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Second edition
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Internal combustion engines — Piston rings —

Part 2:
Coil-spring-loaded oil control rings of narrow width made of cast iron

Moteurs à combustion interne — Segments de piston —

Partie 2: Segments racleurs régulateurs d'huile étroits, en fonte, mis en charge par ressort hélicoïdal

Reference number
ISO 6626-2:2013(E)

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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 documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2. www.iso.org/directives

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The committee responsible for this document is ISO/TC 22, *Road vehicles*.

This second edition cancels and replaces the first edition (ISO 6626-2:2003), which has been technically revised.

ISO 6626 consists of the following parts, under the general title *Internal combustion engines — Piston rings*:

— *Part 2: Coil-spring-loaded oil control rings of narrow width made of cast iron*

— *Part 3: Coil-spring-loaded oil control rings made of steel*

ISO 6626:1989 (*Internal combustion engines — Piston rings — Coil-spring-loaded oil control rings*) is to be withdrawn and replaced with a part 1 (i.e. a revision) at a later date.

Introduction

ISO 6626 (all parts) is one of a series of International Standards dealing with piston rings for reciprocating internal combustion engines. The others are ISO 6621 (all parts), ISO 6622 (all parts),[2] ISO 6623,[3] ISO 6624 (all parts),[4] ISO 6625[5] and ISO 6627.[6]

Internal combustion engines — Piston rings —

Part 2:
Coil-spring-loaded oil control rings of narrow width made of cast iron

1 Scope

This part of ISO 6626 specifies the essential dimensional features of coil-spring-loaded oil control rings made of cast iron, types DSF-C, SSF, GSF, DSF, SSF-L, DSF-NG and DSF-CNP. It is applicable to those piston rings in sizes 60 mm to 110 mm, inclusive, for reciprocating internal combustion engines for road vehicles and other applications.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable to its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6621-2, *Internal combustion engines — Piston rings — Part 2: Inspection measuring principles*

ISO 6621-3, *Internal combustion engines — Piston rings — Part 3: Material specifications*

ISO 6621-4, *Internal combustion engines — Piston rings — Part 4: General specifications*

ISO 6621-5, *Internal combustion engines — Piston rings — Part 5: Quality requirements*

3 Overview

The coil-spring-loaded oil control ring types are specified in Figures 1 to 8. Their common features and the dimensions of the features are specified in Tables 1 and 2 and shown in Figures 9 to 11. Essential features of coil-springs are shown in Figures 12 to 16. Table 3 specifies different classes of contact pressure. Tables 4 to 9 give the dimensions and forces of coil-spring-loaded oil control rings.

The common features and dimensional tables presented in this part of ISO 6626 constitute a broad range of variables and, in selecting a particular ring type, the designer shall bear in mind the conditions under which it will be required to operate.

It is also essential that the designer refer to the specifications and requirements of ISO 6621-3 and ISO 6621-4 before completing a selection.

For the cast iron part, the recommended material is class 10 and shall be in accordance with ISO 6621-3. For special applications, material classes 20 to 50 may be used.

Variation from these in face design and spring groove may be used, as recommended by individual manufacturers, in plain or chromed versions.

4 Piston ring types and designation

4.1 DSF-C, SSF, GSF, DSF, SSF-L, DSF-NG and DSF-CNP types

4.1.1 General features and dimensions

See Figure 1 and Tables 4, 5, 6, 7, 8 and 9.

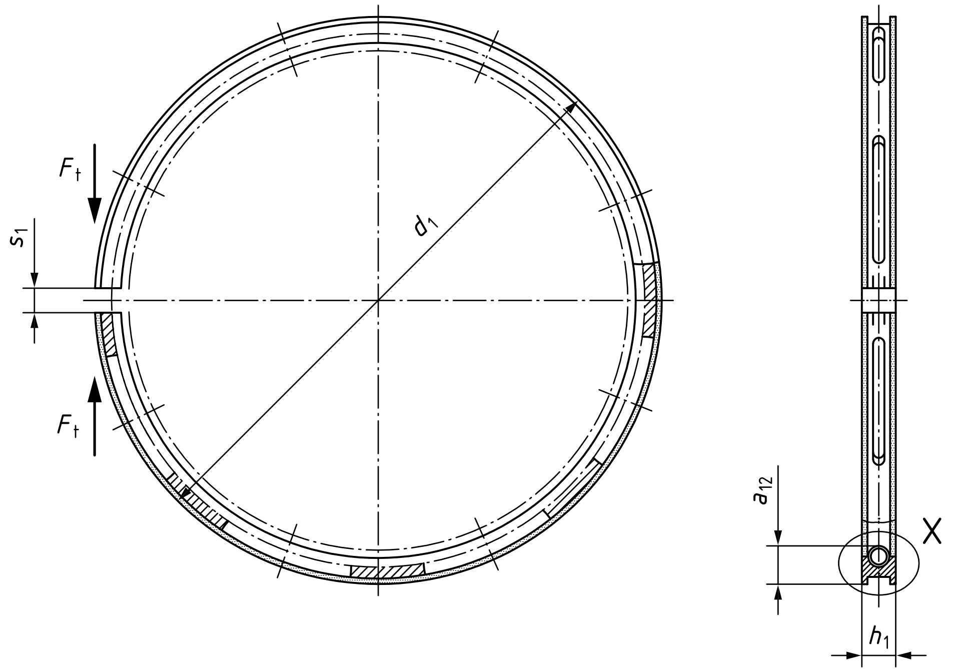


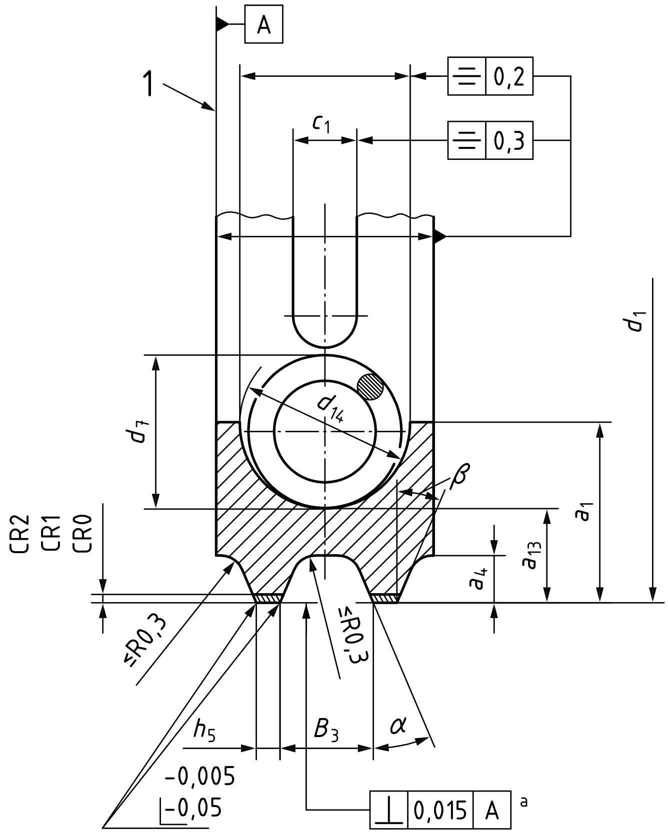
Figure 1 — Types DSF-C, SSF, GSF, DSF, SSF-L, DSF-NG and DSF-CNP

4.2 Type DSF-C — Coil-spring-loaded bevelled edge oil control ring, chromium-plated, and profile ground

4.2.1 General features and dimensions

See Figure 2 and Table 4.

