

INTERNAL COMBUSTION ENGINES - PISTON RINGS - OIL CONTROL RINGS

This document is equivalent to ISO Standard 6625.

1. SCOPE AND FIELD OF APPLICATION:

Differences, where they exist, are shown in Appendix A.

This document specifies the dimensional features of S, G, D, and DV oil control piston ring types.

The normal range for the axial width of oil control rings (2.5 to 8 mm inclusive) is divided into 0.5 or 1.0 increments. In Table 7, dimensions in inch units are given for oil control rings with axial width 4.75 mm (equal to 3/16 in) for existing applications.

The requirements of this document apply to oil control rings for reciprocating internal combustion piston engines up to and including 200 mm in diameter. They may also be used for piston rings of compressors working under similar conditions.

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2. REFERENCES:

SAE
DESIGNATIONISO*
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
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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
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J2003	6626	INTERNAL COMBUSTION ENGINES - COIL SPRING LOADED OIL CONTROL RINGS
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J2004	6627 TR	INTERNAL COMBUSTION ENGINES - EXPANDER/SEGMENT OIL CONTROL RINGS
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*TR refers to Technical Report

3. RING TYPES AND DESIGNATION EXAMPLES:

3.1 Type S – Slotted Oil Control Ring:

3.1.1 General Features:

NOTE: See Table 5 or 7 for dimensions and forces.

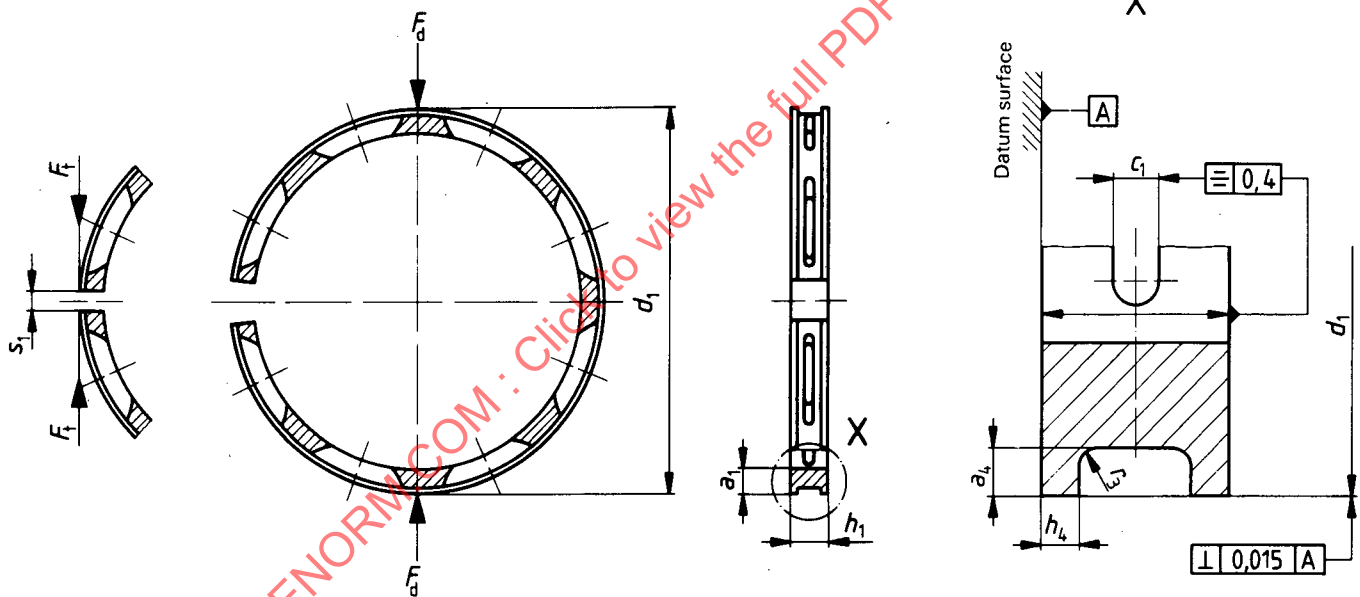


FIGURE 1 – Type S

3.1.2 Designation Example: Designation of a slotted oil control ring of $d_1 = 90$ mm nominal diameter, $h_1 = 4$ mm ring width, made of grey cast iron, non-heat-treated (material subclass l2), general features as shown in Fig. 1, and inside chamfered edges.

