
**Internal combustion engines — Piston
rings —**

Part 3:

**Coil-spring-loaded oil control rings made
of steel**

Moteurs à combustion interne — Segments de piston —

*Partie 3: Segments racleurs régulateurs d'huile, en acier, mis en charge
par ressort hélicoïdal*



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 6626-3 was prepared by Technical Committee ISO/TC 22, *Road vehicles*.

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

- *Coil-spring-loaded oil control rings*¹⁾
- *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*

1) ISO 6626:1989, published without a part number, is regarded as the first part of the ISO 6626 series since publication of the other parts.

Introduction

ISO 6626 is one of a series of International Standards dealing with piston rings for reciprocating internal combustion engines. Others are ISO 6621, ISO 6622, ISO 6623, ISO 6624, ISO 6625 and ISO 6627 (see Clause 2 and Bibliography).

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 will bear in mind the conditions under which it will be required to operate.

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Internal combustion engines — Piston rings —

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

1 Scope

This part of ISO 6626 specifies the essential dimensions of coil-spring-loaded, nitrided oil control rings made of steel, of piston ring types SOR (with R-shaped groove) and SOV (with V-shaped groove).

This part of ISO 6626 applies to coil-spring-loaded, nitrided oil control rings made of steel with a diameter of between 60 mm and 200 mm inclusive for reciprocating internal combustion engines. It can also be used for piston rings of compressors working under analogous conditions.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Symbols

The following symbols are used in this part of ISO 6626.

NOTE These symbols (including associated indices) are in accordance with the symbols used in ISO 6621, ISO 6622, ISO 6623, ISO 6624, ISO 6625, ISO 6627 and other parts of ISO 6626.

a_1 radial wall thickness

a_4 groove depth

a_{12} radial thickness over coil spring

a_{13} groove depth and bridge

a_{14} external land depth

B_3 land spacing

c_1 slot width

d_1 nominal diameter (nominal bore diameter)

d_7 coil-spring diameter

d_{14} coil-spring groove diameter for type SOR

f_1 coil-spring excursion

F_t tangential force

h_1 ring width

h_5 land width

p_0 contact pressure

s_1 closed gap

w_1 slot length

w_3 slot spacing

α land angle inside

β land angle outside

θ groove angle for type SOV

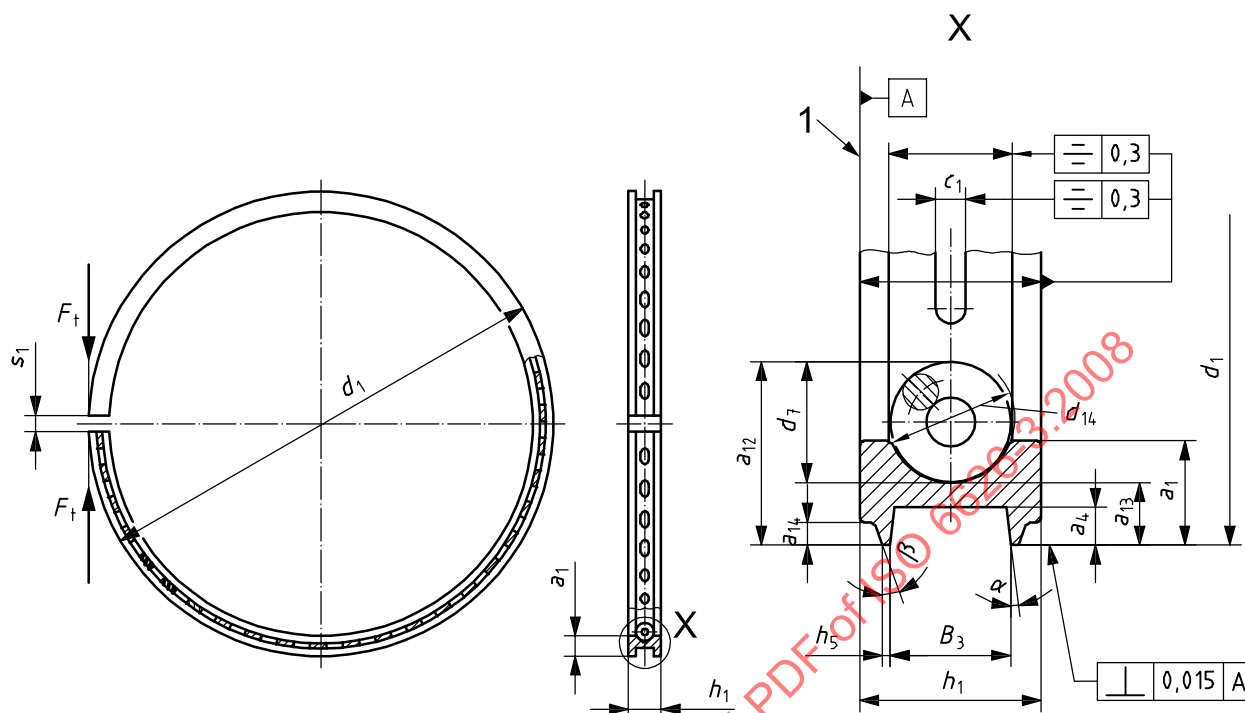
4 Piston ring types and designation examples

4.1 Type SOR — Steel oil control rings with R-shaped groove

4.1.1 General features and dimensions

Figure 1 shows the general features and dimensions of piston ring type SOR.

Dimensions in millimetres



For definitions of symbols, see Clause 3.

For dimensions, see Tables 3, 4, 5, 10, 13, 14, 15 and 16.