Dimensions in millimetres



Key

1 reference plane

a In accordance with ISO 6621-2, land offset

Figure 2 — Type DSF-C

4.2.2 Designation of a type DSF-C piston ring in accordance with this part of ISO 6626

EXAMPLE A coil-spring-loaded bevelled edge oil control ring, chromium plated and profile ground (DSF-C), of nominal diameter d_1 = 80 mm (80), nominal ring width h_1 = 2,5 mm (2,5), made of grey cast iron, non-heat treated, material subclass 11 (MC11), having a selected closed gap of 0,20 mm min. (S020), a chromium layer thickness on the lands of 0,10 mm (CR2), reduced slot length (WK), a coil spring with reduced heat set (WF), and a variable pitch with coil diameter d_7 ground (CSE), with tangential force F_t in accordance with the medium nominal contact pressure class (PNM) and the ring marked with the manufacturer's mark (MM) is designated as follows. Parameters in parentheses are used in the ISO ring designation:

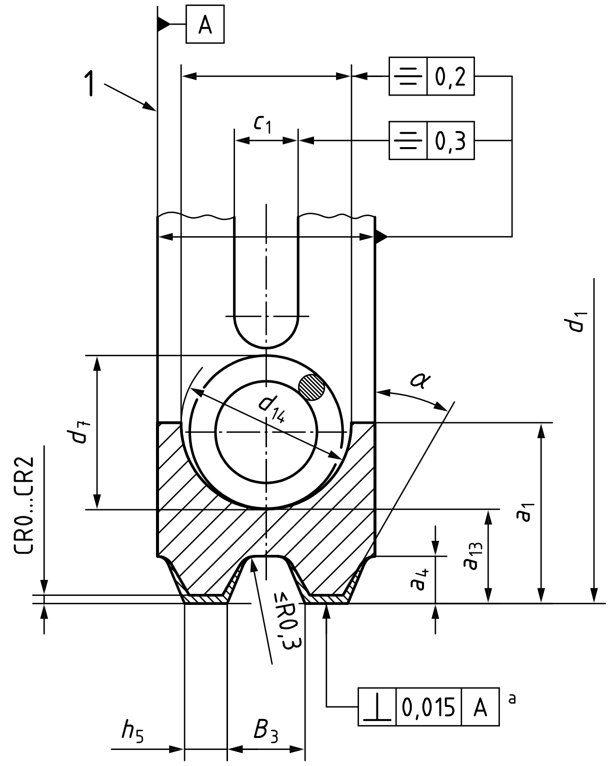
Piston ring ISO 6626-2 DSF-C - 80 × 2,5 - MC11/S020 CR2 WK WF CSE PNM MM

4.3 Type DSF-CNP — Coil-spring-loaded bevelled-edge oil control ring, chromium-plated not profile ground

4.3.1 General features and dimensions

See Figure 3 and Tables 5.

Dimensions in millimetres



Key

1 reference plane

a In accordance with ISO 6621-2, land offset

Figure 3 — Type DSF-CNP

4.3.2 Designation of a type DSF-CNP piston ring in accordance with this part of ISO 6626

EXAMPLE A coil-spring-loaded slotted oil control ring (DSF-CNP) of nominal diameter d_1 = 100 mm (100), nominal ring width h_1 = 2,0 mm (2,0), made of grey cast iron, non-heat treated, material subclass 12 (MC12), constant spring pitch (CSN) and tangential force F_t in accordance with the low nominal contact pressure class (PNL) is designated as follows. Parameters in parentheses are used in the ISO ring designation:

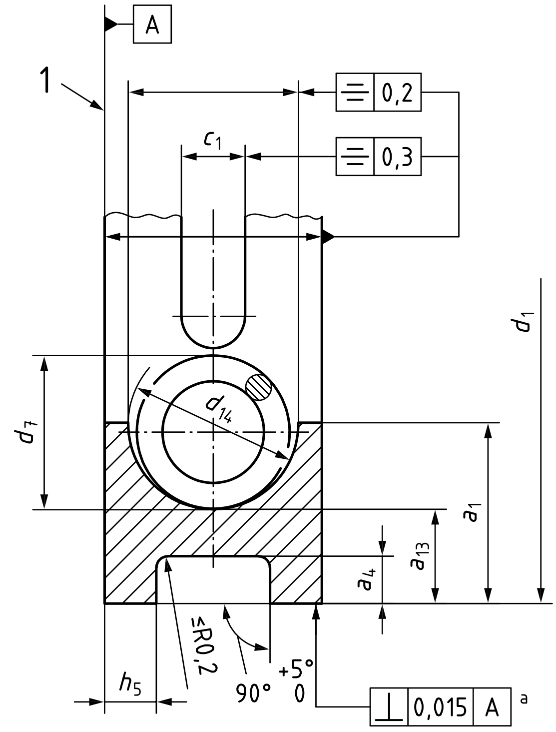
Piston ring ISO 6626-2 DSF-CNP 100 × 2 - MC12/CSN PNL

4.4 Type SSF — Coil-spring-loaded slotted oil control ring

4.4.1 General features and dimensions

See Figure 4 and Table 6.

Dimensions in millimetres



Key

1 reference plane

a In accordance with ISO 6621-2, land offset

Figure 4 — Type SSF

4.4.2 Designation of a type SSF piston ring in accordance with this part of ISO 6626

EXAMPLE A coil-spring-loaded slotted oil control ring (SSF) of nominal diameter d_1 = 80 mm (80), nominal ring width h_1 = 2,5 mm (2,5), made of grey cast iron, non-heat treated, material subclass 12 (MC12), constant spring pitch (CSN) and tangential force F_t in accordance with the low nominal contact pressure class (PNL) is designated as follows. Parameters in parentheses are used in the ISO ring designation:

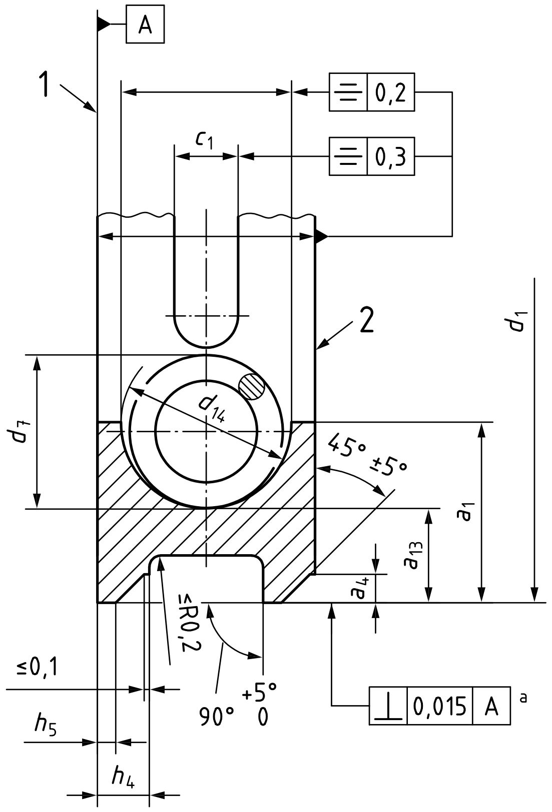
Piston ring ISO 6626-2 SSF- 80 × 2,5 - MC12/CSN PNL

4.5 Type GSF — Coil-spring-loaded double bevelled oil control ring

4.5.1 General features and dimensions

See Figure 5 and Table 7. Top-side marking is mandatory in accordance with ISO 6621-4.

