
**Geometrical product specifications
(GPS) — Dimensional measuring
equipment: Dial test indicators (lever
type) — Design and metrological
characteristics**

*Spécification géométrique des produits (GPS) — Équipement de
mesurage dimensionnel. Comparateurs à levier mécaniques —
Caractéristiques de conception et caractéristiques métrologiques*

ISO 9493:2010

[https://standards.iteh.ai/catalog/standards/sist/5c304527-04d3-4643-
8972-71e88e5f3c9d/iso-9493-2010](https://standards.iteh.ai/catalog/standards/sist/5c304527-04d3-4643-8972-71e88e5f3c9d/iso-9493-2010)



PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 9493:2010

<https://standards.iteh.ai/catalog/standards/sist/5c304527-04d3-4643-8972-71e88e5f3c9d/iso-9493-2010>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2010

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction.....	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Design characteristics	2
4.1 General design features.....	2
4.2 Type	2
4.3 Nomenclature.....	4
4.4 Dovetail mounting	4
4.5 Dial and pointer	5
4.6 Stylus	6
4.7 Zero adjustment.....	7
4.8 Design characteristics (manufacturer's specification).....	7
5 Metrological characteristics	7
5.1 Maximum permissible error (MPE) and maximum permissible limit (MPL) for a number of metrological characteristics.....	7
5.2 Stylus	8
5.3 Measuring forces	8
6 Proving of conformance with specification.....	8
6.1 General	8
6.2 Measurement standards for calibration of metrological characteristics	8
7 Marking.....	8
Annex A (informative) Examples of a diagram of errors of indication	9
Annex B (informative) Example of data sheet for dial test indicators	11
Annex C (informative) Calibration of metrological characteristics.....	13
Annex D (informative) Notes on use	15
Annex E (informative) Relation to the GPS matrix model.....	17
Bibliography.....	19

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 9493 was prepared by Technical Committee ISO/TC 213, *Dimensional and geometrical product specifications and verification*.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 9493:2010

<https://standards.iteh.ai/catalog/standards/sist/5c304527-04d3-4643-8972-71e88e5f3c9d/iso-9493-2010>

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 chains of standards on size, distance, form of a line independent of datum, form of a line dependent of datum, form of a surface independent of datum, form of a surface independent of datum, orientation, location, circular run-out and total run-out in the general GPS matrix.

When using this International Standard, see ISO 14978.

For more detailed information on the relation of this International Standard to other standards and the GPS matrix, see Annex E.

iTeh STANDARD PREVIEW (standards.iteh.ai)

ISO 9493:2010

<https://standards.iteh.ai/catalog/standards/sist/5c304527-04d3-4643-8972-71e88e5f3c9d/iso-9493-2010>

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

ISO 9493:2010

<https://standards.iteh.ai/catalog/standards/sist/5c304527-04d3-4643-8972-71e88e5f3c9d/iso-9493-2010>

Geometrical product specifications (GPS) — Dimensional measuring equipment: Dial test indicators (lever type) — Design and metrological characteristics

1 Scope

This International Standard specifies the most important design and metrological characteristics of dial test indicators (lever type).

2 Normative references

The following referenced documents are indispensable for the application 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 14253-1:1998, *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:—¹⁾, *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*

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/IEC Guide 99, ISO 14253-1, ISO 14253-2, ISO 14978 and the following apply.

3.1

dial test indicator

⟨lever type⟩ measuring instrument in which the displacement of a pivoting stylus is transmitted and magnified by suitable mechanical means to a pointer which rotates in front of a circular scale

1) To be published. (Revision of ISO/TS 14253-2:1999)

4 Design characteristics

4.1 General design features

4.1.1 The general design and workmanship of the dial test indicator shall be such that its metrological characteristics comply with the requirements of this International Standard under all orientations of operation.

4.1.2 Dial test indicators indicate displacement in a direction normal to the axis of the stylus, and in the same plane as the rotational direction of the stylus, unless otherwise stated. See Figure D.1 as an example. If used at some other angle, a correction shall be made (see Annex D).

