# SLOVENSKI STANDARD
# SIST EN 4537-2:2009

**01-september-2009**

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**Aeronavtika - Puġe s prirobnico iz korozijsko odpornega jekla s samomazalno oblogo, serija za veļ je obremenitve - 2. del: Mere in nosilnosti - Colski tip**

Aerospace series - Bushes, flanged in corrosion-resisting steel with self-lubricating liner, elevated load - Part 2: Dimensions and loads - Inch series

Luft- und Raumfahrt - Buchsen mit Flansch aus korrosionsbeständigem Stahl mit selbstschmierender Beschichtung, erhöhte Belastung - Teil 2: Maße und Belastungen - Inch Reihe



Série aérospatiale - Bagues, à épaulement en acier résistant à la corrosion à garniture autolubrifiante, charge élevée - Partie 2: Dimensions et charges - Série en inches



**Ta slovenski standard je istoveten z:** **EN 4537-2:2009**

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**ICS:**

| | | |
|---|---|---|
| 49.035 | Sestavni deli za letalsko in vesoljsko gradnjo | Components for aerospace construction |

**SIST EN 4537-2:2009** **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

# EN 4537-2

June 2009

ICS 49.035

English Version

# Aerospace series - Bushes, flanged in corrosion-resisting steel with self-lubricating liner, elevated load - Part 2: Dimensions and loads - Inch series

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This European Standard was approved by CEN on 24 April 2009.

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EUROPÄISCHES KOMITEE FÜR NORMUNG

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# Contents

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## Foreword

This document (EN 4537-2:2009) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2009, and conflicting national standards shall be withdrawn at the latest by December 2009.

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# 1 Scope

This standard specifies the characteristics of flanged bushes in corrosion resisting steel with self-lubricating liner elevated load for aerospace applications.

The bushes are intended for use in fixed or moving parts of the aircraft structure and control mechanisms.

They shall be used in the temperature range – 55 °C to 163 °C.

# 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.

EN 2311, *Aerospace series — Bushes with self-lubricating liner — Technical specification*

EN 2424, *Aerospace series — Marking of aerospace products*

EN 3161, *Aerospace series — Steel FE-PM3801 (X5CrNiCu17-4) — Air melted — Solution treated and precipitation treated — Bar — a or D ≥ 200 mm — $R_m$ ≥ 930 MPa* [1)]

TR 4475, *Aerospace series — Bearings and mechanical transmissions for airframe applications — Vocabulary* [2)]



ISO 2768-1, *General tolerances — Part 1: Tolerances for linear and angular dimensions without individual tolerance indications*



ISO 8075, *Aerospace — Surface treatment of hardenable stainless steel parts*

# 3 Terms and definitions

For the purposes of this document, the terms and definitions given in TR 4475 apply.

# 4 Requirements

## 4.1 Configuration, dimensions and mass

According to Figures 1 and 2 and Tables 1, 2, 4 and 5. Dimensions apply after surface treatment. Dimensions and tolerances are expressed in millimetres (inches).

General tolerances shall be ISO 2768-m in accordance with ISO 2768-1.

## 4.2 Surface roughness

According to Figures 1 and 2.

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1) Published as ASD Prestandard at the date of publication of this standard.

2) Published as ASD Technical Report at the date of publication of this standard.

