

Internal Combustion Engines—Piston Rings—Vocabulary

This SAE Standard is equivalent to ISO Standard 6621-1.

- 1. Scope**—Differences, where they exist, are shown in Appendix A with associated rationale.

This SAE Standard defines the most commonly used terms for piston rings. These terms designate either types of piston rings or certain characteristics and phenomena of piston rings.

The terms and definitions apply to piston rings for reciprocating internal combustion engines and compressors working under analogous conditions.

Appendix B is included which lists equivalent terms in English, French, Russian, German, Spanish, Portuguese, Italian, and Japanese.

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2. References

2.1 Applicable Publications—The following publications form a part of the specification to the extent specified herein. Unless otherwise indicated the latest revision of SAE publications shall apply.

2.1.1 SAE PUBLICATIONS—Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

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 ENGINES—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
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 286	ISO SYSTEM OF LIMITS AND FITS

1. TR refers to Technical Report

3. Piston Ring Classification

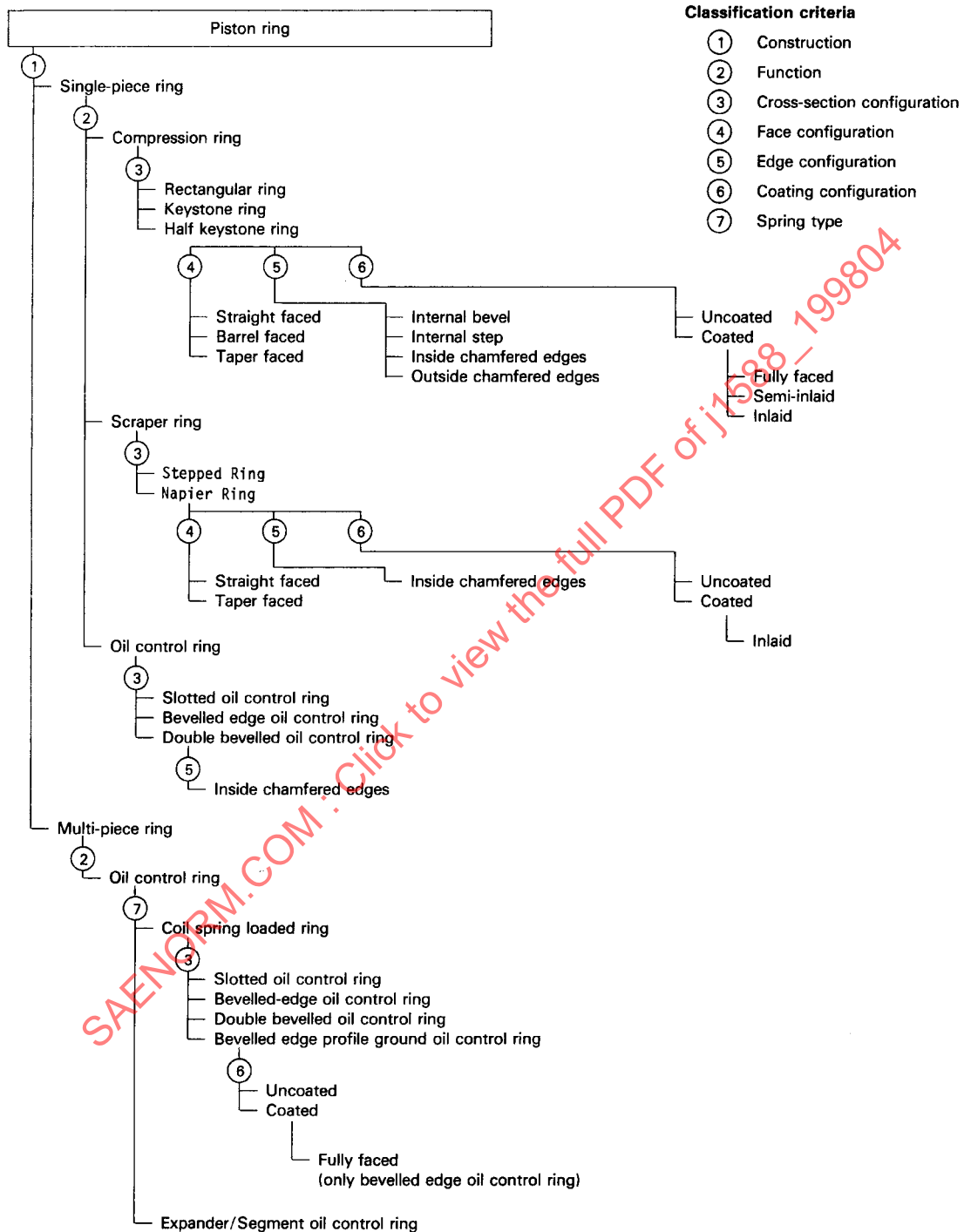


FIGURE 1—PISTON RING CLASSIFICATION

4. Piston Ring Types

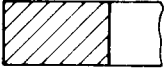
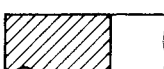
4.1 Cross section configuration	(These cross sections may be combined with the "common features" shown in 4.2, 4.3, 4.4 and 4.5)
Rectangular ring	
Keystone ring	
Half keystone ring	
Scraper ring (stepped)	
Scraper ring (Napier)	
Slotted oil control ring	
Bevelled edge oil control ring	
Coil spring loaded slotted oil control ring	
Coil spring loaded bevelled edge oil control ring	
Coil spring loaded double bevelled oil control ring	
Expander/Segment oil control ring	

FIGURE 2—PISTON RING TYPES

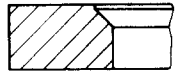
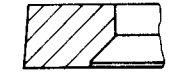
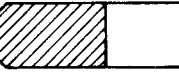
4.2 Face configuration	
Straight faced	
Barrel faced	
Taper faced	
4.3 Edge configuration	
Internal bevel top (positive twist type)	
Internal step top (positive twist type)	
Internal bevel bottom (negative twist type)	
Internal step bottom (negative twist type)	
Inside edges chamfered	
Outside edges chamfered	
Inside and outside edges chamfered	

FIGURE 2 (CONTINUED)

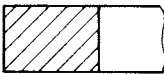
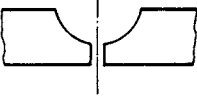
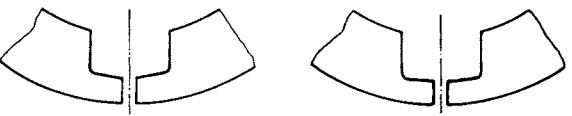
4.4 Coating configuration	
Uncoated	
Coated	
— Fully faced	
— Semi-inlaid	
— Inlaid	
4.5 Joint configuration	
Joint with side notch	
Joint with internal notch	

FIGURE 2 (CONTINUED)

