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**Aeronavtika - Puše s prirobnico iz aluminijeve zlitine s samomazalno oblogo, serija za večje obremenitve - 2. del: Mere in nosilnosti - Colski tip**

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

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

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Série aérospatiale - Bagues à épaulement en alliage d'aluminium à garniture autolubrifiante, charge élevée - Partie 2 : Dimensions et charges - Série en inches

**Ta slovenski standard je istoveten z: EN 4535-2:2009**

**ICS:**

49.025.20	Aluminij	Aluminium
49.035	Sestavni deli za letalsko in vesoljsko gradnjo	Components for aerospace construction

**SIST EN 4535-2:2009****en**

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 4535-2**

June 2009

ICS 49.035

English Version

**Aerospace series - Bushes, flanged in aluminium alloy with self-lubricating liner, elevated load - Part 2: Dimensions and loads - Inch series**

Série aérospatiale - Bagues à épaulement en alliage d'aluminium à garniture autolubrifiante, charge élevée - Partie 2 : Dimensions et charges - Série en inches

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

This European Standard was approved by CEN on 23 April 2009.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION  
COMITÉ EUROPÉEN DE NORMALISATION  
EUROPÄISCHES KOMITEE FÜR NORMUNG

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## Foreword

This document (EN 4535-2:2009) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

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.

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.

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

This standard was reviewed by the Domain Technical Coordinator of ASD-STAN's Mechanical Domain.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

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**EN 4535-2:2009 (E)****1 Scope**

This standard specifies the characteristics of bushes flanged in aluminium alloy 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 121 °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 2101, *Aerospace series — Chromic acid anodizing of aluminium and wrought aluminium alloys*

EN 2284, *Aerospace series — Sulphuric acid anodizing of aluminium and wrought aluminium alloys*

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

EN 2318, *Aerospace series — Aluminium alloy AL-P2024- — T3511 — Extruded bars and sections — 1,2 mm ≤ a or D ≤ 150 mm*

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

TR 4475, *Aerospace series — Bearings and mechanical transmissions for airframe applications — Vocabulary*<sup>1)</sup>

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

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**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.

**4.3 Materials**

Bush: Aluminium alloy according to EN 2318.

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

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

#### 4.4 Surface treatment

Code R: Chromic acid anodizing according to EN 2101, type A or Sulphuric acid anodizing according to EN 2284, type A.

