SAE The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

SURFACE VEHICLE RECOMMENDED PRACTICE

Submitted for recognition as an American National Standard

SAE J1588
(ISO 6621/1)

Issued 1990-09-24

INTERNAL COMBUSTION ENGINES - PISTON RINGS - VOCABULARY

This document is equivalent to ISO Standard 6621/1

1. SCOPE AND FIELD OF APPLICATION:

Differences, where they exist, are shown in the appendix with associated rationale.

This SAE Recommended Practice 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.

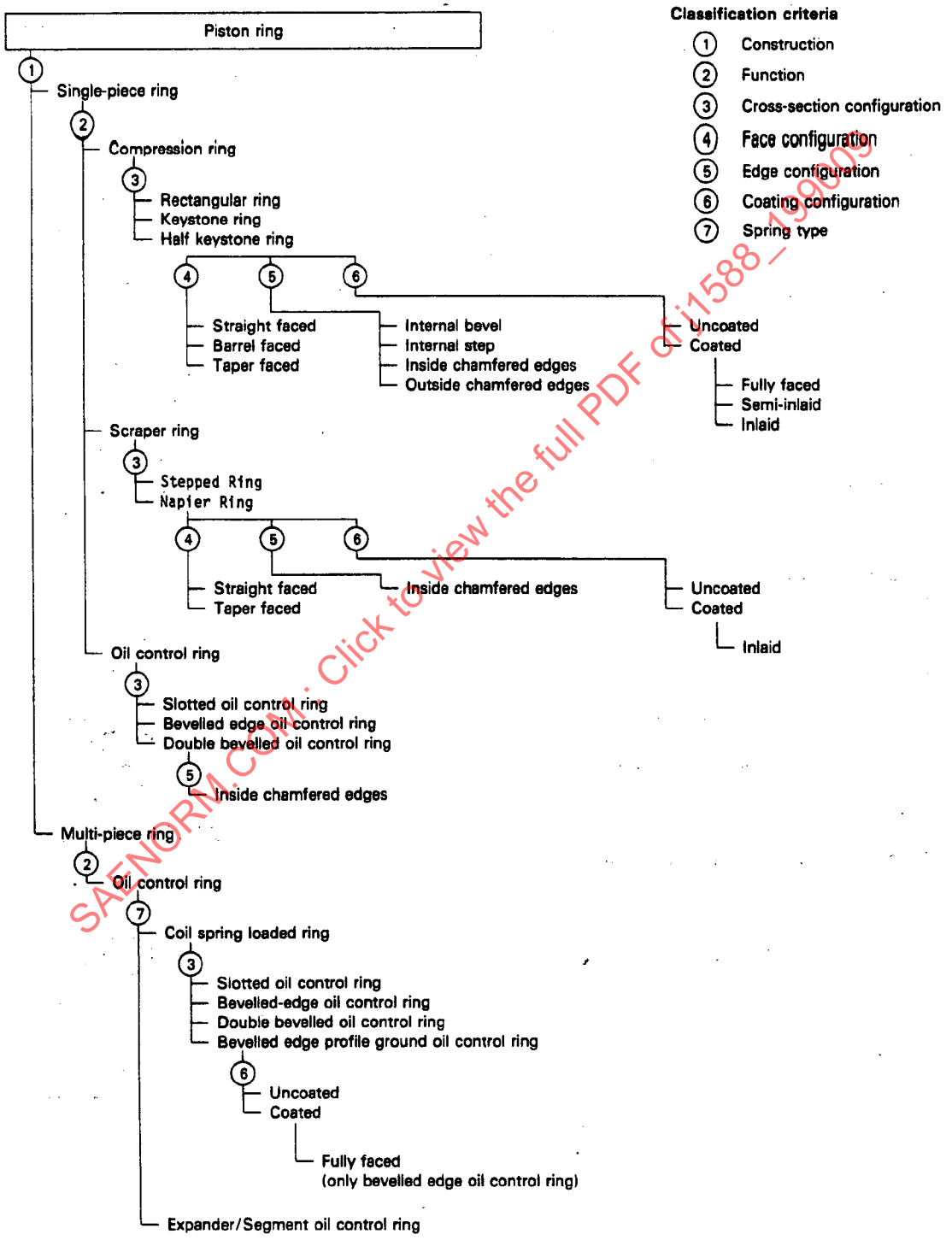
An addendum is included which lists equivalent terms in English, French, Russian, German, Spanish, Portuguese, Italian, and Japanese.

