
**Geometrical product specifications
(GPS) — Dimensional measuring
equipment —**

**Part 2:
Calliper depth gauges; Design and
metrological characteristics**

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*Spécification géométrique des produits (GPS) — Équipement de
mesurage dimensionnel —*

*Partie 2: Jauges de profondeur; caractéristiques de conception et
caractéristiques métrologiques*

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 13385-2 was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

This first edition of ISO 13385-2, together with ISO 13385-1, cancels and replaces ISO 3599:1976 and ISO 6906:1984, which have been technically revised.

ISO 13385 consists of the following parts, under the general title *Geometrical product specifications (GPS) — Dimensional measuring equipment*:

- *Part 1: Callipers; Design and metrological characteristics*
- *Part 2: Calliper depth gauges; Design and metrological characteristics*

Introduction

This part of ISO 13385 is a geometrical product specification (GPS) standard and is to be regarded as a general GPS standard (see ISO/TR 14638). It influences chain link 5 of the chains of standards on size and distance in the general GPS matrix.

The ISO/GPS Masterplan given in ISO/TR 14638 gives an overview of the ISO/GPS system of which this document is a part. The fundamental rules of ISO/GPS given in ISO 8015 apply to this document and the default decision rules given in ISO 14253-1 apply to specifications made in accordance with this document unless otherwise indicated.

For more detailed information on the relation of this part of ISO 13385 to other standards and the GPS matrix model, see Annex E.

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Geometrical product specifications (GPS) — Dimensional measuring equipment —

Part 2: Calliper depth gauges; Design and metrological characteristics

1 Scope

This part of ISO 13385 provides the most important design and metrological characteristics of calliper depth gauges:

- with analogue indication: vernier scale or circular scale (dial), and
- with digital indication: digital display.

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2 Normative references (standards.iteh.ai)

The following referenced documents are indispensable for the application of this document. For dated references, only the cited editions apply. For undated references, the latest edition of the referenced document (including any amendments) applies. <https://standards.iteh.ai/standards/sist/fd4a3ba9-aede-43d3-93fc-00e0d3e3f1c5/iso-13385-2-2011>

ISO 14253-1, *Geometrical Product Specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 1: Decision rules for proving conformance or non-conformance with specifications*

ISO 14253-2:2011, *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 2: Guidance for the estimation of uncertainty in GPS measurement, in calibration of measuring equipment and in product verification*

ISO 14978:2006, *Geometrical product specifications (GPS) — General concepts and requirements for GPS measuring equipment*

IEC 60529, *Degrees of protection by enclosures (IP Code)*

ISO/IEC Guide 98-3, *Uncertainty of measurement — Part 3: Guide to the expression of uncertainty in measurement (GUM:1995)*

ISO/IEC Guide 99, *International vocabulary of metrology — Basic and general concepts and associated terms (VIM)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 14978, ISO/IEC Guide 99 and the following apply.

3.1 calliper depth gauge
 measuring instrument which gives the evaluation of a dimensional quantity of a step or depth of a feature corresponding to the distance between the end of a beam and the face of a measuring base on the basis of the movement of a slider, moving relative to a measuring scale on a rigid beam

See Figure 1.

NOTE The indication may be either analogue (vernier), circular scale or digital. Regarding data transfer, see 4.3.2.

3.2 measuring face contact
 contact between the measuring face and a feature of a workpiece

