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

**Part 1:
Design and metrological
characteristics of callipers**

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

*Partie 1: Caractéristiques de conception et caractéristiques
métrologiques des pieds à coulisse*

ISO 13385-1:2019

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

This second edition cancels and replaces the first edition (ISO 13385-1:2011), which has been technically revised.

The main changes compared to the previous edition are as follows:

- figures have been updated to show more modern technology;
- general design characteristics have been removed and reference to ISO 14978:2018 included;
- metrological characteristics have been clarified and modified;
- requirements for test methods have been included;
- default values for maximum permissible errors have been added.

A list of all parts in the ISO 13385 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is a geometrical product specification (GPS) standard and is to be regarded as a general GPS standard (see ISO 14638). It influences the chain links F and G of the chain of standards on size and distance in the general GPS matrix (see [Annex C](#)).

The ISO/GPS matrix model given in ISO 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; see ISO/TR 14253-6 for additional information on the selection of alternative decision rules.

For more detailed information on the relation of this document to other standards and the GPS matrix model, see [Annex C](#).

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Geometrical product specifications (GPS) — Dimensional measuring equipment —

Part 1: Design and metrological characteristics of callipers

1 Scope

This document provides the most important design and metrological characteristics of callipers

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

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 14253-1, *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 1: Decision rules for verifying conformity or nonconformity with specifications*

ISO 14253-5, *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 5: Uncertainty in verification testing of indicating measuring instruments*

ISO/TR 14253-6, *Geometrical product specifications (GPS) — Inspection by measurement of workpieces and measuring equipment — Part 6: Generalized decision rules for the acceptance and rejection of instruments and workpieces*

ISO 14978:2018, *Geometrical product specifications (GPS) — General concepts and requirements for GPS measuring equipment*

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 and ISO/IEC Guide 99 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

**3.1
calliper**

measuring instrument which evaluates a dimensional quantity of an internal or external feature on the basis of opposing contact from the movement of a slider with a measuring jaw, moving relative to a measuring scale on a rigid beam and to a fixed jaw

Note 1 to entry: See examples in [Figures 1, 2](#) and [3](#).

Note 2 to entry: Callipers can be equipped for additional measurements, such as depth and step measurements (see [Figures 1](#) and [2](#)).

Note 3 to entry: The indication can be either analogue (vernier scale or circular scale) or digital.

**3.2
measuring face contact**

contact between the measuring face and an integral feature of a workpiece

**3.2.1
full measuring face contact**

contact between the full area of the measuring face and an integral feature of a workpiece

**3.2.2
partial measuring face contact**

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

**3.2.3
measuring face line contact**

contact between a line, nominally perpendicular to the length of the jaws, on the measuring face and an integral feature of a workpiece

4 Design characteristics

4.1 General design and nomenclature

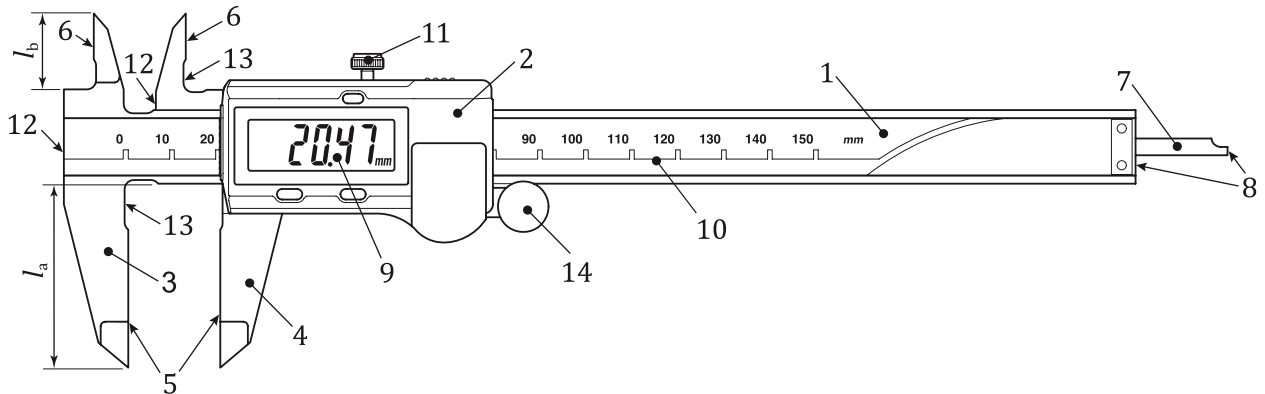
The design shall follow the general guidelines in ISO 14978, including the common design characteristics in ISO 14978:2018, Annex C. Examples of the general design of callipers are shown in [Figures 1, 2](#) and [3](#).