3.2 Type G – Double Bevelled Oil Control Ring:

3.2.1 General Features:

NOTE: See Table 6 or 7 for dimensions and forces.

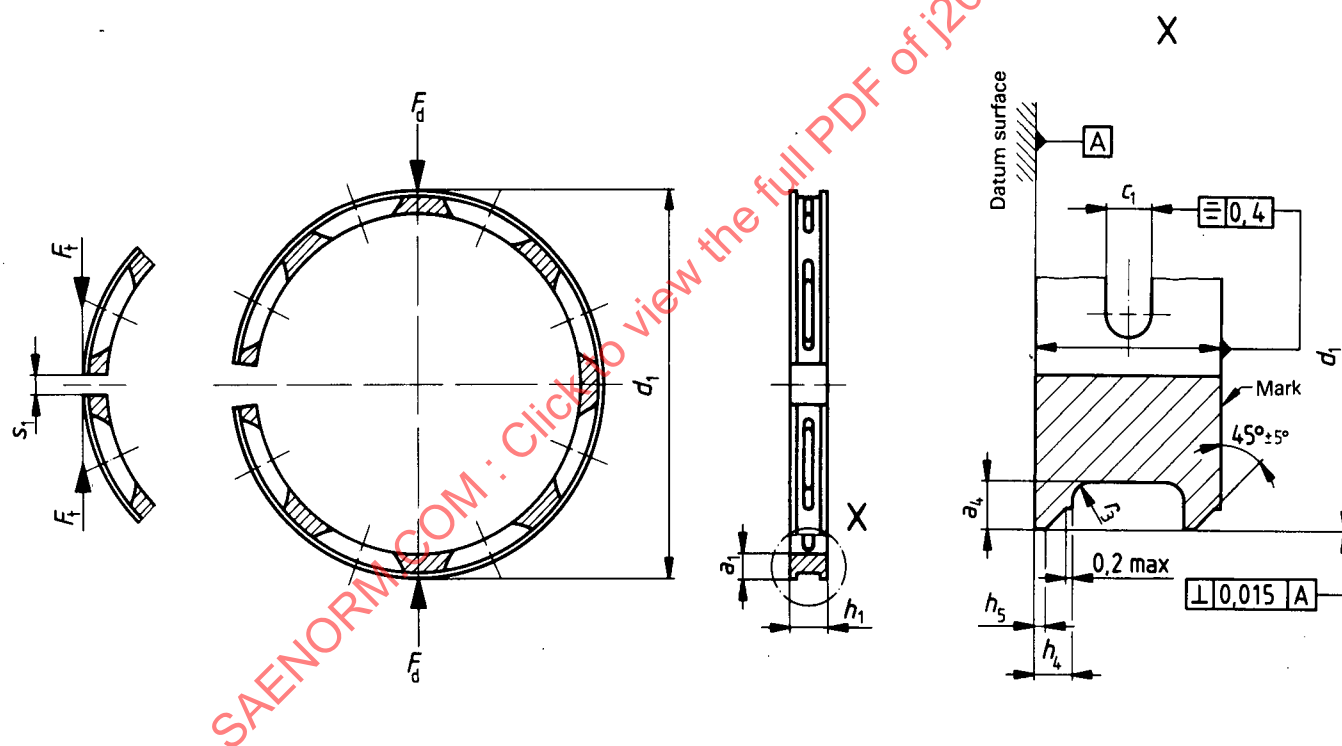


FIGURE 2 – Type G

3.2.2 Designation Example: Designation of a double bevelled oil control ring of $d_1 = 90$ mm nominal diameter, $h_1 = 4$ mm ring width, made of grey cast iron, non-heat-treated (material subclass 12), general features as shown in Fig. 2, and phosphate coated.

