
**Internal combustion engines —
Piston rings —
Part 2:
Inspection measuring principles**

*Moteurs à combustion interne — Segments de piston —
Partie 2: Principes de mesure pour inspection*
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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 6621-2 was prepared by Technical Committee ISO/TC 22, *Road vehicles*.

This second edition cancels and replaces the first edition (ISO 6621-2:1984), which has been technically revised.

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ISO 6621 consists of the following parts, under the general title *Internal combustion engines — Piston rings*:

- *Part 1: Vocabulary* [ISO 6621-2:2003](https://standards.iteh.ai/catalog/standards/sist/6093e7aa-a221-4723-9d69-38aa7e33538d/iso-6621-2-2003)
- *Part 2: Inspection measuring principles* <https://standards.iteh.ai/catalog/standards/sist/6093e7aa-a221-4723-9d69-38aa7e33538d/iso-6621-2-2003>
- *Part 3: Material specifications*
- *Part 4: General specifications*
- *Part 5: Quality requirements*

Introduction

ISO 6621 is one of a series of International Standards dealing with piston rings for reciprocating internal combustion engines. Others are ISO 6622 [4], [5], ISO 6623 [6], ISO 6624 [7], [8], [9], [10], ISO 6625 [11], ISO 6626 [12], [13] and ISO 6627 [14].

The common features and dimensional tables presented in this part of ISO 6621 constitute a broad range of variables, and the designer selecting a particular ring type must bear in mind the conditions under which it will be required to operate. It is also essential that the designer refer to the specifications and requirements of ISO 6621-3 and ISO 6621-4 before completing a selection.

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Internal combustion engines — Piston rings —

Part 2: Inspection measuring principles

1 Scope

This part of ISO 6621 specifies the principles to be used in the measuring for inspection purposes of piston rings for both reciprocating internal combustion engines and compressors working under analogous conditions. It is applicable to all such rings of a diameter ≤ 200 mm.

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 4287-1:1984, *Surface roughness — Terminology — Part 1: Surface and its parameters*

ISO 4287:1997, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*

ISO 6507-3, *Metallic materials — Vickers hardness test — Part 3: Calibration of reference blocks*

ISO 6621-1, *Internal combustion engines — Piston rings — Part 1: Vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6621-1 and in 4.2 apply.

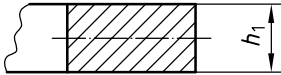
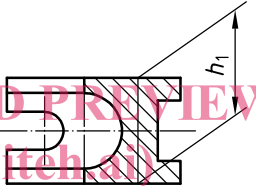
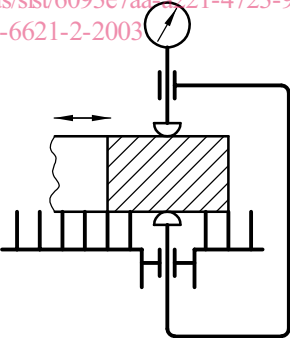
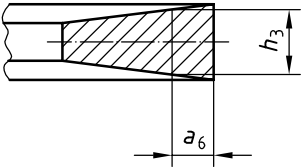
4 Measuring principles

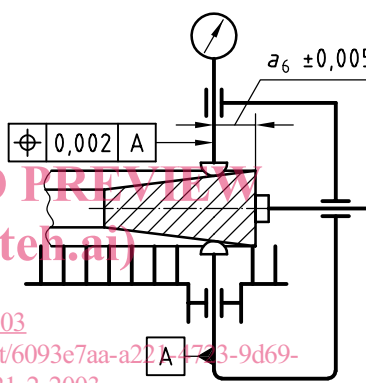
4.1 General measuring conditions

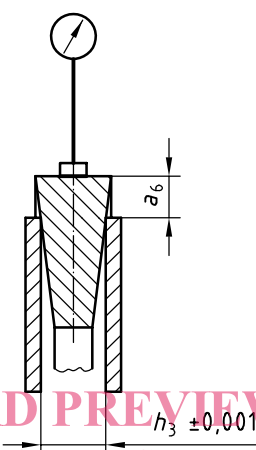
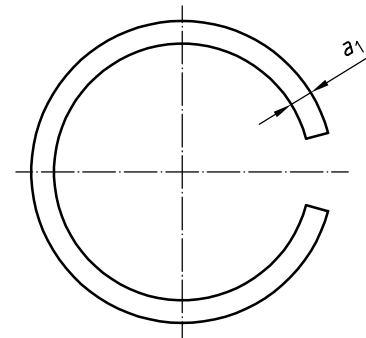
The following general conditions are applicable to all measuring principles, unless otherwise specified.

