भारतीय मानक

Indian Standard

IS 1481 : 2024

अभियंताओं के लिए मीट्रिक इस्पात स्केल — विशिष्टि

(दूसरा पुनरीक्षण)

Metric Steel Scales for Engineers — Specification

(Second Revision)

ICS 01.100.40

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002
www.bis.gov.in www.standardsbis.in

April 2024 **Price Group 4**

Educational Instruments and Equipment Sectional Committee, PGD 22

FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Educational Instruments and Equipment Sectional Committee had been approved by the Production and General Engineering Division Council.

This standard was first published in 1961 and subsequently revised in 1970. This revision has been taken up to keep pace with the latest technological developments and international practices. In this revision, the following changes have been made:

a) UDC number has been replaced by ICS number on first cover page;
b) Amendment 1 and 2 have been incorporated; and
c) In **6.4**, radius of segment for scale with nominal size of 15 cm has been added.

The composition of the Committee, responsible for the formulation of this standard is given in Annex A.

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, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)‘. 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

METRIC STEEL SCALES FOR ENGINEERS — SPECIFICATION

(Second Revision)

1 SCOPE

This standard specifies the requirements for metric scales made of steel for the use of engineers.

2 TYPE

Metric scales for engineers shall be of following types:

Type A — End measuring scale, graduated, on one edge in millimetre, every cm graduation marked (*see* Fig. 1).

Type AA — End measuring scale, graduated on both edges in millimetre, on same face, every cm graduation marked (*see* Fig. 2).

Type B — End measuring scale, graduated on one edge in millimetre, 0 cm to 5 cm graduated in -½ mm, every cm graduation marked (*see* Fig. 3).

Type BB — End measuring scale, graduated on both edges in millimetre on same face, 0 cm to 5 cm graduated in ½ mm, every cm graduation marked (*see* Fig. 4).

Type CC — Edge measuring scale, graduated on both edges in millimetre on same face, 0 cm to 5 cm graduated in ½ mm, every cm graduation marked (nominal size 100 only) (*see* Fig. 5).

3 MATERIAL

3.1 The scale shall be made of good quality rust-resistant spring steel or manganese spring steel having 0.55 percent to 0.65 percent carbon and 0.60 percent manganese, minimum or suitable grade of stainless steel. The coefficient of expansion of steel shall be $(11.0 \pm 1.5) \times 10^{-6}$ mm/ °C within the range 0 °C to 60 °C.

3.2 The blanks shall be cut from sheets or strips and shall be free from seams, flaws, scales, burrs or other defects. They shall be uniform in thickness and width throughout the entire length. They shall be suitably hardened and tempered.

4 DIMENSIONS AND GRADUATIONS

4.1 The principal dimensions of the scales shall be as given in Table 1.

4.2 When kept in horizontal position, end measuring scales shall have graduation starting from left to right on both edges.

4.3 When kept in horizontal position, edge measuring scales (Type CC) shall have graduation from left to right on top edge and in reverse direction on bottom edge.

4.4 Graduation lines shall be fine, clear and of uniform thickness of not more than 0.1 mm. The line shall be of sufficient depth to maintain legibility and indelibility. The length of the graduation lines shall be as follows:

Sl No.	*Graduation mark*	*For sizes 10* mm,*15* mm *and 20* mm	*For sizes 30 and above* mm
(1)	(2)	(3)	(4)
i)	cm scale mark	5	6
ii)	5 mm scale mark	3.5	4
iii)	mm scale mark	2.5	2.5
iv)	0.5 mm scale mark	1.5	1.5

5 ACCURACY

When compared against a certified metal scale at 27 °C tolerance on the various graduations of the scale shall not exceed the following limits:

a) Between any two adjacent scale marks or contiguous centimeter scale marks — ± 0.02 mm

b) Between any two scale marks, more than one centimeter apart up to and including full length of the scale. — ± 0.05 mm

6 GENERAL REQUIREMENTS

6.1 End measuring scales shall have the zero-mark replaced by the square end and the extra lengthover the maximum scale mark shall be rounded.

6.2 Edge measuring scales shall have both ends finished square.

6.3 The edges of the scales shall not deviate from a straight line by more than 0.l mm and their plane surfaces shall not vary from a plane' by more than 0.5 mm at any point.

6.4 Flexibility Test

6.4.1 The scales of Types A, AA, B and BB shall be subjected to the flexibility test. The scale shall be bent round the periphery of a wooden segment of the following radii (with depth not less than the width of the scale) until the scale is in contact with the segment throughout its length:

Sl No.	*Nominal Size of Scale cm*	*Radius of Segment* mm (3)
i)	10	35
ii)	15	50
iii)	20	70
iv)	30	100
v)	50	160

6.4.2 The scale shall not show any sign of damage or permanent set on completion of the test.

7 DESIGNATION

The designation of the scale shall include the type, nominal size and the number of the standard,for example:

Scale of type BB of size 30 cm shall be designated as:

Scale BB 30 IS 1481 nominal

8 MARKING

8.1 Every centimeter scale mark shall be numbered clearly. The height of the figure shall be notless than 2 mm.

8.2 The abbreviation 'cm' and 'सेमी' shall be marked at the end of the scale.

8.3 Each scale shall be legibly and indelibly marked with the maker's name, initial or recognized trademark.

8.4 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

9 PRESERVATIVE TREATMENT

The scales shall be smeared with a thin coating of mineral jelly or any other suitable preservativeand then wrapped in grease-proof paper.