3.3 Type D – Bevelled Edge Oil Control Ring:

3.3.1 General Features:

NOTE: See Table 6 or 7 for dimensions and forces.

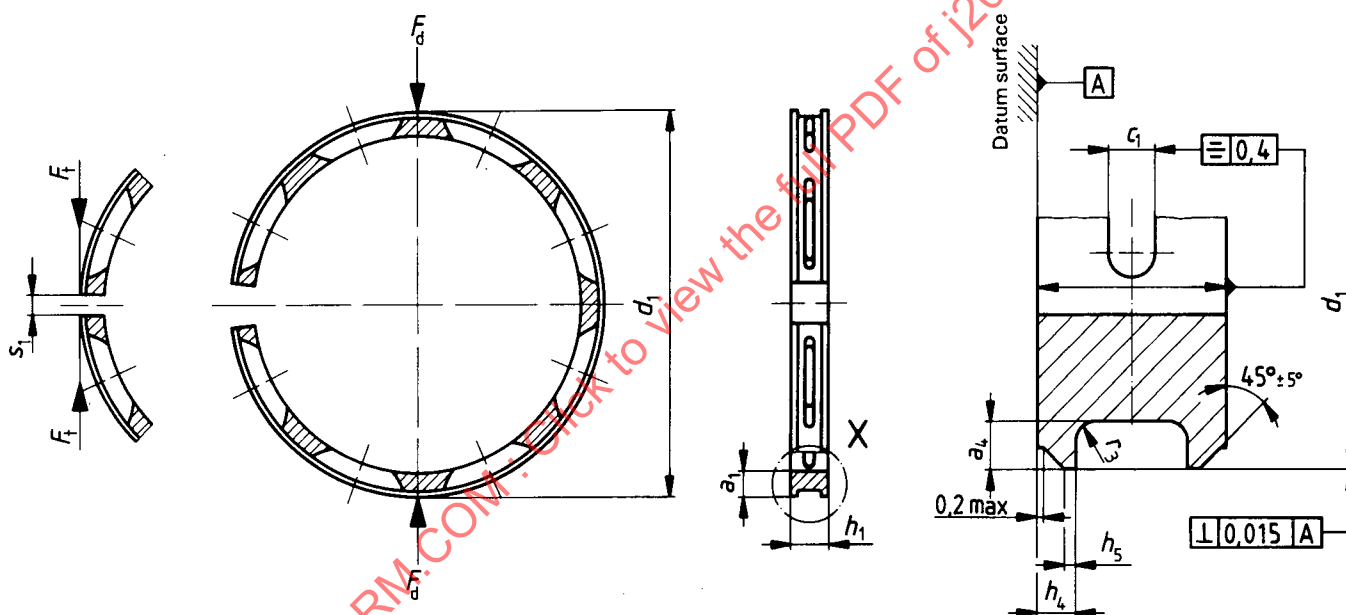


FIGURE 3 – Type D

3.3.2 Designation Example: Designation of a bevelled edge oil control ring of $d_1 = 90$ mm nominal diameter, $h_1 = 4$ mm ring width, made of grey cast iron, non-heat-treated (material subclass 12), general features as shown in Fig. 3.

3.4 Type DV – Bevelled Edge V Groove Oil Control Ring (Only for Ring Widths $h_1 > 4$ mm):

3.4.1 General Features:

NOTE: See Table 6 or 7 for dimensions and forces.