The scale interval of the main scale on the beam of a calliper with a vernier scale shall be 1 mm. In the case of callipers with circular scales, the scale interval on the beam shall be either 1 mm or 2 mm.

4.2 Dimensions

The manufacturer shall state important calliper design dimensions, such as those shown in [Table 1](#). The values shown in [Table 1](#) are typical dimensions of the elements of callipers and are not requirements of this document. [Table 1](#) does not include the length of the undercut, which is typically kept as small as practicable.

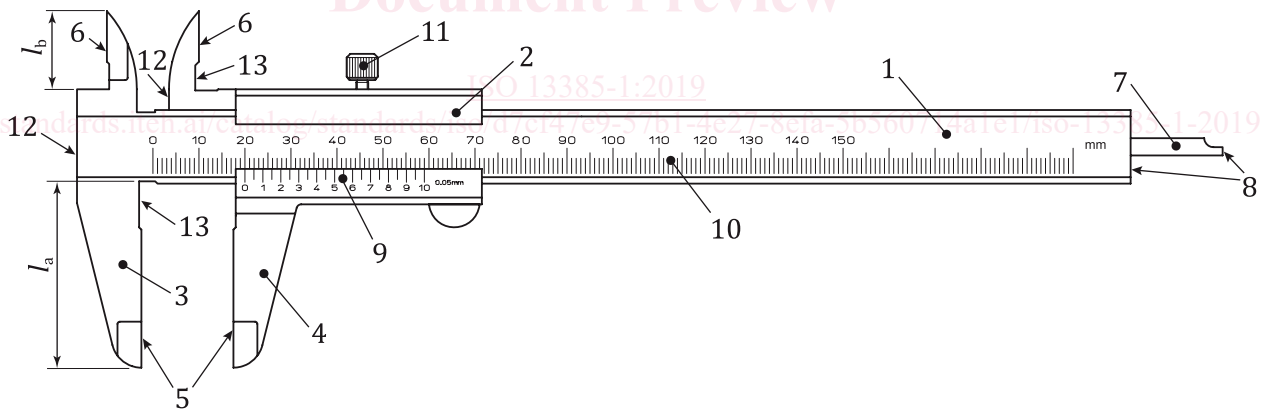
For callipers equipped with a depth measuring rod, the manufacturer shall state the cross-sectional dimensions of the rod, for example \varnothing 1,5 mm for round section or 1,2 mm × 3 mm for rectangular section.



Key

- | | |
|--|---|
| 1 beam | 9 digital display |
| 2 slider | 10 main scale |
| 3 fixed (measuring) jaw | 11 locking screw |
| 4 sliding (measuring) jaw | 12 measuring faces for step measurement |
| 5 measuring faces for external measurements | 13 undercut |
| 6 measuring faces for internal measurements (crossed knife-edge faces) | 14 thumb roller |
| 7 depth measuring rod | l_a length of jaw for external measurements |
| 8 measuring faces for depth measurement | l_b length of jaw for internal measurements |

