मानकः पथप्रदर्शकः

COMPENDIUM OF INDIAN STANDARDS ON

LENGTH MEASURING INSTRUMENTS

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Introduction

Length measuring instruments are tools and devices designed to determine the physical dimensions of an object, specifically its length, height, or distance between two points.

Types of Length Measuring Instruments:

1. **General Purpose Length Measuring Instruments**
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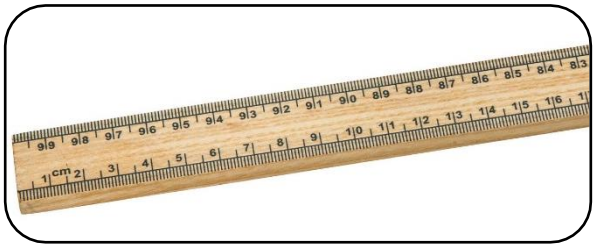
Standards on General Purpose Length Measuring Instruments

IS 1059 : 1994 (Reaffirmed in 2024) [Legal Metrology Commercial Length Measures (Non-Flexible)]



Scope: Specifies requirements for **non-flexible commercial length measures** made of **metal or wood**, used in legal metrology.

Denominations & Materials: Available in 0.5 m, 1 m (metal/wood), and 2 m (wood only); metal types include mild steel, plated brass, stainless steel; wood types include teak, rosewood, and sissoo.

Graduations: 1 cm marks for the first 10 cm, then every 5 cm; numbered every 10 cm with cross marks at 25, 50, and 75 cm; markings on one side only. Uses Hindu-Arabic numerals along with 'मीटर' and 'metre'.

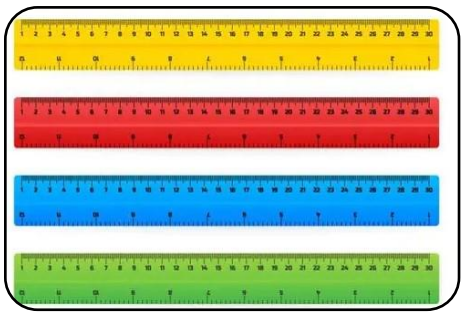
IS 1269 (Part 1 & 2) : 1970 (Reaffirmed in 2021) [Material Measures of Length -Tape Measures]

IS 1269 series defines the **design, material, construction, accuracy, and testing requirements** for **flexible tape measures** made from metallic yarn, glass fibre, or steel. These are used where rigid measures are impractical, such as in construction, geodetics, medicine, and surveying.

Scope & Key Aspects of IS 1269 (Part 1 & 2)

Part	Scope	Key Aspects
Part 1	Woven metallic and glass fibre tape measures	Tapes made from woven yarn + metal wires or glass fibre + resilient plastic. Nominal lengths range from 0.5 m to 100 m. Accuracy Classes I, II, III. Metric graduations only. Permissible error: ±0.1 mm/m (Class I) to ±0.6 mm/m (Class III). Tests include bend, wear, waterproofness. May have handles, rings, winding cases.
Part 2	Steel tape measures	Covers steel/stainless steel tapes from 0.5 m to 200 m. Includes end, line, and composite types. Accuracy Classes I, II, III with defined permissible errors. Metric-only, indelible graduations. Rustproof, burr-free design with manual/auto winding devices. Markings include nominal length, zero point, manufacturer, and class. Tests include tension, winding, durability.

IS 1480 : 1970 (Reaffirmed in 2021) [Specification for Metric Scales for General Purposes]



Scope: This specification defines the requirements for rigid and foldable metric scales made from wood or plastic for general measuring purposes. It covers both end and edge measuring types in standard lengths from 10 cm to 100 cm. The standard highlights proper scale identification, rounding rules, and ensures measurement precision.

IS 1481 : 2024 [Metric Steel Scales for Engineers — Specification]

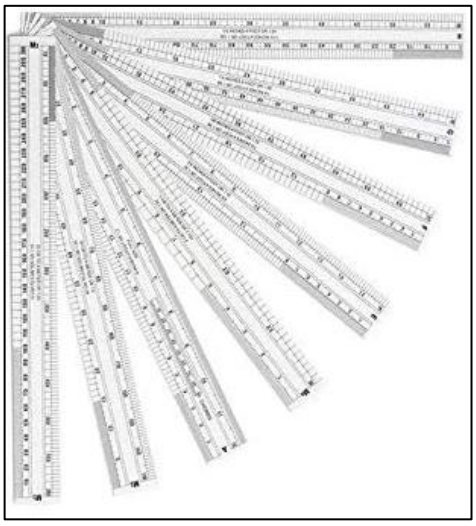
Scope: Specifies the requirements for rigid and foldable rust-resistant spring steel or manganese spring steel scales. Metric scales for engineers are categorized into five types (A, AA, B, BB, CC), all designed as end measuring scales with specific graduation patterns for precise measurements in technical applications.