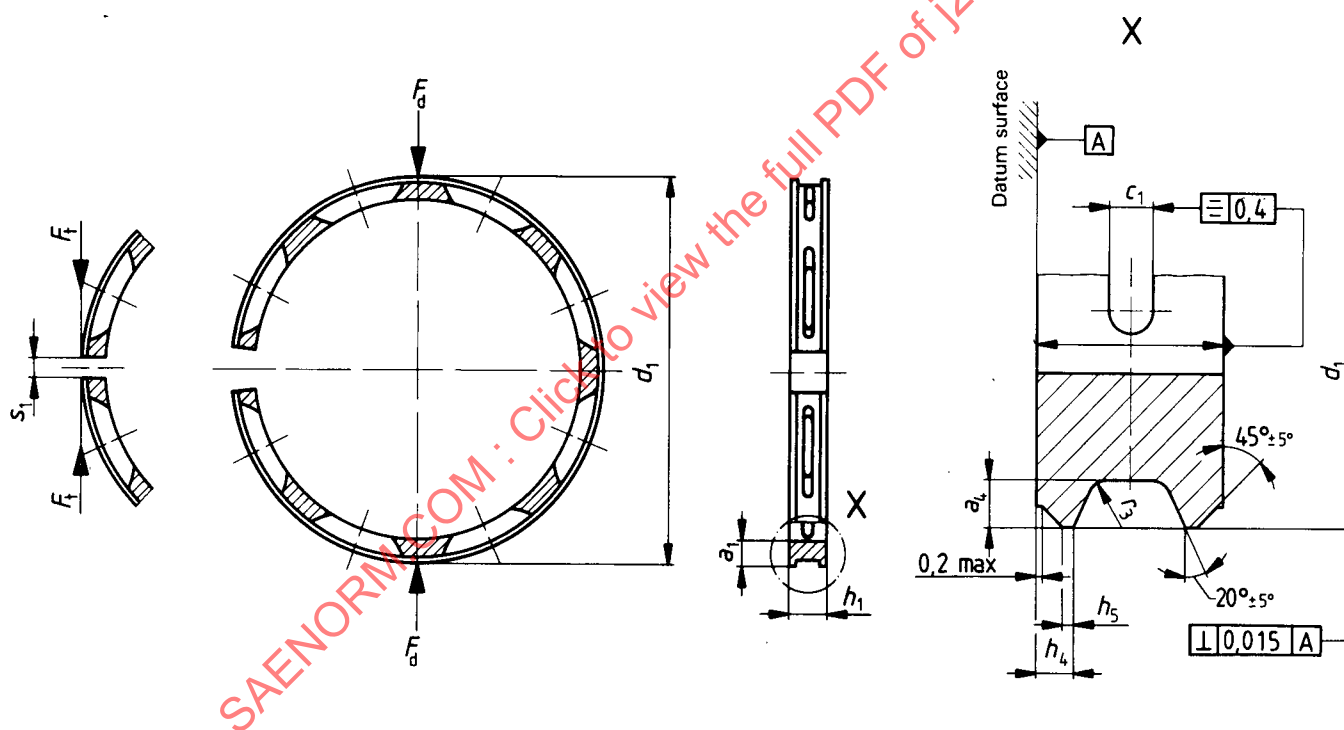


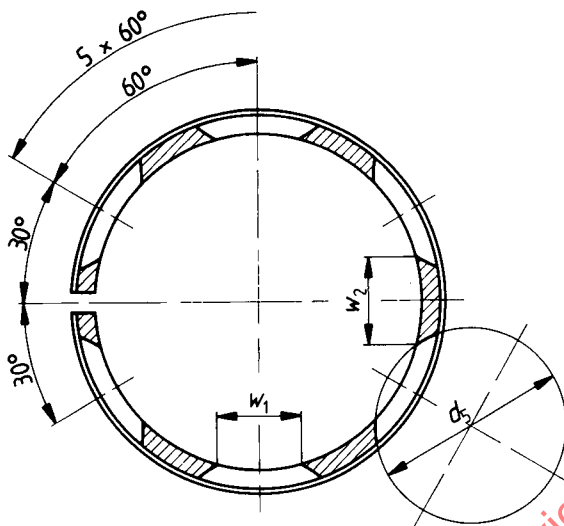
FIGURE 4 – Type DV

3.4.2 Designation Example: Designation of a bevelled edge V-groove oil control ring of $d_1 = 90$ mm nominal diameter, $h_1 = 4.5$ mm ring width, made of grey cast iron, non-heat-treated (material subclass 12), general features as shown in Fig. 4.