Key

1 reference plane

Figure 1 — General features and dimensions of piston ring type SOR

4.1.2 Designation

EXAMPLE A coil-spring-loaded, nitrided oil control ring made of steel with R-shaped groove (SOR), a radial wall thickness class = small (S), of nominal diameter $d_1 = 100$ mm (100), a nominal ring width $h_1 = 3$ mm (3), a land width $h_5 = 0,20$ mm (0,20), a nitrided depth of 0,030 mm min. (NT030), coil spring with reduced heat set (WF), and variable pitch with coil diameter d_7 ground (CSE), medium nominal contact pressure $p_0 = 1,5$ MPa (PN1,5):

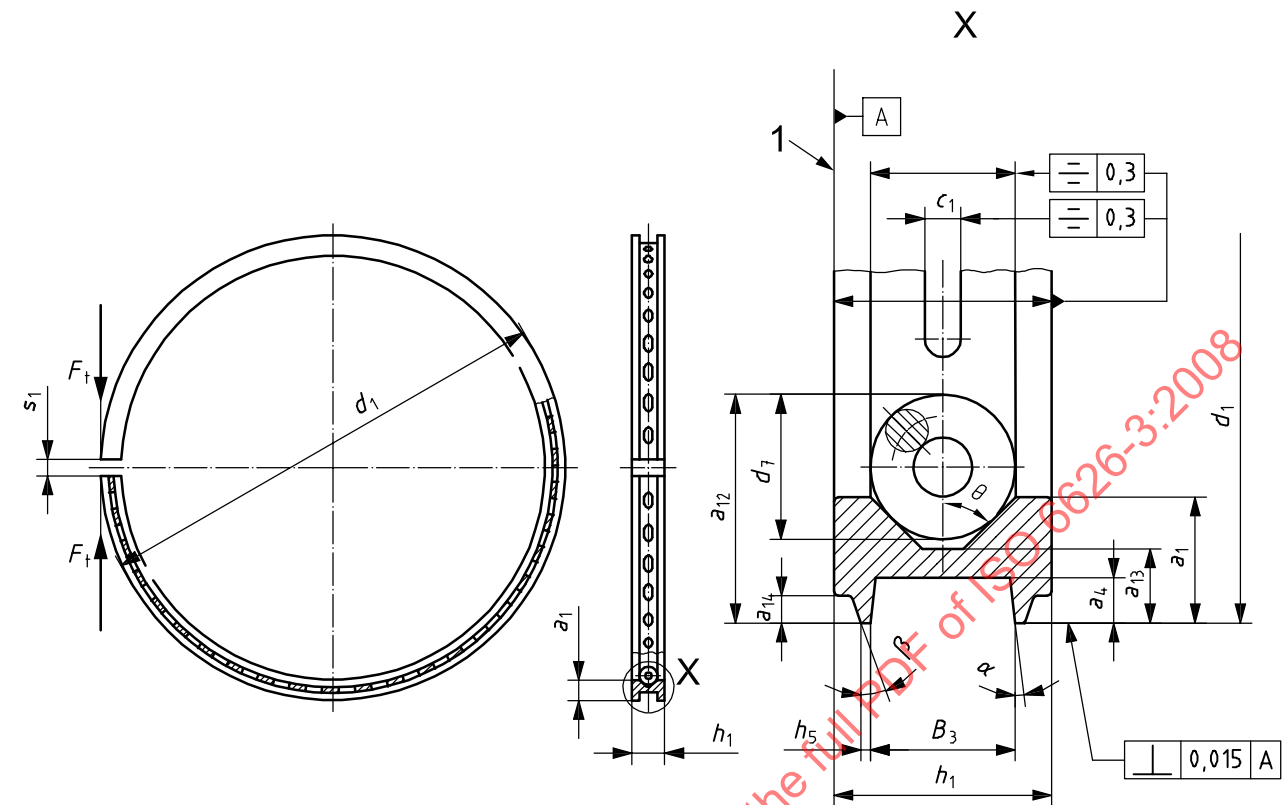
Piston ring ISO 6626-3-SOR-S 100 x 3 x 0,20 NT030 WF CSE PN1,5

4.2 Type SOV — Steel oil control rings with V-shaped groove

4.2.1 General features and dimensions

Figure 2 shows the general features and dimensions of piston ring type SOV.

Dimensions in millimetres



For definitions of symbols, see Clause 3.
For dimensions, see Tables 3, 4, 5, 11, 17, 18 and 19.

Key
1 reference plane

Figure 2 — General features and dimensions of piston ring type SOV

4.2.2 Designation

EXAMPLE A coil-spring-loaded, nitrided oil control ring made of steel with V-shaped groove (SOV), a radial wall thickness class = small (S), V-shaped groove angle 40° (V40), of nominal diameter $d_1 = 100$ mm (100), a nominal ring width $h_1 = 3$ mm (3), a land width $h_5 = 0,20$ mm (0,20), a nitrided depth of 0,030 mm min. (NT030), coil spring with reduced heat set (WF), and constant pitch with coil diameter d_7 ground (CSN), medium nominal contact pressure $p_0 = 1,5$ MPa (PN1,5):

Piston ring ISO 6626-3-SOV-S-V40-100 x 3 x 0,20 NT030 WF CSN PN1,5

5 Common features

5.1 Ring width h_1 and radial wall thickness a_1

Table 1 shows common features for ring width h_1 and radial wall thickness a_1 .

Table 1 — Ring width h_1 and radial wall thickness a_1

Dimensions in millimetres

Ring width $h_1 = \begin{smallmatrix} -0,01 \\ -0,03 \end{smallmatrix}$	Radial wall thickness $a_1 \pm 0,15$		Type
	Small (Code: S)	Large (Code: L)	
2,0	1,8 to 2,0	—	SOR
2,5	1,8 to 2,0	—	SOR
3,0	1,8 to 2,0	2,3 to 2,6	SOR and SOV
4,0	2,0 to 2,6	2,8 to 3,2	SOR and SOV

5.2 Land width h_5

Table 2 shows common features for land width h_5 .

Table 2 — Land width h_5

Dimensions in millimetres

Ring width h_1	Land width $h_5 \pm 0,07$		
2,0	0,20	—	—
2,5	0,20	0,25	—
3,0	0,20	0,25	0,30
4,0	0,20 ^a	0,25	0,30

^a For diameters greater than 120 mm and ring width equal to 4,0 mm, land width equal to 0,20 mm shall not be used.

5.3 Land angle α, β

Table 3 shows common features for land angle α, β .

Table 3 — Land angle α, β

Land angle	Range of nominal angle	Tolerance
inside α	5° to 20° ^a	$\pm 5^\circ$
outside β	10° to 30° ^a	$\pm 5^\circ$

^a Nominal angle subject to agreement between manufacturer and client.

5.4 Land spacing B_3

Table 4 shows common features for land spacing B_3 .