Key Features: All scales are end-measuring (except Type CC, which is edge-measuring), with mm graduations, cm marks, and finer ½ mm increments for the first 5 cm in Types B, BB, and CC.

Orientation: Graduations run left to right on both edges, ensuring consistency.
Type CC Specificity: Limited to a 100 mm nominal size, making it distinct from other types.

IS 1491 : 2023 [Metric Scales for Architectural Purposes — Specification]

Scope:

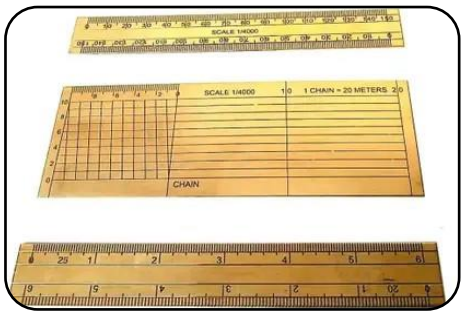


This standard outlines the requirements for metric scales primarily used in architecture, made from **varnished cardboard** or plastic. It defines six types of scales (A to F) with different reduction ratios to ensure accurate and consistent measurements for architects, engineers, and surveyors. The standard covers all aspects including materials, dimensions, graduations, accuracy, testing, marking, and packaging in line with current practices.

Key Aspects:

- Six scale designations (A to F) with two sizes each, from full size (1:1) to 1:2000 reduction.
- Made from high-quality varnished cardboard or smooth, defect-free plastic materials.
- Precise dimensions and graduations ensure clarity; accuracy within ±0.25 mm.
- Tested for flexibility and ink adhesion; paper scales have protective varnish coating.

IS 1562 : 2023 [Metric Diagonal Scales (Cartographers Scale)]



Scope: This standard defines the technical specifications for metric diagonal scales used by cartographers, surveyors, and engineers for scaled measurements up to 1:100,000 scale ratio. The standard comprehensively covers dimensions, materials, construction, accuracy, testing, marking, and packaging.
Material & Construction: Diagonal scales are made of rust-proof steel, stainless steel, or brass with smooth surfaces.

Sizes & Types: Four types (A, B, C, D) with specific sizes. B and C have three scales (1:100,000; 1:50,000; 1:25,000), D has (1:100,000; 1:8,000; 1:4,000), and A has one scale (1:1).

IS 3515 : 1966 (Reaffirmed in 2022) [Tapes used in Measurement of Oil Quantities]

Scope: Covers specifications for **steel dip tapes** with **dip weights** used in **measuring oil quantities** and gauging petroleum products in containers.
Tape & Lengths: Made of steel with minimum tensile strength of 150 kgf/mm²; available in lengths of 5, 10, 15, 20, and 25 meters.

Graduations & Dip Weights: Graduated in mm/cm/dm/m with defined line heights; includes light (700±50 g) and heavy (1500±50 g) torpedo-shaped dip weights with a 150 mm graduated portion.

Accuracy: Maximum permissible errors range from ±0.2 mm (per cm) to ±2.0 mm (for longer lengths).

IS 17582 : 2021 [Specification for Infantometer]

Scope: Specifies the construction, material, and metrological requirements for **infantometers** used to measure the length of infants (up to 24 months) in a **recumbent position.**

- **Types & Range**: Available in plastic, wooden, or metallic forms; measures length up to at least 100 cm.
- **Design & Material**: Made from ABS plastic, hardwoods, stainless steel, or anodized aluminium; foldable, portable, and lightweight with a sliding footpiece and fixed headboard.
- **Accuracy & Safety**: Offers ±0.2 cm accuracy with 0.1 cm graduations; child-safe design with no sharp edges and compliant with IS 9873.
- **Calibration & Markings**: Requires annual calibration traceable to national standards; dual-side, indelible markings visible in low light.

IS 17583 : 2021 [Specification for Stadiometer]

Scope:

Specifies the construction, material, and metrological requirements for **stadiometers**, used to measure the **height of individuals above 24 months** in a **standing position**.

Key Aspects:

- **Design & Material**: Rigid vertical board (min. 200 cm) with sliding headpiece; made from ABS plastic, stainless steel, or selected hardwoods.
- **Accuracy & Graduation**: Accuracy of ±0.2 cm with 0.1 cm graduations; dual-sided, indelible, and visible in low light.
- **Safety & Durability**: Child-safe design with no sharp edges; resistant to shock, humidity, water, and high temperatures; complies with IS 9873.
- **Usage & Calibration:** Used in hospitals, health surveys, and by health workers; calibrated annually with traceability to national standards.

IS 2747 : 1990 (Reaffirmed in 2022) [Taximeters - Performance Requirements]

Scope:

Specifies performance requirements for both **mechanical and electronic taximeters** used to compute fares based on **distance and time** for public hire vehicles.