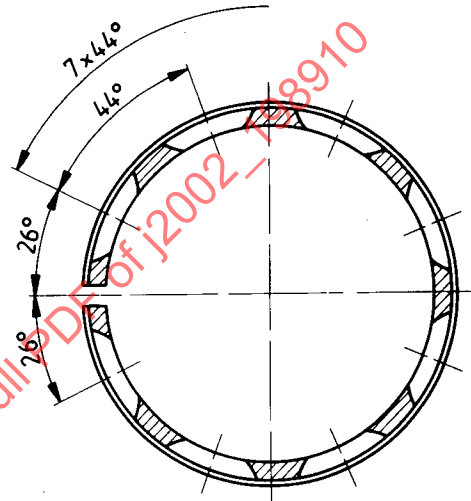
4. COMMON FEATURES:

4.1 S, G, D, and DV Rings - Arrangement of Slots: (See Fig. 5.)

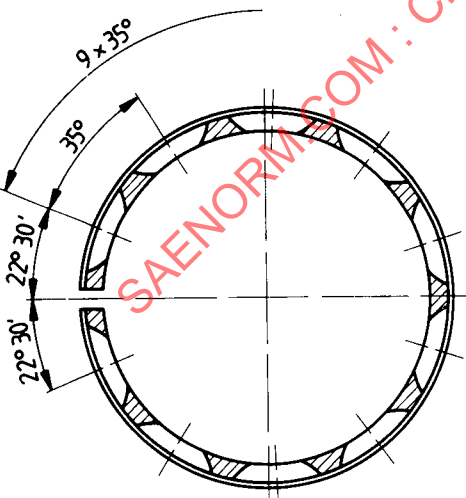
NOTE: See Tables 1 and 2 for dimensions.



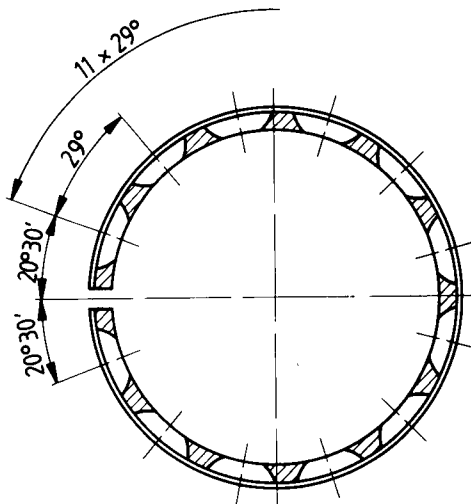
a) 6 slots
for $30 \leq d_1 < 60$



b) 8 slots
for $60 \leq d_1 < 105$



c) 10 slots
for $105 < d_1 < 140$



d) 12 slots
for $140 \leq d_1 \leq 200$

FIGURE 5 - Arrangement of Slots

TABLE 1 - Cutter Diameter

Dimensions in millimeters

d_1	Cutter diameter d_5 max
$30 < d_1 < 50$	55
$50 < d_1 < 170$	60
$170 < d_1 < 200$	75

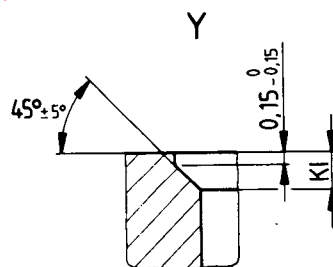
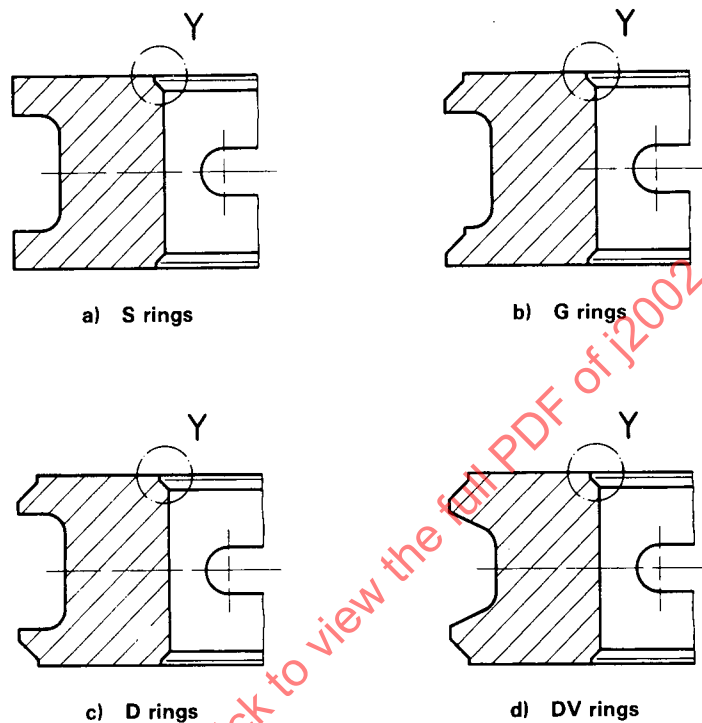
TABLE 2 - Slot Length

