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**Geometrical product specifications  
(GPS) — Dimensional measuring  
equipment; Height gauges — Design and  
metrological characteristics**

*Spécification géométrique des produits (GPS) — Équipement de  
mesurage dimensionnel; Mesureurs verticaux — Caractéristiques de  
conception et caractéristiques métrologiques*

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Published in Switzerland

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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 13225 was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

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## Introduction

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

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 of the relation of this International Standard to the GPS matrix model, see Annex D.

This International Standard is intended to serve the purpose of promoting

- the relationship between the manufacturer and purchaser, and
- the management of measuring instruments in the quality-assurance system.

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# Geometrical product specifications (GPS) — Dimensional measuring equipment; Height gauges — Design and metrological characteristics

## 1 Scope

This International Standard specifies the most important design and metrological characteristics of height gauges (with analogue indication or digital indication) for linear-dimensional measurements perpendicular to a surface plate.

## 2 Normative references

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.

ISO 1:2002, *Geometrical Product Specifications (GPS) — Standard reference temperature for geometrical product specification and verification*

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, *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 provided 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

#### height gauge

measuring instrument in which a slider with a measuring stylus moves relative to a measuring scale on a beam and in which this motion is along a single vertical axis nominally perpendicular to a reference plane on the instrument base

NOTE 1 Height gauges are designed to be used with surface plates in which the reference plane of the height gauge is placed in contact with the surface plate.

NOTE 2 Various types of measuring scales on the beam with appropriate indication are possible, such as analogue indication, including vernier and circular scales, and digital indication.

NOTE 3 Most height gauges are capable of using various types of measuring styli, including a scriber.

NOTE 4 Height gauges are sometimes equipped with motorized motion of the slider, while on others the slider can only be moved by hand (manually).

NOTE 5 Height gauges are sometimes equipped with a device to control the measuring force.

NOTE 6 Height gauges are sometimes designed only for measuring distances parallel to the beam while others have measuring devices which allow for more complex measurements, including scanning functions and measurements perpendicular to the beam.

### 3.2 measuring-face contact

contact between the measuring face and a feature of a workpiece

#### 3.2.1 full measuring-face contact

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

#### 3.2.2 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

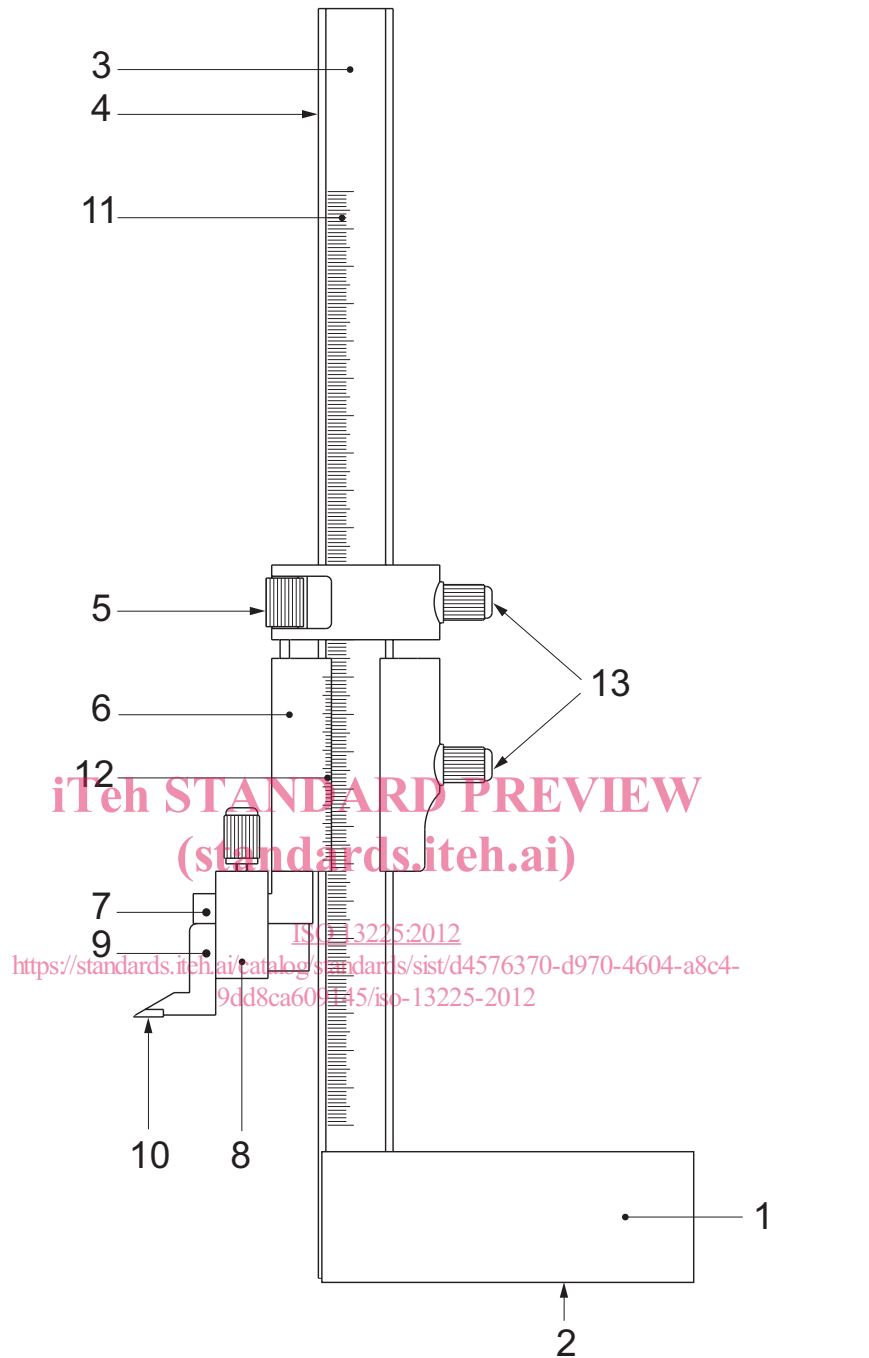
The general design and workmanship of the height gauge shall be such that its metrological characteristics comply with the requirements of this International Standard, unless otherwise specified by the manufacturer.