Dimensions in millimetres



Key

1 reference plane

2 top side identification mark

a In accordance with ISO 6621-2, land offset

Figure 5 — Type GSF

4.5.2 Designation of a type GSF piston ring in accordance with this part of ISO 6626

EXAMPLE A coil-spring-loaded double bevelled oil control ring (GSF) of nominal diameter d_1 = 75 mm (75), nominal ring width h_1 = 2,5 mm (2,5), made of grey cast iron, non-heat treated, material subclass 12 (MC12), with constant spring pitch (CSN) and tangential force F_t in accordance with the low nominal contact pressure class (PNL) is designated as follows. Parameters in parentheses are used in the ISO ring designation:

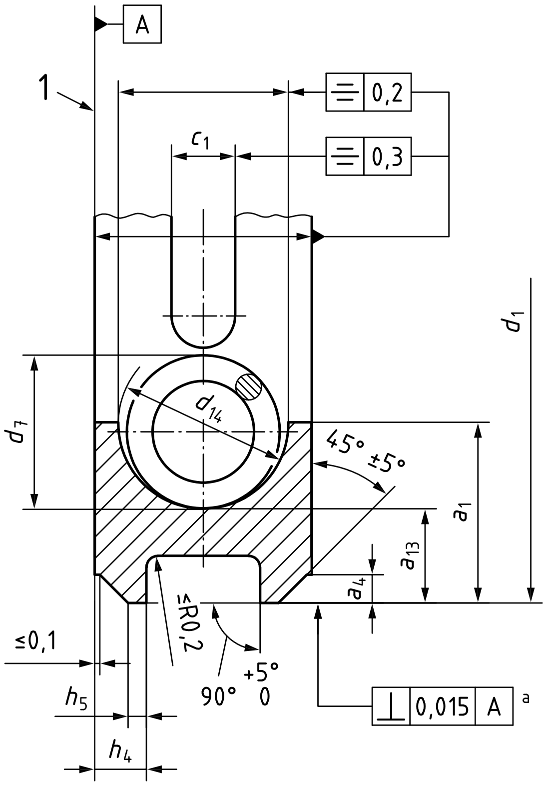
Piston ring ISO 6626-2 GSF- 75 × 2,5 - MC12/CSN PNL

4.6 Type DSF — Coil-spring-loaded bevelled edge oil control ring

4.6.1 General features and dimensions

See Figure 6 and Table 7.

Dimensions in millimetres



Key

1 reference plane

a In accordance with ISO 6621-2, land offset

Figure 6 — Type DSF

4.6.2 Designation of a type DSF piston ring in accordance with this part of ISO 6626

EXAMPLE A coil-spring-loaded double bevelled oil control ring (DSF) of nominal diameter d_1 = 90 mm (90), nominal ring width h_1 = 2,5 mm (2,5), made of grey cast iron, non-heat treated, material subclass 12 (MC12), with constant spring pitch (CSN) and tangential force F_t in accordance with the reduced nominal contact pressure class (PNR) is designated as follows. Parameters in parentheses are used in the ISO ring designation:

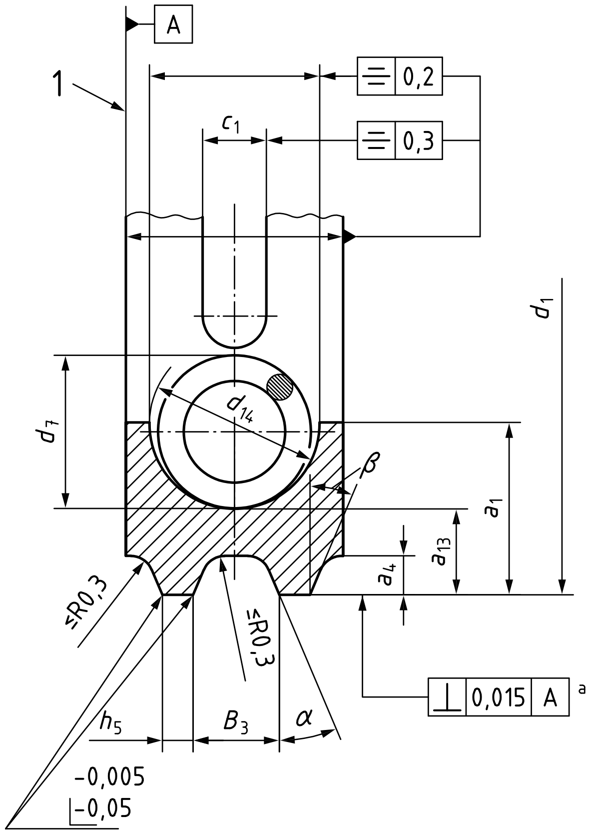
Piston ring ISO 6626-2 DSF- 90 × 2,5 - MC12/CSN PNR

4.7 Type DSF-NG — Coil-spring-loaded bevelled-edge oil control ring (face geometry similar to type DSF-C)

4.7.1 General features and dimensions

See Figure 7 and Table 8.

Dimensions in millimetres



Key

1 reference plane

a In accordance with ISO 6621-2, land offset

Figure 7 — Type DSF-NG

4.7.2 Designation of a type DSF-NG piston ring in accordance with this part of ISO 6626

EXAMPLE A coil-spring-loaded slotted oil control ring (DSF-NG) of nominal diameter d_1 = 80 mm (80), nominal ring width h_1 = 2,0 mm (2,0), made of grey cast iron, non-heat treated, material subclass 12 (MC12), constant spring pitch (CSN) and tangential force F_t in accordance with the reduced nominal contact pressure class (PNR) is designated as follows. Parameters in parentheses are used in the ISO ring designation:

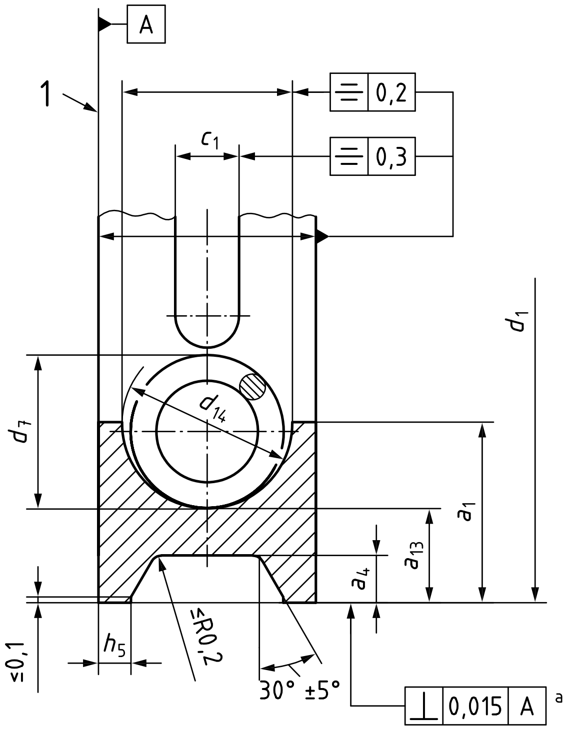
Piston ring ISO 6626-2 DSF-NG - 80 × 2,0 - MC12/CSN PNR

4.8 Type SSF-L — Coil-spring-loaded slotted oil control ring with 0,4 mm nominal land width

4.8.1 General features and dimensions

See Figure 8 and Table 9.

Dimensions in millimetres



Key

1 reference plane

a In accordance with ISO 6621-2, land offset

Figure 8 — Type SSF-L

4.8.2 Designation of a type SSF-L piston ring in accordance with this part of ISO 6626

EXAMPLE A coil-spring-loaded slotted oil control ring (SSF-L) of nominal diameter d_1 = 80 mm (80), nominal ring width h_1 = 2,5 mm (2,5), made of grey cast iron, non-heat treated, material subclass 12 (MC12), constant spring pitch (CSN) and tangential force F_t in accordance with the reduced nominal contact pressure class (PNR) is designated as follows. Parameters in parentheses are used in the ISO ring designation:

Piston ring ISO 6626-2 SSF-L - 80 × 2,5 - MC12/CSN PNR

5 Common features

5.1 Oil drainage by slots or holes

5.1.1 Arrangement of slots

5.1.1.1 General

Figure 9 shows the arrangement of oil drainage slots.

5.1.1.2 Slot length

5.1.1.3 Standard slot length

Slot length, w_1, shall be equal to bridge length, w_2.