2. REFERENCE:

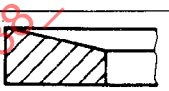
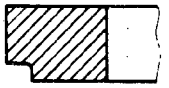
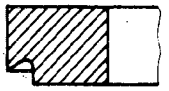
SAE DESIGNATION	ISO* EQUIVALENT	
		INTERNAL COMBUSTION ENGINES - PISTON RINGS
J1588	6621/1	Vocabulary
J1589	6621/2	Measuring principles
J1590	6621/3	Material specifications
J1591	6621/4	General specifications
J1996	6621/5	Quality requirements
		INTERNAL COMBUSTION ENGINES - PISTON RINGS
J1997	6622/1	Rectangular rings
J1998	6622/2 TR	Rectangular rings with narrow ring width
J1999	6623	INTERNAL COMBUSTION ENGINES - PISTON RINGS - SCRAPER RINGS
		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 - COIL SPRING LOADED OIL CONTROL RINGS
J2004	6627 TR	INTERNAL COMBUSTION ENGINES - EXPANDER/SEGMENT OIL CONTROL RINGS
	ISO 286	ISO SYSTEM OF LIMITS AND FITS

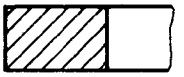
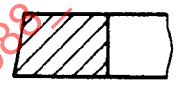
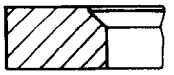
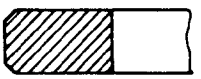
*TR refers to Technical Report

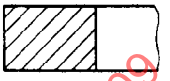
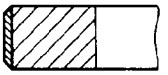
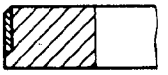
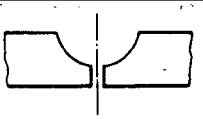
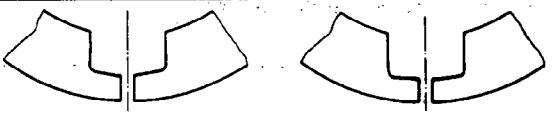
3. PISTON RING CLASSIFICATION:



4. PISTON RING TYPES:

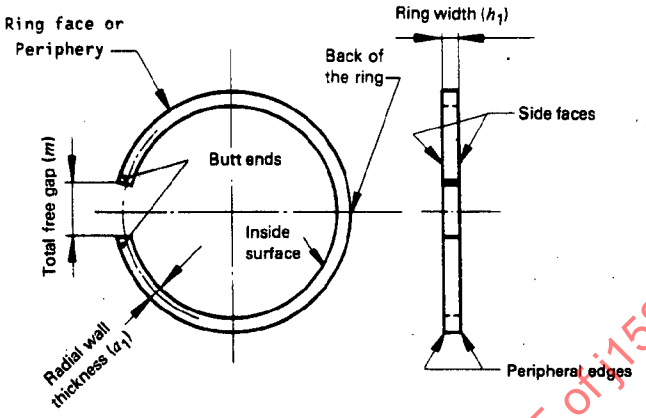
4.1 Cross section configuration	(These cross sections may be combined with the "common features" shown in 4.2, 4.3, 4.4 and 4.5)
Rectangular ring	
Keystone ring	
Half keystone ring	
Scraper ring (stepped)	
Scraper ring (Napier)	
Slotted oil control ring	
Bevelled edge oil control ring	
Coil spring loaded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

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	

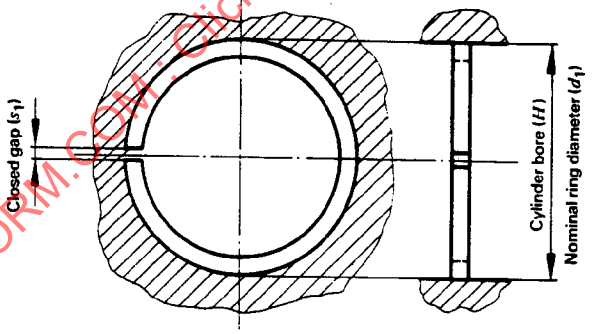
4.4 Coating configuration	
Uncoated	
Coated	
– Fully faced	
– Semi-inlaid	
– Inlaid	
4.5 Joint configuration	
Joint with side notch	
Joint with internal notch	