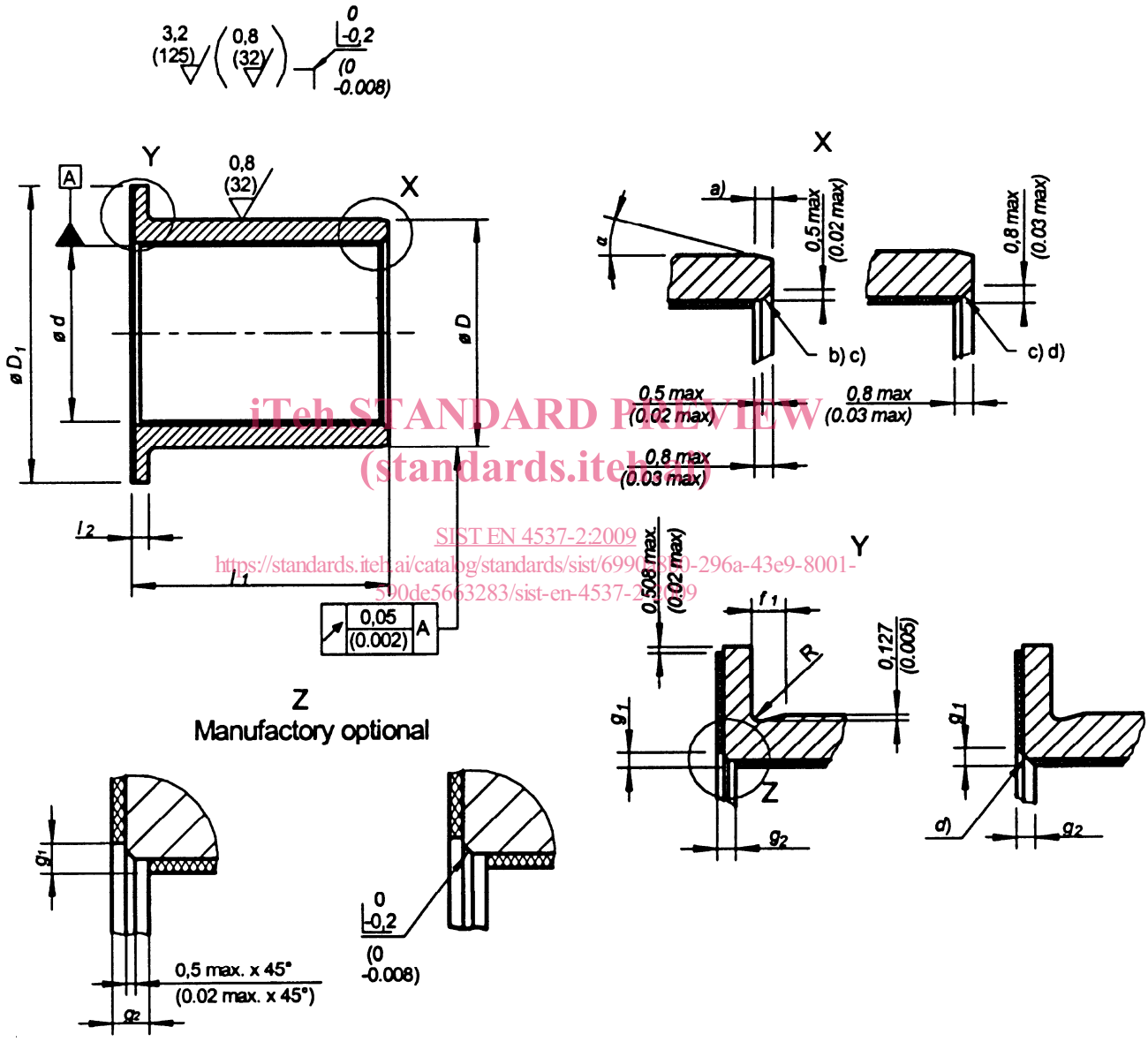
### 4.3 Materials

Bush: Stainless steel according to EN 3161.

Liner: Self-lubricating wear resistant material consistent with the requirements of EN 2311.

### 4.4 Surface treatment

Code T: Passivation according to ISO 8075.