- a) The ring shall rest on the reference plane in the free or open condition. No additional force shall be applied to load the ring on the reference plane, except when measuring *unevenness* in accordance with 4.2.19 or *helix* in accordance with 4.2.20.
- b) Certain measurements are made with the ring in the closed condition in a gauge of nominal cylinder bore diameter. When orientated rings are measured in this way, they shall be so placed that the top side of the ring is towards the reference plane.
- c) Measurements shall be made using instruments with a resolution not exceeding 10 % of the tolerance of the dimension being measured.

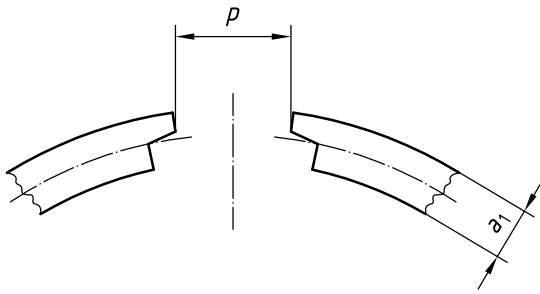
4.2 Ring characteristics and their measurement

Characteristic/Definition	Measuring principle/method
<p>4.2.1 Ring width (in millimetres)</p>	
<p>4.2.1.1 Parallel-sided rings, h_1</p>	
<p>distance between the sides at any particular point perpendicular to the reference plane measured in millimetres (see Figures 1 and 2)</p>	<p>Measure with spherical measuring probes, each of radius $1,5 \text{ mm} \pm 0,05 \text{ mm}$, exerting a measuring force of approximately 1 N (see Figure 3).</p> <p>In the case of slotted oil rings, the measurement shall be made between the slots and not across them, i.e. across a solid portion of the ring cross section (see Figure 2).</p> <div style="text-align: center;">  <p>Figure 1</p>  <p>Figure 2</p> <p style="text-align: center;">ISO 6621-2:2003 https://standards.iteh.ai/catalog/standards/sist/6093e7aa-a221-4723-9d69-38aa7e33538d/iso-6621-2-2003</p>  <p>Figure 3</p> </div>
<p>4.2.1.2 Keystone rings, half-keystone rings, h_3</p>	
<p>distance between the sides at a distance a_6 from the peripheral surface (see Figure 4), or, alternatively, width controlled by a_6 at a specified width h_3 (see Figure 6)</p>	<p>Method A</p> <p>This method determines h_3 for a specified value of a_6 (see Figure 4).</p> <div style="text-align: center;">  <p>Figure 4</p> </div>

Characteristic/Definition	Measuring principle/method
	<p>Measure with spherical measuring probes, each of radius $1,5 \text{ mm} \pm 0,05 \text{ mm}$, exerting a measuring force of approximately 1 N (see Figure 5).</p> <p>If the measuring equipment is set up with parallel gauges instead of keystone gauges, the use of spherical measuring probes will give rise to an error, as follows:</p> <ul style="list-style-type: none"> — for 6° keystone angle: 0,004 mm (ring types: T, TB, TBA, and TM); — for 7° keystone angle: 0,012 mm (ring types: HK, and HKB); — for 15° keystone angle: 0,026 mm (ring types: K, KB, KBA, and KM). <p>To obtain the correct measured width of the keystone ring, the above values shall be deducted from the measured values.</p> <p>NOTE Values of a_6 are given in ISO 6624-1 to ISO 6624-4.</p> <p style="text-align: right;">Dimensions in millimetres</p>  <p style="text-align: center;">Figure 5</p>

