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ISO/FDIS 6621-4

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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 34, *Propulsion, powertrain and powertrain fluids*.

This fourth edition cancels and replaces the third edition (ISO 6621-4:2015), which has been technically revised.

The main changes are as follows:

- harmonization of the nomenclature with revised standards;
- side notch dimensioning revised.

A list of all parts in the ISO 6621 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document is one of a series of International Standards dealing with piston rings for reciprocating internal combustion engines. Others are ISO 6622-1, ISO 6622-2, ISO 6623, ISO 6624-1, ISO 6624-2, ISO 6624-3, ISO 6624-4, ISO 6625, ISO 6626-1, ISO 6626-2, ISO 6626-3, and ISO 6627.

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Internal combustion engines — Piston rings —

Part 4: General specifications

1 Scope

This document specifies the general characteristics of piston rings for reciprocating internal combustion engines for road vehicles and other applications (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 nominal diameter from 30 mm up to and including 200 mm.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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, *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.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

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 in alphabetical order

Code	Description	Relevant International Standard
B	Symmetrical barrel-faced rectangular ring	ISO 6622-1, ISO 6622-2
BA	Asymmetrical barrel-faced rectangular ring	ISO 6622-1, ISO 6622-2
CR1E ... CR2E	Peripheral surface chromium plated semi-inlaid design	ISO 6621-4
CR1F ... CR2F	Peripheral surface chromium plated inlaid design	ISO 6621-4

^a Material mark (for alternative materials) at the discretion of the manufacturer.

^b Any other additional marking on customer's request, which shall be quoted clearly in the order, shall be agreed upon between the manufacturer and customer.

Table 1 (continued)

Code	Description	Relevant International Standard
CRF ... CR4	Peripheral surface chromium plated fully-faced design	ISO 6621-4
CRS5 ... CRS10	Chromium plating thickness for side faces	ISO 6621-4
CSN, CSG, CSE	Type of coil spring	ISO 6626-1, ISO 6626-2
D	Bevelled edge oil control ring	ISO 6625
D/22	Radial wall thickness for "d ₁ /22"	ISO 6622-1, ISO 6623
DSF	Coil-spring loaded bevelled edge oil control ring	ISO 6626-1, ISO 6626-2
DSF-C	Coil-spring loaded bevelled edge oil control ring, chromium plated, and profile ground	ISO 6626-1, ISO 6626-2
DSF-CNP	Coil-spring loaded bevelled edge oil control ring, chromium plated, not profile ground	ISO 6626-1
DSF-NG	Coil-spring loaded bevelled edge oil control ring (face geometry like type DSF-C or DSF-CNP)	ISO 6626-1
DV	Bevelled edge V-groove oil control ring	ISO 6625
E	Scraper ring (stepped)	ISO 6623
EM2 ... EM4	Scraper ring (stepped), taper-faced	ISO 6623
ES1 ... ES3	Expander/rail oil control rings	ISO 6627
FE	Ferro-oxidized on all sides	ISO 6621-4
G	Double bevelled oil control ring	ISO 6625
GSF	Coil-spring loaded double bevelled oil control ring	ISO 6626-1, ISO 6626-2
HK	Straight faced half keystone ring 7°	ISO 6624-2, ISO 6624-4
HKB	Symmetrical barrel-faced half keystone ring 7°	ISO 6624-2, ISO 6624-4
HKBA	Asymmetrical barrel-faced half keystone ring 7°	ISO 6624-2, ISO 6624-4
IF	Internal bevel top side	ISO 6622-1, ISO 6622-2, ISO 6624-1, ISO 6624-3
IFU	Internal bevel bottom side	ISO 6622-1, ISO 6622-2
IFV	Variable internal bevel on the top side	ISO 6622-1
IFVU	Variable internal bevel on the bottom side	ISO 6622-1
IW	Internal step top side	ISO 6622-1, ISO 6624-1
IWU	Internal step bottom side	ISO 6622-1
K	Straight-faced keystone ring 15°	ISO 6624-1, ISO 6624-3
KA	Outside chamfered edges	ISO 6622-1
KB	Symmetrical barrel-faced keystone ring 15°	ISO 6624-1, ISO 6624-3
KBA	Asymmetrical barrel-faced keystone ring 15°	ISO 6624-1, ISO 6624-3
KG	Reduced size of peripheral edges at the gap of chromium plated/spray coated/nitride/PVD coated rings	ISO 6621-4
KI	Inside chamfered edges	ISO 6622-1
KM1 ... KM5	Taper-faced keystone ring 15°	ISO 6624-1, ISO 6624-3
KU	Reduced peripheral bottom edge chromium plated fully faced design	ISO 6621-4
LF	Uncoated ring peripheral surface or uncoated land peripheral surface, fully lapped	ISO 6621-4
LM	Taper-faced piston ring with partly cylindrical machined peripheral surface	ISO 6621-4

^a Material mark (for alternative materials) at the discretion of the manufacturer.