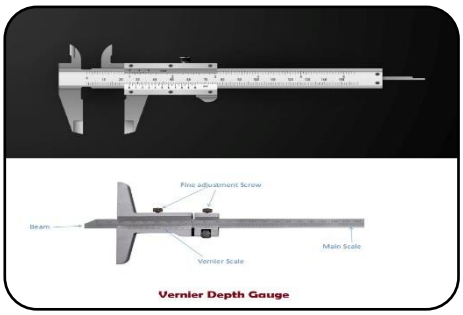
Key Aspects:

- **Function & Build**: Covers fare calculation (time/distance) with electronic, magnetic, or gearbox drives; must be robust, tamper-resistant, and weatherproof.
- **Testing & Accuracy**: Includes bench, road, endurance, and environmental tests; defined tolerance limits for fare accuracy.
- **Features & Markings**: Must have manufacturer details, constants (K), monetary units, and space for verification stamps.
- **Controls & Add-ons**: Operates in 'Free', 'Hired', 'To Pay' modes with control logic; allows optional extras like totalizers for distance or fare tracking.

Standards Covered under Precision Length Measuring Instruments

IS 16491 (Part 1) : 2024 [Dimensional Measuring Equipment - Calipers]

The IS 16491 series, under the GPS (Geometrical Product Specifications) framework, defines **design and metrological characteristics** for **calipers and caliper-type depth gauges** used in dimensional measurement. It ensures accurate, reliable, and repeatable performance across analogue and digital formats.



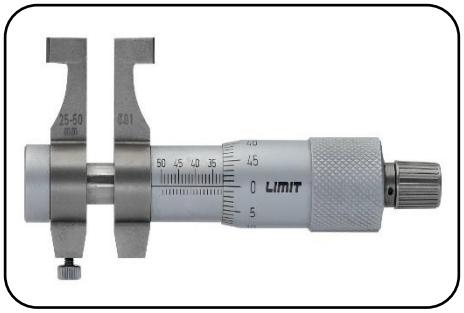
Scope & Key Aspects of IS 16491 (Part 1)

Part	Scope	Key Aspects
Part 1	Design and metrological characteristics of calipers including depth gauge	Applies to vernier, dial, and digital calipers. Measures external, internal, depth, and step dimensions. Tests include partial surface contact error (E), shift error (S). Calibration uses gauge blocks at 20°C. MPE values defined (Annex B). Serial number marking mandatory.

IS 2966 : 1964 (Reaffirmed in 2019) [Specification for Internal Micrometers (Including Stick Micrometers)]

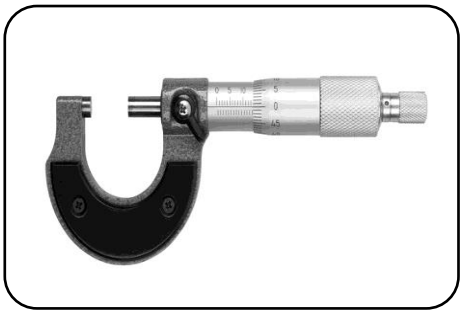
Scope:

Covers specifications for **internal micrometers** (25 mm to 600 mm range) and **stick micrometers** (for longer internal lengths) used for precision measurement of internal dimensions.



- **Components & Material**: Includes measuring head, extension rods, spacing collars, and detachable handle; made of hardened steel (≥800 HV) with carbide-tipped faces recommended.
- **Accuracy & Graduation**: Internal micrometers allow ±0.005 to ±0.02 mm error; stick micrometers have ±0.003 to ±0.018 mm tolerance; graduations of 0.01 mm (thimble) and 0.5 mm (barrel).
- **Design Features**: Equipped with zero setting and wear compensation; ensures rigidity with max deflection ≤0.05 mm per 25 cm under 0.5 kg load.
- **Marking & Packaging**: Marked with serial number, manufacturer name, and ISI mark (if applicable); coated for corrosion resistance and packed in a protective case.

IS 2967 : 1983 (Reaffirmed in 2019) [Specification for External Micrometer]



Scope:

Specifies dimensional, functional, and accuracy requirements for **external micrometers** with **0.5 mm or 1 mm screw pitch**, measuring up to **500 mm** with **least count 0.01 mm**.

Key Aspects:

- **Design:** Rigid frame, fixed anvils, graduated thimble/barrel, ratchet/friction drive
- **Material:** Hardened tool or stainless steel (≥530 HV); carbide tips recommended
- **Accuracy:**
  - **Max error (F_{max}):** from ±4 µm (0–25 mm) to ±13 µm (475–500 mm)
  - **Parallelism tolerance:** 2–11 µm; zero setting: ±2–±11 µm
- **Graduation:** 0.01 mm; 50 or 100 divisions depending on pitch
- **Marking:** Range, least count, manufacturer's name, IS number
- **Testing:** Methods for flatness, parallelism, screw traverse, and frame deflection provided.