The height gauge can be manually moved on a surface plate. Between the height gauge and surface plate there may be

- mechanical contact, or <https://standards.iteh.ai/catalog/standards/sist/d4576370-d970-4604-a8c4-9dd8ca609145/iso-13225-2012>
- an air bearing system.

The general terms related to the structure of the height gauge are given and illustrated in Figures 1 and 2. The representations given in Figures 1 and 2 are only examples of height gauge design.

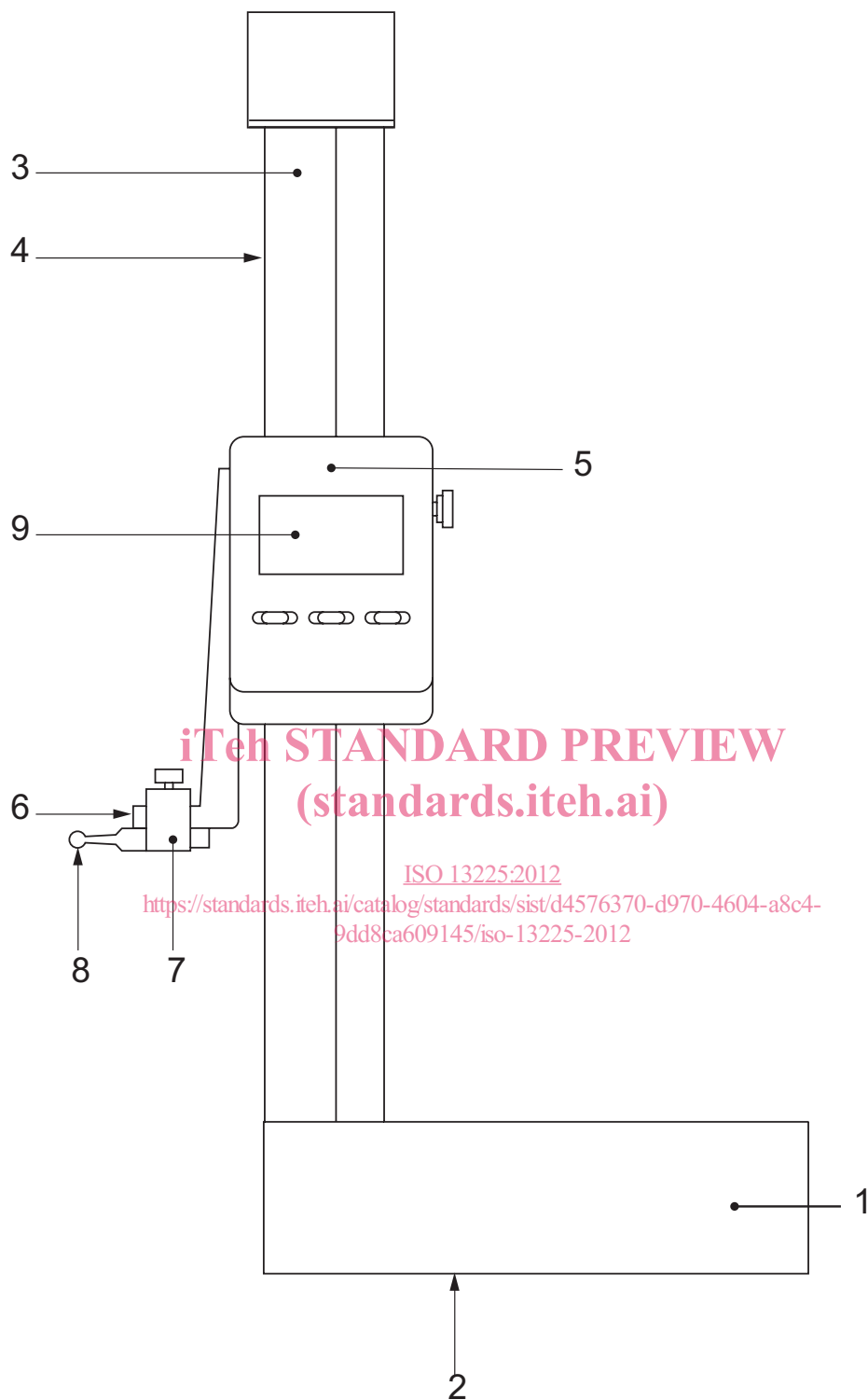




**Key**

- |                                   |                                 |                    |
|-----------------------------------|---------------------------------|--------------------|
| 1 instrument base                 | 6 slider                        | 11 main scale      |
| 2 instrument-base reference plane | 7 probe extension               | 12 vernier scale   |
| 3 beam                            | 8 fixing device                 | 13 locking devices |
| 4 guiding face                    | 9 measuring and scribing stylus |                    |
| 5 fine-adjustment device          | 10 measuring face               |                    |

**Figure 1 — Example and nomenclature of height gauge with vernier scale**



**Key**

- |                                   |   |
|-----------------------------------|---|
| 1 instrument base                 | 6 probe extension                                 |
| 2 instrument base reference plane | 7 fixing device                                   |
| 3 beam                            | 8 stylus tip (the measuring face in this example) |
| 4 guiding face                    | 9 digital display                                 |
| 5 slider                          |   |

**Figure 2 — Example and nomenclature of height gauge with digital indication on the slider**

## 4.2 Main dimensions

As a minimal requirement, the manufacturer shall specify the main dimensions as shown in Figure 3 and Table 1.