Table 4 — Land spacing B_3

Dimensions in millimetres

Ring width h_1	Land spacing B_3^a
2,0	1,25 to 1,45
2,5	1,35 to 1,75
3,0	1,45 to 2,10
4,0	1,80 to 3,20
^a $B_3 > (c_1 + 0,95)$	

5.5 Slot sizes

Table 5 shows common features for slot sizes.

Table 5 — Standard slot sizes

Dimensions in millimetres

Ring width h_1	Slot width c_1	Slot length w_1	Slot spacing w_3
2,0	0,3 to 0,5	1,4 to 2,5	5 to 10
2,5	0,4 to 0,6	2,0 to 3,0	5 to 10
3,0	0,5 to 0,7	2,5 to 3,5	5 to 10
4,0	0,6 to 1,0	3,0 to 5,0	5 to 10

Slots may open into the gap faces (see Figure 3).

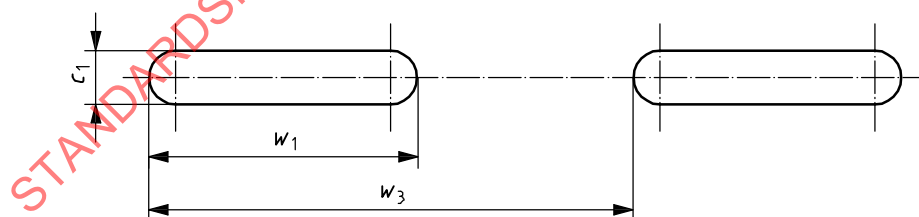


Figure 3 — Arrangement of slots

5.6 Nitrided surface

Table 6 shows common features for nitrided surfaces.

Table 6 — Nitrided case depth of peripheral surface and sideface

Dimensions in millimetres

Code	Nitrided case depth ^a	
	Peripheral surface min.	Sideface min.
NT010	0,010	0,005
NT030	0,030	0,010
NT050	0,050	0,015

^a For tolerances, see ISO 6621-4.

5.7 Nominal contact pressure and tangential force

Table 7 shows common features for nominal contact pressure.

Table 7 — Nominal contact pressure classes

Dimensions in millimetres

Ring width h_1	Nominal contact pressure p_0 MPa			
	Code PN1,0	Code PN1,5	Code PN2,0	Code PN2,5
2,0	1,0	1,5	2,0	—
2,5	1,0	1,5	2,0	—
3,0	—	1,5	2,0	2,5
4,0	—	1,5	2,0	2,5

5.8 Tolerance of tangential force F_t

Table 8 shows common features for tangential force F_t , where

$$F_t = d_1 \times h_5 \times p_0$$

(1)

Table 8 — Tolerance of tangential force F_t

Tangential force N	Tolerance
$F_t < 20$	± 4 N
$F_t \geq 20$	± 20 %

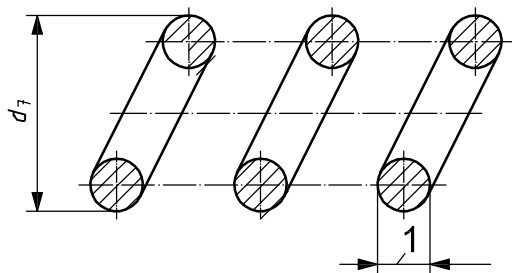
6 Coil springs

6.1 Types of coil spring

6.1.1 All values in the dimensional tables are based on cylindrical coil springs made of round wire.

The three designs shown in Figures 4 to 7 are common.

6.1.2 Figure 4 illustrates the design of type CSN coil spring with constant pitch.

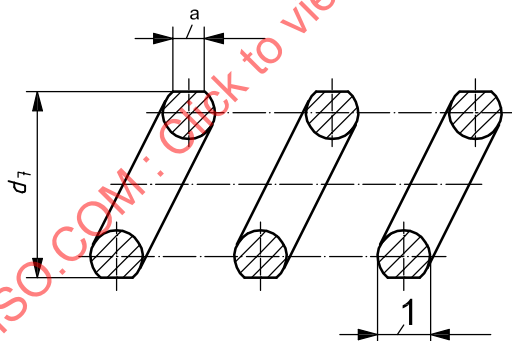


Key

1 diameter of wire

Figure 4 — Type CSN coil spring

6.1.3 Figure 5 illustrates the design of type CSG coil spring with constant pitch (coil diameter d_7 ground).



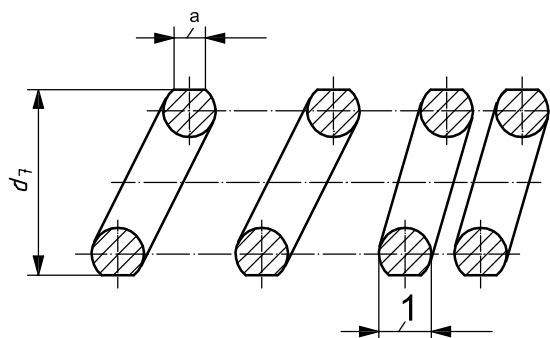
Key

1 diameter of wire

^a Approximately $0,8 \times$ diameter of wire.

Figure 5 — Type CSG coil spring

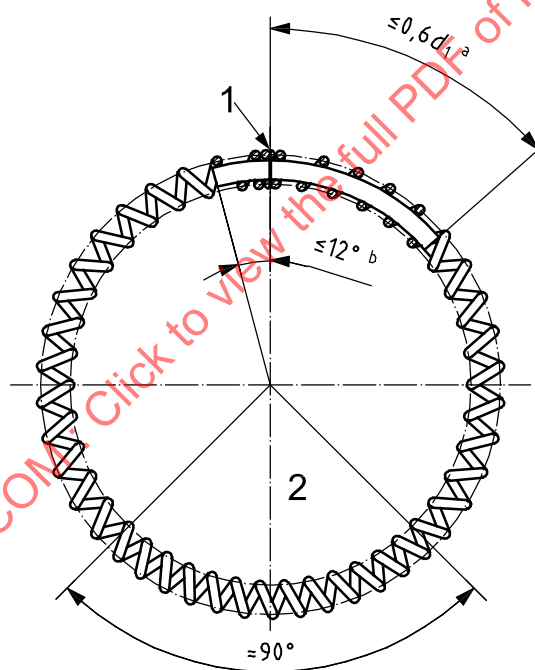
6.1.4 Figure 6 illustrates the design of type CSE coil spring with variable pitch (coil diameter d_7 ground), and Figure 7 shows the position of the area with small pitch.