IS 2984 : 2003 [Slip Gauges – Specification]

Scope:

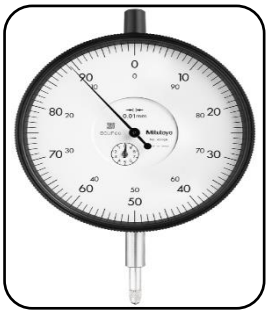
The standard defines the design and metrological requirements for gauge blocks with lengths from 0.5 mm to 1000 mm, covering calibration grades K, 0, 1, and 2. It aligns with ISO 3650 and establishes gauge blocks as length standards based on the meter (SI). The standard also replaces grade 00 with grade K and includes calibration guidelines with uncertainty assessment.

Key Aspects:

- Defines key terms and references related ISO and Indian calibration standards.
- Length based on the meter (light path in vacuum) with traceable measurements at 20°C and standard pressure.
- Gauge blocks made from high-grade materials with specified dimensions, hardness, stability, and markings.
- Specifies tolerances for flatness, parallelism, perpendicularity, and wringing properties.
- Calibration via interferometry or comparison, with certified results and traceability; annexes offer further guidance.

IS 2092 : 2025 [Dimensional Measuring Equipment — Design and Metrological Characteristics of Mechanical Dial Gauges]

Scope:



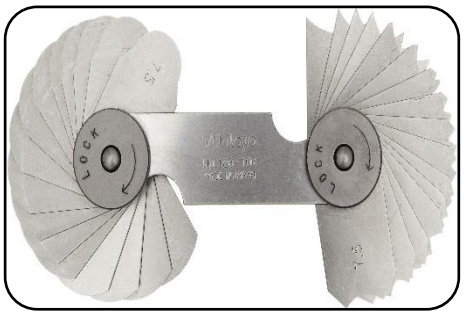
Specifies the **design and metrological characteristics** of **mechanical dial gauges** used for measuring small linear displacements in dimensional metrology.

Key Aspects:

- **Design & Components**: Comprises plunger, dial, pointer, revolution counter, zero setting, and contact element for precise measurements.
- **Accuracy & Calibration**: Specifies MPE, repeatability, and hysteresis limits; calibration follows ISO/GPS model with detailed methods in Annex C.
- **Dial & Dimensions**: Supports multiple/partial revolution dials; bezel sizes range from 30–100 mm with standardized thread and stem for interchangeability.
- **Marking & Standards**: Markings must be permanent, readable, and non-intrusive; error limits based on scale intervals detailed in National Annex E.

IS 5273 : 1967 (Reaffirmed in 2024) [Specification for Radius Gauges]

Scope:



This Indian Standard specifies radius gauges for checking concave and convex radii (0.6 mm to 25 mm) on components like bends and welds, housed in protective sheaths. Made from tool steel or hardenable stainless steel, the standard ensures consistency in dimensions, construction, and markings for reliable engineering use.

Material & Design: Made from hardened tool steel or stainless steel (min. 650 HV); blades are sheathed, hinged for easy use, and corrosion-protected.

Accuracy & Standards: Standardized dimensions and tolerances (±0.02 mm) ensure precision, as detailed in accompanying tables and figures.

IS 7606 : 1982 (Reaffirmed in 2022) [Specification for Plain Adjustable Snap Gauges]

Scope:

This Indian Standard specifies requirements for plain adjustable snap gauges (Types A, B, C, and MC) used for measurements from 0 to 300 mm. It covers dimensions, materials, accuracy, testing, setting, marking, and packaging to ensure reliable performance, especially for IT8 tolerance and above.

Key Aspects:

- **Types & Dimensions**: Covers four types of snap gauges (A, B, C, MC) with specified dimensions and size ranges detailed in tables.
- **Material & Construction**: Frames use grey cast iron or equivalent; anvils made of high-quality steel hardened to 650–750 HV.
- **Accuracy & Features**: Ensures precision with parallelism limits, slip gauge/plug settings, strong frames, insulating pads, and locking devices.
- **Testing & Marking**: Includes multi-setting parallelism checks, anti-corrosive coatings, size/manufacturer markings, and ISI certification guidelines.

IS 8916 : 1978 (Reaffirmed in 2022) [Specification for Spherometer]

Scope: This Indian Standard outlines the general and functional requirements for spherometers used to measure plate thickness and curvature of spherical surfaces like lenses and mirrors. It specifies materials, dimensions, accuracy, marking, packaging, and finishing to ensure consistency and reliable performance.

Key Aspects:

- **Function & Design**: Spherometers measure thickness and curvature of spherical surfaces using a micrometer screw mechanism with legs arranged in an equilateral triangle.
- **Materials**: Made from brass/aluminum (table & disc), steel (legs), and tool/stainless steel (screw), with corrosion-resistant coatings.
- **Accuracy & Testing**: Requires smooth, backlash-free screw motion; precise graduations; tested for dimensional accuracy, squareness, and zero error.
- **Marking & Packaging**: Marked with manufacturer info and optionally ISI certified; packed with a ground glass plate in protective casing.