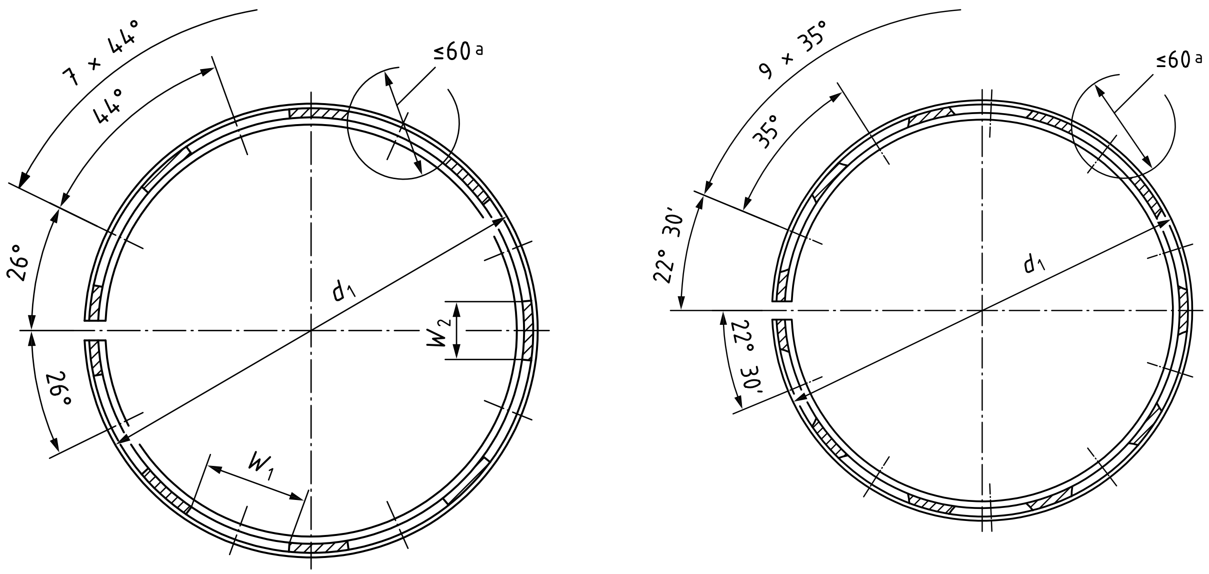
The maximum difference between w_1 and w_2 shall be 4 mm.

5.1.1.4 Reduced slot length — Code WK

Oil control rings with reduced slot length will retain the same number of slots and the same angular spacing. The maximum difference between w_1 and w_2 for the standard slot length does not apply.

See Table 1.

Dimensions in millimetres



a) **8 slots for** $60 \leq d_1 < 80$ **b)** **10 slots for** $80 \leq d_1 \leq 110$

a Cutter diameter

Figure 9 — Arrangement of slots

Table 1 — Reduced slot length

Dimensions in millimetres

d_1	w_1 (range of nominal values)
$60 \leq d_1 < 80$	6 ... 11
$80 \leq d_1 < 110$	8 ... 13

5.1.2 Arrangement of holes

The arrangement of holes is shown in Figure 10. Deviating arrangements shall be agreed between the manufacturer and customer.

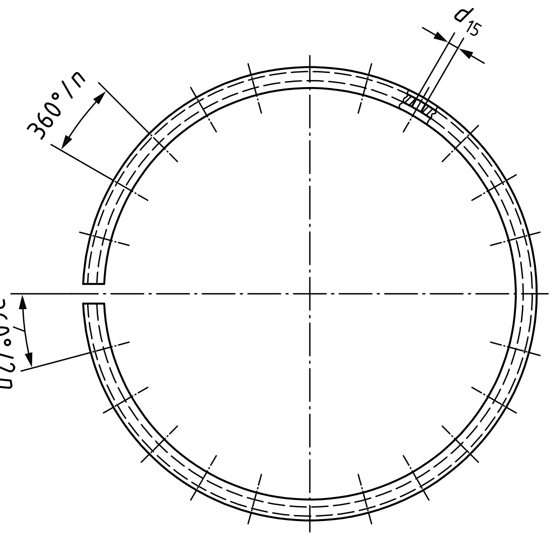


Figure 10 — Arrangement of holes

5.1.2.1 Diameter and number of holes

The diameter, d_{15}, and number, n, of holes to be agreed between the manufacturer and customer.

5.2 Plating thickness — DSF-C and DSF-CNP (coil-spring-loaded bevelled edge oil control ring, chromium plated)

See Figure 11 and Table 2.

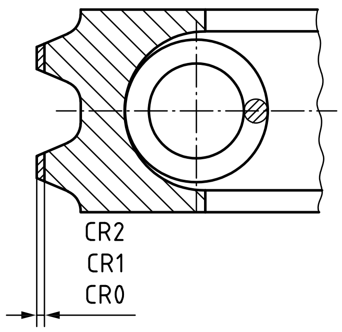


Figure 11 — Plating thickness

Table 2 — Plating thickness

Dimensions in millimetres

Code	Thickness[a] min.
CR0	0,03
CR1	0,05
CR2	0,10

[a] Plating thickness tolerances are given in ISO 6621-4.

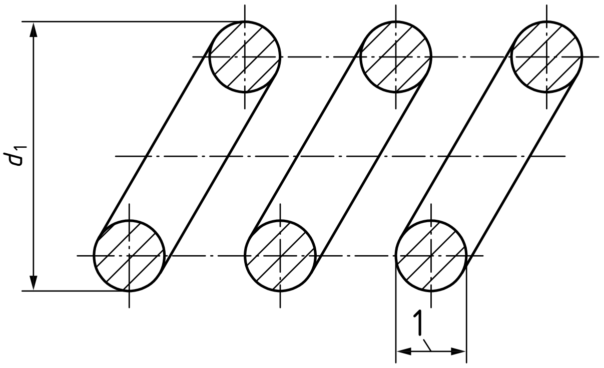
5.3 Peripheral edges at gap of chromium plated oil control rings

For features and their dimensions, see ISO 6621-4.

6 Coil springs

6.1 Types of coil spring

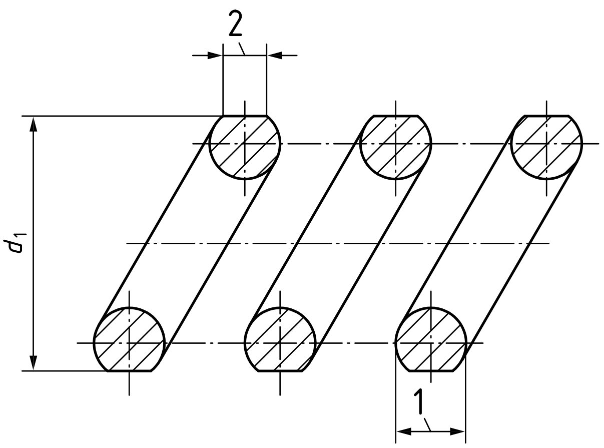
All values in the dimensional tables of Clause 8 are based on cylindrical coil springs made of round wire. The three designs shown in Figures 12 to 14 are common. The use of different spring designs may be agreed between the manufacturer and client. Changed spring groove configurations and dimensions could then be necessary.



Key

1 diameter of wire

Figure 12 — Type CSN coil spring with constant pitch

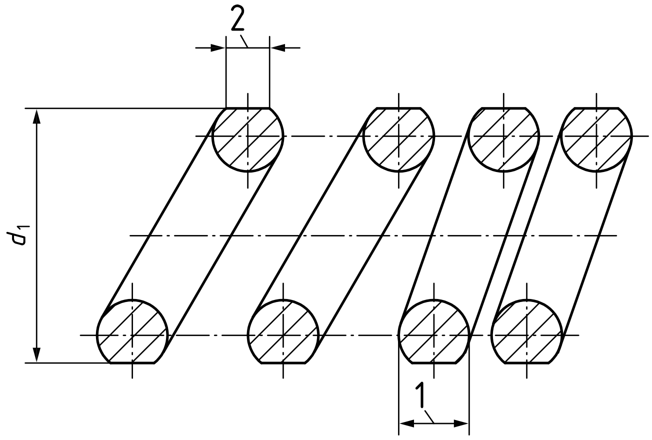


Key

1 diameter of wire

2 approximately 0,8 times the diameter of wire

Figure 13 — Type CSG coil spring with constant pitch (coil diameter, d_7, ground)