10 PACKING

The packaging of scales shall be as agreed upon between the manufacturer and the purchaser.

Table 1 Dimensions for Blanks for Scales

(*Clause* 4.1)

All dimensions are in millimetres.

Sl No.	**Nominal Size** cm	***l***	***l*1**		***b***		***t***
			Max	*Min*	*Max*	*Min*	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	10	100	110	105	15	14	0.8 ± 0.1
ii)	15	150	165	160	15	14	0.8 ± 0.1
iii)	20	200	215	210	20	19	0.8 ± 0.1
iv)	30	300	320	315	30	29	1.0 ± 0.2
v)	50	500	520	515	30	29	1.5 ± 0.3
vi)	100	1 000	1 030	1 025	40	39	1.5 ± 0.3

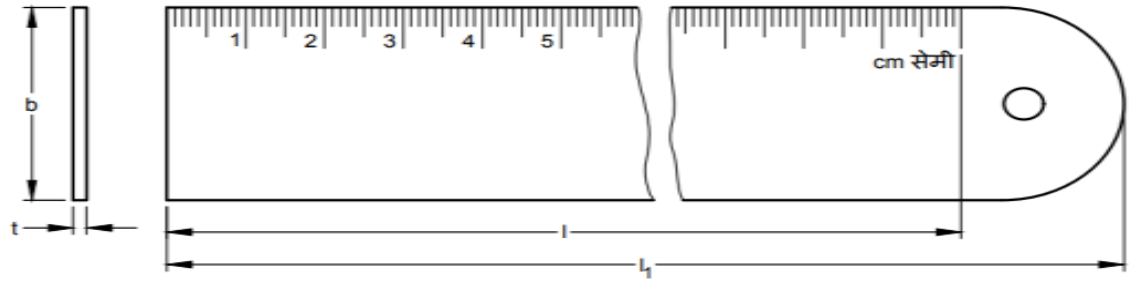

FIG. 1 TYPE 'A' SCALE

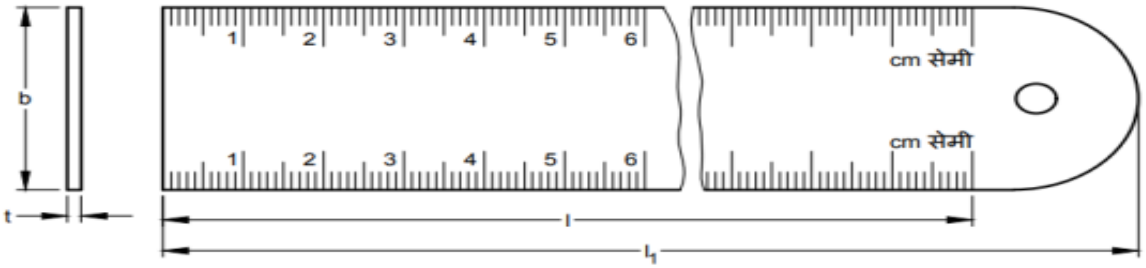

FIG. 2 TYPE 'AA' SCALE

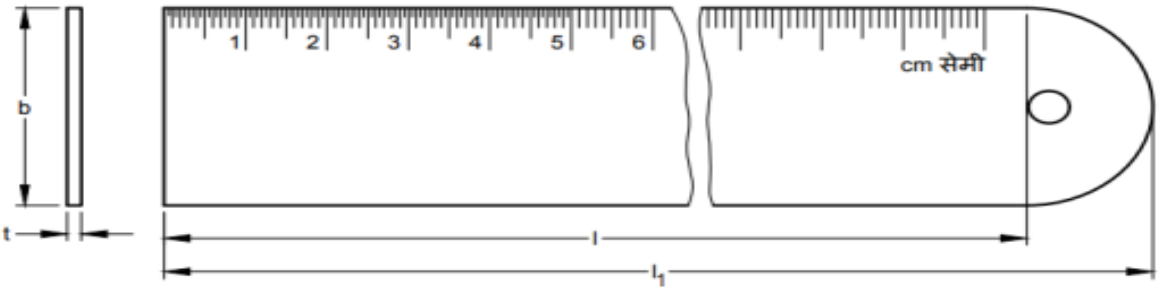

FIG. 3 TYPE 'B' SCALE

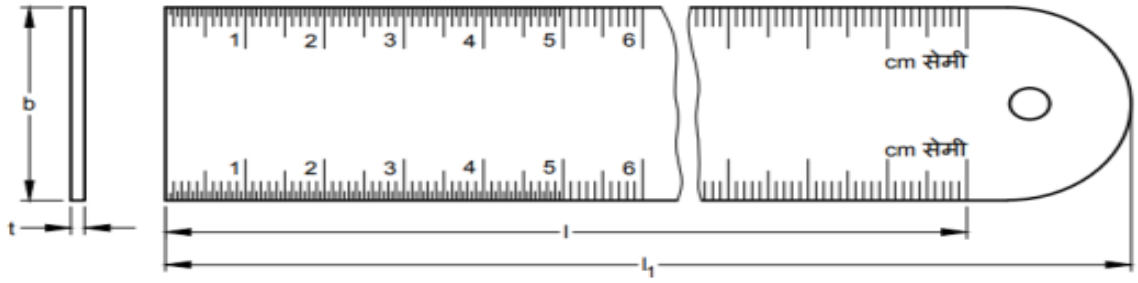

FIG. 4 TYPE 'BB' SCALE

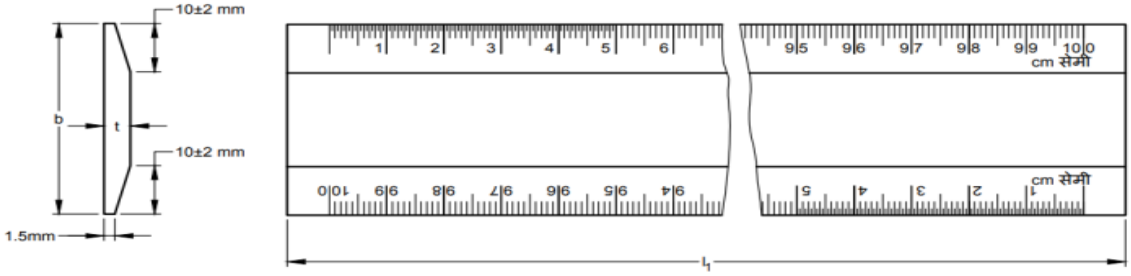

FIG. 5 TYPE 'CC' SCALE

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Educational Instruments and Equipment Sectional Committee, PGD 22

Organization	*Representatives(s)*
In Personal Capacity (*7/57, Second Floor, Old Rajinder Nagar, New Delhi - 110060*)	DR SUKHVIR SINGH **(*Chairperson*)**
Ambala Scientific Instruments Manufacturers Association, Ambala Cantt	SHRI ASHWANI GOEL SHRI PUNEET GUPTA (*Alternate*)
CSIR - Central Scientific Instruments Organisation, Chandigarh	DR AMIT LOCHAN SHARMA DR RAJ KUMAR (*Alternate*)
CSIR - National Physical Laboratory, New Delhi	DR PREMSHANKAR K. DUBEY
Directorate General of Quality Assurance, CQA (Instruments), Dehradun	SHRI A. RADHAKRISHANAN SHRI MANJIT SINGH (*Alternate*)
Indian Association of Physics Teachers, New Delhi	DR MAMTA
Indian Institute of Technology Delhi, New Delhi	SHRI SATISH KUMAR DUBEY
Instrument Research and Development Establishment, Dehradun	SHRI SUBHASH CHANDER KUMAR SHRI K. K. KAILASIA (*Alternate*)
