



**SLOVENSKI STANDARD**  
**SIST EN 2285:2001**  
**01-januar-2001**

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**Aerospace series - Bushes, plain aluminium alloy with self-lubricating liner - Dimensions and loads**

Aerospace series - Bushes, plain aluminium alloy with self-lubricating liner - Dimensions and loads

Luft- und Raumfahrt - Buchsen ohne Flansch aus Aluminium-Legierung mit selbstschmierender Beschichtung - Maße und Belastungen

Série aérospatiale - Bagues cylindriques en alliage d'aluminium a garniture autolubrifiante - Dimensions et charges

<https://standards.iteh.ai/catalog/standards/sist/85e61dc9-dfa9-4dde-9f0a-31d53b7225c6/sist-en-2285-2001>

**Ta slovenski standard je istoveten z: EN 2285:1989**

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**ICS:**

49.025.20	Aluminij	Aluminium
49.030.99	Drugi vezni elementi	Other fasteners

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 2285**

December 1989

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Key words : Aeronautical industry, bush, aluminium alloy, liner, self-lubricating piece, dimension.

English version

**Aerospace series  
Bushes, plain  
aluminium alloy  
with self-lubricating liner  
Dimensions and loads**

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SIST EN 2285:2001

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Central Secretariat 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 CEN Central Secretariat has the same status as the official versions.

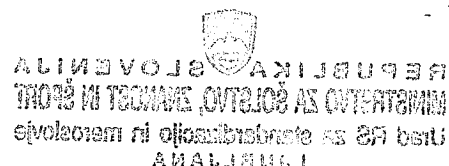
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**CEN**

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

Central Secretariat : Rue Bréderode 2, B-1000 Bruxelles

### Brief history



This European Standard has been prepared by the European Association of Aerospace Manufacturers (AECMA).

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

According to the Common CEN/CENELEC Rules, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxemburg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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## 1 Scope

This standard specifies the characteristics of plain bushes in aluminium alloy with self-lubricating liner and the design recommendation of shafts and housings.

## 2 Field of application

The bushes are intended for operation within the temperature range of -55 °C to +150 °C and assembly with an interference fit into fixed and moving aerospace parts.

## 3 References

- EN 2086, Aluminium alloy 2618A-T851 (Al-P11-T851) - Forged bars and slabs a  $\leq$  150 mm - Aerospace series 1)
- EN 2101, Aerospace series - Chromic acid anodizing of aluminium and wrought aluminium alloys 1)
- EN 2284, Aerospace series - Sulphuric acid anodizing of aluminium and wrought aluminium alloys 1)
- EN 2311, Aerospace series - Bushes with self lubricating liners - Technical specification

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## 4 Required characteristics

### 4.1 Configuration - Dimensions - Tolerances - Masses

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Configuration : see figure 1

Dimensions, tolerances and masses : see figure 1 and table 1.

Dimensions and tolerances apply after surface treatment.

### 4.2 Surface roughness

See figure 1.

### 4.3 Materials

Bush : Aluminium alloy EN 2086.

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

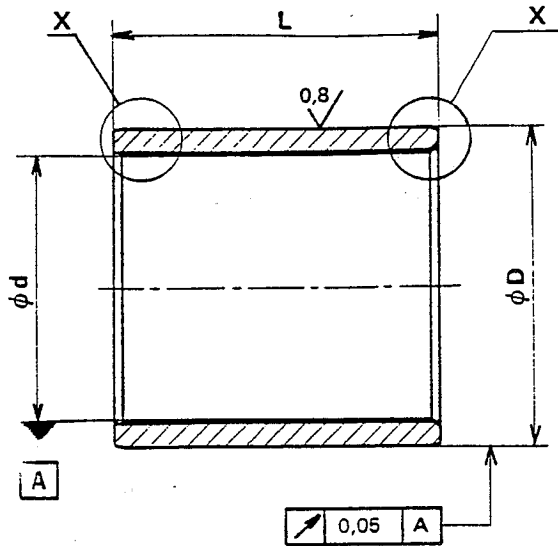
### 4.4 Surface treatment

Chromic acid anodizing EN 2101A or  
Sulphuric acid anodizing EN 2284A.

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1) Published as AECMA standard.