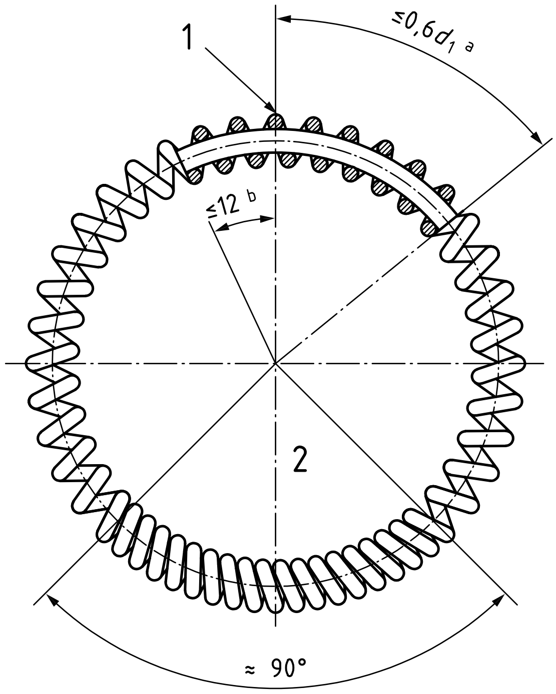
Key

1 diameter of wire

2 approximately 0,8 times the diameter of wire

Figure 14 — Type CSE coil spring with variable pitch (coil diameter, d_7, ground)

Dimensions in millimetres



Key

1 spring gap

2 area with small pitch

a Latch pin free length

b Latch pin fixed length

Figure 15 — Position of area with small pitch

6.2 Coil spring excursion (extended gap)

Coil spring excursion, f_1, is the distance between the ends of the ring gap, with unstressed ring, measured in the middle of the spring groove (see Figure 16). The maximum value of f_1 shall not exceed 0,13 d_1.

6.3 Position of coil spring gap and fixing

The spring gap shall be approximately 180° from the gap and the spring gap ends fixed with a connecting or latch pin.

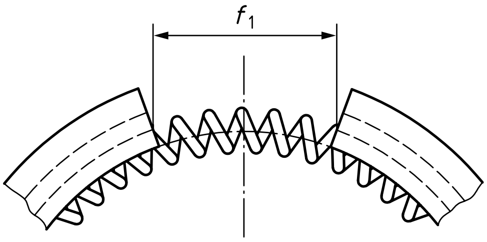


Figure 16 — Coil spring excursion

6.4 Material

Coil springs are made of valve spring wire, oil heat-treated. A suitable material for coil spring expanders is subclass 62 and shall be in accordance with ISO 6621-3.

Springs are available with two different heat-set-resistance levels (loss of tangential force under load and temperature):

— standard heat resistance;

— reduced heat set, code WF.

Test conditions and the permissible loss of tangential forces shall be as specified in ISO 6621-5.

7 Tangential force and nominal contact pressure

7.1 Tangential force

The tangential force of coil-spring-loaded oil control rings is mainly determined by the force of the spring. The cast iron part itself has a very small tangential force due to its low radial wall thickness and the decreased ratio “total free gap/nominal diameter”.

The tangential force measurement only can be used because of the flexible design of the cast iron part of the coil-spring-loaded oil control rings.

7.2 Force factors

Because of the small contribution of the cast iron part in the tangential force, force factors are not necessary when additional features, materials or both (other than grey cast iron with modulus of elasticity of 100 GN/m^2) are being used.

7.3 Tangential force, F_t

7.3.1 General

The tangential force, F_t, of a spring-loaded oil control ring is determined by

a) nominal diameter, d_1, in millimetres,

b) land width, h_5, in millimetres, and

c) required nominal contact pressure, p_o, in newtons per square millimetre (N/mm²), calculated using Formula (1):

$$F_t = \frac{1}{2} \cdot d_1 \cdot 2 \cdot h_5 \cdot p_o \qquad (1)$$

The land width, h_5, depends on the ring type, nominal diameter and ring width. The nominal contact pressure, p_o, can be selected over a wide range to suit the application and the required oil scraping effect.

7.3.2 Specific tangential force, F_{tc}

The specific tangential force, F_{tc}, is that required to maintain a spring-loaded oil control ring at a unit contact pressure, p_{ou}, of 1 N/mm² using Formula (2):

$$F_{tc} = \frac{1}{2} \cdot d_1 \cdot 2 \cdot h_5 \cdot p_{ou} \qquad (2)$$

In Clause 8, F_{tc} is tabulated for every ring type.

7.3.3 Actual tangential force, F_t, and tolerance

The actual tangential force of a spring-loaded oil control ring can be calculated with the F_{tc} value and the required nominal contact pressure from using Formula (3):

$$F_t = \frac{p_o \cdot F_{tc}}{p_{ou}} \qquad (3)$$

The tolerance on F_t is the actual value F_t ± 20 %. Actual values of tangential force should be rounded up or down in accordance with ISO 6621-4.

7.4 Classes of nominal contact pressure, p_o

The nominal contact pressure, p_o, decreases with increasing nominal diameter, d_1. The correlation between p_o and d_1 for medium contact pressure (code PNM) is given by Formula (4):

$$p_0 = -0{,}010 \cdot d_1 + 2{,}5 \qquad (4)$$

The range of the nominal contact pressure has been subdivided into six classes. The nominal contact pressure for all classes can be calculated by a factor in relation to PNM or by a formula, according to Table 3.

Table 3 — Classes of nominal contact pressure, p_o

Code	Factor	Formula	Meaning
PNV	1,60	$p_0 = -0{,}0160 \cdot d_1 + 4{,}000$	Very high
PNH	1,25	$p_0 = -0{,}0125 \cdot d_1 + 3{,}125$	High
PNM	1,00	$p_0 = -0{,}0100 \cdot d_1 + 2{,}500$	Medium
PNR	0,80	$p_0 = -0{,}0180 \cdot d_1 + 2{,}000$	Reduced
PNL	0,60	$p_0 = -0{,}0060 \cdot d_1 + 1{,}500$	Low
PNE	0,45	$p_0 = -0{,}0045 \cdot d_1 + 1{,}125$	Very low

Figure 17 shows characteristic values of p_o depending on d_1.