Dimensions in millimeters

d_1	Slot Length		Permissible difference between w_1 and w_2
	w_1	Tolerance	
$30 < d_1 < 36$	5	± 2	-
$36 < d_1 < 40$	6	± 2	-
$40 < d_1 < 50$	8	± 2	-
$50 < d_1 < 170$	$w_1 = w_2$	-	2
$170 < d_1 < 200$	$w_1 = w_2$	-	4

4.2 S, G, D, and DV Rings – Inside Chamfered Edges (KI): (See Fig. 6.)

NOTE: See Table 3 for dimensions.



Nominal KI > 0.3

FIGURE 6 – Inside Chamfered Edges

TABLE 3 – KI Dimensions

Dimensions in millimeters

d_1	KI
$30 < d_1 < 125$	0.3 ± 0.15
$125 < d_1 < 175$	0.4 ± 0.15
$175 < d_1 < 200$	0.6 ± 0.2

5. FORCE FACTORS:

The tangential and diametral forces, given in Tables 5, 6, and 7 shall be corrected when additional features and/or materials other than grey cast iron with a modulus of elasticity of 100 000 MPa are being used.

For common features, the multiplier correction factors given in Table 4 and the force correction factors given in SAE J1591 shall be used.

TABLE 4 – Force Correction Factors for S, G, D,
and DV Rings With KI Feature

d_1 mm	Factor
$30 < d_1 < 50$	1
$50 < d_1 < 100$	0.98
$100 < d_1 < 150$	0.98
$150 < d_1 < 200$	0.97

TABLE 5 - Dimensions of S Oil Control Rings

Dimensions in millimeters

Non- inal diam- eter d_1	Radial wall thickness "regular" a_1	Ring width h_1				Closed gap s_1	Radius r_3	Land width h_4				Groove depth a_4	Num- ber of slots	Slot width c_1	Tangential force F_t , N				Diametral force F_d , N																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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NOTES

¹For intermediate sizes (for example repair sizes), the radial wall thickness of the next smaller nominal diameter should be applied.

²For values for F_t and F_d , given in Table 5, apply to as cast grey cast iron with a typical modulus of elasticity (E_n) of 100 000 MPa. Multiplying factors for materials having a different modulus (E_n) are given in SAE J1591.

Mean forces are calculated for nominal radial wall thickness (a_1) and mean ring width (h_1).

³For the sole purpose of this document, the assumed average ratio F_d/F_t is 2.15. However, for rings up to 50 mm, the ratio F_d/F_t shall be determined between the manufacturer and client.

This table is shown in ISO format. Commas represent decimal points.

TABLE 6 - Dimensions for G, D, and DV Oil Control Rings

Dimensions in millimeters

Non- inal diam- eter d_1	Radial wall thickness "regular" a_1	Ring width h_1				Closed gap s_1	Radius r_3	Land width h_4				Land width h_5				Groove depth a_4	Num- ber of slots	Slot width c_1				Tangential force F_t , N				Diametral force F_d , N																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
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Nominal diameter d_1	Radial wall thickness "regular" a_1	Ring width h_1				Closed gap s_1	Radius r_3	Land width h_4				Land width h_5				Groove depth a_4	Number of slots	Slot width c_1				Tangential force F_t , N				Diametral force F_d , N																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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NOTES

1For intermediate sizes (for example repair sizes), the radial wall thickness of the next smaller nominal diameter should be applied.