5. Piston Ring Nomenclature

5.1 Free (Unstressed) Ring

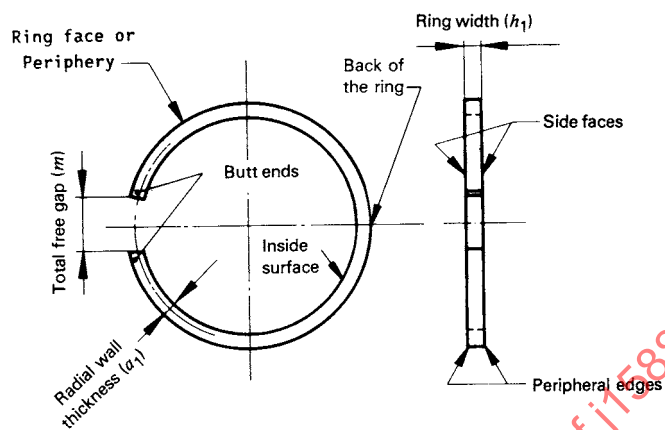


FIGURE 3—FREE (UNSTRESSED) RING

5.2 Closed Ring

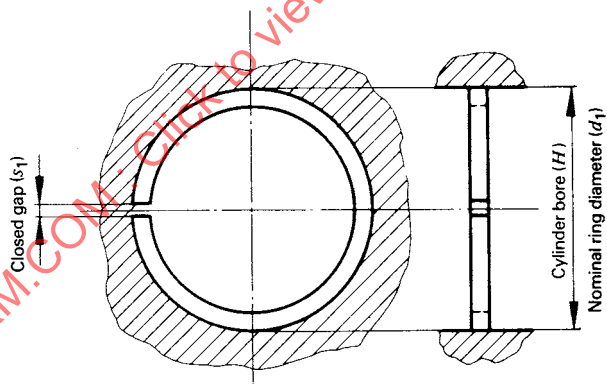


FIGURE 4—CLOSED RING

5.3 Ring Clearances

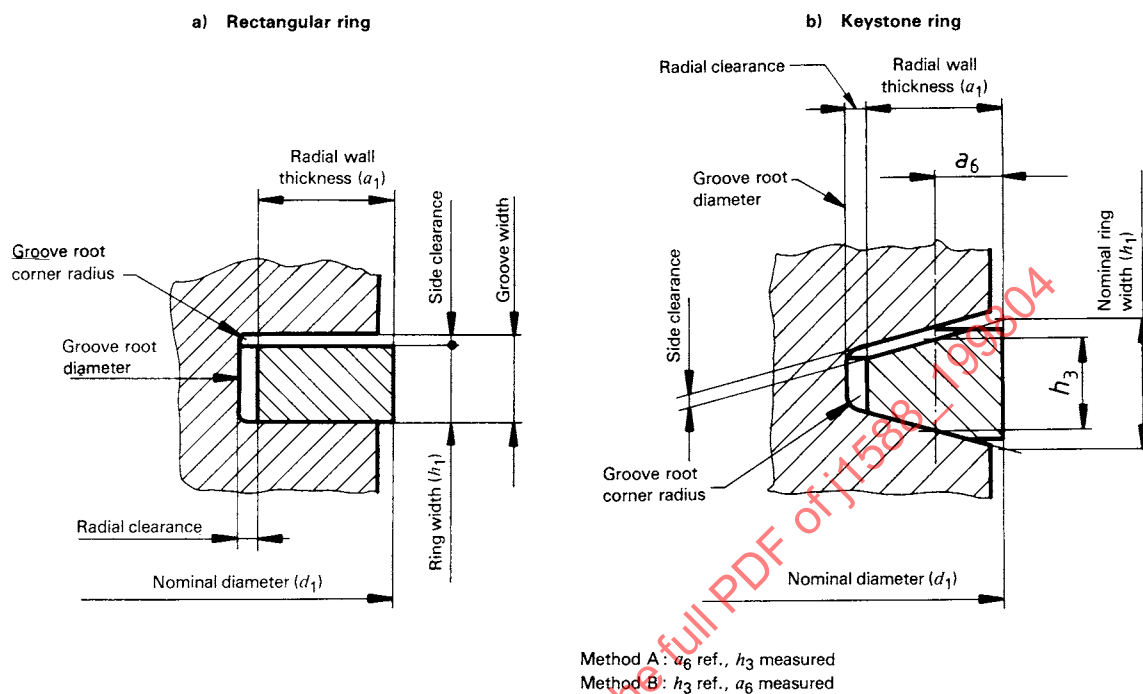


FIGURE 5—RING CLEARANCES

5.4 Edges, Surfaces, and Faces

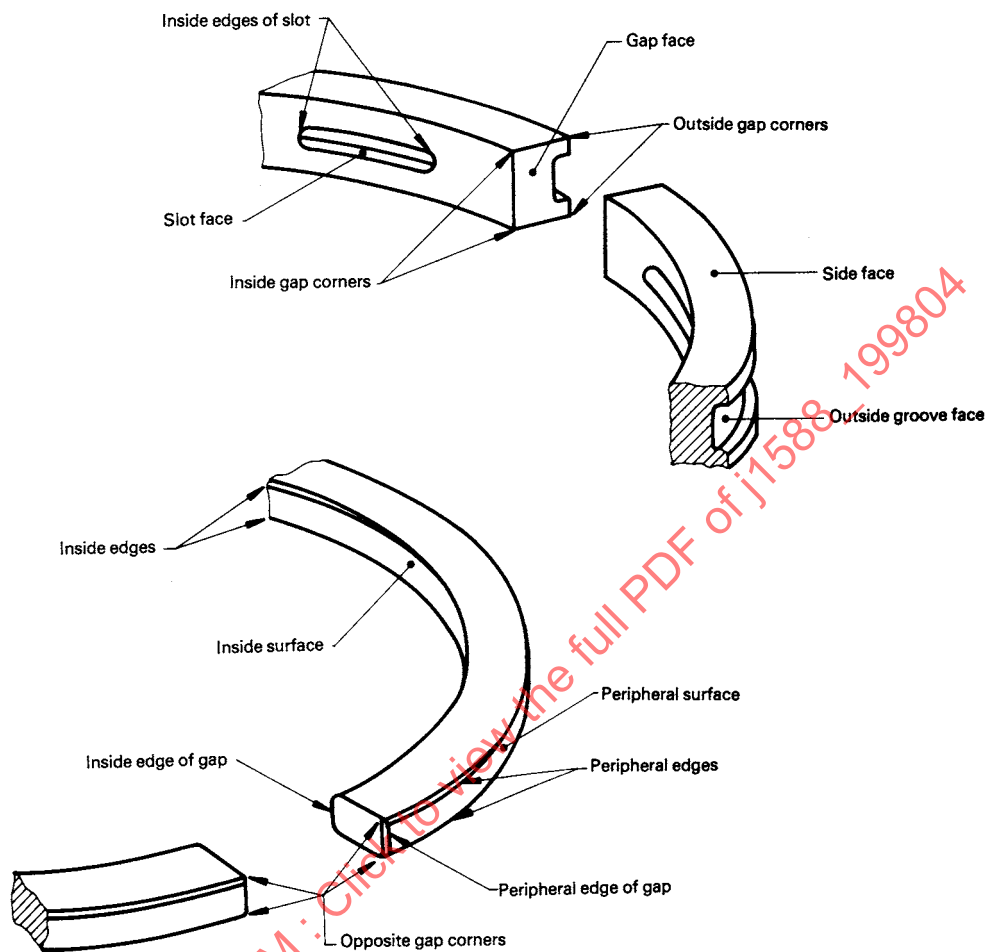


FIGURE 6—EDGES, SURFACES, AND FACES

5.5 Section of Straight-Faced Rectangular Ring

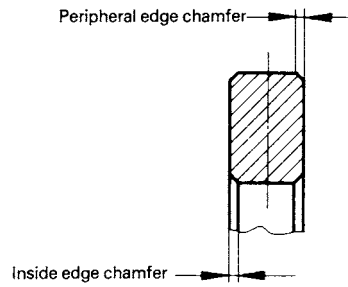


FIGURE 7—SECTION OF STRAIGHT-FACED RECTANGULAR RING

5.6 Section of Scraper Ring

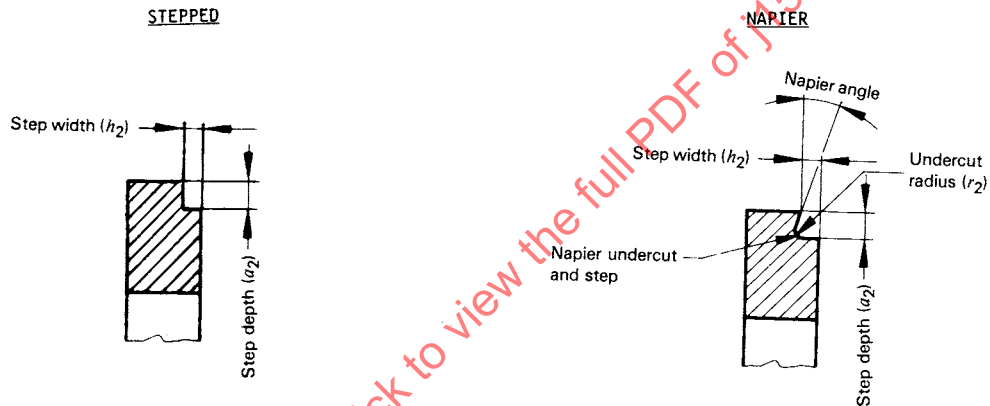


FIGURE 8—SECTION OF SCRAPER RING

5.7 Slotted Oil Control Ring

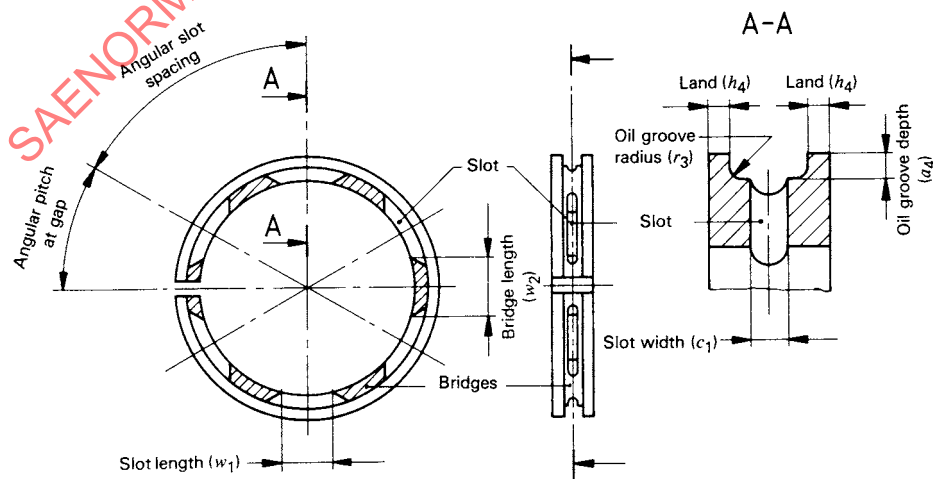


FIGURE 9—SLOTTED OIL CONTROL RING

6. Terms and Definitions

No.	Term	Definition
6.0	piston ring	A metallic circular spring with a high relative outward expanding strain. It fits into an annular groove that fits its section. The reciprocating and/or rotating piston ring seals against a pressure differential of gases or liquids between the ring face and a cylinder bore and one side of the ring and groove.
6.1	Types of piston ring	
6.1.1	single-piece ring	A ring formed from only one part which is intended for installation in a single ring groove.
6.1.2	multi-piece ring	A ring comprising two or more component parts which are intended for installation in a single ring groove.