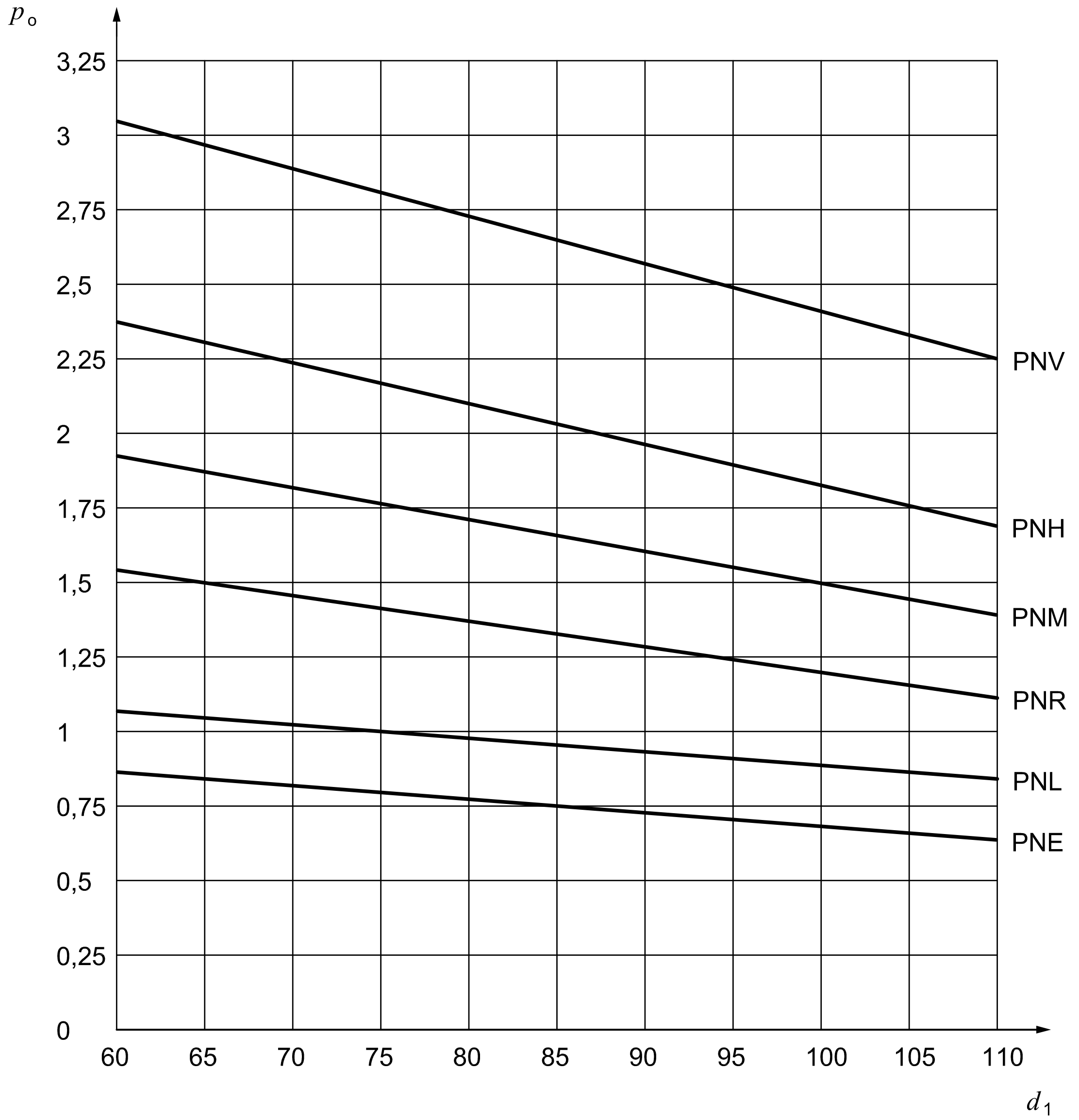


Figure 17 — Characteristic values of p_o depending on d_1

8 Dimensions and tangential forces

The dimensions and tangential force are shown in Tables 4 to 9. Land spacing B3 shall be agreed between the manufacturer and customer.

The dimensions of Tables 4 to 9 are in millimetres.

Table 4 — Dimensions and tangential forces of DSF-C coil-spring-loaded oil control rings of narrow ring width

Nominal diameter	Radial thickness over coil spring a_{12}		Ring width h_1			Closed gap	Radial wall thickness a_1			Land width h_5	
d_1	1	2	1	2	Tol.		1	2	Tol.	1	2
60											
61											
62											
63											
64						0,20	2,15	2,20			
65						+0,20					
66						0					
67											
68											
69											
70					−0,010						
71					−0,030						
72					For						
73					phosphated						
74	2,75	3,00	2,0	2,5	PO surface:		2,25	2,30	±0,15	0,25	0,30
75	0	0			−0,005				within a ring	±0,07	±0,07
76	−0,25	−0,25			−0,030				0,15 max.		
77											
78											
79											
80											
81						0,25					
82						+0,25					
83						0					
84							2,35	2,40			
85											
86											
87											
88											
89											

Table 4 — *(continued)*

Groove depth a_4		Groove depth and bridge a_{13}		Coil spring groove diameter d_{14}		Coil spring diameter d_7		Tangential force N[a] F_{tc}	
1	2	1	2	1	2	1	2	1	2
								15,0	18,0
								15,3	18,3
								15,5	18,6
								15,8	18,9
								16,0	19,2
								16,3	19,5
								16,5	19,8
								16,8	20,1
								17,0	20,4
								17,3	20,7
								17,5	21,0
								17,8	21,3
								18,0	21,6
								18,3	21,9
0,35	0,4	1,35	1,40	1,50	1,70	1,40	1,60	18,5	22,2
±0,10	±0,10	0 −0,15	0 −0,15	+0,10 0	+0,10 0	0 -0,10	0 -0,10	18,8	22,5
								19,0	22,8
								19,3	23,1
								19,5	23,4
								19,8	23,7
								20,0	24,0
								20,3	24,3
								20,5	24,6
								20,8	24,9
								21,0	25,2
								21,3	25,5
								21,5	25,8
								21,8	26,1
								22,0	26,4
								22,3	26,7

Table 4 — *(continued)*

Nominal diameter	Radial thickness over coil spring a_{12}		Ring width h_1			Closed gap	Radial wall thickness a_1			Land width h_5	
d_1	1	2	1	2	**Tol.**		1	2	**Tol.**	1	2
90											
91											
92											
93											
94							2,45	2,50			
95											
96											
97											
98					−0,01 −0,03						
99											
100	2,85 0 −0,25	3,10 0 −0,25	2,0	2,5	For phos-phated PO surface: −0,005 −0,030	0,30 +0,25 0			±0,15 within a ring 0,15 max.	0,25 ±0,07	0,3 ±0,07
101											
102											
103											
104											
105							2,50	2,55			
106											
107											
108											
109											
110											

NOTE 1 For intermediate sizes (e.g. repair sizes), the radial thickness of the next smaller nominal diameter applies.

NOTE 2 Values of specific tangential force, F_{tc}, are calculated with mean land width, h_5.

a Tangential force F_{tc} (in newton) for unit pressure p_{ou} = 1 N/mm².

Table 4 — *(continued)*

Groove depth a_4		Groove depth and bridge a_{13}		Coil spring groove diameter d_{14}		Coil spring diameter d_7		Tangential force N[a] F_{tc}	
1	2	1	2	1	2	1	2	1	2
								22,5	27,0
								22,8	27,3
								23,0	27,6
								23,3	27,9
								23,5	28,2
								23,8	28,5
								24,0	28,8
								24,3	29,1
								24,5	29,4
								24,8	29,7
0,35 ±0,10	0,4 ±0,10	1,45 0 −0,15	1,50 0 −0,15	1,5 +0,1 0	1,7 +0,1 0	1,4 0 -0,1	1,6 0 -0,1	25,0	30,0
								25,3	30,3
								25,5	30,6
								25,8	30,9
								26,0	31,2
								26,3	31,5
								26,5	31,8
								26,8	32,1
								27,0	32,4
								27,3	32,7
								27,5	33,0

Table 5 — Dimensions of DSF-CNP coil-spring-loaded bevelled-edge oil control ring, chromium-plated not profile ground

Nominal diameter	Radial thickness over coil spring a_{12}		Ring width h_1			Closed gap	Radial wall thickness a_1			Land width h_5	
d_1	1	2	1	2	Tol.		1	2	Tol.	1	2
60											
61											
62											
63											
64						0,20	2,15	2,20			
65						+0,20					
66						0					
67											
68											
69											
70					−0,010						
71					−0,030						
72					For phos-phated PO surface:						
73											
74	2,75	3,00	2,0	2,5			2,25	2,30	±0,15	0,25	0,30
75	0	0			−0,005				within a ring 0,15 max.	±0,12	±012
76	−0,25	−0,25			−0,030						
77											
78											
79											
80											
81						0,25					
82						+0,25					
83						0					
84							2,35	2,40			
85											
86											
87											
88											
89											

Table 5 — *(continued)*

Groove depth a_4		Groove depth and bridge a_{13}		Coil spring groove diameter d_{14}		Coil spring diameter d_7		Tangential force N[a] F_{tc}	
1	2	1	2	1	2	1	2	1	2
0,35 ±0,10	0,4 ±0,10	1,35 0 −0,15	1,40 0 −0,15	1,50 +0,10 0	1,70 +0,10 0	1,40 0 -0,10	1,60 0 -0,10	15,0	18,0
								15,3	18,3
								15,5	18,6
								15,8	18,9
								16,0	19,2
								16,3	19,5
								16,5	19,8
								16,8	20,1
								17,0	20,4
								17,3	20,7
								17,5	21,0
								17,8	21,3
								18,0	21,6
								18,3	21,9
								18,5	22,2
								18,8	22,5
								19,0	22,8
								19,3	23,1
								19,5	23,4
								19,8	23,7
								20,0	24,0
								20,3	24,3
								20,5	24,6
								20,8	24,9
								21,0	25,2
								21,3	25,5
								21,5	25,8
								21,8	26,1
								22,0	26,4
								22,3	26,7