**Key**

- 1 diameter of wire
- a Approximately $0,8 \times$ diameter of wire.

Figure 6 — Type CSE coil spring

Dimensions in millimetres

**Key**

- 1 spring gap
- 2 area with small pitch
- a Latch pin free length.
- b Latch pin fixed length.

Figure 7 — Position of area with small pitch

NOTE The use of different spring designs can be agreed between manufacturer and client. Changed spring groove configurations and dimensions can then be necessary.

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 8 and Table 9).

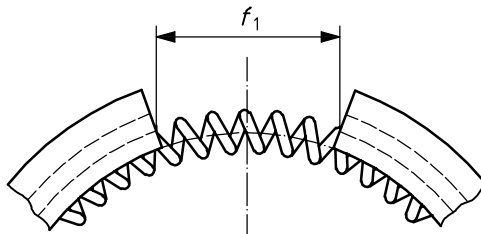


Figure 8 — Coil-spring excursion

Table 9 — Coil-spring excursion

Dimensions in millimetres

Nominal diameter d_1	Coil-spring excursion f_1 max.
$60 \leq d_1 < 100$	$0,1 \times d_1$
$100 \leq d_1 \leq 200$	$0,12 \times d_1$

6.3 Position of coil spring gap and fixing

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

6.4 Material

Coil springs are made of materials as shown in ISO 6621-3:2000, Table 1, subclasses MC62 (valve spring wire), MC67 (stainless steel) and MC68 (piano wire).

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.

The test conditions and the permissible loss of tangential forces are given in ISO 6621-5:2005, Table 10.

7 Type SOR

Table 10 gives the tolerance and calculation criteria on a_4 , a_{13} , a_{14} , d_{14} , d_7 and a_{12} for type SOR.

Table 10 — Tolerance and calculation criteria on a_4 , a_{13} , a_{14} , d_{14} , d_7 and a_{12} for type SOR

Dimensions in millimetres

Item	Symbol	Tolerance	Calculation criteria
Groove depth	a_4	$\pm 0,1$	$a_4 = (0,35 \text{ to } 0,6) \times a_1 - 0,2$
Groove depth and bridge	a_{13}	$\pm 0,1$	$a_{13} = a_4 + (0,45 \text{ to } 0,65)$
External land depth	a_{14}^a	max.	$a_{14} = (0,1 \text{ to } 0,3) \times a_1$
Coil-spring groove diameter	d_{14}	$\pm 0,05$	$d_{14} = (0,65 \text{ to } 0,85) \times h_1^b$
Coil-spring diameter	d_7	$\pm 0,05$	$d_7 = d_{14} \times (0,05 \text{ to } 0,3)$
Radial thickness over coil spring	a_{12}	$\pm 0,15$	$a_{12} = a_{13} + d_7$
^a This value is to be determined between manufacturer and client.			
^b When h_1 is 2,0 or 2,5, $d_{14} = (0,75 \text{ to } 0,85) \times h_1$.			

8 Type SOV

8.1 The angle of inside groove, θ , is as follows:

$40^\circ \pm 1^\circ$ (code V40) or $45^\circ \pm 1^\circ$ (code V45) $\pm 1^\circ$ (angle to reference plane).

See Figure 2.

8.2 Table 11 gives the tolerance and calculation criteria on a_4 , a_{13} , a_{14} , d_{14} , d_7 and a_{12} for type SOV.

Table 11 — Tolerance and calculation criteria on a_4 , a_{13} , a_{14} , d_{14} , d_7 and a_{12} for type SOV

Dimensions in millimetres

Item	Symbol	Tolerance	Calculation criteria
Groove depth	a_4	$\pm 0,1$	$a_4 = (0,35 \text{ to } 0,6) \times a_1 - 0,3$
Groove depth and bridge	a_{13}	$\pm 0,1$	$a_{13} = a_4 + (0,45 \text{ to } 0,65)$
External land depth	a_{14}^a	max.	$a_{14} = (0,1 \text{ to } 0,3) \times a_1$
Coil-spring diameter	d_7	$\pm 0,05$	$d_7 = (0,6 \text{ to } 0,8) \times h_1$
Radial thickness over coil spring	a_{12}	$\pm 0,15$	$a_{12} = a_4 + (-0,1 \text{ to } 0,4) + \left(1 + \frac{1}{\sin \theta}\right) \times \frac{d_7}{2}$
^a This value is to be determined between manufacturer and client.			

9 Dimensions

The two cross-sections specified in this part of ISO 6626 (SOR and SOV) are applicable for different diameter ranges. Table 12 provides a summary of the specifications given in Tables 13 to 19. The detailed Tables 13 to 19 contain the recommended nominal tangential forces of all types and diameters shown in Table 12.

Table 12 — Index of Tables 13 to 19

Dimensions in millimetres

Table	Type	Ring width h_1	Radial wall thickness a_1	Nominal diameter d_1
13	SOR	2,0 and 2,5	SOR-S	60 to 100
14		3,0	SOR-S and SOR-L	65 to 120
15		4,0	SOR-S and SOR-L	80 to 124
16		4,0	SOR-S and SOR-L	125 to 200
17	SOV	3,0	SOV-S and SOV-L	70 to 120
18		4,0	SOV-S and SOV-L	80 to 124
19		4,0	SOV-S and SOV-L	125 to 200
NOTE Codes S and L are described in Table 1.				