4.1.3 Dial test indicators shall be capable of measuring when the stylus is displaced in either direction from its rest position.

NOTE Some dial test indicators have the ability to measure in both directions without external adjustments and some dial test indicators are provided with a bias lever to change the measuring direction.

4.2 Type

Dial test indicators are commonly manufactured in three types [see Figure 1 a), b) and c)]. These types have the following names.

- Type S, Standard, where the dial face is mounted on the body of the dial test indicator, in a plane perpendicular to the plane in which the stylus moves.
- Type H, Horizontal, where the dial face is mounted on the body of the dial test indicator, in a plane parallel to the plane in which the stylus moves.
- Type V, Vertical, where the dial face is mounted at the end of the dial test indicator opposite that of the stylus.

NOTE Although less common, configurations of dial test indicators, which do not fall into the above three categories, exist. The above-mentioned list of three named types includes those that are the most common.

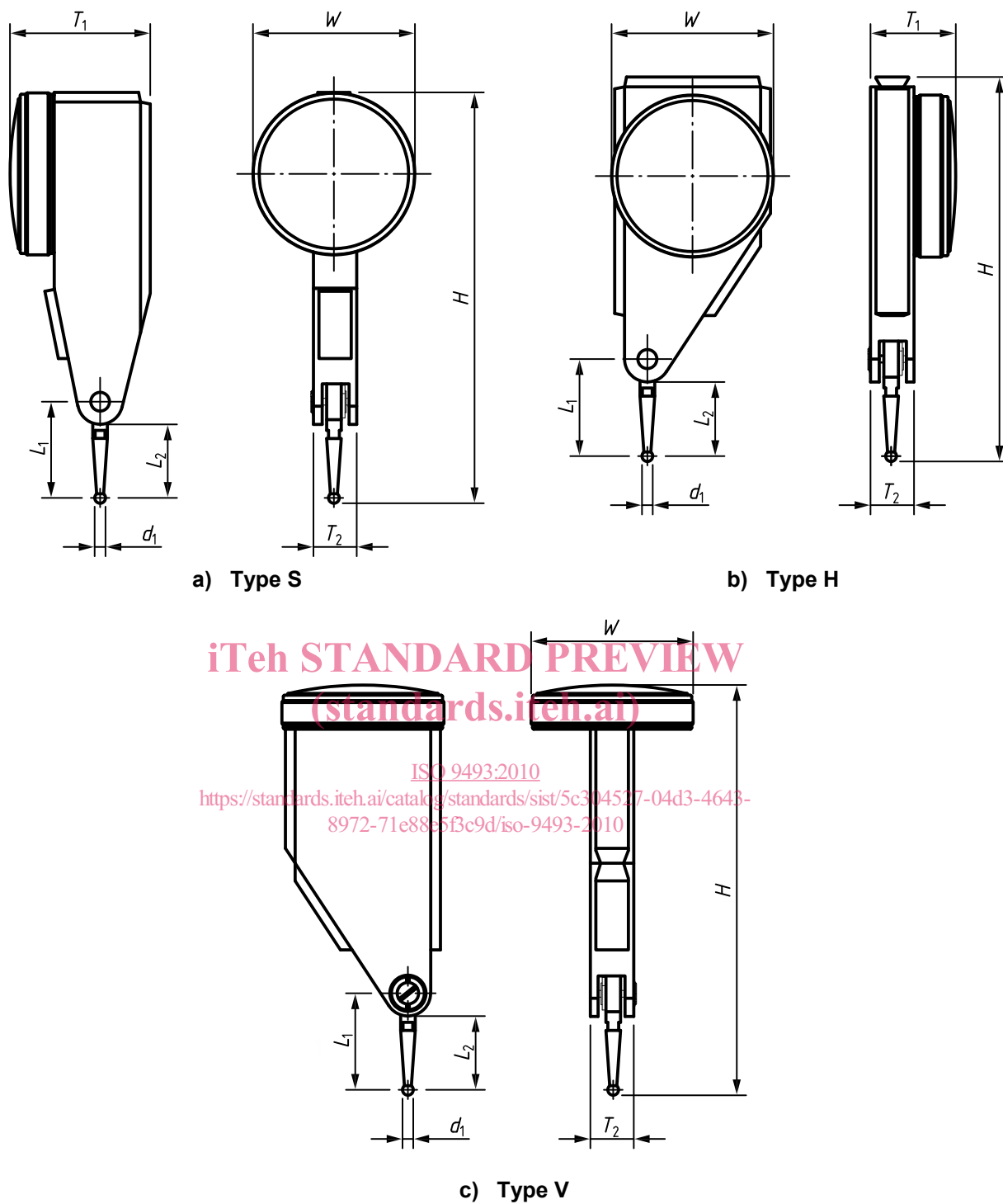
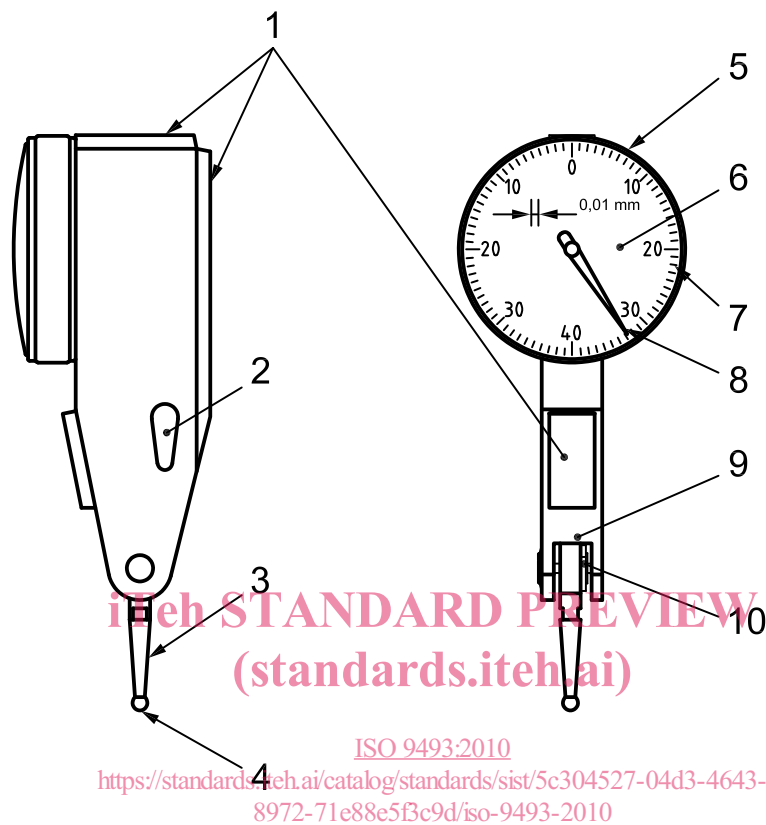


Figure 1 — Examples of dial test indicator types

4.3 Nomenclature

Design features of dial test indicators are shown in Figure 2. The descriptions in this International Standard use the nomenclature shown in this figure.



Key

- 1 dovetail segments
- 2 bias lever (if required)
- 3 stylus
- 4 stylus tip
- 5 bezel
- 6 dial
- 7 scale
- 8 pointer
- 9 housing
- 10 friction or ratchet drive

Figure 2 — Nomenclature

4.4 Dovetail mounting

Dial test indicators shall be provided with a means to facilitate attachment to test stands or other similar devices. This is often accomplished by means of dovetail segments on the body of the dial test indicator (see Figure 2) and a dovetail clamp. The exact design and location of these dovetail segments is left to the manufacturer's discretion.