Table 5 — *(continued)*

Nominal diameter	Radial thickness over coil spring a_{12}		Ring width h_1			Closed gap	Radial wall thickness a_1			Land width h_5	
d_1	1	2	1	2	**Tol.**		1	2	**Tol.**	1	2
90											
91											
92											
93											
94							2,45	2,50			
95											
96											
97											
98					-0,01						
99					-0,03						
100	2,85	3,10			For phos-phated PO surface:	0,30			±0,15	0,25	0,3
101	0	0	2,0	2,5		+0,25			within a ring 0,15 max.	±0,12	±0,12
102	−0,25	−0,25				0					
103					−0,005						
104					−0,030						
105							2,50	2,55			
106											
107											
108											
109											
110											

NOTE 1 For intermediate sizes (e.g. repair sizes), the radial thickness of the next smaller nominal diameter applies.

NOTE 2 Values of specific tangential force, F_{tc}, are calculated with mean land width, h_5.

[a] Tangential force F_{tc} (in newton) for unit pressure p_{ou} = 1 N/mm².

Table 5 — *(continued)*

Groove depth a_4		Groove depth and bridge a_{13}		Coil spring groove diameter d_{14}		Coil spring diameter d_7		Tangential force N[a] F_{tc}	
1	2	1	2	1	2	1	2	1	2
								22,5	27,0
								22,8	27,3
								23,0	27,6
								23,3	27,9
								23,5	28,2
								23,8	28,5
								24,0	28,8
								24,3	29,1
								24,5	29,4
								24,8	29,7
0,35	0,4	1,45	1,50	1,5	1,7	1,4	1,6	25,0	30,0
±0,10	±0,10	0 −0,15	0 −0,15	+0,1 0	+0,1 0	0 -0,1	0 -0,1	25,3	30,3
								25,5	30,6
								25,8	30,9
								26,0	31,2
								26,3	31,5
								26,5	31,8
								26,8	32,1
								27,0	32,4
								27,3	32,7
								27,5	33,0

Table 6 — Dimensions of SSF coil-spring-loaded oil control rings of narrow ring width

Nominal diameter	Radial thickness over coil spring	Ring width		Closed gap	Radial wall thickness		Land width	Groove depth	Groove depth and bridge	Coil spring groove diameter	Coil spring diameter	Tangential force N[a]
d_1	a_{12}	h_1	**Tol.**	s_1	a_1	**Tol.**	h_5	a_4	a_{13}	d_{14}	d_7	F_{tc}
60												30,0
61												30,5
62												31,0
63												31,5
64					2,20							32,0
65				0,20								32,5
66				+0,20								33,0
67				0								33,5
68			-0,010									34,0
69			-0,030									34,5
70			For									35,0
71			phos-									35,5
72			phated PO									36,0
73			surface:									36,5
74	3,00		-0,005		2,30	±0,15			1,40	1,70	1,60	37,0
75	0		-0,030			within			0	+0,10	0	37,5
76	-0,25					a ring			-0,15	0	-0,10	38,0
77						0,15						38,5
78						max.						39,0
79												39,5
80				0,25								40,0
81				+0,25								40,5
82				0								41,0
83												41,5
84												42,0
85		2,50			2,40		0,50	0,45				42,5
86							±0,10	±0,10				43,0
87												43,5
88												44,0
89												44,5
90												45,0
91	3,1			0,3					1,5			45,5
92	0			+0,25	2,5				0			46,0
93	-0,25			0					-0,15			46,5
94												47,0

Table 6 — *(continued)*

Nominal diameter	Radial thickness over coil spring	Ring width		Closed gap	Radial wall thickness		Land width	Groove depth	Groove depth and bridge	Coil spring groove diameter	Coil spring diameter	Tangential force N[a]
d_1	a_{12}	h_1	**Tol.**	s_1	a_1	**Tol.**	h_5	a_4	a_{13}	d_{14}	d_7	F_{tc}
95												47,5
96												48,0
97					2,5							48,5
98			-0,010 -0,030									49,0
99												49,5
100												50,0
101												50,5
102	3,10 0 -0,25	2,5	For phos-phated PO surface:	0,3 -0,00 +0,25		±0,15 within a ring 0,15 max.	0,5 ±0,10	0,45 ±0,10	1,50 0 -0,15	1,7 +0,1 0	1,6 0 -0,10	51,0
103												51,5
104												52,0
105					2,55							52,5
106			-0,005 -0,030									53,0
107												53,5
108												54,0
109												54,5
110												55,0

NOTE 1 For intermediate sizes (e.g. repair sizes), the radial thickness of the next smaller nominal diameter applies.

NOTE 2 Values of specific tangential force, F_{tc}, are calculated with mean land width, h_5.

[a] Tangential force F_{tc} (in newton) for unit pressure p_{ou} = 1 N/mm².

Table 7 — Dimensions of GSF and DSF coil-spring-loaded oil control rings of narrow ring width

Nominal diameter	Radial thickness over coil spring	Ring width		Closed gap	Radial wall thickness		Land width	Land width	Groove depth	Groove depth and bridge	Coil spring groove diameter	Coil spring diameter	Tangential force N[a]
d_1	a_{12}	h_1	Tol.	s_1	a_1	Tol.	h_4	h_5	a_4	a_{13}	d_{14}	d_7	F_{tc}
60													18,0
61													18,3
62													18,6
63													18,9
64					2,20								19,2
65													19,5
66				0,20									19,8
67				+0,20 0									20,1
68													20,4
69													20,7
70													21,0
71													21,3
72						±0,15 within							21,6
73						a ring							21,9
74	3,00	2,5	-0,010 -0,030		2,30	0,15	0,70	0,30	0,45	1,40	1,70	1,60	22,2
75	0 -0,25					max.	+0,15 0	±0,07	±0,10	0 -0,15	+0,10 0	0 -0,10	22,5
76													22,8
77			For										23,1
78			phos-										23,4
79			phated PO										23,7
80			surface:	0,25									24,0
81			-0,005 -0,030	+0,25 0									24,3
82													24,6
83													24,9
84													25,2
85					2,40								25,5
86													25,8
87													26,1
88													26,4
89													26,7
90													27,0
91	3,10			0,3	2,50					1,5			27,3
92	0 -0,25			+0,25 0						0 -0,15			27,6
93													27,9

Table 7 — *(continued)*

Nominal diameter	Radial thickness over coil spring	Ring width		Closed gap	Radial wall thickness		Land width	Land width	Groove depth	Groove depth and bridge	Coil spring groove diameter	Coil spring diameter	Tangential force N[a]
d_1	a_{12}	h_1	Tol.	s_1	a_1	Tol.	h_4	h_5	a_4	a_{13}	d_{14}	d_7	F_{tc}
94													28,2
95													28,5
96					2,50								28,8
97			-0,010 -0,030										29,1
98													29,4
99													29,7
100	3,10 0 -0,25	2,5	For phos-phated PO surface: -0,005 -0,030	0,30 +0,25 0		±0,15 within a ring 0,15 max.	0,70 +0,15 0	0,30 ±0,07	0,45 ±0,10	1,50 0 -0,15	1,70 +0,10 0	1,60 0 -0,10	30,0
101													30,3
102													30,6
103													30,9
104													31,2
105					2,55								31,5
106													31,8
107													32,1
108													32,4
109													32,7
110													33,0

NOTE 1 For intermediate sizes (e.g. repair sizes), the radial thickness of the next smaller nominal diameter applies.

NOTE 2 Values of specific tangential force, F_{tc}, are calculated with mean land width, h_5.