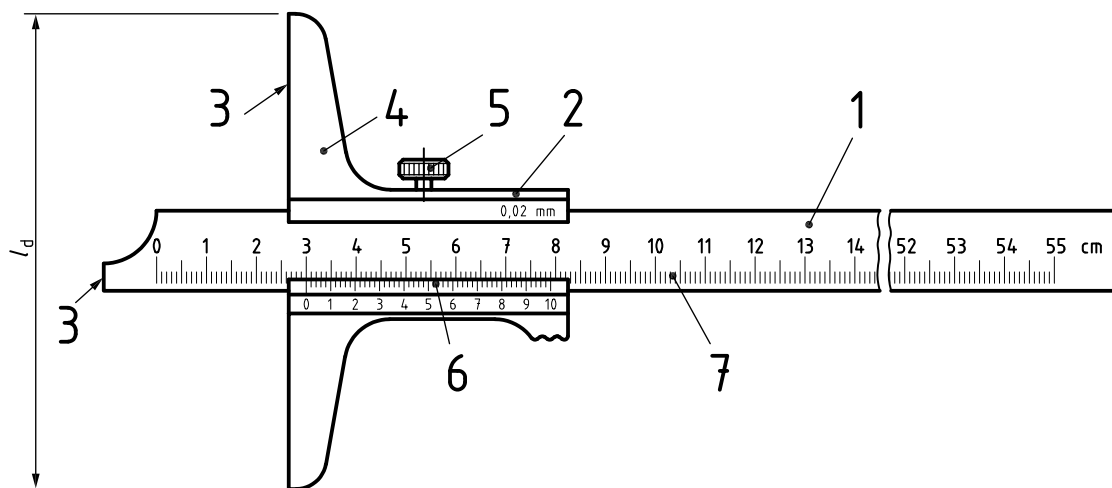
3.2.1 partial measuring face contact
 contact between a partial area of the measuring face and a feature of a workpiece

4 Design characteristics

4.1 General design and nomenclature

The general design and workmanship of the calliper depth gauges shall be such that its metrological characteristics comply with this part of ISO 13385 under all operational orientations unless otherwise specified by the manufacturer.

See Figure 1 for general design.



Key

1	beam	5	locking screw
2	slider	6	vernier scale
3	measuring face	7	main scale
4	measuring base		
l_d	length of measuring base		

Figure 1 — Example for a design of a calliper depth gauge (slider with locking screw)

4.2 Dimensions

The dimensions of the measuring base which are given in Table 1 are typical dimensions.

Table 1 — Dimensions of calliper depth gauges

Dimensions in millimetres

Measuring range up to	Typical length, l_d , of the measuring base
150	100
200	100
250	100
300	100 to 150
350	100 to 150
500	150 to 250
600	150 to 250

For calliper depth gauges with changeable bases, the following base lengths are preferred: 180 mm, 260 mm, 320 mm.

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4.3 Types of indicating devices

4.3.1 General

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Several types of indicating devices exist: [catalog/standards/sist/fd4a3ba9-aede-43d3-93fc-00e0d3e3ffc5/iso-13385-2-2011](#)

- analogue indicating devices with either a vernier scale or a circular scale (see Figures 2 and 7);
- digital indicating devices with a digital display (see Figure 8).

On calliper depth gauges with analogue indicating devices, the scale interval and its unit shall be labelled.

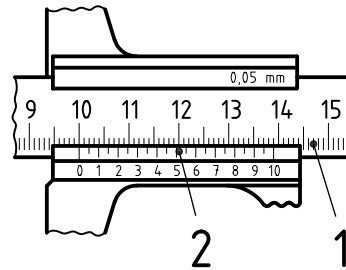
On calliper depth gauges with a digital indicating device, the unit of the indication shall be labelled.

4.3.2 Analogue indicating devices

4.3.2.1 General

The scale interval of the main scale on the beam of a calliper depth gauge with a vernier scale shall be 1 mm. The main scale shall be longer by at least one vernier scale length than the measuring range of the calliper depth gauge. In the case of calliper depth gauges with circular scales, the scale interval on the beam may be 1 mm or 2 mm (see Figure 7).

4.3.2.2 Main scale and vernier scale



- Key**
 1 main scale
 2 vernier scale

NOTE The actual reading in this figure is 100,00 mm.

Figure 2 — Example of an analogue indicating device with vernier scale

4.3.2.3 Design of vernier scale

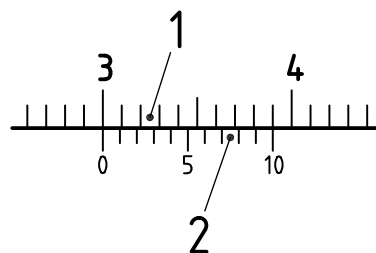
The graduating method of vernier scales is shown in Table 2.