3,2 / (0,8 /)



X (2,5:1)

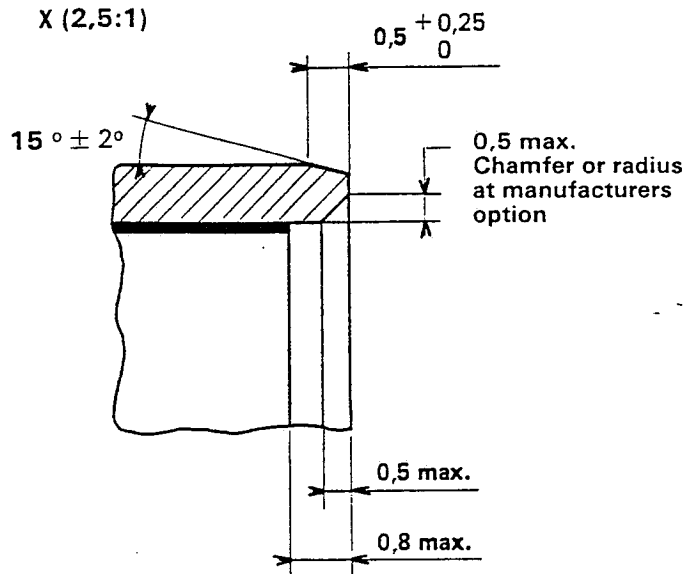


Figure 1

Table 1

Dimensions in millimetres

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d		D		L = 0,1 L = 0,4																		
Nom	Tol. $\mu\text{m}$	Nom	Tol. $\mu\text{m}$	6	8	10	12	15	16	18	20	22	25	28	30	32	35	40	45	50		
				Mass in kg/1000 pieces $\approx$																		
6	+22 +4	10	+24 +15	0,9*																		
8	+27	12	+29 +18	1,1	1,4*																	
10	+5	14		1,3	1,7	2,1*																
12	+33 +6	16	+35 +22	1,5	2,0*	2,5	3,0*															
15		19		2,4	3,0*	3,6	4,6*															
16		20		2,6	3,2	3,8	4,8	5,1														
18		22		3,6	4,3	5,5		6,6														
20	+40 +7	25	+42 +26		5,0	6,0*	7,5				10,0*											
22		26			5,1	6,4*				8,5	9,4*											
25		30			7,4	9,2*				12,5	13,5	15,3*										
28		34				12,4				16,6	18,2	20,7	23,2									
30	+48 +9	36	+51 +32			13,3			17,7*	19,5	22,1		26,5*									
32		38			14,0				18,7	20,5	23,5		28,0	29,9								
35		42								24,0*	26,5	30,1		36,0		42,2*						
40		48								31,0		39,0		46,9*		54,9	62,8*					
45		52									38,0		45,6		53,1*	60,7	68,2*					
50		58									48,7		58,2		67,7	77,3*	86,8	96,4*				

*Only bushes whose masses lie within the bold lines are standard.  
The recommended sizes are indicated by \*.*