6.1.3	compression ring	A ring intended primarily to prevent the leakage of gas past the piston.
6.1.4	oil control ring	A ring having oil return slots or an equivalent and intended to scrape oil from the cylinder wall.
6.1.5	rectangular ring	A compression ring with a rectangular cross-section; with its geometrically simple form, it provides an adequate seal under normal operating conditions.
6.1.6	keystone ring	A compression ring with both sides tapered; it is used in those cases when ring sticking can be expected. Due to its wedge shape, any radial movement of the ring will alter its axial clearance and thus minimize the build-up of combustion residues.
6.1.7	half keystone ring	A compression ring with one side tapered. Usually the tapered side is the one which faces the combustion chamber.
6.1.8	scraper ring (stepped)	A ring which has a step on the lower peripheral edge to scrape oil from the cylinder wall. It can also act as a lower compression ring.
6.1.9	scraper ring (Napier)	A scraper ring with an undercut step.
6.1.10	slotted oil control ring	A slotted oil control ring with parallel sides and two contact lands. Due to the narrow lands of this type of ring, a high unit pressure is achieved.
6.1.11	bevelled-edge oil control ring	A slotted oil control ring with parallel sides and two lands. The peripheral edges of both lands are chamfered, in order to achieve a further increase in unit pressure and thereby a better oil scraping effect.