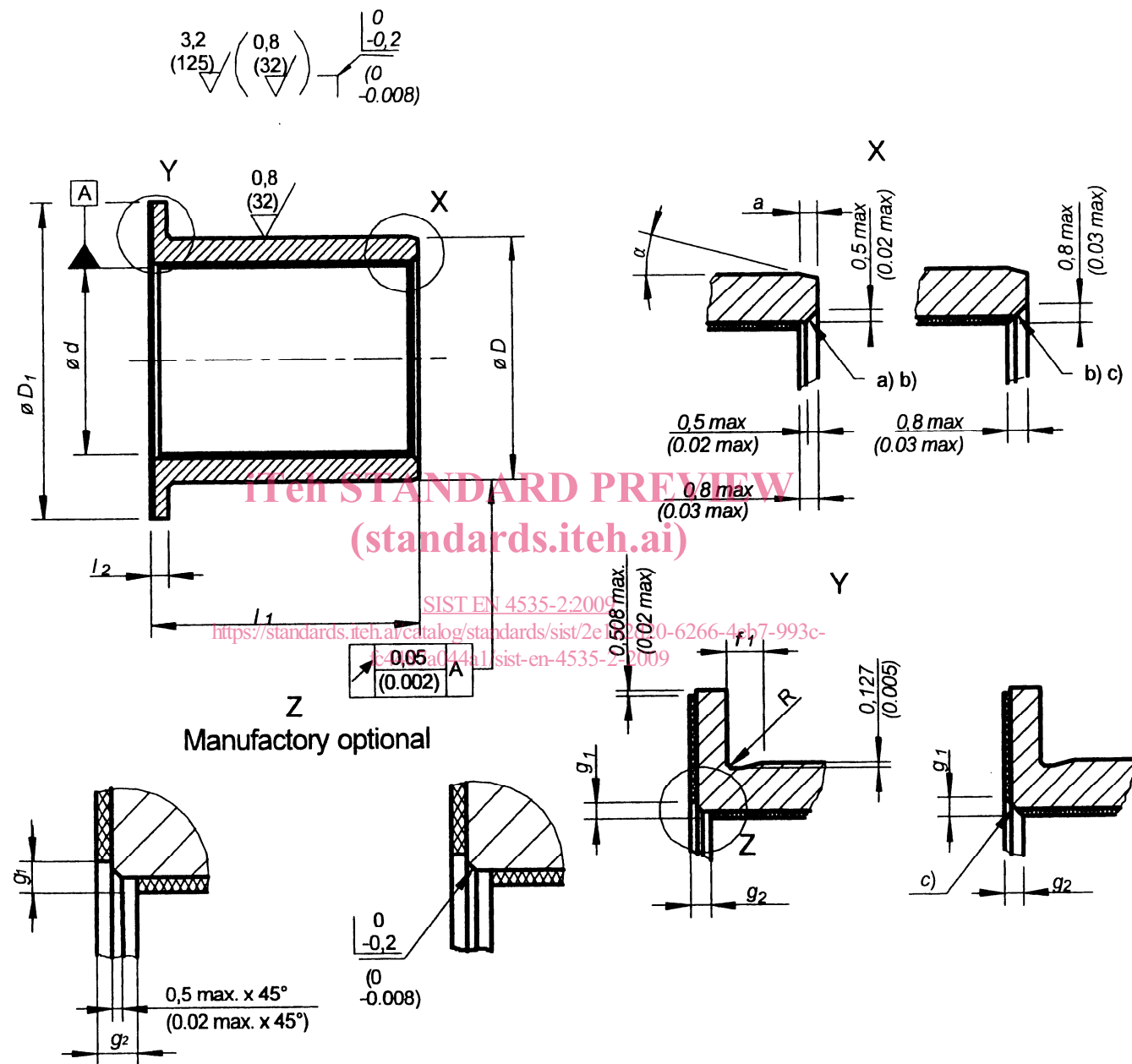


Figure 1 — Configuration — Type D

Table 1 — Dimensions and tolerances — Type D

Diameter code <sup>a</sup>	$d$		$D$	$D_1$	$g_1$	$g_2$	$l_2$	$f_1$	$a$	$\alpha$	$R$
	Nominal diameter	$\begin{matrix} 0 \\ -0,025 \\ (-0,0010) \end{matrix}$	$\begin{matrix} \pm 0,013 \\ (\pm 0,0005) \end{matrix}$	$\begin{matrix} 0 \\ -0,51 \\ (-0,020) \end{matrix}$	max.	max.	$\begin{matrix} 0 \\ -0,13 \\ (-0,005) \end{matrix}$	max.		$\pm 2^\circ$	$\begin{matrix} +0,25 \\ 0 \\ (+0,010) \end{matrix}$
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)	2,39 (0.094)				
24	38,100 (1.5000)	38,138 (1.5015)	44,508 (1.7523)	57,15 (2.250)							
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)							

<sup>a</sup> Diameter code corresponds to nominal diameter  $d$  in 1/16 inch.