Table 13 — Recommended nominal tangential force of ring type SOR-S ($h_1 = 2,0$ mm and $h_1 = 2,5$ mm)

Dimensions in millimetres

Nominal diameter d_1	Closed gap s_1	Recommended nominal tangential force N									
		Ring type SOR-S									
		$h_1 = 2,0^{+0,01}_{-0,03}$			$h_1 = 2,5^{+0,01}_{-0,03}$						
		$h_5 = 0,2 \pm 0,07$			$h_5 = 0,2 \pm 0,07$			$h_5 = 0,25 \pm 0,07$			
		PN1,0 (1,0 MPa)	PN1,5 (1,5 MPa)	PN2,0 (2,0 MPa)	PN1,0 (1,0 MPa)	PN1,5 (1,5 MPa)	PN2,0 (2,0 MPa)	PN1,0 (1,0 MPa)	PN1,5 (1,5 MPa)	PN2,0 (2,0 MPa)	
60	$0,2^{+0,2}_0$	12	18	24	12	18	24	15	22,5	30	
61		12,2	18,3	24,4	12,2	18,3	24,4	15,3	22,9	30,5	
62		12,4	18,6	24,8	12,4	18,6	24,8	15,5	23,3	31	
63		12,6	18,9	25,2	12,6	18,9	25,2	15,8	23,7	31,5	
64		12,8	19,2	25,6	12,8	19,2	25,6	16	24	32	
65		13	19,5	26	13	19,5	26	16,3	24,4	32,5	
66		13,2	19,8	—	13,2	19,8	26,4	16,5	24,8	33	
67		13,4	20,1		13,4	20,1	26,8	16,8	25,1	33,5	
68		13,6	20,4		13,6	20,4	27,2	17	25,5	34	
69		13,8	20,7		13,8	20,7	27,6	17,3	25,9	34,5	
70		14	21		14	21	28	17,5	26,3	35	
71		14,2	21,3	14,2	21,3	28,4	17,8	26,6	35,5		
72		14,4	21,6	14,4	21,6	28,8	18	27	36		
73		14,6	21,9	14,6	21,9	29,2	18,3	27,4	36,5		
74		14,8	22,2	14,8	22,2	29,6	18,5	27,8	37		
75	$0,25^{+0,2}_0$	15	22,5	—	15	22,5	30	18,8	28,1	37,5	
76		15,2	22,8		15,2	22,8	30,4	19	28,5	38	
77		15,4	23,1		15,4	23,1	30,8	19,3	28,9	38,5	
78		15,6	23,4		15,6	23,4	31,2	19,5	29,3	39	
79		15,8	23,7		15,8	23,7	31,6	19,8	29,6	39,5	
80		16	24		16	24	32	20	30	40	
81		16,2	24,3		16,2	24,3	32,4	20,3	30,4	40,5	
82		16,4	24,6		16,4	24,6	32,8	20,5	30,8	41	
83		16,6	24,9		16,6	24,9	33,2	20,8	31,1	41,5	
84		16,8	25,2		16,8	25,2	33,6	21	31,5	42	
85		17	25,5		17	25,5	34	21,3	31,9	42,5	
86		17,2	25,8		17,2	25,8	34,4	21,5	32,3	—	
87		17,4	26,1		17,4	26,1	34,8	21,8	32,6		
88		17,6	26,4		17,6	26,4	35,2	22	33		
89		17,8	26,7		17,8	26,7	35,6	22,3	33,4		
90	$0,3^{+0,25}_0$	18	27	—	18	27	36	22,5	33,8	—	
91		18,2	27,3		18,2	27,3	36,4	22,8	34,1		
92		18,4	27,6		18,4	27,6	36,8	23	34,5		
93		18,6	27,9		18,6	27,9	37,2	23,3	34,9		
94		18,8	28,2		18,8	28,2	37,6	23,5	35,3		
95		19	19		19	28,5	38	23,8	35,6		
96		—	19,2		28,8	19,2	28,8	38,4	24		36
97			19,4		29,1	19,4	29,1	38,8	24,3		36,4
98			19,6		29,4	19,6	29,4	39,2	24,5		36,8
99			19,8		29,7	19,8	29,7	39,6	24,8		37,1
100			20		30	20	30	40	25		37,5
101		—	—		—	—	—	—	—		—
102											
103											
104											
105											
106	—	—	—	—	—	—	—	—			
107											
108											
109											
110											
111	$0,35^{+0,25}_0$	—	—	—	—	—	—	—	—		
112											
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118											
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121											
122											
123											
124											

NOTE Diameters without value for tangential force are not recommended for use.

NOTE Diameters without value for tangential force are not recommended for use.

Table 14 — Recommended nominal tangential force of ring type SOR-S and SOR-L ($h_1 = 3,0$ mm)