^b Any other additional marking on customer's request, which shall be quoted clearly in the order, shall be agreed upon between the manufacturer and customer.

Table 1 (continued)

Code	Description	Relevant International Standard
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
M1 ...M6	Taper-faced rectangular ring	ISO 6622-1, ISO 6622-2
MC11 ... MC69	Material subclasses	ISO 6621-3
MM	Manufacturer's mark	ISO 6621-4
MR	Reduced ratio $m/(d_1 - a_1)$ for reduced load	ISO 6621-4
MU	Any other additional mark ^b	ISO 6621-4
MX	Material mark ^a	ISO 6621-4
MY	Mark for required ring shape "negative ovality"	ISO 6621-4
MZ	Mark for required ring shape "round"	ISO 6621-4
N	Napier ring (undercut step)	ISO 6623
NB030 ... NB130	Nitride surface, case depth specified on peripheral surface and bottom side	ISO 6621-4
NE1 ... NE3	Ring joint with lateral stop	ISO 6621-4
NH1 ... NH3	Ring joint with internal stop	ISO 6621-4
NM2 ... NM4	Napier ring (undercut step), taper-faced	ISO 6623
NP030 ... NP130	Nitride surface, case depth specified on peripheral surface only	ISO 6621-4
NS 010 ... NS 050	Nitride surface, case depth on rails	ISO 6627
NT010 ... NT130	Nitride surface, case depth specified on peripheral surface and side faces	ISO 6621-4, ISO 6626-3
NX003 ... NX025	Nitride surface of expanders	ISO 6627
PC001...PC050	Physical vapour deposition coating (PVD) thickness	ISO 6621-4
PN 0.5...PN 2.5	Nominal unit pressure classes	ISO 6626-3
PNE, PNL, PNR, PNM, PNH, PNV	Classes of nominal unit pressure	ISO 6626-1, ISO 6626-2, ISO 6627
PO	Phosphated on all sides (max. value specified)	ISO 6621-4
PR	Phosphated on all sides (minimum value specified)	ISO 6621-4
R	Straight-faced rectangular ring	ISO 6622-1, ISO 6622-2
RU	Napier or scraper ring with reduced undercut or step (mini napier/stepped)	ISO 6623
S	Slotted oil control ring	ISO 6625
S005 ... S100	Closed gap (minimum values)	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
SOR-L	Steel oil control ring with R-shaped groove (radial wall thickness large)	ISO 6626-3
SOR-S	Steel oil control ring with R-shaped groove (radial wall thickness small)	ISO 6626-3
SOV-L	Steel oil control ring with V-shaped groove (radial wall thickness large)	ISO 6626-3

^a Material mark (for alternative materials) at the discretion of the manufacturer.

^b Any other additional marking on customer's request, which shall be quoted clearly in the order, shall be agreed upon between the manufacturer and customer.

Table 1 (continued)

Code	Description	Relevant International Standard
SOV-S	Steel oil control ring with V-shaped groove (radial wall thickness small)	ISO 6626-3
SSF	Coil-spring loaded slotted oil control ring with rectangular groove	ISO 6626-1, ISO 6626-2
SSF-L	Coil-spring loaded slotted oil control ring with rectangular groove at periphery and V-shaped groove beneath	ISO 6626-1, ISO 6626-2
T	Straight-faced keystone ring 6°	ISO 6624-1, ISO 6624-3
TB	Symmetrical 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
TT00 ... TT30	Seating tab angle θ	ISO 6627
WF	Reduced heat set	ISO 6621-5, ISO 6626-1, ISO 6626-2
WK	Reduced slot length	ISO 6626-1, ISO 6626-2
Y	Ring shape negative ovality	ISO 6621-4
Z	Ring shape round	ISO 6621-4
<p>^a Material mark (for alternative materials) at the discretion of the manufacturer.</p> <p>^b Any other additional marking on customer's request, which shall be quoted clearly in the order, shall be agreed upon between the manufacturer and customer.</p>		

5 Designation of piston rings

5.1 Designation elements and order

5.1.1 General

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 D/22 if the selected wall thickness, in accordance with ISO 6622-1 and ISO 6623, is $d_1/22$;
- hyphen;
- material code (e.g. MC11).

5.1.3 Measurement principles

Measurements shall be made according to ISO 6621-2.

5.1.4 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. KI);
- inside step of bevel (e.g. IWU);
- selected notch to prevent ring rotation (e.g. NH1);
- reduced slot length, if required (e.g. 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).

5.1.5 Elements for additional marking

Any additional marking shall be the following with the additional elements of 5.1.3:

- manufacturer's mark, if required (e.g. MM);
- marking of required ring shape (MY or 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) and nominal ring width $h_1 = 2,5$ mm (2,5), made of grey cast iron, non-heat-treated material subclass 11 (MC11):

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

Parameters in parentheses are used in the ISO ring designation.

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