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**Internal combustion engines — Piston  
rings —**

**Part 4:  
General specifications**

*Moteurs à combustion interne — Segments de piston —  
Partie 4: Spécifications générales*  
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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 6621-4 was prepared by Technical Committee ISO/TC 22, *Road vehicles*.

This second edition cancels and replaces the first edition (ISO 6621-4:1988), 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* <https://standards.iteh.ai/catalog/standards/sist/21ae9855-e42e-4036-afb2-2a5a40d6b066/iso-6621-4-2003>
- *Part 2: Inspection measuring principles*
- *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 [1], [2], ISO 6623 [3], ISO 6624 [4], [5], [6], [7], ISO 6625 [8], ISO 6626 [9], [10] and ISO 6627 [11].

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# Internal combustion engines — Piston rings —

## Part 4: General specifications

### 1 Scope

This part of ISO 6621 specifies the general characteristics of piston rings for both reciprocating internal combustion engines and compressors (the individual dimensional criteria for these rings are given in the relevant International Standards). It also provides a system for ring coding, designation and marking. It is applicable to all such rings of a diameter  $\leq 200$  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 6507-3, *Metallic materials — Vickers hardness test — Part 3: Calibration of reference blocks*

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

ISO 6621-2:2003, *Internal combustion engines — Piston rings — Part 2: Inspection measuring principles*

### 3 Terms and definitions

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

### 4 Piston ring codes

Codes used for piston rings shall be as given in Table 1, corresponding to their explanatory descriptions.

Table 1 — Codes and descriptions

Code	Description	Relevant International Standard
R	Straight faced rectangular ring	ISO 6622-1, ISO 6622-2
B	Barrel faced rectangular ring	ISO 6622-1, ISO 6622-2
BA	Asymmetrical barrel faced rectangular ring	ISO 6622-1, ISO 6622-2
M1 ... M5	Taper faced rectangular ring	ISO 6622-1, ISO 6622-2
N	Napier ring (undercut step)	ISO 6623
NM1 ... NM4	Napier ring (undercut step), taper faced	ISO 6623
E	Scraper ring (stepped)	ISO 6623
EM1 ... EM4	Scraper ring (stepped), taper faced	ISO 6623
T	Straight faced keystone ring 6°	ISO 6624-1, ISO 6624-3
TB	Barrel faced keystone ring 6°	ISO 6624-1, ISO 6624-3
TBA	Asymmetrical barrel faced keystone ring 6°	ISO 6624-1, ISO 6624-3
TM1 ... TM5	Taper faced keystone ring 6°	ISO 6624-1, ISO 6624-3
K	Straight faced keystone ring 15°	ISO 6624-1, ISO 6624-3
KB	Barrel faced keystone ring 15°	ISO 6624-1, ISO 6624-3
KBA	Asymmetrical barrel faced keystone ring 15°	ISO 6624-1, ISO 6624-3
KM1 ... KM5	Taper faced keystone ring 15°	ISO 6624-1, ISO 6624-3
HK	Straight faced half keystone ring 7°	ISO 6624-2, ISO 6624-4
HKB	Barrel faced half keystone ring 7°	ISO 6624-2, ISO 6624-4
S	Slotted oil control ring	ISO 6625
G	Double bevelled oil control ring	ISO 6625
D	Bevelled edge oil control ring	ISO 6625
DV	Bevelled edge V-groove oil control ring	ISO 6625
DSF-C	Coil spring loaded bevelled edge oil control ring, chromium plated and profile ground	ISO 6626, ISO 6626-2
DSF-CNP	Coil spring loaded bevelled edge oil control ring, chromium plated, not profile ground	ISO 6626
SSF	Coil spring loaded slotted oil control ring	ISO 6626, ISO 6626-2
GSF	Coil spring loaded double bevelled oil control ring	ISO 6626, ISO 6626-2
DSF	Coil spring loaded bevelled edge oil control ring	ISO 6626, ISO 6626-2
DSF-NG	Coil spring loaded bevelled edge oil control ring(face geometry similar type DSF-C or DSF-CNP)	ISO 6626
SSF-L	Coil spring loaded slotted oil control ring with 0,6 mm nominal land width	ISO 6626, ISO 6626-2
ES-1 ... ES-4	Expander/ segment oil control rings	ISO 6627
D22	Radial wall thickness for "D/22"	ISO 6622-1, ISO 6623
MC11 ... MC68	Material subclasses	ISO 6621-3
MR	Ratio $m/(d_1-a_1)$ reduced	ISO 6621-4
Z	Ring shape round	ISO 6621-4



