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SURFACE VEHICLE STANDARD

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Submitted for recognition as an American National Standard

INTERNAL COMBUSTION ENGINES—PISTON RINGS—MATERIAL SPECIFICATIONS

This SAE Standard is equivalent to ISO Standard 6621/3.

1. *Scope and Field of Application*—Differences, where they exist, are shown in Appendix A.

   This SAE Standard establishes a classification of materials intended for the manufacture of piston rings based on mechanical properties and the stresses that these materials are capable of withstanding.

   This document applies to the manufacture of piston rings up to and including 200 mm diameter for reciprocating internal combustion engines. It also applies to piston rings for compressors working under similar conditions.

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(R) *2. References*

SAE DESIGNATION	ISO[1] EQUIVALENT	
		INTERNAL COMBUSTION ENGINES—PISTON RINGS
J1588	6621/1	Vocabulary
J1589	6621/2	Measuring principles
J1590	6621/3	Material specifications
J1591	6621/4	General specifications
J1996	6621/5	Quality requirements
		INTERNAL COMBUSTION ENGINE—PISTON RINGS
J1997	6622/1	Rectangular rings
J1998	6622/2 TR	Rectangular rings with narrow ring width
J1999	6623	INTERNAL COMBUSTION ENGINES—PISTON RINGS—SCRAPER RINGS
		INTERNAL COMBUSTION ENGINES—PISTON RINGS
J2000	6624/1	Keystone rings
J2001	6624/2 TR	Half keystone rings
J2002	6625	INTERNAL COMBUSTION ENGINES—PISTON RINGS—OIL CONTROL RINGS
J2003	6626	INTERNAL COMBUSTION ENGINES—PISTON RINGS—COIL SPRING LOADED OIL CONTROL RINGS
J2004	6627 TR	INTERNAL COMBUSTION ENGINES—PISTON RINGS—EXPANDER/SEGMENT OIL CONTROL RINGS
J2226		INTERNAL COMBUSTION ENGINES—PISTON RINGS—STEEL RECTANGULAR RINGS
	ISO/R 80	ROCKWELL HARDNESS TEST (B AND C SCALES) FOR STEEL

[1] TR refers to Technical Report

3. *Mechanical Properties*—See Table 1.

TABLE 1—MECHANICAL PROPERTIES

Class	Mechanical Properties MPa or N/mm² Typical Modulus of Elasticity	Mechanical Properties MPa or N/mm² Minimum Bending Strength	Materials Meeting the Required Mechanical Properties Type of Material	Materials Meeting the Required Mechanical Properties Minimum Hardness	Materials Meeting the Required Mechanical Properties Specific Details	Materials Meeting the Required Mechanical Properties Subclass
10	90 000	300	Grey cast iron	93 HRB	Nonheat-treated	11
	100 000	350		95 HRB		12
		450		23 HRC		21
		450		28 HRC		22
20	115 000	450	Grey cast iron	40 HRC	Heat-treated	23
		500		32 HRC		24
	130 000	650		37 HRC		25
30	145 000	550	Carbidic cast iron	25 HRC	Heat-treated pearlitic	31
		500		30 HRC	Heat-treated martensitic	32
		600		95 HRB	Heat-treated pearlitic	41
		600		22 HRC	Heat-treated martensitic	42
40	160 000	600	Malleable cast iron	30 HRC	Heat-treated martensitic	43
		1000		27 HRC	Heat-treated carbidic	44
		1100		23 HRC	Heat-treated martensitic	51
		1300		23 HRC	Heat-treated martensitic	52
50	160 000	1300	Spheroidal graphite	28 HRC	Heat-treated martensitic	53
		1300	cast iron	95 HRB	Pearlitic	54
		–		97 HRB	Ferritic	55
				38 HRC	CrMoV - alloyed	61
60	200 000	–	Steel	40 HRC	CrSi - alloyed	62
				48 HRC	CrSi - alloyed	63

NOTE—The hardness values are averages from three measurements on one ring, one being at the gap and one each 90 and 180 degrees around from the gap. HRB and HRC hardness testing is in accordance with ISO/R 80.

The application of the hardness measuring methods HRB and HRC is restricted, due to the geometry and the material of piston rings. The hardness values stated are used only for grouping the materials into the individual subclasses. Other hardness measuring methods and their equivalent values shall be agreed upon between customer and manufacturer.

4. Notes

4.1 Marginal Indicia—The (R) is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.

PREPARED BY THE SAE PISTON RING STANDARDS COMMITTEE 7

APPENDIX A

A.1 This SAE Standard has been established to harmonize the ISO and SAE piston ring standards. The U.S. Technical Advisory Group, with the support of the National Engine Parts Manufacturers Association, has worked with other national organizations on this worldwide standard. Some of the wording and phrasing may differ slightly from U.S. terminology for translation purposes.

In preparing this SAE Standard, the Scope and Field of Application and Reference sections of the ISO 6621/3 have been editorially revised and reorganized.