**Key**

a Chamfer machined before bonding

b Chamfer or radius at manufacturers option

c Chamfer machined after bonding

d Manufactory optional

**Figure 1 — Configuration — Type D**

**Table 1 — Dimensions and tolerances — Type D**

| Diameter code [a] | $d$ Nominal diameter | $d$ $^{0}_{-0,025}$ ($^{0}_{-0.0010}$) | $D$ $^{0}_{-0,013}$ ($^{0}_{-0.0005}$) | $D_1$ $^{0}_{-0,51}$ ($^{0}_{-0.020}$) | $g_1$ max. | $g_2$ max. | $l_2$ $^{0}_{-0,13}$ ($^{0}_{-0.005}$) | $f_1$ [b] max. | $a$ | $\alpha$ ± 2° | $R$ $^{+0,25}_{0}$ ($^{+0.010}_{0}$) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **04** | 6,350 (0.2500) | 6,388 (0.2515) | 9,550 (0.3760) | 19,05 (0.750) | 0,70 (0.028) | 0,70 (0.028) | 1,60 (0.063) | 1,20 (0.047) | 0,50 to 0,70 (0.020 to 0.030) | 15° | 0,13 (0.005) |
| **05** | 7,938 (0.3125) | 7,976 (0.3140) | 11,140 (0.4386) | 20,64 (0.813) | | | | | | | |
| **06** | 9,525 (0.3750) | 9,563 (0.3765) | 12,730 (0.5012) | 22,23 (0.875) | | | | | | | |
| **07** | 11,113 (0.4375) | 11,151 (0.4390) | 14,321 (0.5638) | 23,81 (0.938) | | | | | | | |
| **08** | 12,700 (0.5000) | 12,738 (0.5015) | 15,913 (0.6265) | 25,40 (1.000) | | | | | | | |
| **09** | 14,288 (0.5625) | 14,326 (0.5640) | 17,506 (0.6892) | 28,58 (1.125) | | | | | | | |
| **10** | 15,875 (0.6250) | 15,913 (0.6265) | 20,681 (0.8142) | 31,75 (1.250) | | | | | | | |
| **11** | 17,463 (0.6875) | 17,501 (0.6890) | 22,268 (0.8767) | 34,93 (1.375) | | | | | | | |
| **12** | 19,050 (0.7500) | 19,088 (0.7515) | 23,858 (0.9393) | 38,10 (1.500) | | | | | | | |
| **14** | 22,225 (0.8750) | 22,263 (0.8765) | 27,038 (1.0645) | 41,28 (1.625) | | | | | | | |
| **16** | 25,400 (1.0000) | 25,438 (1.0015) | 30,221 (1.1898) | 44,45 (1.750) | | | | | | | |
| **18** | 28,575 (1.1250) | 28,613 (1.1265) | 33,396 (1.3148) | 47,63 (1.875) | | | | | | | |
| **20** | 31,750 (1.2500) | 31,788 (1.2515) | 36,571 (1.4398) | 50,80 (2.000) | | | | | | | |
| **22** | 34,925 (1.3750) | 34,963 (1.3765) | 39,746 (1.5648) | 53,98 (2.125) | 1,00 (0.039) | 1,00 (0.039) | | | | | |
| **24** | 38,100 (1.5000) | 38,138 (1.5015) | 44,508 (1.7523) | 57,15 (2.250) | | | 2,39 (0.094) | | | | |
| **26** | 41,275 (1.6250) | 41,313 (1.6265) | 47,683 (1.8773) | 60,33 (2.375) | | | | | | | |
| **28** | 44,450 (1.7500) | 44,488 (1.7515) | 50,858 (2.0023) | 63,50 (2.500) | | | | | | | |
| **32** | 50,800 (2.0000) | 50,838 (2.0015) | 57,208 (2.2523) | 69,85 (2.750) | | | | | | | |

[a] Diameter code corresponds to nominal diameter $d$ in 1/16 inch.

[b] Min. length code 010 or higher.