2The values for F_t and F_d given in Table 6 apply to as cast grey cast iron with a typical modulus of elasticity (E_n) of 100 000 MPa. Multiplying factors for materials having a different modulus (E_n) are given in SAE J1591.

Mean forces are calculated for nominal radial wall thickness (a_1) and mean ring width (h_1).

3For the sole purpose of this document, the assumed average ratio F_d/F_t is 2.15. However, for rings up to 50 mm, the ratio F_d/F_t shall be determined between the manufacturer and client.

This table is shown in ISO format. Commas represent decimal points.

TABLE 7 - Dimensions for S, G, D, and DV Oil Control Rings With Special Ring
Width $h_1 = 4.75 \text{ mm}$ (3/16 in)

Dimensions in millimeters

Non- inal diam- eter d_1	Radial wall thickness "regular" a_1	Ring width h_1	Closed gap s_1	Radius r_3	Land width h_4	Land width h_5	Groove depth a_4	Num- ber of slots	Slot width c_1	Type S				Types G and D			
										Tangential force F_t , N	Toler- ance	Diametral force F_d , N	Toler- ance	Tangential force F_t , N	Toler- ance	Diametral force F_d , N	Toler- ance
50	2,1									11,1		23,9		9,5		20,4	
51	2,15									11,5		24,7		9,9		21,3	
52	2,15									11		23,7		9,5		20,4	
53	2,2									11,5		24,7		10		21,5	
54	2,25		0,15				0,6 $\pm 0,1$	6		11,9		25,6		10,4		22,4	
55	2,3									12,3		26,4		10,8		23,2	
56	2,35									12,8		27,5		11,2		24,1	
57	2,4									13,2		28,4		11,7		25,2	
58	2,4									12,8		27,5		11,3		24,3	
59	2,45									13,2		28,4		11,7		25,2	
60	2,5									12,6		27,1		10,9		23,4	
61	2,55									13		28		11,3		24,3	
62	2,6									13,4		28,8		11,7		25,2	
63	2,65			0,2 max						13,8		29,7		12,1		26	
64	2,65									13,4		28,8		11,8		25,4	
65	2,7									13,8		29,7		12,2		26,2	
66	2,75									14,2		30,5		12,6		27,1	
67	2,8		0,2 0							14,6		31,4		13		28	
68	2,85									15,1	$\pm 30\%$ if $F_t < 10\text{N}$	32,5	$\pm 30\%$ if $F_d < 21,5\text{N}$	$\pm 30\%$ if $F_t < 10\text{N}$		$\pm 30\%$ if $F_d < 21,5\text{N}$	
69	2,9	4,75			0,8 $\pm 0,1$	0,28 $\pm 0,08$	0,8 $\pm 0,1$			14,6		31,4		13,8		29,7	
70	2,9	Within a ring: 0,15 max								15	$\pm 20\%$ if $F_t > 10\text{N}$	32,3	$\pm 20\%$ if $F_d > 21,5\text{N}$	13,4	$\pm 20\%$ if $F_t > 10\text{N}$	28,8	$\pm 20\%$ if $F_d > 21,5\text{N}$
71	2,95	phos- phated PO surface: $\pm 0,005$ $-0,025$								15,5		33,3		13,9		29,9	
72	3									15,9		34,2		14,3		30,7	
73	3,05									16,3		35		14,7		31,6	
74	3,1									16,8		36,1		15,1		32,5	
75	3,15									17,1		36,8		15,5		33,3	
76	3,15									16,7		35,9		15,1		32,5	
77	3,2									17,1		36,8		15,5		33,3	
78	3,25									17,5		37,6		15,9		34,2	
79	3,3									18		38,7		16,4		35,3	
80	3,35									17,4		37,4		15,7		33,8	
81	3,4									17,9		38,5		16,2		34,8	
82	3,4		0,25 0							17,4		37,4		15,8		34	
83	3,45									17,9		38,5		16,2		34,8	
84	3,5			0,5 max			1 $\pm 0,1$			18,3		39,3		16,6		35,7	
85	3,55									18,7		40,2		17		36,6	
86	3,6									19,1		41,1		17,4		37,4	
87	3,65									19,6		42,1		17,9		38,5	
88	3,65									19,1		41,1		17,5		37,6	
89	3,7									19,6		42,1		17,9		38,5	

This table is shown in ISO format. Commas represent decimal points.