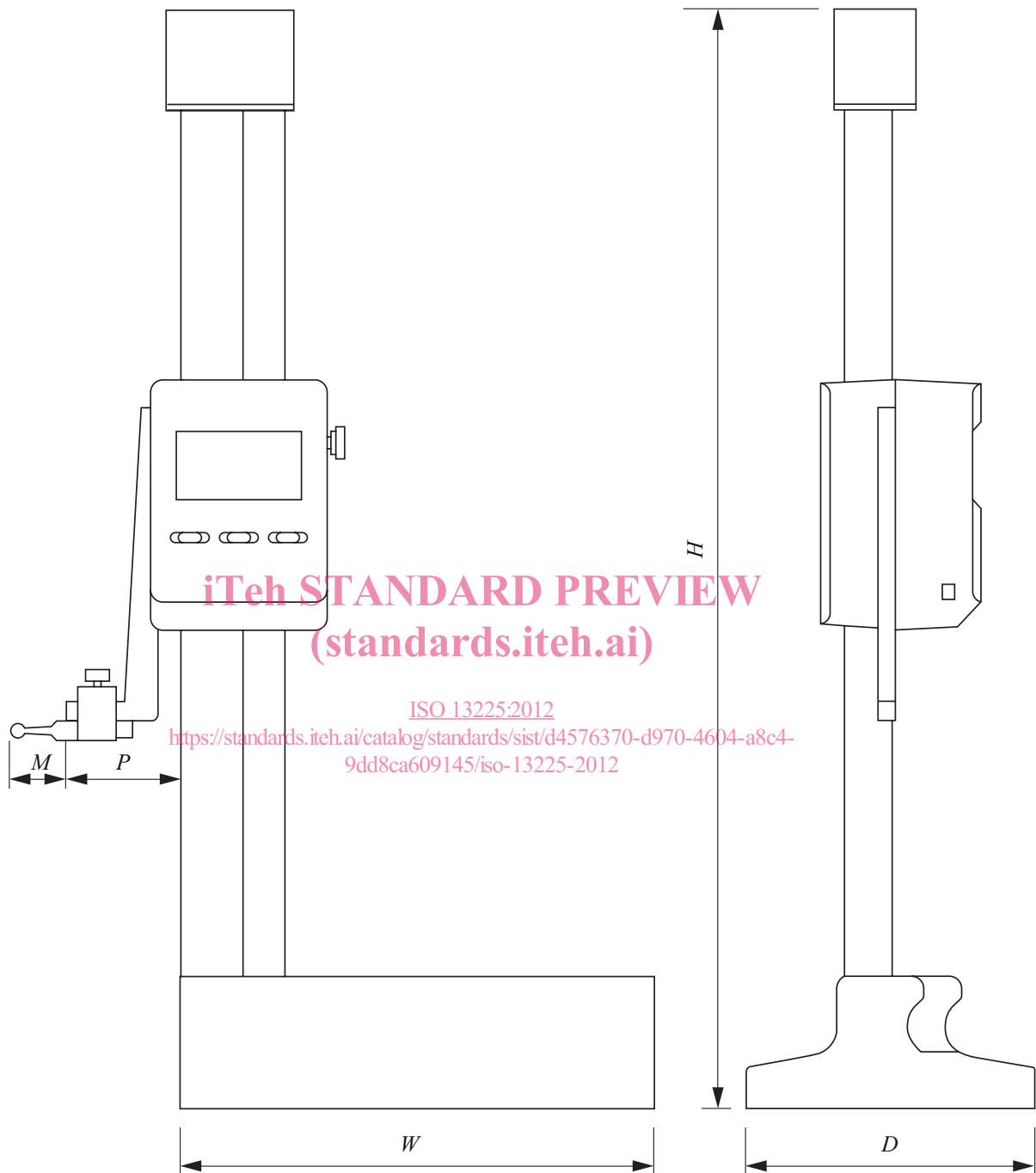


Figure 3 — Main dimensions of height gauge

**Table 1 — Main dimensions and design characteristics**

Characteristics			
Main dimensions	Width of instrument base	$W$	mm
	Depth of instrument base	$D$	
	Overall height	$H$	
	Measuring range	$L$	
	Probe extension offset	$P$	
	Minimum stylus length	$M_{min}$	
	Maximum stylus length	$M_{max}$	
Air bearing system	Yes/No	if Yes: air pressure consumption	Pa l/min
Fixing devices	Yes/No		
Presence of fine adjustment	Yes/No		
Protection	Water or dust		IP code
	Yes/No		

**4.3 Types of indicating devices**

**4.3.1 General**

Several types of indicating devices are possible.

- analogue indicating devices with a vernier scale or circular scale (see Figures 4 and 9);
- digital indicating devices with digital display (see Figure 10);

NOTE Combinations of these types of indicating devices are possible.

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

On instruments with digital indicating devices, the unit of the indication shall be labelled.

**4.3.2 Analogue indicating devices with a vernier scale**

**4.3.2.1 General**

The scale interval of the main scale on the beam of an instrument with a vernier scale shall be specified in millimetres.

The main scale shall be longer, by at least one vernier scale length, than the measuring range of the instrument.

In the case of instruments with circular scales, the scale interval on the beam may be greater than 1 mm.