IS 2921 : 2016 Height Gauges — Design and Metrological Characteristics

Scope:

Specifies the **design and metrological characteristics** of **height gauges** (vernier, dial, or digital) used for measuring linear dimensions perpendicular to a surface plate.

Key Aspects:

- **Types:** Analogue (vernier or circular), Digital
- **Main Features:** Slider, beam, scale, stylus, fine-adjustment, optional air-bearing base
- **Measurement Range:** Defined by manufacturer; key dimensions include height, base width/depth
- **Accuracy:**
  - Length error (E)
  - Repeatability (R)
  - Bidirectional error (B)
  - Squareness error (S)
- **Marking:** Manufacturer name, scale interval, serial number

- **Testing:** Error, repeatability, bidirectional and squareness tests (Annex A)
- **Calibration:** Guidance in Annex C; follows ISO 14978 principles

IS 3179 : 2024 [Feeler Gauges – Specification]

Scope:

Specifies requirements for **metallic feeler gauges** consisting of blades (0.03 mm to 1.00 mm) used for measuring gaps on finished or painted surfaces.

Key Aspects:

- **Blade Sets:** Available in sets of 10 to 28 blades; lengths: 75, 100, 250, 300 mm
- **Material:** Hardened and tempered steel (400–600 HV)
- **Accuracy:** Thickness tolerance up to ±0.010 mm
- **Design:** Blades housed in protective sheath; semi-circular tips; width ~10 mm
- **Calibration:** Done at 3 points using ULM, micrometer, or dial comparator
- **Marking:** Blades marked with thickness; sheath marked with length, set number, and range
- **Finish:** Smooth, rust-free; free from bends or sharp edges
- **Packing:** Blades coated with anticorrosive material (e.g., lanolin)

IS 3485: 1983 (Reaffirmed in 2019) [Specification for Plain and Master Setting Ring Gauges (Size Range from 1 Up to and including 315 mm)]

Scope:

This standard specifies requirements for GO and NO GO plain ring gauges and master setting ring gauges used to check internal bores and major diameters of external ISO metric screw threads, covering sizes from 1 mm to 315 mm. It outlines dimensions, designations, and markings to ensure accuracy and aligns with international standards like ISO 3670 and DIN for consistency.

Key Aspects:

- Covers GO and NO GO plain ring gauges and master setting ring gauges for sizes 1 mm to 315 mm.
- Applicable for dial bore and pneumatic setting gauges as well as checking major diameters of ISO metric external threads.
- Specifies dimensions for gauges in two size ranges: 1-100 mm and 100-315 mm, detailed in Tables 1 and 2.
- Designation rules based on nominal size and tolerance classes per IS 919 and IS 4218 standards.
- Marking requirements include "GO" or "NO GO," nominal size, tolerance class/limits, and manufacturer's identification.
- Harmonized with international standards (ISO 3670, DIN 2250, DIN 2254) for design, dimensions, and tolerances.

IS 6137 : 1983 (Reaffirmed in 2019) [Specification for Gauging Members for Plain Plug Gauges, Go and No Go Members (Size Range from 1 Up to and including 40 mm)]

Scope:

The Indian Standard IS 6137 specifies requirements for GO and NO GO gauging members in plain plug gauges ranging from 1 mm to 40 mm, also applicable for checking minor diameters of ISO metric internal threads as per IS 4218. It details dimensions, tolerances, materials, and markings to ensure accuracy, uniformity, and interchangeability in precision engineering and manufacturing applications.

Key Aspects:

- Covers GO and NO GO gauging members for plain plug gauges from 1 mm to 40 mm.
- Applicable also for checking minor diameter of internal ISO metric screw threads (per IS 4218).
- Specifies materials as per IS 7018 (Technical supply conditions for gauges).
- Defines dimensional tolerances and designs, including taper shanks for gauge fitting.
- Includes detailed marking and certification requirements, with NO GO members painted red.
- Incorporates features for interchangeability and maintenance, including taper lock system and handle design.

IS 7014 : 1973 (Reaffirmed in 2020) [Specification for Length Bars]

Scope:

This Indian Standard defines requirements for cylindrical length bars up to 1200 mm with lapped parallel end faces, available in plane or annular designs with threaded holes. Primarily used for precision calibration tasks, it covers materials, grades, dimensions, and strict tolerances to ensure high accuracy in length, flatness, parallelism, and squareness.

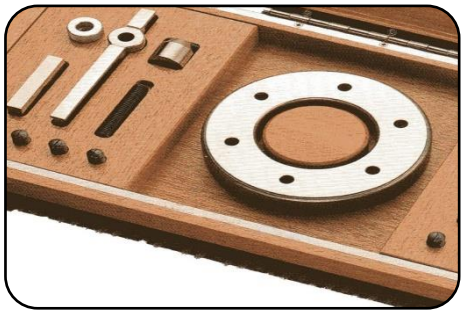
Key Aspects:

- **Designs & Grades**: Two designs—plane ends and threaded holes; four accuracy grades—Reference, Calibration, Inspection, and Workshop, each suited for specific applications.
- **Material & Finish**: Made from hardened, stabilized tool steel with lapped end faces for precision and wringing ability.
- **Dimensional Standards**: Specifies tight tolerances for length, diameter, flatness, straightness, parallelism, and squareness, measured at 20°C; Airy positions used for support.

