INTERNATIONAL STANDARD

ISO 18669-2

First edition
2004-09-01

Internal combustion engines — Piston pins —

Part 2: Inspection measuring principles

Moteurs à combustion interne — Axes de pistons —
Partie 2: Principes de mesure pour le contrôle

Reference number
ISO 18669-2:2004(E)

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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 18669-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*.

ISO 18669 consists of the following parts, under the general title *Internal combustion engines — Piston pins*:

Part 1: General specifications

Part 2: Inspection measuring principles

Internal combustion engines — Piston pins —

Part 2: Inspection measuring principles

1 Scope

This part of ISO 18669 defines the measuring principles to be used for measuring piston pins; it applies to piston pins from 8 mm up to and including 100 mm outside diameter for reciprocating internal combustion engines and compressors.

In certain applications, except road vehicles, and provided that mutual agreement is made between the purchaser and the manufacturer, this part of ISO 18669 may be used with suitable modifications.

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 1101, *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

ISO 2639, *Steels — Determination and verification of the depth of carburized and hardened cases*

ISO 4287, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*

ISO 4288, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Rules and procedures for the assessment of surface texture*

ISO 9934 (all parts), *Non-destructive testing — Magnetic particle testing*

ISO 6506 (all parts), *Metallic materials — Brinell hardness test*

ISO 6507 (all parts), *Metallic materials — Vickers hardness test*

ISO 6508 (all parts), *Metallic materials — Rockwell hardness test*

QS 9000, *Quality Systems Requirements*

ISO 14104:1995, *Gears — Surface temper etch inspection after grinding*

ISO 14253 (all parts), *Geometrical Product Specifications (GPS) — Inspection by measurement of work pieces and measuring equipment*

ISO 18669-1:2004, *Internal combustion engines — Piston pins — Part 1: Specifications*

EN 583 (all parts), *Non-destructive testing — Ultrasonic examination*

3 Measuring principles

3.1 General measuring conditions

The following general requirements are applicable to all measuring principles unless otherwise specified:

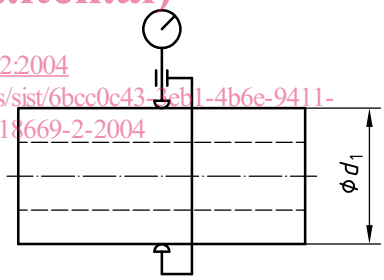
a) Measurements shall be made using instruments with a resolution not exceeding 10 % of the tolerance of the dimension being measured.

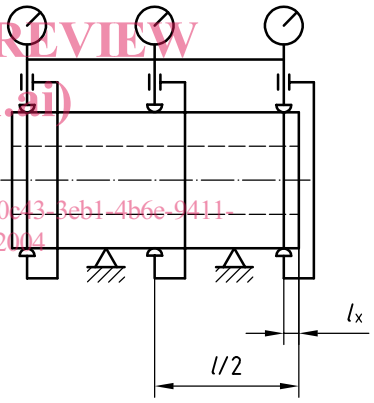
b) Concerning “Measuring uncertainty”, take notice of ISO 14253.

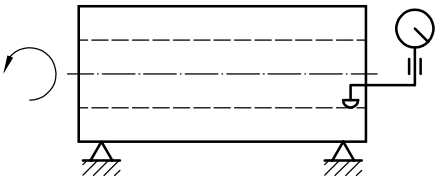
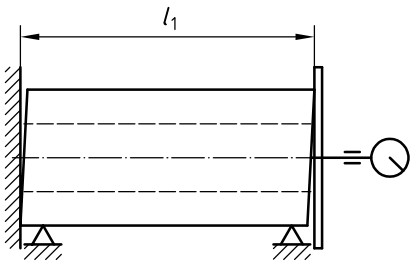
c) Concerning “Acceptance of gauge repeatability and reproducibility (% R & R)” take notice of QS 9000.

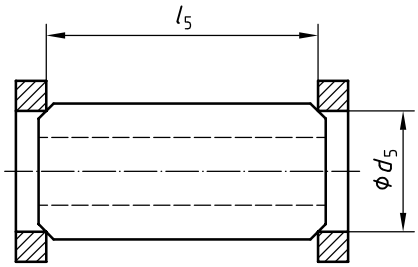
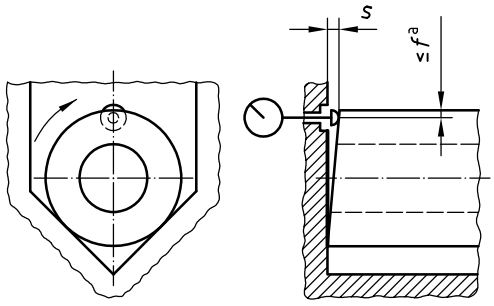
d) The reference temperature for outside-diameter measurements shall be 21 ± 1 °C.

