martensitic Steels							
X12Cr12	A	700 to 780	a	Q + T	950 to 1 000	a	700 to 750
	A	770 to 870	f				
X20Cr13	A	770 to 870	f	Q + T	980 to 1 030	a	630 to 770
X30Cr13	A	770 to 870	f	Q + T ³⁾	980 to 1 030	a	630 to 770
				Q + T ⁴⁾	980 to 1 030	a	100 to 250
X40Cr13	A	770 to 870	f	Q + T	1 000 to 1 050	a	100 to 250
X15Cr16Ni2	A	750 to 800	a	Q + T	980 to 1 030	o	630 to 700
	—	620 to 670	a	—	—	o,a	—
X106Cr17Mo	—	780 to 880	f	Q + T	1 000 to 1 050	—	100 to 250
Austenitic Steels							
X02Cr19Ni10	S	1 000 to 1 120	w,a	—	—	—	—
X04Cr19Ni9	S	1 000 to 1 120	w,a	—	—	—	—
X07Cr18Ni9	S	1 000 to 1 120	w,a	—	—	—	—
X04Cr18Ni10Ti	S	1 000 to 1 120	w,a	—	—	—	—
X04Cr18Ni10Nb	S	1 000 to 1 120	w,a	—	—	—	—
X04Cr17Ni12Mo2	S	—	—	—	—	—	—
X02Cr17Ni12Mo2	S	—	—	—	—	—	—
X04Cr17Ni12Mo2Ti	S	—	—	—	—	—	—
X10Cr17Mn6Ni4N	S	—	—	—	—	—	—

¹⁾A = annealing, Q = quenching, T = tempering, and S = softening

²⁾f = furnace, a = air, o = oil, w = water

³⁾Applicable for the properties given in Table 4.

⁴⁾Applicable for the properties given in Table 5.

ANNEX B
(*Clause 14.1.2*)

INFORMATION TO BE GIVEN BY THE PURCHASER

B-1 BASIS FOR ORDER

While placing an order for the purchase of stainless steel bars and flats covered by this standard, the purchaser should specify the following:

- | | |
|--|----------------------------------|
| a) Type of steel; | c) Condition of delivery; |
| b) Description regarding size, shape, length, etc; | d) Tests required; |
| | e) Methods of manufacture; |
| | f) Any special requirements; and |
| | g) Test report, if required. |

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