- **Marking & Packaging**: Marked with size, grade, ID, and manufacturer; packed in dustproof compartmentalized cases; threaded bars allow precise combination use.

IS 7604 : 1975 (Reaffirmed in 2022) [Specification for Length Bar Accessories]

Scope:



This Indian Standard specifies requirements for length bar accessories—base, large rounded jaw, small plane-faced jaw, and spherical end-piece—used for precise internal and external measurements. It details their design, materials, hardness, accuracy, finish, marking, and use with slip gauges, complementing IS 7014 on length bars.

Key Aspects:

- **Accessory Types**: Includes four key accessories—base, large rounded jaw, small plane-faced jaw, and spherical end-piece.
- **Design & Material**: Made from high-grade, hardened steel with precise lapping and grinding; strict tolerances for flatness, stability, and parallelism.
- **Accuracy & Marking**: Ensures micron-level accuracy; accessories are marked with nominal sizes and packed for climate protection.
- **Usage & Appendices**: Guides on assembly and usage; appendices cover slip gauges and converting bars into tools like height or pin gauges.

IS 8023 : 1991 (Reaffirmed in 2025) [Gauges-Single Ended Progressive Type Plate Snap Gauges (Up to 160 mm)-Specification]

Scope:

This Indian Standard specifies the requirements for single-ended progressive type plate snap gauges up to 160 mm, detailing their shapes, dimensions, and tolerances for accurate workpiece gauging. It aligns with international standards like DIN and BS, includes design and marking guidelines, and introduces alternate designs for gauges between 100 mm and 160 mm.

Key Aspects:

- Covers single ended progressive type plate snap gauges up to 160 mm size.
- Specifies dimensions, shapes, and tolerances as per IS 3455 and IS 7018 (Part 1).
- Limits the maximum size range to 160 mm, aligning with DIN and BS standards.
- Provides detailed tables with dimensional data for various size ranges (3 mm to 160 mm).
- Includes marking requirements such as nominal size, tolerance, "GO" and "NO GO" indications, and manufacturer details.
- Provides an alternate gauge design option for sizes 100 mm to 160 mm in accordance with BS specifications.

IS 9483 : 1993 (Reaffirmed in 2020) [Measuring Instruments - Micrometer Heads - Specification]

Scope:

This Indian Standard outlines the requirements for micrometer heads with a least count of 0.01 mm, featuring spindle screws with 0.5 mm or 1 mm pitch and optional mechanical digital displays. It classifies them by thimble diameter and specifies features, accuracy, design, marking, and packaging to ensure reliability in engineering and manufacturing use.

Key Aspects:

- **Types & Classification**: Micrometer heads are categorized into three types based on thimble diameter—Type 1 (<25 mm), Type 2 (25–50 mm), and Type 3 (≥50 mm).
- **Accuracy & Design**: Specifies permissible errors, zero-setting limits, and construction from quality steel or light alloy with hardened spindles and anvils.
- **Drive Force & Measurement**: Standardized contact force of 10 ± 5 N for friction or ratchet drives; force measured using a spring scale or force meter.
- **Marking & Packaging**: Marked with scale, range, type, and manufacturer info; packed in protective cases with anti-corrosion coating.

IS 11103 : 1984 (Reaffirmed in 2025) [Specification for Cylindrical Measuring Pins (Size Range from 0.1 mm Up to and including 20 mm)]

Scope:

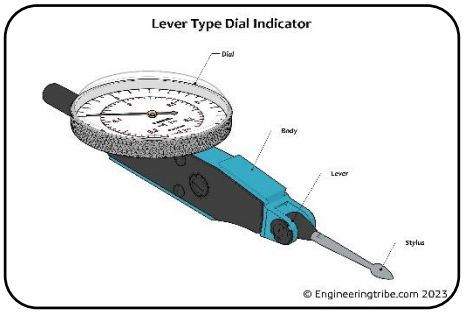
This standard specifies the dimensions and technical requirements for cylindrical measuring pins ranging from 0.1 mm to 20 mm, used in gauging bores, threads, tapers, and other features. It classifies pins into three accuracy grades (0, 1, 2) and defines tolerances, materials, hardness, and surface finish to ensure precision and interchangeability in industrial applications.

Key Aspects:

- **Size & Grades**: Covers nominal diameters from 0.1 mm to 20 mm with specified lengths; three accuracy grades—0 (highest), 1, and 2—each with defined tolerance limits.
- **Material & Hardness**: Made from gauge steel (IS 7018) or optionally carbide/plated steel; gauging surfaces must have a minimum hardness of 700 HV (60 HRC).
- **Design & Marking**: Pins may include fixed grips, with chamfered or rounded edges; pins ≥ 3 mm are marked with diameter and grade.
- **Tolerances & Inspection**: Tolerances for diameter, circularity, and straightness detailed; inspected using parallel gauging faces and surface roughness checked as per IS 3073.