Characteristic/Definition	Measuring principle/method
	<p>Method B</p> <p>This method determines a_6 for a specified value of h_3 (see Figure 4).</p> <p>Measure with a flat face probe exerting a measuring force of approximately 1 N. The ring shall be placed between two sharp edged (radius $\leq 0,01$ mm) circular discs which are spaced apart at the specified gauge width h_3 (see Figure 6).</p> <p>NOTE Values of h_3 are given in ISO 6624-1 to ISO 6624-4.</p> <p style="text-align: right;">Dimensions in millimetres</p>  <p style="text-align: center;">Figure 6</p>
<p>4.2.2 Radial wall thickness, a_1 (in millimetres)</p>	<p style="text-align: right;">ISO 6621-2:2003 https://standards.iteh.ai/catalog/standards/sist/6093e7aa-a221-4723-9d69-88e733751b2d/iso-6621-2:2003</p>
<p>radial distance between the peripheral surface and the inside surface of the ring measured in millimetres (see Figure 7)</p>	<p>a) Measure radially between a flat measuring surface on the peripheral surface and a special measuring surface with a radius of approximately 4 mm on the bore using a measuring force of 3 N to 10 N (see Figure 8).</p>  <p style="text-align: center;">Figure 7</p>

Characteristic/Definition	Measuring principle/method
	<div data-bbox="837 302 1268 638" data-label="Image"> </div> <p data-bbox="997 660 1109 694">Figure 8</p> <p data-bbox="614 716 1492 840">b) Measure radially between cylindrical inserts or rollers of radius approximately 4 mm with a measuring force of 3 N to 10 N. The peripheral surface of the rollers shall be perpendicular to the reference plane.</p> <p data-bbox="614 884 1492 940">The length of the rollers shall be greater than the axial ring width (see Figure 9).</p> <div data-bbox="462 974 1125 1097" data-label="Text"> <p>iTeh STANDARD PREVIEW (standards.iteh.ai)</p> </div> <div data-bbox="702 1131 885 1164" data-label="Text"> <p>ISO 6621-2:2003</p> </div> <div data-bbox="422 1164 1165 1232" data-label="Text"> <p>https://standards.iteh.ai/catalog/standards/sist/6093e7aa-a221-4723-9d69-38aa7e33538d/iso-6621-2-2003</p> </div> <div data-bbox="837 952 1268 1288" data-label="Image"> </div> <p data-bbox="997 1310 1109 1344">Figure 9</p>
<p>4.2.3 Total free gap m, p (in millimetres)</p>	
<p>chordal distance between the gap ends of the ring in a free unstressed state, measured at the centre line of the radial wall thickness measured in millimetres (see Figure 10); for rings with an internal notch for a peg — chordal distance marked as p in Figure 11</p>	<p>Measure with a steel rule to the nearest 0,25 mm. Optionally, this feature may be measured with callipers.</p> <div data-bbox="774 1523 1324 1803" data-label="Image"> </div> <p data-bbox="989 1836 1117 1870">Figure 10</p>

Characteristic/Definition	Measuring principle/method
	 <p style="text-align: center;">Figure 11</p>

4.2.4 Closed gap, s_1 (in millimetres)

distance between the gap ends of the ring measured at the narrowest point, which the ring would have when fitted in a gauge of nominal cylinder bore size (see Figure 12)

NOTE The closed gap s_1 is related to the nominal diameter d_1 .

Measure in a bore gauge of nominal diameter using a wedge gauge or feeler gauges and using a measuring force of approximately 1 N (see Figure 12).

The diameter of the bore gauge shall comply with

$$d_1 \begin{matrix} +0,001d_1 \\ 0 \end{matrix}$$

Correction shall be made for any deviation of the bore gauge from the nominal ring diameter

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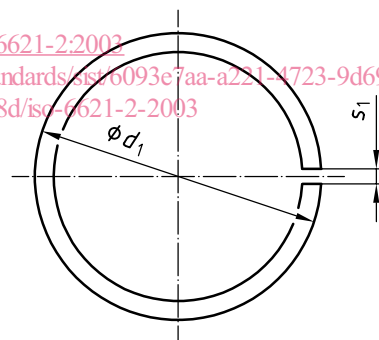


Figure 12