Dimensions in millimetres

Nominal diameter d_1	Closed gap s_1	Recommended nominal tangential force											
		N											
		Ring type SOR-S						Ring type SOR-L					
		$h_1 = 3,0 \begin{smallmatrix} -0,01 \\ -0,03 \end{smallmatrix}$						$h_1 = 3,0 \begin{smallmatrix} -0,01 \\ -0,03 \end{smallmatrix}$					
		$h_5 = 0,2 \pm 0,07$			$h_5 = 0,25 \pm 0,07$			$h_5 = 0,2 \pm 0,07$			$h_5 = 0,25 \pm 0,07$		
PN1,5 (1,5 MPa)	PN2,0 (2,0 MPa)	PN2,5 (2,5 MPa)	PN1,5 (1,5 MPa)	PN2,0 (2,0 MPa)	PN2,5 (2,5 MPa)	PN1,5 (1,5 MPa)	PN2,0 (2,0 MPa)	PN2,5 (2,5 MPa)	PN1,5 (1,5 MPa)	PN2,0 (2,0 MPa)	PN2,5 (2,5 MPa)		
60	$0,2 \begin{smallmatrix} +0,2 \\ 0 \end{smallmatrix}$	—	—	—	—	—	—	—	—	—	—	—	
61		19,5	26	32,5	24,4	32,5	40,6	—	—	—	—	—	
62		19,8	26,4	33	24,8	33	41,3						
63		20,1	26,8	33,5	25,1	33,5	41,9						
64		20,4	27,2	34	25,5	34	42,5						
65		20,7	27,6	34,5	25,9	34,5	43,1						
66		21	28	35	26,3	35	43,8						
67	$0,25 \begin{smallmatrix} +0,2 \\ 0 \end{smallmatrix}$	21,3	28,4	35,5	26,6	35,5	44,4	—	—	—	—	—	
68		21,6	28,8	36	27	36	45						
69		21,9	29,2	36,5	27,4	36,5	45,6						
70		22,2	29,6	37	27,8	37	46,3						
71		22,5	30	37,5	28,1	37,5	46,9						
72		22,8	30,4	38	28,5	38	47,5						
73		23,1	30,8	38,5	28,9	38,5	48,1						
74		23,4	31,2	39	29,3	39	48,8						
75	$0,25 \begin{smallmatrix} +0,2 \\ 0 \end{smallmatrix}$	23,7	31,6	39,5	29,6	39,5	49,4	—	—	—	—	—	
76		24	32	40	30	40	50						
77		24,3	32,4	40,5	30,4	40,5	50,6						
78		24,6	32,8	41	30,8	41	51,3						
79		24,9	33,2	41,5	31,1	41,5	51,9						
80		25,2	33,6	42	31,5	42	52,5						
81		25,5	34	42,5	31,9	42,5	53,1						
82		25,8	34,4	43	32,3	43	53,8						
83	$0,3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix}$	26,1	34,8	43,5	32,6	43,5	54,4	—	—	—	—	—	
84		26,4	35,2	44	33	44	55						
85		26,7	35,6	44,5	33,4	44,5	55,6						
86		27	36	45	33,8	45	56,3						
87		27,3	36,4	45,5	34,1	45,5	56,9						
88		27,6	36,8	46	34,5	46	57,5						
89		27,9	37,2	46,5	34,9	46,5	58,1						
90		28,2	37,6	47	35,3	47	58,8						
91	$0,3 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix}$	28,5	38	47,5	35,6	47,5	59,4	—	—	—	—	—	
92		28,8	38,4	48	36	48	60						
93		29,1	38,8	48,5	36,4	48,5	60,6						
94		29,4	39,2	49	36,8	49	61,3						
95		29,7	39,6	49,5	37,1	49,5	61,9						
96		30	40	50	37,5	50	62,5						
97		30,3	40,4	50,5	37,9	50,5	63,1						
98		30,6	40,8	51	38,3	51	63,7						
99	$0,35 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix}$	30,9	41,2	51,5	38,6	51,5	64,3	—	—	—	—	—	
100		31,2	41,6	52	39	52	64,9						
101		31,5	42	52,5	39,4	52,5	65,5						
102		31,8	42,4	53	39,8	53	66,1						
103		32,1	42,8	53,5	40,1	53,5	66,7						
104		32,4	43,2	54	40,5	54	67,3						
105		32,7	43,6	54,5	40,9	54,5	67,9						
106		33	44	55	41,3	55	68,5						
107	$0,35 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix}$	33,3	44,4	55,5	41,6	55,5	69,1	—	—	—	—	—	
108		33,6	44,8	56	42	56	69,7						
109		33,9	45,2	56,5	42,4	56,5	70,3						
110		34,2	45,6	57	42,8	57	70,9						
111		34,5	46	57,5	43,1	57,5	71,5						
112		34,8	46,4	58	43,5	58	72,1						
113		35,1	46,8	58,5	43,9	58,5	72,7						
114		35,4	47,2	59	44,3	59	73,3						
115	$0,35 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix}$	35,7	47,6	59,5	44,6	59,5	73,9	—	—	—	—	—	
116		36	48	60	45	60	74,5						
117		—	—	—	—	—	—						
118		—	—	—	—	—	—						
119		—	—	—	—	—	—						
120		—	—	—	—	—	—						
121		—	—	—	—	—	—						
122		—	—	—	—	—	—						
123	$0,35 \begin{smallmatrix} +0,25 \\ 0 \end{smallmatrix}$	—	—	—	—	—	—	—	—	—	—	—	
124		—	—	—	—	—	—	—	—	—	—	—	

Table 15 — Recommended nominal tangential force of ring type SOR-S and SOR-L
($h_1 = 4,0$ mm; nominal diameters $d_1 < 125$ mm)