5. PISTON RING NOMENCLATURE:

5.1 Free (Unstressed) Ring:

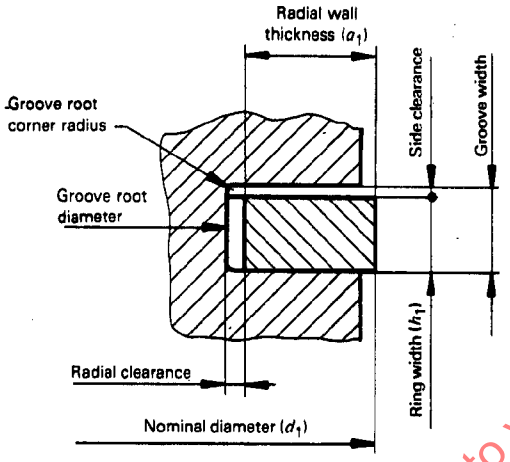


5.2 Closed Ring:

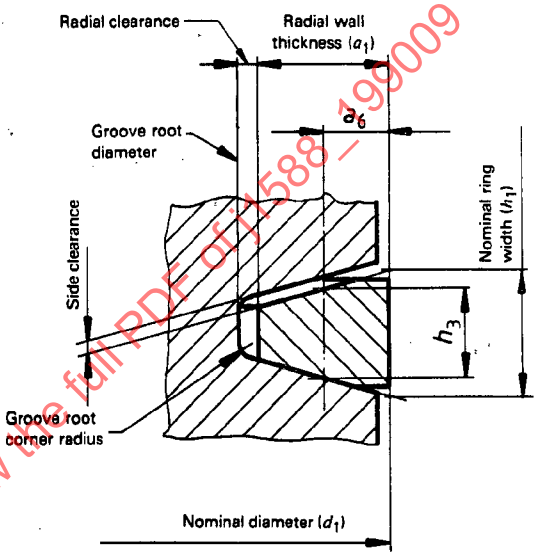


5.3 Ring Clearances:

a) Rectangular ring

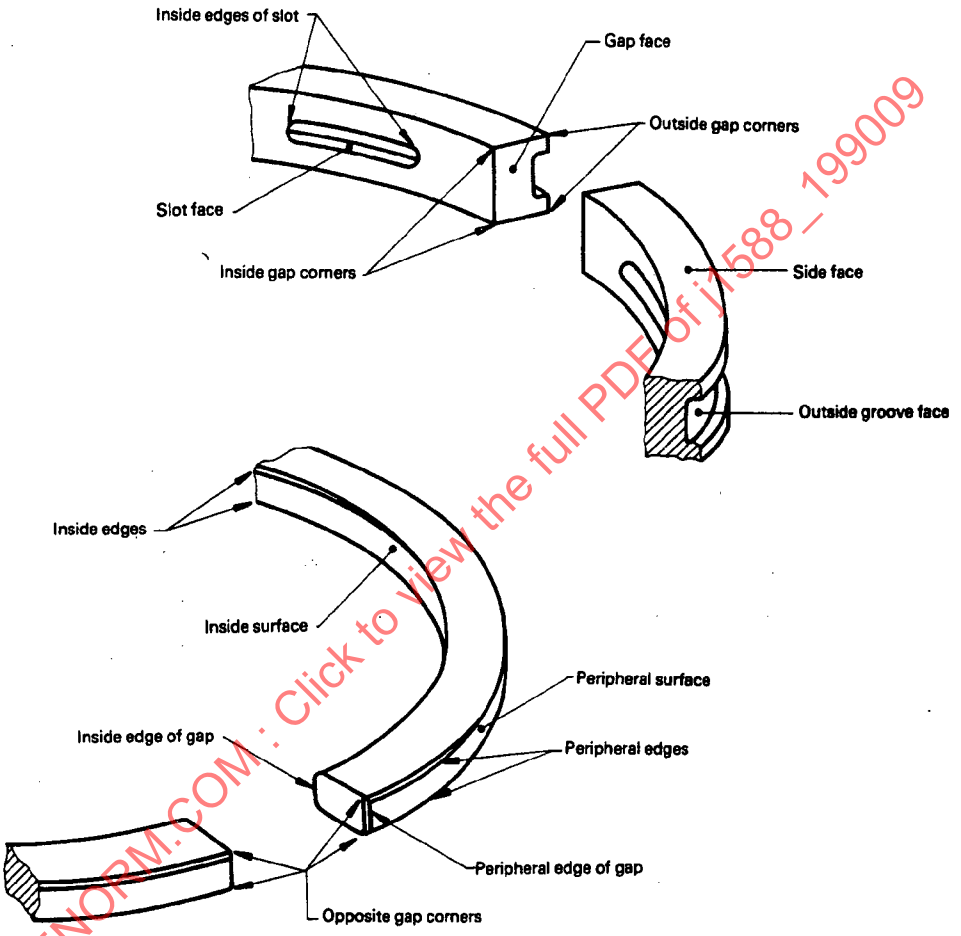


b) Keystone ring

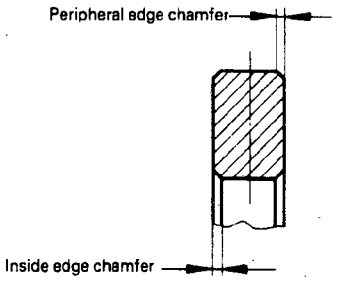


Method A : a_6 ref., h_3 measured
Method B : h_3 ref., a_6 measured

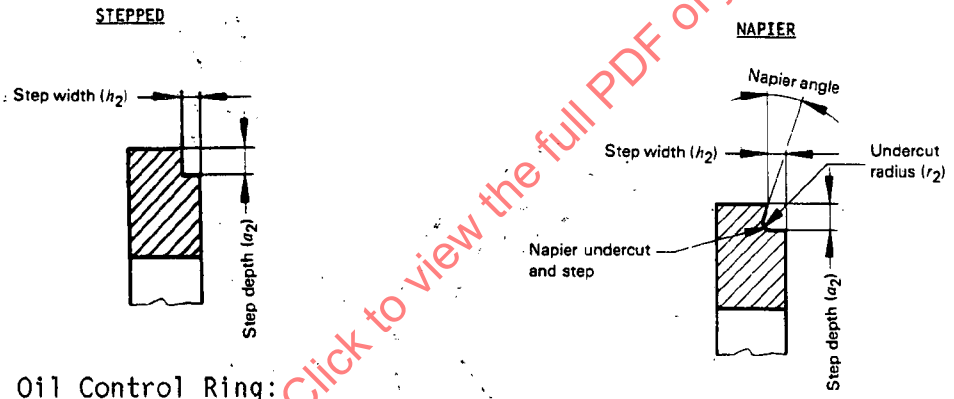