6.1.12	double-bevelled oil control ring	A ring similar to type 6.1.11 except that both lands are chamfered on their upward facing edges. By chamfering the edges of both lands in the same direction, the oil scraping effect is even further improved.

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No.	Term	Definition
6.1.13	coil spring loaded slotted oil control ring	A ring similar to type 6.1.10, the radial pressure of which is increased by means of a cylindrical coil spring. This spring acts equally in all directions against the inside of the ring.
6.1.14	coil spring loaded bevelled-edge oil control ring	A ring similar to type 6.1.11 but coil spring loaded with both lands chamfered on their outer edges.
6.1.15	coil spring loaded double-bevelled oil control ring	A ring similar to type 6.1.12 but coil spring loaded with both lands chamfered in the same direction on their upward facing edges.
6.1.16	coil spring loaded bevelled-edge chromium plated oil control ring	A ring similar to type 6.1.14 but with both lands chromium plated and chamfered on their inner and outer edges. May or may not be profile ground.
6.1.17	expander/segment oil control ring	A three-piece oil control ring comprised of an expander-spacer and two segments. Expander-spacer design will vary with manufacturer.
6.2	Physical characteristics of rings	
6.2.1	nominal ring diameter (symbol d_1)	The nominal diameter is identical to the nominal cylinder bore (H),
6.2.2	witness line	A narrow continuous line of contact lapped on the periphery of the ring, which can be seen around the circumference with normal vision.
6.2.3	joint	The joint at the butt ends of the ring.
6.2.4	butting	An effect which occurs when the gap faces of the ring touch.
6.2.5	effective free gap	The total free gap, m (see figure in 5.1), minus the measured closed gap s_1 (see figure in 5.2); it is the free gap used in the formulae for the calculations of E value, tangential and diametral forces and stresses.
6.2.6	pressure pattern	The radial pressure distribution around the circumference of the ring when closed in its nominal cylinder bore.
6.2.7	contact pressure	Pressure, in newtons per square millimetre, which a ring exerts radially against the cylinder wall.
6.2.8	pin point or burry light	Intermittent pin points of bright light or hazy light, but not bright direct light, observed in the test for light-tightness.
6.3	Piston part	
6.3.1	ring groove	The groove in the piston in which the piston ring is fitted.
6.4	Measuring devices	
6.4.1	ring gauge	A solid annular gauge having an inside diameter of nominal (H) cylinder bore.
6.4.2	datum surface	The plane on which the ring lies for measurements, except where otherwise specified.