Clamping stems shall conform to the fit tolerance h6 (see Figure 3 and Table 1) to ensure interchangeability. Common nominal diameters of clamping stems include 4 mm, 6 mm and 8 mm. A portion of the clamping stem (L_3 in Figure 3) no shorter than 12 mm shall be held to the fit tolerance (controlled diameter). The clamping stem can be longer than this minimum length, but it is not necessary to hold the h6 tolerance on the entire length.

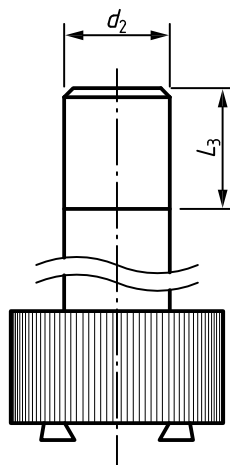


Figure 3 — Example of clamping stems

4.5 Dial and pointer

The circular scale shall be graduated in scale intervals. The scale interval and its unit shall be labelled. Examples of scale layouts are shown in Figure 4 (e.g. scale intervals of 0,01 mm, 0,001 mm, and 0,002 mm).

At rest, the pointer shall be at least 1/10 revolution counterclockwise from the point representing the beginning of the measuring range. This beginning point is normally the 12 o'clock or the 6 o'clock position on the dial. The pointer shall move at least one full revolution beyond this beginning point of the measuring range, to the next occurrence of this point, plus at least another 1/10 revolution before reaching the end of its travel. This range before the measuring range begins is called pre-span, and the range after one full revolution is called post-span. The pre-span and post-span movements shall not be considered in the measuring range of the dial test indicator.

<https://standards.iteh.ai/catalog/standards/sist/5c304527-04d3-4643-8972-71e88e5f3c9d/iso-9493-2010>

NOTE There are dial test indicators in use with less than 1/10 revolution of pre-span or post-span. In these cases, it is the responsibility of the user and the manufacturer to agree on the amount of pre-span allowed.

In any case, there shall be at least one full revolution of measuring range, plus some agreed upon amount of pre-span and post-span.

The dial test indicator may have a measuring range great enough to allow the pointer to move multiple complete dial revolutions. In practice, some dial test indicators with a measuring range of more than one complete revolution may include a secondary scale and pointer to denote the number of revolutions travelled by the primary pointer [e.g. Figure 4 c)]. When a revolution counting device is provided, the secondary pointer shall indicate the appropriate division on its scale when the pointer is at 12 o'clock on each of its revolutions.

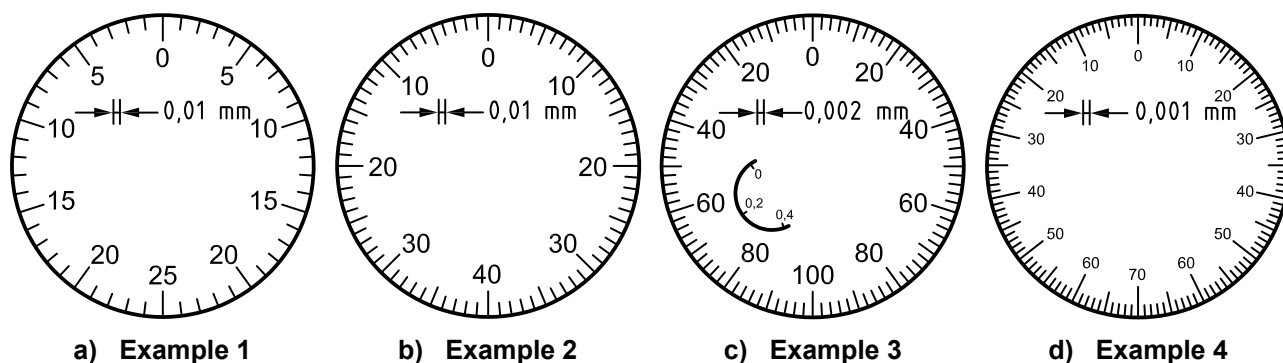


Figure 4 — Examples of scale layout