**Table 2 — Mass — Type D**

| Dia-meter code [a] | Length code [b] | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 006 | 007 | 008 | 009 | 010 | 011 | 012 | 014 | 016 | 018 | 020 | 022 | 024 | 028 | 032 |
| | $l_1$ $^{-0,10}_{-0,40}$ ($^{-0.004}_{-0.016}$) | | | | | | | | | | | | | | |
| | 4,76 (0.188) | 5,56 (0.219) | 6,35 (0.250) | 7,14 (0.281) | 7,94 (0.313) | 8,73 (0.344) | 9,53 (0.375) | 11,11 (0.438) | 12,70 (0.500) | 14,29 (0.563) | 15,88 (0.625) | 17,46 (0.688) | 19,05 (0.750) | 22,23 (0.875) | 25,40 (1.000) |
| | Mass in kg/1 000 pieces ≈ | | | | | | | | | | | | | | |
| **04** | 4,13 | 4,38 | 4,62 | 4,87 | 5,11 | 5,36 | 5,60 | — | — | — | — | — | — | — | — |
| **05** | 4,72 | 5,02 | 5,31 | 5,61 | 5,90 | 6,19 | 6,49 | 7,08 | 7,67 | — | — | — | — | — | — |
| **06** | 5,31 | 5,66 | 6,00 | 6,34 | 6,69 | 7,03 | 7,37 | 8,06 | 8,75 | 9,43 | — | — | — | — | — |
| **07** | 5,90 | 6,30 | 6,69 | 7,08 | 7,47 | 7,87 | 8,26 | 9,04 | 9,83 | 10,62 | 11,40 | — | — | — | — |
| **08** | 6,50 | 6,94 | 7,38 | 7,82 | 8,27 | 8,71 | 9,15 | 10,03 | 10,92 | 11,80 | 12,69 | 13,57 | 14,46 | — | — |
| **09** | 7,95 | 8,45 | 8,94 | 9,43 | 9,92 | 10,41 | 10,91 | 11,89 | 12,88 | 13,86 | 14,84 | 15,83 | 16,81 | — | — |
| **10** | 10,78 | 11,63 | 12,48 | 13,32 | 14,17 | 15,02 | 15,87 | 17,57 | 19,26 | 20,96 | 22,66 | 24,35 | 26,05 | 29,44 | — |
| **11** | — | — | 14,47 | 15,39 | 16,32 | 17,24 | 18,16 | 20,00 | 21,85 | 23,69 | 25,54 | 27,38 | 29,22 | 32,91 | 36,60 |
| **12** | — | — | 16,62 | 17,62 | 18,61 | 19,61 | 20,60 | 22,60 | 24,59 | 26,58 | 28,57 | 30,57 | 32,56 | 36,54 | 40,53 |
| **14** | — | — | 18,69 | 19,84 | 20,98 | 22,13 | 23,27 | 25,56 | 27,85 | 30,14 | 32,43 | 34,72 | 37,01 | 41,59 | 46,17 |
| **16** | — | — | 20,77 | 22,07 | 23,36 | 24,65 | 25,95 | 28,54 | 31,13 | 33,72 | 36,30 | 38,89 | 41,48 | 46,66 | 51,84 |
| **18** | — | — | — | — | 31,28 | 32,73 | 34,17 | 37,05 | 39,94 | 42,82 | 45,71 | 48,59 | 51,47 | 57,24 | 63,01 |
| **20** | — | — | — | — | — | — | 37,26 | 40,44 | 43,62 | 46,80 | 49,98 | 53,16 | 56,34 | 62,70 | 69,06 |
| **22** | — | — | — | — | — | — | 40,36 | 43,83 | 47,31 | 50,78 | 54,26 | 57,73 | 61,21 | 68,16 | 75,11 |
| **24** | — | — | — | — | — | — | 49,52 | 54,64 | 59,76 | 64,88 | 70,00 | 75,12 | 80,24 | 90,48 | 100,72 |
| **26** | — | — | — | — | — | — | — | — | 64,08 | 69,59 | 75,11 | 80,62 | 86,13 | 97,16 | 108,19 |
| **28** | — | — | — | — | — | — | — | — | 68,40 | 74,31 | 80,22 | 86,12 | 92,03 | 103,84 | 115,66 |
| **32** | — | — | — | — | — | — | — | — | 77,04 | 83,74 | 90,43 | 97,13 | 103,82 | 117,21 | 130,59 |