Table 2 — Graduating methods of vernier scales

Dimensions in millimetres

Main scale interval	Graduating method of vernier scales	Nominal vernier scale interval	Explanatory figure
1	Divide 9 mm into 10 equal parts	0,1	Figure 3
1	Divide 19 mm into 10 equal parts	0,1	
1	Divide 19 mm into 20 equal parts	0,05	
1	Divide 39 mm into 20 equal parts	0,05	
1	Divide 49 mm into 50 equal parts	0,02	Figure 4

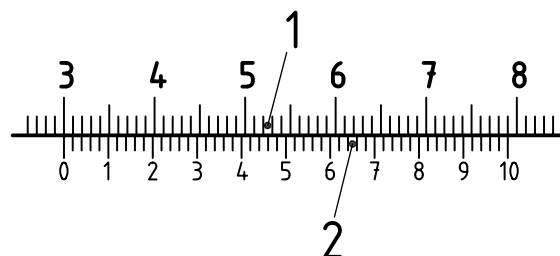
Examples of vernier scales with vernier intervals of 0,1 mm and 0,02 mm are shown in Figures 3 and 4.



- Key**
 1 main scale
 2 vernier scale

NOTE The actual reading in this figure is 30,0 mm.

Figure 3 — 0,1 vernier scale of length 9 mm



- Key**
 1 main scale
 2 vernier scale

NOTE The actual reading in this figure is 30,00 mm.

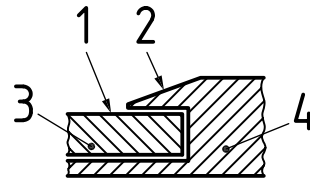
Figure 4 — 0,02 vernier scale of length 49 mm

4.3.2.4 Scale surface

For common types of scale surfaces, see Figures 5 and 6.

Key

- 1 main scale
- 2 vernier scale
- 3 beam
- 4 slider

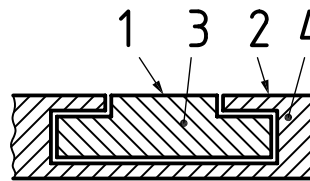


The height difference between the edge of the vernier scale surface and the main scale surface should be as small as practical.

Figure 5 — Standard slider with vernier scale

Key

- 1 main scale
- 2 vernier scale
- 3 beam
- 4 slider



The main scale surface and vernier scale surface shall be nominally at the same level and the distance between the main scale and the vernier scale should be as small as practical.

Figure 6 — Slider with vernier scale for readings without parallax error
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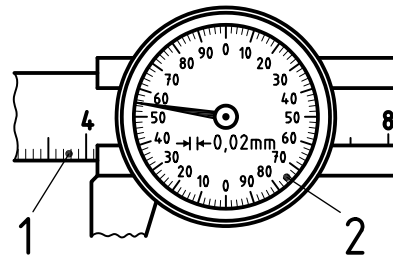
4.3.2.5 Main scale and circular scale

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The main scale is located on the beam and the circular scale is located on the slider. The circular scale shall be graduated in scale intervals. The scale interval and its unit shall be labelled.

Key

- 1 main scale
- 2 circular scale



NOTE The actual reading in this figure is 41,55 mm.

Figure 7 — Example of analogue indicating device with circular scale

4.3.3 Digital indicating devices

Key

- 1 electronic main scale
- 2 digital display

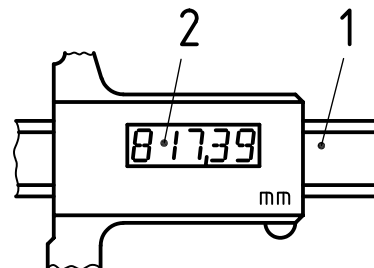


Figure 8 — Example of digital indicating device with digital display