Dimensions in millimetres

Nominal diameter d_1	Closed gap s_1	Recommended nominal tangential force N														
		Ring type SOR-S									Ring type SOR-L					
		$h_1 = 4,0^{+0,01}_{-0,03}$									$h_1 = 4,0^{+0,01}_{-0,03}$					
		$h_5 = 0,2 \pm 0,07$			$h_5 = 0,25 \pm 0,07$			$h_5 = 0,3 \pm 0,07$			$h_5 = 0,25 \pm 0,07$			$h_5 = 0,3 \pm 0,07$		
		PN1,5 1,5 MPa	PN2,0 2,0 MPa	PN2,5 2,5 MPa	PN1,5 1,5 MPa	PN2,0 2,0 MPa	PN2,5 2,5 MPa	PN1,5 1,5 MPa	PN2,0 2,0 MPa	PN2,5 2,5 MPa	PN1,5 1,5 MPa	PN2,0 2,0 MPa	PN2,5 2,5 MPa	PN1,5 1,5 MPa	PN2,0 2,0 MPa	PN2,5 2,5 MPa
60	0,2 ^{+0,2} ₀	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
61		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
62		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
63		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
64		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
65		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
66		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
67		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
68		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
69		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
70	0,25 ^{+0,2} ₀	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
71		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
72		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
73		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
74		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
75		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
76		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
77	0,25 ^{+0,2} ₀	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
78		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
79		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
80		24	32	40	30	40	50	36	48	60	—	—	—	—	—	—
81		24,3	32,4	40,5	30,4	40,5	50,6	36,5	48,6	60,8	—	—	—	—	—	—
82		24,6	32,8	41	30,8	41	51,3	36,9	49,2	61,5	—	—	—	—	—	—
83		24,9	33,2	41,5	31,1	41,5	51,9	37,4	49,8	62,3	—	—	—	—	—	—
84		25,2	33,6	42	31,5	42	52,5	37,8	50,4	63	—	—	—	—	—	—
85	0,3 ^{+0,25} ₀	25,5	34	42,5	31,9	42,5	53,7	38,3	51	63,8	—	—	—	—	—	—
86		25,8	34,4	43	32,3	43	53,8	38,7	51,6	64,5	—	—	—	—	—	—
87		26,1	34,8	43,5	32,6	43,5	54,4	39,2	52,2	65,3	—	—	—	—	—	—
88		26,4	35,2	44	33	44	55	39,6	52,8	66	—	—	—	—	—	—
89		26,7	35,6	44,5	33,4	44,5	55,6	40,1	53,4	66,8	—	—	—	—	—	—
90		27	36	45	33,8	45	56,3	40,5	54	67,5	—	—	—	—	—	—
91		27,3	36,4	45,5	34,1	45,5	56,9	41	54,6	68,3	—	—	—	—	—	—
92	0,3 ^{+0,25} ₀	27,6	36,8	46	34,5	46	57,5	41,4	55,2	69	—	—	—	—	—	—
93		27,9	37,2	46,5	34,9	46,5	58,1	41,9	55,8	69,8	—	—	—	—	—	—
94		28,2	37,6	47	35,3	47	58,8	42,3	56,4	70,5	—	—	—	—	—	—
95		28,5	38	47,5	35,6	47,5	59,4	42,8	57	71,3	—	—	—	—	—	—
96		28,8	38,4	48	36	48	60	43,2	57,6	72	—	—	—	—	—	—
97		29,1	38,8	48,5	36,4	48,5	60,6	43,7	58,2	72,8	—	—	—	—	—	—
98		29,4	39,2	49	36,8	49	61,3	44,1	58,8	73,5	—	—	—	—	—	—
99	0,3 ^{+0,25} ₀	29,7	39,6	49,5	37,1	49,5	61,9	44,6	59,4	74,3	—	—	—	—	—	—
100		30	40	50	37,5	50	62,5	45	60	75	37,5	40	50	45	60	75
101		30,3	40,4	50,5	37,9	50,5	63,1	45,5	60,6	75,8	37,9	40,5	50,6	45,5	60,6	75,8
102		30,6	40,8	51	38,3	51	63,8	45,9	61,2	76,5	38,3	41	51,3	45,9	61,2	76,5
103		30,9	41,2	51,5	38,6	51,5	64,4	46,4	61,8	77,3	38,6	41,5	51,9	46,4	61,8	77,3
104		31,2	41,6	52	39	52	65	46,8	62,4	78	39,0	42	52,5	46,8	62,4	78
105		31,5	42	52,5	39,4	52,5	65,6	47,3	63	78,8	39,4	42,5	53,1	47,3	63	78,8
106	0,35 ^{+0,25} ₀	31,8	42,4	53	39,8	53	66,3	47,7	63,6	79,5	39,8	43	53,8	47,7	63,6	79,5
107		32,1	42,8	53,5	40,1	53,5	66,9	48,2	64,2	80,3	40,1	43,5	54,4	48,2	64,2	80,3
108		32,4	43,2	54	40,5	54	67,5	48,6	64,8	81	40,5	44	55	48,6	64,8	81
109		32,7	43,6	54,5	40,9	54,5	68,1	49,1	65,4	81,8	40,9	44,5	55,6	49,1	65,4	81,8
110		33	44	55	41,3	55	68,8	49,5	66	82,5	41,3	45	56,3	49,5	66	82,5
111		33,3	44,4	55,5	41,6	55,5	69,4	50	66,6	83,3	41,6	45,5	56,9	50	66,6	83,3
112		33,6	44,8	56	42	56	70	50,4	67,2	84	42,0	46	57,5	50,4	67,2	84
113	0,35 ^{+0,25} ₀	33,9	45,2	56,5	42,4	56,5	70,6	50,9	67,8	84,8	42,4	46,5	58,1	50,9	67,8	84,8
114		34,2	45,6	57	42,8	57	71,3	51,3	68,4	85,5	42,8	47	58,8	51,3	68,4	85,5
115		34,5	46	57,5	43,1	57,5	71,9	51,8	69	86,3	43,1	47,5	59,4	51,8	69	86,3
116		34,8	46,4	58	43,5	58	72,5	52,2	69,6	87	43,5	48	60	52,2	69,6	87
117		35,1	46,8	58,5	43,9	58,5	73,1	52,7	70,2	87,8	43,9	48,5	60,6	52,7	70,2	87,8
118		35,4	47,2	59	44,3	59	73,8	53,1	70,8	88,5	44,3	49	61,3	53,1	70,8	88,5
119		35,7	47,6	59,5	44,6	59,5	74,4	53,6	71,4	89,3	44,6	49,5	61,9	53,6	71,4	89,3
120	0,35 ^{+0,25} ₀	36	48	60	45	60	75	54	72	90	45,0	50	62,5	54	72	90
121		—	—	—	45,4	60,5	75,6	54,5	72,6	90,8	45,4	50,5	63,1	54,5	72,6	90,8
122		—	—	—	45,8	61	76,3	54,9	73,2	91,5	45,8	51	63,8	54,9	73,2	91,5
123		—	—	—	46,1	61,5	76,9	55,4	73,8	92,3	46,1	51,5	64,4	55,4	73,8	92,3
124		—	—	—	46,5	62	77,5	55,8	74,4	93	46,5	52	65	55,8	74,4	93

Table 16 — Recommended nominal tangential force of ring type SOR-S and SOR-L
 ($h_1 = 4,0$ mm; nominal diameters $d_1 \geq 125$ mm)