Table 1 (continued)

Code	Description	Relevant International Standard
Y	Ring shape negative ovality	ISO 6621-4
S005 ... S100	Closed gap (minimum values)	ISO 6621-4
CRF ... CR4	Peripheral surface chromium plated fully faced design	ISO 6621-4
CR1E ... CR2E	Peripheral surface chromium plated semi-inlaid design	ISO 6621-4
CR1F ... CR2F	Peripheral surface chromium plated inlaid design	ISO 6621-4
SC1 ... SC4	Peripheral surface spray coated fully faced design	ISO 6621-4
SC1E ... SC4E	Peripheral surface spray coated semi-inlaid design	ISO 6621-4
SC1F ... SC4F	Peripheral surface spray coated inlaid design	ISO 6621-4
NT030 ... NT130	Nitrided surface, case depth specified on peripheral surface and side faces	ISO 6621-4
NB030 ... NB130	Nitrided surface, case depth specified on peripheral surface and bottom side	ISO 6621-4
NP030 ... NP130	Nitrided surface, case depth specified on peripheral surface only	ISO 6621-4
NS010 ... NS050	Nitrided surface, case depth on segments	ISO 6627
NX	Nitrided surface of expanders/spacers	ISO 6627
LF	Uncoated ring peripheral surface or uncoated land peripheral surface, fully lapped	ISO 6621-4
LP	Taper faced piston ring with lapped land over the whole circumference but not over the whole width of the peripheral surface	ISO 6621-4
LM	Taper faced piston ring with partly cylindrical machined peripheral surface	ISO 6621-4
FE	Ferro oxidized on all sides	ISO 6621-4
PO	Phosphated on all sides	ISO 6621-4
PR	Phosphated on all sides (for rust protection purposes)	ISO 6621-4
KA	Peripheral edges chamfered	ISO 6622
KI	Inside edges chamfered	ISO 6622
IF	Internal bevel (top side)	ISO 6622, ISO 6624-1, ISO 6624-3
IFU	Internal bevel (bottom side)	ISO 6622
IW	Internal step (top side)	ISO 6622-1, ISO 6624-1
IWU	Internal step (bottom side)	ISO 6622-1
IFV	Variable internal bevel (top side) for defined twist	ISO 6622-1
IFVU	Variable internal bevel (bottom side) for defined twist	ISO 6622-1
KU	Reduced peripheral bottom edge chromium plated fully faced design	ISO 6621-4
KG	Reduced size of peripheral edges at the gap of chromium plated/ spray coated/ nitrided rings	ISO 6621-4
NE1 ... NE3	Ring joint with lateral stop	ISO 6621-4
NH1 ... NH3	Ring joint with internal stop	ISO 6621-4

Table 1 (continued)

Code	Description	Relevant International Standard
WK	Reduced slot length	ISO 6626, ISO 6626-2
WF	Reduced heat set	ISO 6621-5, ISO 6626, ISO 6626-2
CSN, CSG, CSE	Type of coil spring	ISO 6626, ISO 6626-2
PNE, PNL, PNR, PNM, PNH, PNV	Contact pressure class	ISO 6626, ISO 6626-2, ISO 6627
	<b>Additional marking</b>	
MM	Manufacturer's mark	ISO 6621-4
MZ	Mark for required ring shape "round"	ISO 6621-4
MY	Mark for required ring shape "negative ovality"	ISO 6621-4
MX	Material mark <sup>a</sup>	ISO 6621-4
MU	Any other additional mark <sup>b</sup>	ISO 6621-4
<sup>a</sup> Material mark (for alternative materials) at the discretion of the manufacturer. <sup>b</sup> Any other additional marking on client's request, which shall be quoted clearly in the order, shall be agreed between manufacturer and client.		

## 5 Designation of piston rings

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### 5.1 Designation elements and order

#### 5.1.1 General

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When designating piston rings complying with the relevant International Standards, the following details shall be provided, in the order given, using the codes according to Table 1.