*continued*

**Table 2** *(concluded)*

| Diameter code [a] | Length code [b] | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 036 | 040 | 044 | 048 | 052 | 056 | 060 | 064 | 068 | 072 | 076 | 080 | 088 |
| | $l_1$ $^{-0,10}_{-0,40}$ ($^{-0.004}_{-0.016}$) | | | | | | | | | | | | |
| | 28,58 (1.125) | 31,75 (1.250) | 34,93 (1.375) | 38,10 (1.500) | 41,28 (1.625) | 44,45 (1.750) | 47,63 (1.875) | 50,80 (2.000) | 53,98 (2.125) | 57,15 (2.250) | 60,33 (2.375) | 63,50 (2.500) | 69,85 (2.750) |
| | Mass in kg/1 000 pieces ≈ | | | | | | | | | | | | |
| 04 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 05 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 06 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 07 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 08 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 09 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 10 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 11 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 12 | — | — | — | — | — | — | — | — | — | — | — | — | — |
| 14 | 50,75 | 55,32 | — | — | — | — | — | — | — | — | — | — | — |
| 16 | 57,02 | 62,19 | 67,37 | — | — | — | — | — | — | — | — | — | — |
| 18 | 68,78 | 74,55 | 80,32 | 86,09 | 91,85 | — | — | — | — | — | — | — | — |
| 20 | 75,42 | 81,78 | 88,14 | 94,50 | 100,85 | 107,21 | — | — | — | — | — | — | — |
| 22 | 82,06 | 89,01 | 95,96 | 102,91 | 109,86 | 116,81 | 123,76 | 130,71 | — | — | — | — | — |
| 24 | 110,96 | 121,20 | 131,44 | 141,68 | 151,92 | 162,16 | 172,40 | 182,64 | 192,88 | — | — | — | — |
| 26 | 119,22 | 130,24 | 141,27 | 152,30 | 163,32 | 174,35 | 185,38 | 196,41 | 207,43 | 218,46 | — | — | — |
| 28 | 127,47 | 139,28 | 151,10 | 162,91 | 174,73 | 186,54 | 198,35 | 210,17 | 221,98 | 233,80 | 245,61 | 257,42 | — |
| 32 | 143,98 | 157,37 | 170,76 | 184,14 | 197,53 | 210,92 | 224,31 | 237,69 | 251,08 | 264,47 | 277,86 | 291,24 | 318,02 |

[a] Diameter code corresponds to nominal diameter $d$ in 1/16 inch.

[b] Length code corresponds to length $l_1$ in 1/32 inch.