IS 11498 : 2023 [Dimensional Measuring Equipment — Dial Test Indicators (Lever Type) — Design and Metrological Characteristics]

Scope:



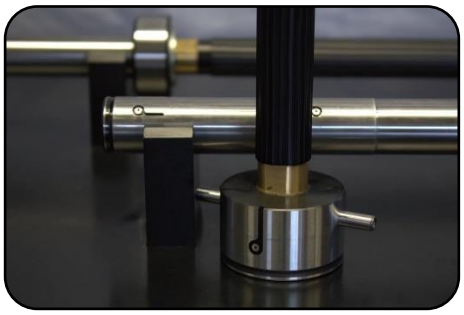
This Indian Standard specifies the design and metrological features of lever-type dial test indicators, adapted from ISO 9493 with modifications for Indian industry. It covers dimensions, measuring forces, error limits, and ensures accuracy, quality, and interchangeability for precision measurement in manufacturing and metrology.

Key Aspects:

- Defines design characteristics including types (Standard, Horizontal, Vertical), dimensions, and mounting (dovetail clamp).
- Specifies metrological characteristics such as maximum permissible error (MPE), repeatability, hysteresis, and measuring forces.
- Requires dial test indicators to measure displacement normal to the stylus axis and in the same plane as stylus rotation.
- Details on calibration, conformance proving, and measurement uncertainty based on ISO 14253 series and ISO 14978.
- Covers zero adjustment, stylus interchangeability, and correction for angular inclination of the stylus.
- Includes annexes with error diagrams, example data sheets, calibration methods, usage notes, and relation to the GPS matrix model.

IS 12257 (Part 1) : 1987 (Reaffirmed in 2022) [Specification for Pneumatic Length Measurement Comparators Part 1 General Information on Principles and Methods]

Scope:



This standard outlines the principles and methods of pneumatic length measurement (air gauging), using compressed air to assess distances based on airflow or pressure variations. It standardizes terminology, describes measurement methods, and highlights system design considerations, referencing DIN 2271 (Part 1) for guiding future applications.

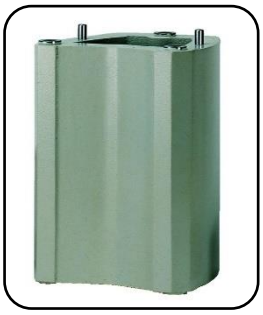
Key Aspects:

- **Working Principle**: Pneumatic length measurement uses compressed air and back pressure changes through a controlled orifice to determine surface distance.
- **Measurement Methods & Pressure Ranges**: Utilizes volumetric flow, pressure, and velocity measurement; operates in high (≥ 0.5 bar) or low (≤ 0.1 bar) pressure ranges, avoiding unstable intermediate pressures.
- **System Configurations**: Instrument circuits include series, network (with/without bridge), or parallel setups, influencing nozzle and indicator connections.

- **Indicators & Standardization**: Pressure/flow changes are displayed via flow meters, gauges, or electronic devices; standardization is limited due to non-interchangeable components across manufacturers.

IS 13907 : 1994 (Reaffirmed in 2025) [Height Setting Micrometers and Rising Blocks-Specification]

Scope:



This Indian Standard specifies the characteristics of height setting micrometers with capacities up to 600 mm and riser blocks of matching height, with a minimum scale value not exceeding 2 micrometers. It defines requirements for design, materials, accuracy, and testing to ensure consistent quality and interchangeability in precision metrology.

Key Aspects:

- **Range & Materials**: For micrometers and riser blocks up to 600 mm; made with durable, stable materials.
- **Accuracy Specs**: Tight tolerances for flatness (0.3 µm), parallelism (1 µm), and repeatability (0.5 µm).
- **Design Features**: Includes precision screw threads, clear scale markings, and spindle clamp.
- **Marking & Testing**: Marked with scale value, maker, serial number; accuracy verified via detailed test methods.

IS 15635 (Part 1 to 12) : 2024 [Acceptance and Reverification Tests for Coordinate Measuring Machines (CMM)]

The IS 15635 series aligns with international GPS (Geometrical Product Specifications) standards and defines the **acceptance and reverification tests** for various types of **Coordinate Measuring Machines (CMMs)** and **Coordinate Measuring Systems (CMSs)**. It ensures **accuracy, repeatability, and reliability** of measurements in diverse probing and operational modes.