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 for the last 10 years 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 6621-1 have been editorially revised and reorganized.

Paragraph numbering has been changed to reflect this reorganization.

In section 5.1 the label "Periphery" has been changed to "Ring Face or Periphery" to conform with wording elsewhere in the document.

Section 5.6 "Section of Scraper Ring" (original ISO section 6.6 "Section of Napier Ring") has been modified to include the scraper cross section which is predominant in North America.

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APPENDIX B

List of equivalent terms in English, French, Russian, German, Spanish, Portuguese, Italian, and Japanese

English	French	Russian	German	Spanish	Portuguese	Italian	Japanese
barrel-faced	portée bombée	бочкообразная рабочая поверхность	ballige Lauffläche	bombeado	face de contacto bombeada	bombatura della superficie periferica	桶面形状, 横 (よこ) リンゴ
barrel on periphery	bombée sur la périphérie	бочкообразность по окружности	Balligkeit	periferia bombeada	periferia bombeada	bombatura sul diametro esterno	桶表面
bevelled-edge oil control ring	segment racleur régulateur d'huile chantreiné symétrique	маслосъемное кольцо со встречными фасками	Dachfasenring	segmento de engrase con patines biselados simétricos	segmento de óleo de chanfros simétricos	anello raschiaccio a patini smussati convergenti	はしはし オイルコントロール リング
butting	arc-boutement	смыкание замка	Berührung der Stoßflächen	contacto de las puntas	contacto das pontas	contatto delle estremità dell'anello	突合せ
cam-turned	tourné en forme	обточенный по копиру	formgedreht	torneado de forma	torneado de forma	torrito con canna	仕上ヤカム
closed gap	jeu à la coupe	тепловой зазор	Stoßspiel	ajuste de puntas	folga entre pontas	gioco delle estremità dell'anello	合口 さま
coating layer thickness	épaisseur de revêtement/incrustation	толщина покрытия	Schichtdicke	espesor de recubrimiento/inserto	espessura do revestimento/enchimento	spessore rivestimento/rivestimento centrale	被覆層厚度
coil spring loaded oil control ring	segment racleur régulateur d'huile mis en charge par ressort hélicoïdal	маслосъемное кольцо с витым расширителем	Schlauchfederring	segmento de engrase con expansor helicoidal	segmento de óleo com mola helicoidal	anello raschiaccio caricato con molla elicoidale	環簧負荷油環 負荷オイル リング
compression ring	segment de compression	компрессионное кольцо	Verdichtungsring	segmento de compresión	segmento de compressão	anello di compressione	圧力 リング
datum surface	surface de référence	базовая плоскость (для измерений)	Meßebene	superficie de referencia	superficie de referência	piano di riferimento	基準面
diametral force	tare diamétrale	диаметральная сила	Diametalkraft	carga diametral	força diametral	forza diametrale	直径力
double-bevelled oil control ring	segment racleur régulateur d'huile chantreiné parallèle	маслосъемное кольцо с параллельными фасками	Gleichfasenring	segmento de engrase con patines biselados asimétricos	segmento de óleo de chanfros paralelos com mola helicoidal	anello raschiaccio a patini con doppio smussi paralleli	兩面 はしはし オイルコントロール リング
effective free gap	ouverture libre efficace	расторг замка минус тепловой зазор	effektive Maulweite	abertura libre efectiva	abertura livre efectiva	gioco effettivo delle estremità ad anello libero	有效自由隙
free flatness	planéité dans un état libre, sans contrainte	отклонение от плоскости кольца в свободном состоянии	Ebenheit, in unbelastetem Zustand	planicidad en estado libre	planeza no estado livre	planità dell'anello libero	自由平面度