**Table 3 — Loads — Type D**

| Diameter code [a] | Length code | Permissible radial load | Radial load | Axial static load |
|---|---|---|---|---|
| | | kN | | |
| | | Static $C_s$ [b] | Dynamic $C_{25}$ [c] | $C_a$ [d] |
| 04 | 006 | 4,02 | 1,92 | 77,34 |
| | 007 | 6,76 | 3,24 | |
| | 008 | 9,50 | 4,55 | |
| | 009 | 12,25 | 5,86 | |
| | 010 | 14,99 | 7,18 | |
| | 011 | 17,73 | 8,49 | |
| | 012 | 20,48 | 9,80 | |
| 05 | 006 | 5,02 | 2,40 | 86,63 |
| | 007 | 8,44 | 4,04 | |
| | 008 | 11,86 | 5,68 | |
| | 009 | 15,29 | 7,32 | |
| | 010 | 18,71 | 8,96 | |
| | 011 | 22,14 | 10,60 | |
| | 012 | 25,56 | 12,24 | |
| | 014 | 32,41 | 15,52 | |
| | 016 | 39,26 | 18,80 | |
| 06 | 006 | 6,01 | 2,88 | 95,92 |
| | 007 | 10,12 | 4,84 | |
| | 008 | 14,23 | 6,81 | |
| | 009 | 18,33 | 8,78 | |
| | 010 | 22,44 | 10,74 | |
| | 011 | 26,55 | 12,71 | |
| | 012 | 30,65 | 14,67 | |
| | 014 | 38,87 | 18,61 | |
| | 016 | 47,08 | 22,54 | |
| | 018 | 55,29 | 26,47 | |
| 07 | 006 | 7,01 | 3,36 | 105,20 |
| | 007 | 11,80 | 5,65 | |
| | 008 | 16,59 | 7,94 | |
| | 009 | 21,38 | 10,23 | |
| | 010 | 26,16 | 12,53 | |
| | 011 | 30,95 | 14,82 | |
| | 012 | 35,74 | 17,11 | |
| | 014 | 45,32 | 21,70 | |
| | 016 | 54,89 | 26,28 | |
| | 018 | 64,47 | 30,86 | |
| | 020 | 74,05 | 35,45 | |
| 08 | 006 | 8,01 | 3,83 | 114,49 |
| | 007 | 13,48 | 6,45 | |
| | 008 | 18,95 | 9,07 | |
| | 009 | 24,42 | 11,69 | |
| | 010 | 29,89 | 14,31 | |
| | 011 | 35,36 | 16,93 | |
| | 012 | 40,83 | 19,55 | |
| | 014 | 51,77 | 24,78 | |
| | 016 | 62,71 | 30,02 | |
| | 018 | 73,65 | 35,26 | |
| | 020 | 84,59 | 40,50 | |
| | 022 | 95,53 | 45,73 | |
| | 024 | 106,47 | 50,97 | |
| 09 | 006 | 9,01 | 4,31 | 151,96 |
| | 007 | 15,16 | 7,26 | |
| | 008 | 21,31 | 10,20 | |
| | 009 | 27,46 | 13,15 | |
| | 010 | 33,61 | 16,09 | |
| | 011 | 39,77 | 19,04 | |
| | 012 | 45,92 | 21,98 | |
| | 014 | 58,22 | 27,87 | |
| | 016 | 70,52 | 33,76 | |
| | 018 | 82,83 | 39,65 | |
| | 020 | 95,13 | 45,54 | |
| | 022 | 107,43 | 51,43 | |
| | 024 | 119,74 | 57,32 | |
| 10 | 006 | 10,01 | 4,79 | 194,53 |
| | 007 | 16,84 | 8,06 | |
| | 008 | 23,67 | 11,33 | |
| | 009 | 30,51 | 14,60 | |
| | 010 | 37,34 | 17,88 | |
| | 011 | 44,17 | 21,15 | |
| | 012 | 51,01 | 24,42 | |
| | 014 | 64,67 | 30,96 | |
| | 016 | 78,34 | 37,50 | |
| | 018 | 92,01 | 44,05 | |
| | 020 | 105,67 | 50,59 | |
| | 022 | 119,34 | 57,13 | |
| | 024 | 133,01 | 63,68 | |
| | 028 | 160,34 | 76,76 | |
| 11 | 008 | 26,03 | 12,46 | 242,22 |
| | 009 | 33,55 | 16,06 | |
| | 010 | 41,06 | 19,66 | |
| | 011 | 48,58 | 23,26 | |
| | 012 | 56,09 | 26,86 | |
| | 014 | 71,13 | 34,05 | |
| | 016 | 86,16 | 41,25 | |
| | 018 | 101,19 | 48,44 | |
| | 020 | 116,22 | 55,64 | |
| | 022 | 131,25 | 62,83 | |
| | 024 | 146,28 | 70,03 | |
| | 028 | 176,34 | 84,42 | |
| | 032 | 206,40 | 98,81 | |
| 12 | 008 | 28,40 | 13,59 | 295,00 |
| | 009 | 36,59 | 17,52 | |
| | 010 | 44,79 | 21,44 | |
| | 011 | 52,99 | 25,37 | |
| | 012 | 61,18 | 29,29 | |
| | 014 | 77,58 | 37,14 | |
| | 016 | 93,97 | 44,99 | |
| | 018 | 110,36 | 52,84 | |
| | 020 | 126,76 | 60,68 | |
| | 022 | 143,15 | 68,53 | |

*continued*