Table 2

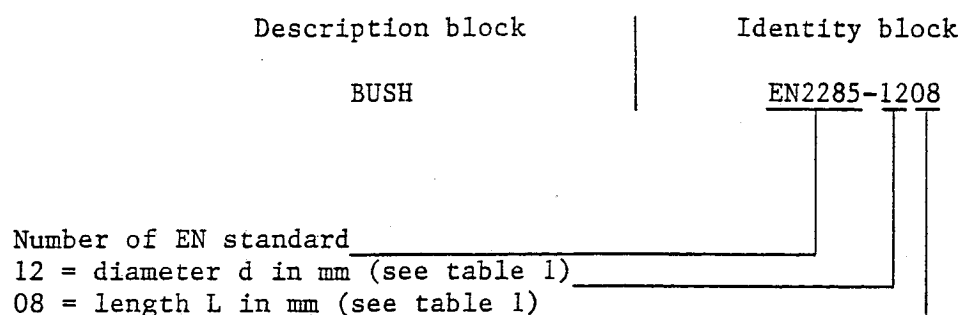
d mm	L mm	Permissible radial load		d mm	L mm	Permissible radial load		d mm	L mm	Permissible radial load	
		Static Cs 1) kN	Dynamic C25 2) kN			Static Cs 1) kN	Dynamic C25 2) kN			Static Cs 1) kN	Dynamic C25 2) kN
6	6	4,9	4,1	20	15	53,6	44,7	32	30	184,6	153,8
	8	6,6	5,5		20	74,2	61,8		32	32	197,8
8	6	9,9	8,3	22	12	45,3	37,7	35	20	129,8	108,2
	8	8,2	6,8		15	58,9	49,1		22	144,2	120,2
10	6	12,4	10,3	25	20	81,6	68,0	40	25	165,8	138,2
	8	16,5	13,8		22	90,6	75,5		30	201,9	168,3
12	6	9,9	8,3	28	12	51,5	42,9	50	35	237,9	198,3
	8	14,8	12,3		15	67,0	55,8		20	148,3	123,6
15	10	19,8	16,5	30	20	92,7	77,3	60	25	189,5	157,9
	12	24,7	20,6		22	103,0	85,8		30	230,7	192,3
16	8	18,5	15,4	32	25	118,5	98,8	70	35	271,9	226,6
	10	24,7	20,6		15	75,0	62,5		40	313,1	260,9
18	12	30,9	25,8	35	20	103,8	86,5	80	25	213,2	177,7
	15	40,2	33,5		22	115,4	96,2		30	259,6	216,3
20	8	19,6	16,5	40	25	110,6	91,0	100	35	305,9	254,9
	10	26,4	22,0		28	150,0	125,0		40	352,3	293,6
22	12	33,0	27,5	45	15	80,3	66,9	120	45	398,5	332,1
	15	42,5	35,7		20	111,2	92,7		25	236,9	197,4
24	16	45,1	38,4	50	22	123,6	103,0	140	30	288,4	240,3
	18	29,7	24,8		25	142,1	118,4		35	339,9	283,3
26	12	37,1	30,9	60	30	173,0	144,2	160	40	391,4	326,2
	15	48,2	40,2		15	85,7	71,4		45	442,9	369,1
28	18	59,3	49,4	70	20	118,7	98,9	180	50	494,4	412,0
	20	33,0	27,5		22	131,8	109,8				
30	10	41,2	34,3	80	25	151,6	126,3	200			
	12										

1)  $C_s = 0,206d (L - 2)$  kN.  
2) Definitions for  $C_{25}$  and ultimate static loads, see EN 2311.

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## 5 Designation

Each bush shall only be designated as in the following example :



## Notes

- 1 The number of characters is constant, zero (0) is inserted at the left of the figure when the diameter d or length L is less than 10.
- 2 If necessary the originators code I9005 may be introduced between the description block and the identity block.

## 6 Marking

In addition to the manufacturer's own marking each bush and its package shall be marked with the identity block specified in clause 5 of this standard.

Marking position and method are at manufacturer's option, and shall not have any detrimental effect on the bush.

## 7 Technical specification

Bushes supplied to this standard shall conform with the requirements of technical specification EN 2311.

The loads given in table 2 of this standard are only applicable under the conditions given in EN 2311.

## 8 Design recommendation

Bushes defined by this standard are intended to be installed by interference fit methods (see figure 2). Therefore, the loads given in table 2 can only be insured if the following mounting is applied.

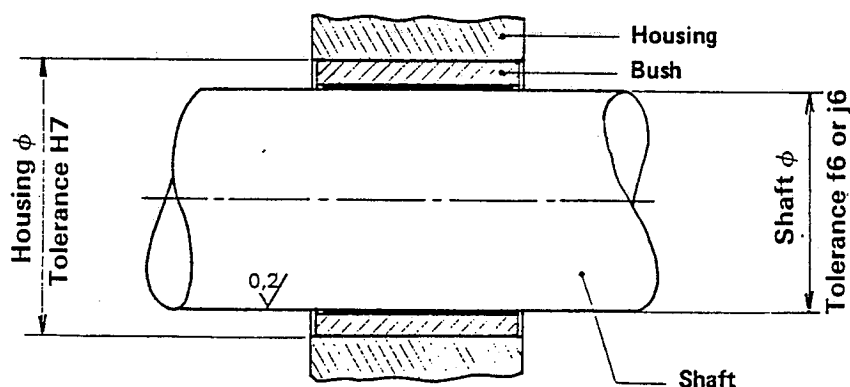


Figure 2

Hardness of the shaft : 45 HRC Surface roughness of the shaft : See figure 2

The reduction in bore diameter d (see figure 1) due to interference fit of the bush in the housing has been taken into account when selecting tolerances for the shaft : f6 (clearance fit) or j6 (transition fit).