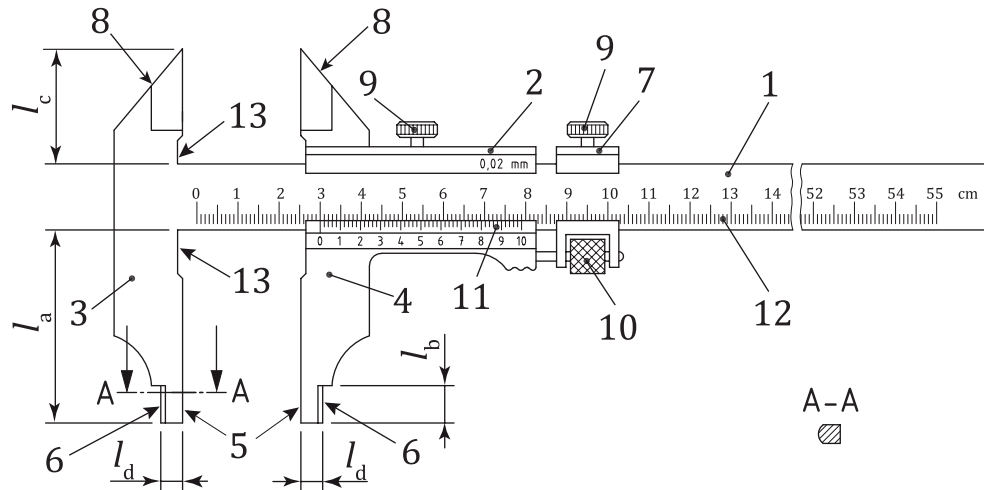
Figure 1 — Example design of callipers with digital display for external, internal, depth and step measurement



Key

- | | |
|--|---|
| 1 beam | 8 measuring faces for depth measurement |
| 2 slider | 9 vernier scale |
| 3 fixed (measuring) jaw | 10 main scale |
| 4 sliding (measuring) jaw | 11 locking screw |
| 5 measuring faces for external measurements | 12 measuring faces for step measurement |
| 6 measuring faces for internal measurements (crossed knife-edge faces) | 13 undercut |
| 7 depth measuring rod | l_a length of jaw for external measurements |
| | l_b length of jaw for internal measurements |

Figure 2 — Example design of vernier callipers for external, internal, depth and step measurement



Key

- 1 beam
- 2 slider
- 3 fixed (measuring) jaw
- 4 sliding (measuring) jaw
- 5 measuring faces for external measurements
- 6 measuring faces for internal measurements
- 7 fine adjustment clamp
- 8 knife edges for external measurements
- 9 locking screw
- 10 fine adjustment device
- 11 vernier scale
- 12 main scale
- 13 undercut
- l_a length of jaw for external measurements
- l_b length of jaw for internal measurements
- l_c length of knife-edge jaw for external measurements
- l_d width of measuring faces

Figure 3 — Example design of vernier callipers for external and internal measurements and with a fine adjustment device

Table 1 — Typical dimensions of callipers

Dimensions in millimetres

Measuring range less than or equal to	Lengths l_a , l_b and l_c of the jaws					Width l_d of the faces for internal measurement
	Calliper according to Figure 1 or 2		Calliper according to Figure 3			
	l_a	l_b	l_a	l_b	l_c	
150	40	8 to 20	50	8 to 10	25 to 35	5
200	40 to 50	8 to 25	60 to 80	8 to 10	25 to 35	5
300	60 to 65	10 to 30	70 to 100	10 to 12	35 to 45	5
500	70 to 95	15 to 40	100 to 150	15 to 20	50 to 60	5 or 10
750	70 to 95	15 to 40	100 to 150	15 to 20	50 to 60	5 or 10
1 000	100 to 130	20 to 60	125 to 150	20 to 30	50 to 60	10 to 20
1 500	100 to 130	20 to 60	150 to 200	20 to 30	50 to 60	10 to 20
2 000	100 to 130	20 to 60	150 to 200	20 to 30	50 to 60	10 to 20

NOTE The measuring range refers to external measurements for the callipers in Figures 1, 2 and 3.