English	French	Russian	German	Spanish	Portuguese	Italian	Japanese
fully-faced	portée totale revêtue	с покрытием рабочей поверхности	Laufflächenbeschichtung	totalmente recubierta	face de contacto totalmente revestida	superficie periferica interamente rivestita	全面成形
half keystone ring	segment demi-trapezoidal	трапециевидное кольцо одностороннее	einsaitiger Trapezring	segmento trapezoidal simple	segmento semitrapezoidal	anello semi-trapezoidale	半キーストーンリング
heat-formed	mise en forme thermique	с горячей формовкой	thermisch gespannt	abertura térmica	conformado térmicamente	sagomato a caldo	熱成形
inlaid	incrusté	с закладной канавкой	Füllung	inserto	incrustado	rivestimento centrale sulla superficie periferica	埋層
inside edges chamfered	arêtes intérieures chanfreinées	с внутренними фасками	Innenkantenbruch	cantos interiores biselados	arestas interiores chanfradas	spigoli interni smussati	内縁修正
inside and peripheral edges chamfered	arêtes intérieures et extérieures chanfreinées	с внутренними и наружными фасками	Innen- und Außenkantenbruch	cantos interiores y exteriores biselados	arestas interiores e exteriores chanfradas	spigoli interni e esterni smussati	内周周辺修正
internal bevel bottom (negative twist type)	chanfrein intérieur de torsion bas (torsion négative)	кольцо с внутренней нижней фаской (обратного скручивания)	Innenfase unten (negative Vertwistung)	chaffan interior inferior (tipo torsional negativo)	chanfro de torção interior inferior (torção negativa)	smusso sul diametro interno inferiore (tipo a torsione negativa)	内側底 (正ねじ型)
internal bevel top (positive twist type)	chanfrein intérieur de torsion haut (torsion positive)	кольцо с внутренней верхней фаской (прямого скручивания)	Innenfase oben (positive Vertwistung)	chaffan interior superior (tipo torsional positivo)	chanfro de torção interior superior (torção positiva)	smusso sul diametro interno superiore (tipo a torsione positiva)	内側底 (負ねじ型)
internal step bottom (negative twist type)	épaulement intérieur bas (torsion négative)	кольцо с внутренней нижней выточкой (обратного скручивания)	Innenwinkel unten (negative Vertwistung)	escalón interior inferior (tipo torsional negativo)	rebaixo interior inferior (torção negativa)	spallamento sul diametro interno inferiore (tipo a torsione negativa)	内側底 (負ねじ型)
internal step top (positive twist type)	épaulement intérieur haut (torsion positive)	кольцо с внутренней верхней выточкой (прямого скручивания)	Innenwinkel oben (positive Vertwistung)	escalón interior superior (tipo torsional positivo)	rebaixo interior superior (torção positiva)	spallamento sul diametro interno superiore (tipo a torsione positiva)	内側上面 (正ねじ型)
joint	coupe	замок	Stoß	corte	corte	estremità	接手
joint with internal notch	coupe avec encoche intérieure	замок с торцевой фиксацией	Stoß mit Innensicherung	entalla para fijo interior	corte com entalhe interior	estremità con tacca interna	内切込み接手
joint with side notch	coupe avec encoche frontale	замок с внутренней фиксацией	Stoß mit Flankensicherung	entalla para fijo lateral	corte com entalhe lateral	estremità con tacca frontale	側切込み接手
keystone angle	angle du trapèze	угол трапеции	Trapezwinkel	angulo trapezoidal	ângulo do trapézio	angolo del trapezio	keystone 角
keystone ring	segment trapézoidal	кольцо трапециевидное двустороннее	Trapezring	segmento trapezoidal	segmento trapezoidal	anello trapezoidale	keystone リング
land offset	déport des lèvres	смещение перемычки	Laufteigversatz	desplazamiento cordón	desencontro das faces	disassamento partino	ランド オフセット