Malaviya National Institute of Technology, Jaipur	DR RAJENDRA KUMAR GOYAL DR RAJEEV AGRAWAL
National Council of Educational Research and Training, New Delhi	DR GAGAN GUPTA PROF ALKA MEHROTRA (*Alternate*)
Office of Development Commissioner (MSME), New Delhi	SHRI S. VIJAYA KUMAR SHRI ALURI SURESH (*Alternate*)
Optics and Allied Engineering Private Limited, Bengaluru	DR RAMAGOPAL V SAREPAKA SHRI D. RAJENDRA KOTARIA (*Alternate*)
Survey of India, Geodetic and Research Branch, Dehradun	SHRI NEERAJ GURJAR SHRI DEEPAK KUMAR (*Alternate*)
BIS Director General	SHRI RAJEEV RANJAN SINGH, SENIOR DIRECTOR/SCIENTIST 'F' AND HEAD (PRODUCTION AND GENERAL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex - officio*)]

Member Secretary

SHRI ASHUTOSH RAI
SCIENTIST 'C'/DEPUTY DIRECTOR
(PRODUCTION AND GENERAL ENGINEERING), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website-www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: PGD 22 (21722).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: 601/A, Konnectus Tower -1, 6th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	2323 7617
Eastern	: 8th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091	2367 0012 2320 9474
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019	265 9930
Southern	: C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113	2254 1442 2254 1216
Western	: Manakalya, 4th Floor, NTH Complex (W Sector), F-10, MIDC, Andheri (East), Mumbai 400093	283 25838

Branches : AHMEDABAD, BENGALURU, BHOPAL, BHUBANESHWAR, CHANDIGARH, CHENNAI, COIMBATORE, DEHRADUN, DELHI, FARIDABAD, GHAZIABAD, GUWAHATI, HARYNA, HUBLI, HYDERABAD, JAIPUR, JAMMU & KASHMIR, JAMSHEDPUR, KOCHI, KOLKATA, LUCKNOW, MADURAI, MUMBAI, NAGPUR, NOIDA, PARWANOO, PATNA, PUNE, RAIPUR, RAJKOT, SURAT, VIJAYAWADA.

Published by BIS, New Delhi