TABLE 7 (Continued)

Dimensions in millimeters

Nom- inal diam- eter d_1	Radial wall thickness "regular" a_1	Ring width h_1	Closed gap s_1	Radius r_3	Land width h_4	Land width h_5	Groove depth a_4	Num- ber of slots	Slot width c_1	Type S		Types G and D	
										Tangential force F_t , N	Toler- ance	Tangential force F_t , N	Toler- ance
90	3,75	4,75	0,3	0,25 0	0,8 $\pm 0,1$	0,28 $\pm 0,08$	1 $\pm 0,1$	8	1,2 $\pm 0,1$	19,9		18,2	
91	3,8									20,4		18,7	
92	3,85									20,8		19,1	
93	3,9									21,2		19,5	
94	3,9	4,75	0,3	0,25 0	0,8 $\pm 0,1$	0,28 $\pm 0,08$	1 $\pm 0,1$	8	1,2 $\pm 0,1$	20,8		19,1	
95	3,95									21,2		19,6	
96	4									21,7		20	
97	4,05									22,1		20,4	
98	4,1	4,75	0,3	0,25 0	0,8 $\pm 0,1$	0,28 $\pm 0,08$	1 $\pm 0,1$	8	1,2 $\pm 0,1$	22,6		20,9	
99	4,15									23		21,3	
100	4,15									21,4		19,7	
101	4,2									21,8		20,1	
102	4,25	4,75	0,3	0,25 0	0,8 $\pm 0,1$	0,28 $\pm 0,08$	1 $\pm 0,1$	8	1,2 $\pm 0,1$	22,2		20,5	
103	4,3									22,6		20,9	
104	4,3									22,1		20,4	
105	4,35									22,5		20,8	
106	4,4	4,75	0,3	0,25 0	0,8 $\pm 0,1$	0,28 $\pm 0,08$	1 $\pm 0,1$	8	1,2 $\pm 0,1$	22,9		21,2	
107	4,4									23,3		21,6	
108	4,45									23,7		21,9	
109	4,5									24,1		22,3	
110	4,55	4,75	0,3	0,25 0	0,8 $\pm 0,1$	0,28 $\pm 0,08$	1 $\pm 0,1$	8	1,2 $\pm 0,1$	24,5		22,7	
111	4,55									24,9		23,1	
112	4,6									25,3		23,5	
113	4,65									25,7		23,9	
114	4,7	4,75	0,3	0,25 0	0,8 $\pm 0,1$	0,28 $\pm 0,08$	1 $\pm 0,1$	8	1,2 $\pm 0,1$	26,1		24,3	
115	4,7									26,5		24,7	
116	4,75									26,9		25,1	
117	4,8									27,3		25,5	
118	4,8	4,75	0,3	0,25 0	0,8 $\pm 0,1$	0,28 $\pm 0,08$	1 $\pm 0,1$	8	1,2 $\pm 0,1$	27,7		25,9	
119	4,85									28,1		26,3	
120	4,9									28,5		26,7	
121	4,95									28,9		27,1	
122	4,95	4,75	0,3	0,25 0	0,8 $\pm 0,1$	0,28 $\pm 0,08$	1 $\pm 0,1$	8	1,2 $\pm 0,1$	29,3		27,5	
123	5									29,7		27,9	
124	5,05									30,1		28,3	
125	5,05									30,5		28,7	
126	5,1	4,75	0,3	0,25 0	0,8 $\pm 0,1$	0,28 $\pm 0,08$	1 $\pm 0,1$	8	1,2 $\pm 0,1$	30,9		29,1	
127	5,15									31,3		29,5	
128	5,2									31,7		29,9	
129	5,2									32,1		30,3	

This table is shown in ISO format. Commas represent decimal points.