3.2 Characteristics and measuring principles

Characteristic	Measuring principle
3.2.1 Outside diameter d_1	
Diameter of the outer surface measured at any point excluding areas of edge drop-off, b (see Figure 10, ISO 18669:2004).	**Method A:** Reference method. Measure with a precision calliper having spherical measuring probes each of radius 1,5 mm min. exerting a measuring force of approximately 1 N (see Figure 1).  **Figure 1 — Outside-diameter measuring principle** **Other methods:** All methods which are able to guarantee the required measurement uncertainty. Method must be agreed to between manufacturer and client. **Measurement uncertainty:** ± 0,000 5 mm in accordance with ISO 14253

Characteristic	Measuring principle
3.2.2 Cylindricity of the outside diameter d_1	
Geometric form of the peripheral surface excluding areas of edge drop-off, b. Characteristics measured in the axial direction are taper, convexity, concavity and waviness. (Reference: ISO 1101)	**Method A:** Record and evaluate a macro-form diagram of opposite sides in the axial direction (profile lines) or by recording and evaluating of a multiple polar diagram (measuring in min. 3 planes, near both ends and centre of pin). **Method B:** Outside diameter, d_1 measured in a V-block by diametral gauging at centre of piston pin and at distance l_x from both ends and calculating the difference rate (see Figure 2). Measuring sensor: according to 3.2.1. $l_x = 0{,}15 \times d_1 \quad d_1 \geqslant 50$ mm $l_x = 0{,}10 \times d_1 \quad d_1 < 50$ mm  **Figure 2 — Cylindricity measuring principle**
3.2.3 Circularity of the outside diameter d_1	
All deviations of the peripheral surface from circularity such as waviness, ovality and spherical-triangular forms. (Reference: ISO 1101)	Recording and evaluation of a macro-form diagram in the circumferential direction and at several planes (polar diagram).
3.2.4 Edge drop-off b, c	
Geometric form of the peripheral surface at the outside edges.	Record and evaluate a macro-form diagram on both ends in the axial direction (profile lines), (see Figure 10, ISO 18669-1:2004).
3.2.5 Inside diameter d_2, d_4	
Diameter of the bore measured at any point.	Measured with inside measuring devices.

Characteristic	Measuring principle
3.2.6 Concentricity of inside diameter ID relative to outside diameter OD	
Difference between the maximum and minimum dimensions of the wall thickness (a) as measured in a plane perpendicular to the peripheral surface. (Reference: ISO 1101)	**Method A:** Measured with a thickness gauge (e.g. dial calliper or comparable gauges) (see Figure 3).  **Figure 3 — Inside-diameter concentricity** (Radial runout) **Method B:** Measured with a calliper or probe-indicator by 360° rotation in a V-block (see Figure 4).  **Figure 4 — Wall-thickness measuring principle**
3.2.7 Length l_1	
Maximum dimension measured between two planes perpendicular to the peripheral surface.	**Method A:** Measured between two planes parallel to each other and perpendicular to the outside surface (see Figure 5).  **Figure 5 — Length measuring principle** **Other methods:** All methods, which are able to guarantee the required measurement uncertainty and take account of runout.

Characteristic	Measuring principle
3.2.8 Gauge length l_5	
Dimension between the gauge points measured perpendicular to the peripheral surface.	The pin is put between two ring gauges perpendicular to the outside surface, with inside diameters d_5. The sharp edges of these gauges measure from contact point to contact point. This "assembly" of pin and two rings is put in a height gauge and measured. A known standard is used to set the gauge at "0" (see Figure 6)  **Figure 6 — Gauge-length measuring principle** NOTE Other lengths: all methods which are able to measure the characteristics according to specification.
3.2.9 Runout s of the end faces	
Axial distance between two circles located concentrically to the axis of the piston pin, between which all points of the end face of the piston pin must lie during rotation around the axis.	Supporting surface: V-block with longitudinal stop at least as large as the outside diameter d_1. Measurement by 360° rotation in the V-block. Measured value = axial eccentricity or runout f / r, see Figure 11, ISO 18669-1:2004.  **Figure 7 — Runout measuring principle**
3.2.10 Outside-edge profile	
Transition from the peripheral surface to the end face of piston pin.	Measuring of the transition using contour-measuring method, or other appropriate methods (see Figure 11, ISO 18669-1:2004).
3.2.11 Inside chamfer t	
Transition from the inside cylindrical surface to the end face.	Measurement using calliper, measuring lenses or contour-measuring equipment (see Figure 12, ISO 18669-1:2004).
3.2.12 Tapered bore diameter d_3	
Diameter of the taper at the end face.	Measured by using e.g. calliper or contour-measuring equipment (see Figure 13, ISO 18669-1:2004).