Scope & Key Aspects of IS 15635 Series:

Part	Scope	Key Aspects
Part 1	Vocabulary for CMMs	Terms for components, measurement types, probing and error types; includes machine types and GPS alignment
Part 2	Linear dimension tests for Cartesian CMMs	Length error (E0, E150), repeatability (R0), 105 measurements, 0 & 150 mm stylus tip offsets
Part 3	CMMs with rotary table (4th axis)	Tests radial, tangential, axial errors using dual test spheres; periodic checks

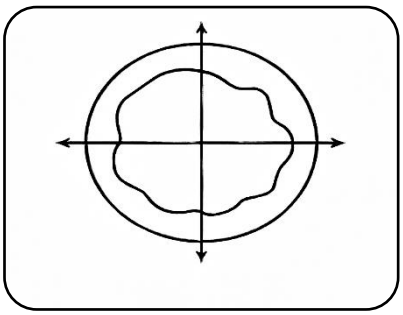
Part 4	CMMs in scanning mode	Measures scanning error (Tij), max permissible time; tests use 3 mm tip on spheres
Part 5	Contacting probing systems (single/multiple stylus)	Tests for various stylus/probe setups; errors in size, form, location; aligned with ISO 10360-5
Part 6	Gaussian feature computation via software	Validates software for lines, circles, spheres, etc.; checks for location, orientation, size, angle
Part 7	Imaging probe CMMs	Tests probing, repeatability, squareness; special error types (EB, EU, PF2D, ESQ); Annex D for thermal compensation
Part 8	Optical distance sensors	Applies to point and area sensors; errors in size, form, length, flatness; strict environmental controls
Part 9	Multiple probing systems	Includes contact/non-contact probes; measures form, size, location; standard error notations used
Part 10	Laser trackers in CMS	Evaluates probing and length errors; supports IFM and ADM modes; includes thermal/inclinometer checks
Part 12	Articulated arm CMMs	Tests form/size errors, articulated location; uses SPAT test, thermal/orientation adjustment

Code of Practices

IS 15373 : 2003 [Method for the Assessment of Departure from Roundness - Measurement of Variations in Radius]

Scope:

This Indian Standard outlines a method for evaluating roundness deviations in workpieces using contact (stylus) instruments, including usage and calibration guidelines. It defines analysis relative to centers like least squares, minimum zone, and circumscribed/inscribed circles, enabling precise, standardized roundness measurement in engineering and metrology.



Key Aspects:

- **Measurement Method & Instruments**: Uses contact (stylus) instruments to assess roundness by detecting radius variations; includes rotating stylus or rotating workpiece setups.
- **Calibration & Accuracy**: Specifies static and dynamic calibration procedures to ensure instrument precision and reliability.
- **Roundness Centers & Applications**: Defines analysis based on least squares, minimum zone, circumscribed, and inscribed circles, each suited for specific measurement contexts.
- **Error Handling & Graphing**: Addresses measurement errors (e.g., spindle, rotation) with correction methods like multi-step and reversal; includes guidance on polar graph plotting and surface roughness effects.

IS 3455 : 1971 (Reaffirmed in 2020) [Gauging Practice for Plain Workpieces]

Scope: This Indian Standard (IS 3455) lays down the gauging practices for inspection of plain workpieces with dimensions less than 500 mm. It details the use of limit gauges as the acceptable method for checking dimensional conformity of plain workpieces, specifies manufacturing tolerances, and permissible wear limits of gauges. The standard also establishes guidelines for inspection by manufacturers and purchasers, reference temperatures for measurements, and the application of the Taylor Principle for interpreting size limits. It aims to ensure uniformity and accuracy in gauging practices within the country for engineering components.

Key Aspects:

- **Inspection Method & Principle**: Uses GO and NO GO limit gauges for dimensional checks, applying the Taylor Principle to ensure functional fits for holes and shafts.
- **Gauge Types**: Covers internal and external gauge types such as cylindrical, spherical, segmental, ring, gap, and rod gauges.
- **Tolerances & Temperature**: Specifies manufacturing tolerances, permissible wear limits, and standardizes measurements at 20°C.
- **Usage & Verification**: Outlines inspection procedures, including regular wear checks using reference gauges and disks for accuracy assurance.

Special Publications

SP 27 : 1987 (Reaffirmed in 2003) [Handbook of Method of Measurement of Building Works]

Scope: This handbook consolidates Indian Standards on measurement methods for building and civil engineering works, promoting uniformity across agencies and ensuring fair, clear communication. It covers rules for various trades—like earthwork, concrete, and brickwork—along with terminology, rounding, and general provisions, serving as a unified reference since 1987.

Key Aspects:

- **Standardization & Scope**: Establishes uniform measurement practices across 25 construction trades, including earthwork, concrete, plumbing, and painting.
- **Units & Terminology**: Uses metric units with defined rounding rules; clearly explains key terms to avoid ambiguity.
- **Material & Work Measurement**: Details separate measurement methods for materials like cement, steel, and timber; outlines rules for booking dimensions and special site conditions.
- **Specific Guidelines**: Covers detailed measurement methods for earthwork, foundations, and various concrete types including formwork and finishes.