#### 5.1.2 Mandatory elements

The following mandatory elements shall constitute the designation of a piston ring:

- designation, i.e. piston ring;
- number of International Standard;
- type of piston ring, e.g. R;
- hyphen;
- size of piston ring,  $d_1 \times h_1$ ;
- radial wall thickness "regular" without code;
- Code D22 if the selected wall thickness, in accordance with ISO 6622-1 and ISO 6623, is D/22;
- hyphen;
- material code, e.g. MC11.

### 5.1.3 Additional elements

The following optional elements may be added to the designation of a piston ring and, if so added, shall be positioned on a second line beneath, or separated by a slash (/) from, the mandatory elements given in 5.1.2.

- reduced ratio  $m/(d_1 - a_1)$ , MR;
- ring shape, e.g. Z;
- selected nominal closed gap if it differs from the closed gap specified in the dimension Tables, e.g. S05;
- the selected coating, e.g. CR3;
- uncoated rings with fully lapped peripheral surface, e.g. for LF taper faced rings with partly cylindrical peripheral surface, LM (machined) or LP (lapped);
- selected surface treatment, e.g. PO;
- selected inside edge feature, e.g. KA;
- inside step of bevel, e.g. IWU;
- selected notch to prevent ring rotation, e.g. NH1;
- reduced slot length, if required, WK;
- coil spring with reduced heat set, if required, e.g. WF;
- selected type of coil spring, e.g. CSG;
- selected pressure class, e.g. PNM.

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### 5.1.4 Elements for additional marking

Any additional marking shall follow the additional elements of 5.1.3:

- manufacturer's mark, if required, MM;
- marking of required ring shape, e.g. MZ;
- material, MX (see Table 1, Footnote a);
- code for any other marking, MU (see Table 1, Footnote b).

## 5.2 Designation examples

### 5.2.1 Designation example of a piston ring in accordance with ISO 6622-1

For

- a straight-faced rectangular ring (R),
- of nominal diameter  $d_1 = 90$  mm (90),
- of nominal ring width  $h_1 = 2,5$  mm (2,5), and
- made of grey cast iron, non heat-treated, material subclass 11 (MC11):

**Piston ring ISO 6622-1 R - 90 × 2,5 - MC11**

### 5.2.2 Designation example of a piston ring in accordance with ISO 6624-1

For

- a keystone ring 6°, taper faced 60' (TM3),
- of nominal diameter  $d_1 = 105$  mm (105),
- and nominal ring width  $h_1 = 2,5$  mm (2,5),
- made of spheroidal graphite cast iron, martensitic type, material subclass 51 (MC51),
- ring shape round (Z),
- with a selected closed gap of 0,3 mm (S003),
- inside edges chamfered (KI), and
- peripheral surface chromium plated, with plating thickness 0,1 mm minimum (CR2):

**Piston ring ISO 6624-1 TM3 - 105 × 2,5 - MC51 / Z S003 KI CR2**

### 5.2.3 Designation example of a piston ring in accordance with ISO 6626

For

- a coil spring loaded, bevelled edge oil control ring, chromium plated and profile ground (DSF-C),
- of nominal diameter  $d_1 = 125$  mm (125),
- and nominal ring width  $h_1 = 5$  mm (5),
- made of grey cast iron, non heat-treated, material subclass 11 (MC11),
- with a selected closed gap of 0,2 mm (S002),
- having a chromium plating thickness on the lands of 0,15 mm minimum (CR3),
- phosphated on all cast iron surfaces to a depth of 0,002 mm minimum (PO),
- with reduced slot length (WK),
- a coil spring with reduced heat seat (WF),
- having a variable pitch with coil diameter,  $d_1$  ground (CSE),
- tangential force  $F_t$  according to the medium nominal contact pressure class (PNM),
- marked with manufacturer's mark (MM):

**Piston ring ISO 6626 DSF-C - 125 × 5 - MC11 / S002 CR3 PO WK WF CSE PNM MM**

## 6 Marking of piston rings

### 6.1 General

The requirements and recommendations for piston ring marking according to 6.2 and 6.3 apply to piston rings of 1,6 mm radial wall thickness and above. Marking of piston rings of less than 1,6 mm is at the discretion of the manufacturer.