5.4 Edges, Surfaces and Faces:



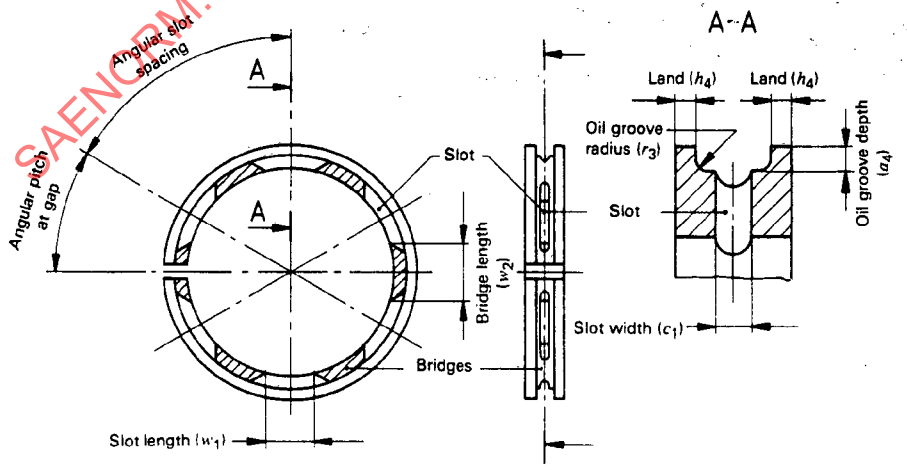
5.5 Section of Straight-Faced Rectangular Ring:



5.6 Section of Scraper Ring:



5.7 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.

No.	Term	Definition
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.
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.

No.	Term	Definition
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.