[a] Tangential force F_{tc} (in newton) for unit pressure p_{ou} = 1 N/mm^2.

Table 8 — Dimensions of DSF-NG coil-spring-loaded oil control rings of narrow ring width

Nominal diameter	Radial thickness over coil spring a_{12}			Ring width h_1 [a]				Closed gap	Radial wall thickness a_1				Land width h_5		
d_1	1	2	3	1	2	3	**Tol.**		1	2	3	**Tol.**	1	2	3
60															
61															
62															
63															
64								0,20		2,15	2,20				
65								+0,20							
66								0							
67															
68															
69															
70							−0,010								
71							−0,030								
72							For phos-								
73							phated PO								
74	2,00	2,75	3,00	1,5	2,0	2,5	surface:		1,7	2,25	2,30	±0,15	0,2	0,25	0,30
75	0	0	0				−0,005					within a ring	±0,05	±0,07	±0,07
76	−0,25	−0,25	−0,25				−0,030					0,15 max.			
77															
78															
79															
80															
81								0,25							
82								+0,25							
83								0							
84										2,35	2,40				
85															
86															
87															
88															
89															

Table 8 — ***(continued)***

Groove depth a_4			Groove depth and bridge a_{13}			Coil spring groove diameter d_{14}			Coil spring diameter d_7			Tangential force F_{tc} [b] N [c]		
1	2	2	1	2	3	1	2	3	1	2	3	1	2	3
												12,0	15,0	18,0
												12,2	15,3	18,3
												12,4	15,5	18,6
												12,6	15,8	18,9
												12,8	16,0	19,2
												13,0	16,3	19,5
												13,2	16,5	19,8
												13,4	16,8	20,1
												13,6	17,0	20,4
												13,8	17,3	20,7
												14,0	17,5	21,0
												14,2	17,8	21,3
												14,4	18,0	21,6
												14,6	18,3	21,9
0,25	0,35	0,4	1,0	1,35	1,40	1,1	1,50	1,70	1,0	1,40	1,60	14,8	18,5	22,2
±0,05	±0,10	±0,10	0	0	0	+0,10	+0,10	+0,10	0	0	0	15,0	18,8	22,5
			−0,10	−0,15	−0,15	0	0	0	-0,10	-0,10	-0,10	15,2	19,0	22,8
												15,4	19,3	23,1
												15,6	19,5	23,4
												15,8	19,8	23,7
												16,0	20,0	24,0
												16,2	20,3	24,3
												16,4	20,5	24,6
												16,6	20,8	24,9
												16,8	21,0	25,2
												17,0	21,3	25,5
												17,2	21,5	25,8
												17,4	21,8	26,1
												17,6	22,0	26,4
												17,8	22,3	26,7

Table 8 — *(continued)*

Nominal diameter	Radial thickness over coil spring a_{12}			Ring width h_1[a]				Closed gap	Radial wall thickness a_1				Land width h_5		
d_1	1	2	3	1	2	3	Tol.		1	2	3	Tol.	1	2	3
90															
91															
92															
93															
94										2,45	2,50				
95															
96															
97															
98							-0,01 -0,03								
99															
100	—	2,85 0 −0,25	3,10 0 −0,25	—	2,0	2,5	For phos-phated PO surface: −0,005 −0,030	0,30 +0,25 0	—			±0,15 within a ring 0,15 max.	—	0,25 ±0,07	0,3 ±0,07
101															
102															
103															
104															
105										2,50	2,55				
106															
107															
108															
109															
110															

NOTE 1 For intermediate sizes (e.g. repair sizes), the radial thickness of the next smaller nominal diameter applies.

NOTE 2 Values of specific tangential force, F_{tc}, are calculated with mean land width, h_5.

[a] Rings with axial width h1=1,5 mm only made from material MC50.

[b] Tangential force F_{tc} (in newton) for unit pressure p_{ou} = 1 N/mm².

Table 8 — *(continued)*

Groove depth a_4			Groove depth and bridge a_{13}			Coil spring groove diameter d_{14}			Coil spring diameter d_7			Tangential force F_{tc} [b] N [c]		
1	2	2	1	2	3	1	2	3	1	2	3	1	2	3
													22,5	27,0
													22,8	27,3
													23,0	27,6
													23,3	27,9
												—	23,5	28,2
													23,8	28,5
													24,0	28,8
													24,3	29,1
													24,5	29,4
													24,8	29,7
—	0,35	0,4	—	1,45	1,50	—	1,5	1,7	—	1,4	1,6		25,0	30,0
	±0,10	±0,10		0	0		+0,1	+0,1		0	0		25,3	30,3
				−0,15	−0,15		0	0		-0,1	-0,1		25,5	30,6
												—	25,8	30,9
													26,0	31,2
													26,3	31,5
													26,5	31,8
												—	26,8	32,1
													27,0	32,4
													27,3	32,7
												—	27,5	33,0

Table 9 — Dimensions of SSF-L coil-spring-loaded oil control rings of narrow ring width

Nominal diameter	Radial thickness over coil spring	Ring width		Closed gap	Radial wall thickness		Land width	Groove depth	Groove depth and bridge	Coil spring groove diameter	Coil spring diameter	Tangential force N[a]
d_1	a_{12}	h_1	**Tol.**	s_1	a_1	**Tol.**	h_5	a_4	a_{13}	d_{14}	d_7	F_{tc}
60												20,0
61												20,3
62												20,7
63												21,0
64					2,20							21,3
65												21,7
66				0,20								22,0
67				+0,25								22,3
68			-0,010	0								22,7
69			-0,030									23,0
70												23,3
71												23,7
72												24,0
73												24,3
74	3,00	2,5	For		2,30	±0,15	0,40	0,45	1,40	1,70	1,60	24,7
75	0		phos-			within	±0,10	±0,10	0	+0,10	0	25,0
76	-0,25		phated			a ring			-0,15	0	-0,10	25,3
77			PO			0,15						25,7
78			surface:			max.						26,0
79			-0,005									26,3
80			-0,030	0,25								26,7
81				+0,25								27,0
82				0								27,3
83												27,7
84												28,0
85					2,40							28,3
86												28,7
87												29,0
88												29,3
89												29,7
90												30,0
91	3,10			0,30	2,5				1,50			30,3
92	0			+0,25					0			30,7
93	-0,25			0					-0,15			31,0

Table 9 — *(continued)*

Nominal diameter	Radial thickness over coil spring	Ring width		Closed gap	Radial wall thickness		Land width	Groove depth	Groove depth and bridge	Coil spring groove diameter	Coil spring diameter	Tangential force N[a]
d_1	a_{12}	h_1	Tol.	s_1	a_1	Tol.	h_5	a_4	a_{13}	d_{14}	d_7	F_{tc}
94												31,3
95												31,7
96					2,5							32,0
97			-0,010 -0,030									32,3
98												32,7
99												33,0
100			For									33,3
101	3,10 0 -0,25	2,5	phos-	0,30 +0,25 0		±0,15	0,40 ±0,10	0,45 ±0,10	1,50 0 -0,15	1,70 +0,10 0	1,60 0 -0,10	33,7
102			phated			within						34,0
103			PO			a ring						34,3
104			surface:			0,15						34,7
105					2,55	max.						35,0
106			-0,005 -0,030									35,3
107												35,7
108												36,0
109												36,3
110												36,7

NOTE 1 For intermediate sizes (e.g. repair sizes), the radial thickness of the next smaller nominal diameter applies.

NOTE 2 Values of specific tangential force, F_{tc}, are calculated with mean land width, h_5.

[a] Tangential force F_{tc} (in newton) for unit pressure p_{ou} = 1 N/mm².

Bibliography

[1] ISO 6621-1, *Internal combustion engines — Piston rings — Part 1: Vocabulary*

[2] ISO 6622 (all parts), *Internal combustion engines — Piston rings*

[3] ISO 6623, *Internal combustion engines — Piston rings — Scraper rings made of cast iron*

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[6] ISO 6627, *Internal combustion engines — Piston rings — Expander/segment oil-control rings*

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