Table 2 — Mass — Type D

Dia- meter code <sup>a</sup>	Length code <sup>b</sup>														
	006	007	008	009	010	011	012	014	016	018	020	022	024	028	032
	$l_1$ -0,10 ( -0,004 ) -0,40 ( -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	1,48	1,57	1,66	1,75	1,84	1,92	2,01	2,19	2,36	—	—	—	—	—	—
05	1,70	1,80	1,91	2,01	2,12	2,22	2,33	2,54	2,75	2,96	3,17	—	—	—	—
06	1,91	2,03	2,15	2,28	2,40	2,52	2,65	2,89	3,14	3,39	3,63	3,88	4,13	—	—
07	2,12	2,26	2,40	2,54	2,68	2,82	2,96	3,25	3,53	3,81	4,09	4,37	4,66	5,22	—
08	2,33	2,49	2,65	2,81	2,97	3,13	3,28	3,60	3,92	4,24	4,55	4,87	5,19	5,83	—
09	2,86	3,03	3,21	3,39	3,56	3,74	3,92	4,27	4,62	4,98	5,33	5,68	6,04	6,74	7,45
10	3,87	4,17	4,48	4,78	5,09	5,39	5,70	6,31	6,91	7,52	8,13	8,74	9,35	10,57	11,79
11	—	—	5,20	5,53	5,86	6,19	6,52	7,18	7,84	8,50	9,17	9,83	10,49	11,81	13,14
12	—	—	5,97	6,32	6,68	7,04	7,40	8,11	8,83	9,54	10,26	10,97	11,69	13,12	14,55
14	—	—	6,71	7,12	7,53	7,94	8,35	9,18	10,00	10,82	11,64	12,46	13,29	14,93	16,57
16	—	—	7,46	7,92	8,39	8,85	9,32	10,24	11,17	12,10	13,03	13,96	14,89	16,75	18,61
18	—	—	—	—	11,23	11,75	12,27	13,30	14,34	15,37	16,41	17,44	18,48	20,55	22,62
20	—	—	—	—	—	—	13,38	14,52	15,66	16,80	17,94	19,08	20,22	22,51	24,79
22	—	—	—	—	—	—	14,49	15,73	16,98	18,23	19,48	20,72	21,97	24,47	26,96
24	—	—	—	—	—	—	17,78	19,61	21,45	23,29	25,13	26,97	28,80	32,48	36,16
26	—	—	—	—	—	—	—	—	23,00	24,98	26,96	28,94	30,92	34,88	38,84
28	—	—	—	—	—	—	—	—	24,55	26,67	28,80	30,92	33,04	37,28	41,52
32	—	—	—	—	—	—	—	—	27,66	30,06	32,46	34,87	37,27	42,07	46,88

continued

Table 2 (concluded)

Dia- meter code <sup>a</sup>	Length code <sup>b</sup>													
	036	040	044	048	052	056	060	064	068	072	076	080	088	096
	$l_1$ -0,10    -0,004 -0,40    (-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)	76,20 (3.000)
Mass in kg/1 000 pieces $\approx$														
04	—	—	—	—	—	—	—	—	—	—	—	—	—	—
05	—	—	—	—	—	—	—	—	—	—	—	—	—	—
06	—	—	—	—	—	—	—	—	—	—	—	—	—	—
07	—	—	—	—	—	—	—	—	—	—	—	—	—	—
08	—	—	—	—	—	—	—	—	—	—	—	—	—	—
09	8,16	—	—	—	—	—	—	—	—	—	—	—	—	—
10	13,01	14,22	—	—	—	—	—	—	—	—	—	—	—	—
11	14,46	15,79	17,11	—	—	—	—	—	—	—	—	—	—	—
12	15,98	17,41	18,84	20,27	—	—	—	—	—	—	—	—	—	—
14	18,22	19,86	21,50	23,15	24,79	—	—	—	—	—	—	—	—	—
16	20,47	22,33	24,18	26,04	27,90	29,76	31,62	—	—	—	—	—	—	—
18	24,69	26,76	28,83	30,90	32,97	35,04	37,11	39,19	—	—	—	—	—	—
20	27,07	29,36	31,64	33,92	36,20	38,49	40,77	43,05	45,34	—	—	—	—	—
22	29,46	31,95	34,45	36,94	39,44	41,93	44,43	46,92	49,41	—	—	—	—	—
24	39,83	43,51	47,18	50,86	54,54	58,21	61,89	65,56	69,24	72,92	76,59	80,27	87,62	—
26	42,80	46,75	50,71	54,67	58,63	62,59	66,55	70,50	74,46	78,42	82,38	86,34	94,26	102,17
28	45,76	50,00	54,24	58,48	62,72	66,96	71,20	75,45	79,69	83,93	88,17	92,41	100,89	109,37
32	51,69	56,49	61,30	66,10	70,91	75,71	80,52	85,33	90,13	94,94	99,74	104,55	114,16	123,77

<sup>a</sup> Diameter code corresponds to nominal diameter  $d$  in 1/16 inch.