ADDENDUM

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	バレル・フェース
barrel on periphery	bombée sur la périphérie	бочкообразность по окружности	Balligkeit	periferia bombeada	periferia bombeada	bombatura sul diametro esterno	バレル面
bevelled edge oil control ring	segment racleur régulateur d'huile chanfreiné symétrique	маслосъемное кольцо со встречными фасками	Dachfasenring	segmento de engrase con patines biselados simétricos	segmento de óleo de chanfros simétricos	anello raschiaolio a pattini smussati convergenti	ベベル型オイル・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	tornito con camma	仕上げカム
closed gap	jeu à la coupe	тепловой зазор	Stoßspiel	ajuste de puntas	folga entre pontas	gioco delle estremità dell'anello	合口すきま
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 hélicoidal	маслосъемное кольцо с витым расширителем	Schlauchfederring	segmento de engrase con expansor helicoidal	segmento de óleo com mola helicoidal	anello raschiaolio caricato con molla elicoidale	背位スプリング付オイル・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	Diametralkraft	carga diametral	força diametral	forza diametrale	直径力
double bevelled oil control ring	segment racleur régulateur d'huile chanfreiné parallèle	маслосъемное кольцо с параллельными фасками	Gleichfasenring	segmento de engrase con patines biselados asimétricos	segmento de óleo de chanfros paralelos com mola helicoidal	anello raschiaolio a pattini con doppio smussi paralleli	両面ベベル型オイル・リング
effective free gap	ouverture libre efficace	раствор замка минус тепловой зазор	effektive Maulweite	abertura libre efectiva	abertura livre efectiva	gioco effettivo delle estremità ad anello libero	有効自由隙間
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	planarità dell'anello libero	自由平面度

ADDENDUM

English	French	Russian	German	Spanish	Portuguese	Italian	Japanese
fully-faced	portée totale revêtue	с покрытием рабочей поверхности	Laufflächen-beschichtung	totalmente recubierto	face de contacto totalmente revestida	superficie periferica interamente rivestita	全面成形
half keystone ring	segment demi-trapézoïdal	трапециевидное кольцо одностороннее	einseitiger Trapezring	segmento trapecial simple	segmento semitrapezoidal	anello semi-trapezoidale	ハーフ・キーストン・リング
heat-formed	mise en forme thermique	с горячей формовкой	thermisch gespannt	abertura térmica	conformado térmica-mente	sagomato a caldo	熱成形
inlaid	incrusté	с заполненной канавкой	Füllung	inserto	incrustado	rivestimento centrale sulla superficie periferica	填層
inside edges chamfered	arêtes intérieures chanfreinées	с внутренними фасками	Innenkantenbruch	cantos interiores biselados	arestas interiores chanfradas	spigoli interni smussati	内部角面取り
inside and peripheral edges chamfered	arêtes intérieures et extérieures chanfreinées	с внутренними и наружными фасками	Innen- und Außen-kantenbruch	cantos interiores y exteriores biselados	arestas interiores e exteriores chanfradas	spigoli interni e esterni smussati	内面周辺修正(面取り)
internal bevel bottom (negative twist type)	chanfrein intérieur de torsion bas (torsion négative)	кольцо с внутренней нижней фаской (обратного скручивания)	Innenfase unten (negative Vertwistung)	chaflan interior inferior (tipo torsional negativo)	chanfro de torção interior inferior (torção negativa)	smusso sul diametro interno inferiore (tipo a torsione negativa)	インナー・ベベル・ボトム(負ねじり型)
internal bevel top (positive twist type)	chanfrein intérieur de torsion haut (torsion positive)	кольцо с внутренней верхней фаской (прямого скручивания)	Innenfase oben (positive Vertwistung)	chaflan interior superior (tipo torsional positivo)	chanfro de torção interior superior (torção positiva)	smusso sul diametro interno superiore (tipo a torsione positiva)	インナー・ベベル・トップ(正ねじり型)
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)	内階底(負ねじり型)
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)	内階上面(正ねじり型)
joint	coupe	замок	Stoß	corte	corte	estremità	継手
joint with internal notch	coupe avec encoche intérieure	замок с торцевой фиксацией	Stoß mit Innen-sicherung	entalla para fijo interior	corte com entalhe interior	estremità con tacca interna	内切欠き継手
joint with side notch	coupe avec encoche frontale	замок с внутренней фиксацией	Stoß mit Flanken-sicherung	entalla para fijo lateral	corte com entalhe lateral	estremità con tacca frontale	側切欠き継手
keystone angle	angle du trapèze	угол трапеции	Trapezwinkel	angulo trapecial	ângulo do trapézio	angolo del trapezio	keystone角
keystone ring	segment trapézoïdal	кольцо трапециевидное двустороннее	Trapezring	segmento trapecial	segmento trapezoidal	anello trapezoidale	keystoneリング
land offset	déport des lèvres	смещение перемычки	Laufstegversatz	desplazamiento cordón	desencontro das faces	disassamento pattino	ランド・オフセット