Dimensions in millimetres

Nominal diameter d_1	Closed gap s_1	Recommended nominal tangential force														
		N														
		Ring type SOR-S									Ring type SOR-L					
		$h_1 = 4,0^{+0,01}_{-0,03}$									$h_1 = 4,0^{+0,01}_{-0,03}$					
		$h_5 = 0,2 \pm 0,07$			$h_5 = 0,25 \pm 0,07$			$h_5 = 0,3 \pm 0,07$			$h_5 = 0,25 \pm 0,07$			$h_5 = 0,3 \pm 0,07$		
		PN1,5 1,5 MPa	PN2,0 2,0 MPa	PN2,5 2,5 MPa	PN1,5 1,5 MPa	PN2,0 2,0 MPa	PN2,5 2,5 MPa	PN1,5 1,5 MPa	PN2,0 2,0 MPa	PN2,5 2,5 MPa	PN1,5 1,5 MPa	PN2,0 2,0 MPa	PN2,5 2,5 MPa	PN1,5 1,5 MPa	PN2,0 2,0 MPa	PN2,5 2,5 MPa
125	0,35 ^{+0,25} ₀	—	—	—	46,9	62,5	78,1	56,3	75	93,8	46,9	62,5	78,1	56,3	75	93,8
126		—	—	—	47,3	63	78,8	56,7	75,6	94,5	47,3	63	78,8	56,7	75,6	94,5
127		—	—	—	47,6	63,5	79,4	57,2	76,2	95,3	47,6	63,5	79,4	57,2	76,2	95,3
128		—	—	—	48	64	80	57,6	76,8	96	48	64	80	57,6	76,8	96
129		—	—	—	48,4	64,5	80,6	58,1	77,4	96,8	48,4	64,5	80,6	58,1	77,4	96,8
130	0,4 ^{+0,3} ₀	—	—	—	48,8	65	81,3	58,5	78	97,5	48,8	65	81,3	58,5	78	97,5
131		—	—	—	49,1	65,5	81,9	59	78,6	98,3	49,1	65,5	81,9	59	78,6	98,3
132		—	—	—	49,5	66	82,5	59,4	79,2	99	49,5	66	82,5	59,4	79,2	99
133		—	—	—	49,9	66,5	83,1	59,9	79,8	99,8	49,9	66,5	83,1	59,9	79,8	99,8
134		—	—	—	50,3	67	83,8	60,3	80,4	100,5	50,3	67	83,8	60,3	80,4	100,5
135		—	—	—	50,6	67,5	84,4	60,8	81	101,3	50,6	67,5	84,4	60,8	81	101,3
136		—	—	—	51	68	85	61,2	81,6	102	51	68	85	61,2	81,6	102
137		—	—	—	51,4	68,5	85,6	61,7	82,2	102,8	51,4	68,5	85,6	61,7	82,2	102,8
138		—	—	—	51,8	69	86,3	62,1	82,8	103,5	51,8	69	86,3	62,1	82,8	103,5
139		—	—	—	52,1	69,5	86,9	62,6	83,4	104,3	52,1	69,5	86,9	62,6	83,4	104,3
140	0,45 ^{+0,3} ₀	—	—	—	52,5	70	87,5	63	84	105	52,5	70	87,5	63	84	105
141		—	—	—	52,9	70,5	88,1	63,5	84,6	105,8	52,9	70,5	88,1	63,5	84,6	105,8
142		—	—	—	53,3	71	88,8	63,9	85,2	106,5	53,3	71	88,8	63,9	85,2	106,5
143		—	—	—	53,6	71,5	89,4	64,4	85,8	107,3	53,6	71,5	89,4	64,4	85,8	107,3
144		—	—	—	54	72	90	64,8	86,4	108	54	72	90	64,8	86,4	108
145		—	—	—	54,4	72,5	90,6	65,3	87	108,8	54,4	72,5	90,6	65,3	87	108,8
146		—	—	—	54,8	73	91,3	65,7	87,6	—	54,8	73	91,3	65,7	87,6	—
147		—	—	—	55,1	73,5	91,9	66,2	88,2	—	55,1	73,5	91,9	66,2	88,2	—
148		—	—	—	55,5	74	92,5	66,6	88,8	—	55,5	74	92,5	66,6	88,8	—
149		—	—	—	55,9	74,5	93,1	67,1	89,4	—	55,9	74,5	93,1	67,1	89,4	—
150	0,55 ^{+0,3} ₀	—	—	—	56,3	75	93,8	67,5	90	—	56,3	75	93,8	67,5	90	—
152		—	—	—	57	76	95	68,4	91,2	—	57	76	95	68,4	91,2	—
154		—	—	—	57,8	77	96,3	69,3	92,4	—	57,8	77	96,3	69,3	92,4	—
155		—	—	—	58,1	77,5	96,9	69,8	93	—	58,1	77,5	96,9	69,8	93	—
156		—	—	—	58,5	78	97,5	70,2	93,6	—	58,5	78	97,5	70,2	93,6	—
158		—	—	—	59,3	79	98,8	71,1	94,8	—	59,3	79	98,8	71,1	94,8	—
160		—	—	—	60	80	100	72	96	—	60	80	100	72	96	—
162		—	—	—	—	—	—	—	—	—	60,8	81	101,3	72,9	97,2	—
164		—	—	—	—	—	—	—	—	—	61,5	82	102,5	73,8	98,4	—
165		—	—	—	—	—	—	—	—	—	61,9	82,5	103,1	74,3	99	—
166		—	—	—	—	—	—	—	—	—	62,3	83	103,8	74,7	99,6	—
168		—	—	—	—	—	—	—	—	—	63	84	105	75,6	100,8	—
170		—	—	—	—	—	—	—	—	—	63,8	85	106,3	76,5	102	—
172		—	—	—	—	—	—	—	—	—	64,5	86	107,5	77,4	103,2	—
174		—	—	—	—	—	—	—	—	—	65,3	87	108,8	78,3	104,4	—
175	0,55 ^{+0,3} ₀	—	—	—	—	—	—	—	—	—	65,6	87,5	109,4	78,8	105	—
176		—	—	—	—	—	—	—	—	—	66	88	—	79,2	105,6	—
178		—	—	—	—	—	—	—	—	—	66,8	89	—	80,1	106,8	—
180		—	—	—	—	—	—	—	—	—	67,5	90	—	81	108	—
182		—	—	—	—	—	—	—	—	—	68,3	91	—	81,9	—	—
184		—	—	—	—	—	—	—	—	—	69	92	—	82,8	—	—
185		—	—	—	—	—	—	—	—	—	69,4	92,5	—	83,3	—	—
186		—	—	—	—	—	—	—	—	—	69,8	93	—	83,7	—	—
188		—	—	—	—	—	—	—	—	—	70,5	94	—	84,6	—	—
190		—	—	—	—	—	—	—	—	—	71,3	95	—	85,5	—	—
192		—	—	—	—	—	—	—	—	—	72	96	—	86,4	—	—
194		—	—	—	—	—	—	—	—	—	72,8	97	—	87,3	—	—
195		—	—	—	—	—	—	—	—	—	73,1	97,5	—	87,8	—	—
196		—	—	—	—	—	—	—	—	—	73,5	98	—	88,2	—	—
198		—	—	—	—	—	—	—	—	—	74,3	99	—	89,1	—	—
200		—	—	—	—	—	—	—	—	—	75	100	—	90	—	—