<sup>b</sup> Length code corresponds to length  $l_1$  in 1/32 inch.

Table 3 — Loads — Type D

Diameter code <sup>a</sup>	Length code	Permissible radial load		Radial load kN	Axial static load C <sub>a</sub> <sup>d</sup>			
		Static C <sub>s</sub> <sup>b</sup>	Dynamic C <sub>25</sub> <sup>c</sup>					
04	006	2,15	1,92	37,05				
	007	3,62	3,24					
	008	5,09	4,55					
	009	6,56	5,86					
	010	8,04	7,18					
	011	9,51	8,49					
	012	10,98	9,80					
	014	13,92	12,43					
05	006	2,69	2,40	41,50				
	007	4,52	4,04					
	008	6,36	5,68					
	009	8,20	7,32					
	010	10,03	8,96					
	011	11,87	10,60					
	012	13,70	12,24					
	014	17,38	15,52					
06	006	3,22	2,88	45,95				
	007	5,42	4,84					
	008	7,63	6,81					
	009	9,83	8,78					
	010	12,03	10,74					
	011	14,23	12,71					
	012	16,43	14,67					
	014	20,83	18,61					
	016	25,24	22,54					
	018	29,64	26,47					
	020	34,04	30,40					
	022	38,44	34,33					
07	006	3,76	3,36	50,40				
	007	6,33	5,65					
	008	8,89	7,94					
	009	11,46	10,23					
	010	14,03	12,53					
	011	16,59	14,82					
	012	19,16	17,11					
	014	24,29	21,70					
	016	29,43	26,28					
	018	34,56	30,86					
	020	39,69	35,45					
	022	44,83	40,03					
08	006	4,29	3,83	54,85				
	007	7,23	6,45					
	008	10,16	9,07					
08	009	13,09	11,69	54,85				
	010	16,02	14,31					
	011	18,95	16,93					
	012	21,89	19,55					
	014	27,75	24,78					
	016	33,62	30,02					
	018	39,48	35,26					
	020	45,34	40,50					
	022	51,21	45,73					
	024	57,07	50,97					
	028	68,80	61,45					
	09	006	4,83			4,31	72,80	
		007	8,13			7,26		
		008	11,42			10,20		
009		14,72	13,15					
010		18,02	16,09					
011		21,32	19,04					
012		24,61	21,98					
014		31,21	27,87					
016		37,80	33,76					
018		44,40	39,65					
020		50,99	45,54					
022		57,59	51,43					
024		64,19	57,32					
028		77,38	69,10					
10	006	5,36	4,79	93,20				
	007	9,03	8,06					
	008	12,69	11,33					
	009	16,35	14,60					
	010	20,02	17,88					
	011	23,68	21,15					
	012	27,34	24,42					
	014	34,67	30,96					
	016	41,99	37,50					
	018	49,32	44,05					
	020	56,65	50,59					
	022	63,97	57,13					
	024	71,30	63,68					
	028	85,95	76,76					
11	006	5,36	4,79	93,20				
	007	9,03	8,06					
	008	12,69	11,33					
	009	16,35	14,60					
	010	20,02	17,88					
	011	23,68	21,15					
	012	27,34	24,42					
	014	34,67	30,96					
	016	41,99	37,50					
	018	49,32	44,05					
	020	56,65	50,59					
	022	63,97	57,13					
	024	71,30	63,68					
	028	85,95	76,76					
11	008	13,96	12,46	116,04				
	009	17,98	16,06					
	010	22,01	19,66					
	011	26,04	23,26					
	012	30,07	26,86					
11	014	38,13	34,05	116,04				

continued