ADDENDUM

English	French	Russian	German	Spanish	Portuguese	Italian	Japanese
land width	largeur des lèvres	высота перемычки	Laufsteghöhe	espesor cordón	espessura dos cordões	altezza pattino	ランド幅
light tightness /	étanchéité à la lumière	плотность прилегания	Lichtspaltdichtheit	estanqueidad	vedação à luz	tenuta alla (prova di) luce	光緊度
modulus of elasticity	module d'élasticité	модуль упругости	Elastizitätsmodul	módulo de elasticidad	módulo de elasticidade	modulo di elasticità	弾性計数
multi-piece ring	segment multipièce	составное кольцо (многоэлементное)	mehrteiliger Kolbenring	segmento múltiplo	segmento de múltiplas peças	anello multipezzo	コンパインド・リング
Napier ring	segment bec d'aigle	скребковое кольцо с поднутрением канавки	Nasenring, hinterstochen	segmento rascador de uña	segmento raspador "Napier"	anello napier	ナピーア・リング
Napier ring, taper-faced	segment bec d'aigle à portée conique	скребковое кольцо с поднутрением и с конической рабочей поверхностью	Nasenminutenring, hinterstochen	segmento rascador de uña con periferia cónica	segmento raspador "Napier" com face de contacto cónica	anello napier con superficie periferica conica	ナピーア・リング斜面成形
nominal ring diameter	diamètre nominal du segment	номинальный диаметр кольца	Nenndurchmesser	diametro nominal del segmento	diâmetro nominal do segmento	diametro nominale dell'anello	リング呼び径
obliqueness	obliquité	коробление	Schieflage	inclinación	inclinação	obliquità	斜面度
oil control ring	segment racleur régulateur d'huile	маслосъемное кольцо	Ölabstreifring	segmento control de aceite	segmento de óleo	anello raschiaolio	オイル・リング
ovality or circularity	ovalisation ou circularité	овальность	Ovalität	ovalidad	ovalização	ovalità	楕円型或円型
peripheral edges chamfered	arêtes extérieures chanfreinées	с наружными фасками	Außenkantenbruch	cantos exteriores biselados	arestas exteriores chanfradas	spigoli esterni smussati	面縁修正
pin point or burry light	pointe d'épingle ou lumière irisée	мерцающий просвет	leichter unterbrochener Lichtschimmer	luz difusa	passagem de luz difusa	puntinatura o diffusione di luce	ピン維手
piston ring	segment de piston	поршневое кольцо	Kolbenring	segmento de pistón	segmento do êmbolo	anello	ピストン・リング
point deflection	point de flexion	прогиб стыкования	Stoßeinfall	punto de flexión	ponto de flexão	inflessione delle punte	点偏差
pressure pattern	diagramme de pression	эпюра распределения давлений	Druckverteilung	distribución de la presión	distribuição da pressão	distribuzione della pressione	圧力パターン
radial wall thickness	épaisseur radiale	радиальная толщина	radiale Wanddicke	espesor radial	espessura radial	spessore radiale	T寸
rectangular ring	segment rectangulaire	прямоугольное кольцо	Rechteckring	segmento rectangular	segmento rectangular	anello rettangolare	長方型リング
ring gauge	bague étalon	кольцевой калибр	Kontrollring	calibre para segmento	calibre do segmento	calibro ad anello	リング・ゲージ
ring groove	gorge du piston	канавка поршня	Ringnut	ranura de pistón	caixa do êmbolo	gola dell'anello	リング溝
ring width	hauteur du segment	высота кольца	Ringhöhe	altura de segmento	altura do segmento	altezza dell'anello	リング幅