
()
INTERSTATE COUNCIL FOR STANDARDIZATION, METROLOGY AND CERTIFICATION
(ISC)

**18855—
2013
(ISO 281:2007)**

(ISO 281:2007, MOD)

18855—2013

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» 1.0-92 «
1.2-2009 «
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1 « »)
2 » 307 «
3 (27 , 2013 . N9 59-)

3166) 004-97 »	(3160) 004-97	
	AM BY KG MD RU UZ	

4
281:2007 Rolling bearings — Dynamic load ratings and rating life (ISO
5.1.2.1) 5.2.2.1

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» 1 4/SC 8 «
(ISO).
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18855—2013

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(MOD)

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2013 . 1382-
18655-2013 (ISO 281:2007)
1 2015 .

6 18855-94

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4	3
5	-	4
5.1	4
5.2	7
5.3	10
6	-	10
6.1	10
6.2	12
6.3	13
7	-	14
7.1	14
7.2	15
7.2.2	16
7.3	16
8	-	17
8.1	17
8.2	19
8.3	20
9	20
9.1	20
9.2	21
9.3	()	21
	()	32
	()	41
	()	45
	()	48
	48

3.1,

8

8

99.95 %

ISO/TR 8646

a_t

ISO/TR 1281-1.

V

федеральное агентство
по техническому регулированию
и метрологии

федеральное агентство
по техническому регулированию
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по техническому регулированию
и метрологии

18855—2013
(ISO 281:2007)

Rolling bearings. Dynamic load rating and rating life

—2015—07—01

1

90 %

2

8

24955-81
18854-2013
ISO 15241:2012
ISO/TR 1281-1:2008

ISO 281

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ISO 15241

« »
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« »

3

24955.

3.1 (life):

3.2 (reliability):

3.3 (rating life):

3.4 (basic rating life): 90 %

3.5 (modified rating life):

90 %*

3.6 « * (basic dynamic radial load rating):

3.7 (basic dynamic axial load rating):

3.8 (dynamic equivalent radial load):

3.9 (dynamic equivalent axial load):

3.10 (fatigue load limit):

3.11 (roller diameter):

1 - () ()
2 -

3.12 (effective roller length):

3.21-3.28. 5593.

18855—2013

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Dp* -	,	,	,
D* -	,	,	,
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F _a -	,	()
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f _c -)	,	,
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5.1

5.1.1

» fc . 16854.

$$C^{\wedge}H^{\wedge}ticoef^{\wedge}O? \quad (1)$$

. £ 25.4

$$, -3.6476_m f_c (i \cos \theta)^{0.7} Z^{2.30} j^4 \quad (2)$$

. > 25.4
f_e

1 2.

1 — *;

		6»
-	(), -	1.3
		1.1

$$\frac{0.52}{0.53} \frac{D_w}{O_w}$$

2 —

£

cos	/			
	-	-	-	()
0.01	29.1	27.5	9.9	9.4
0.02	35.8	33.9	12.4	11.7
0.03	40.3	38.2	14.3	13.4
0.04	43.8	41.5	15.9	14.9
0.05	46.7	44.2	17.3	16.2
0.06	49.1	46.5	16.6	17.4
0.07	51.1	48.4	19.9	18.5
0.08	52.8	50.0	21.1	19.5
0.09	54.3	51.4	22.3	20.6
0.10	55.5	52.6	23.4	21.5
0.11	56.6	53.6	24.5	22.5
0.12	57.5	54.5	25.6	23.4
0.13	58.2	55.2	26.6	24.4
0.14	58.8	55.7	27.7	25.3
0.15	59.3	56.1	28.7	26.2

2

eosu ^{4j}	-	» « 1 fc			{)
		*	-	-	
0.16	59.6	56.5	29.7	27.1	
0.17	59.8	56.7	30.7	27.9	
0.18	59.9	56.8	31.7	28.6	
0.19	60.0	56.8	32.6	29.7	
0.20	59.9	56.8	33.5	30.5	
0.21	59.8	56.6	34.4	31.3	
0.22	59.6	56.5	352	32.1	
0.23	59.3	56.2	36.1	32.9	
0.24	59.0	55.9	36.8	33.7	
0.25	58.6	55.5	37.5	34.5	
0.26	582	55.1	382	35.2	
0.27	57.7	54.6	38.8	35.9	
0.28	57.1	54.1	39.4	36.6	
0.29	56.6	53.6	39.9	372	
0.30	56.0	53.0	40.3	37.6	
0.31	55.3	52.4	40.6	38.4	
0.32	54.6	51.8	40.9	38.9	
0.33	53.9	51.1	41.1	39.4	
0.34	532	50.4	412	39.8	
0.35	52.4	49.7	41.3	40.1	
0.36	51.7	48.9	41.3	40.4	
0.37	50.9	48.2	412	40.7	
0.38	50.0	47.4	41.0	40.8	
0.39	49.2	46.6	40.7	40.9	
0.40	48.4	45.8	40.4	40.9	

41

 f_c $, \cos a/O_{\alpha}$

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5.1.2

5.1.2.1

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X,

X.,

5.1.2.2

X

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X.

5.1.2.3

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0.7.

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5.1.2.4

5.1.2.3

5.2

5.2.1

$$P_r = X F_r + y F_a, \quad (3)$$

X

3.

5.1.1.

ISO/TR 1281-1 (

5.2).

3— X -

	»* **1								
		Pa ie f, izDf,		Pa > e f,		£ , f, >			
		X		X		X	X		
I 18 5 1 19 20	/ F -5* = 10*	F _a							
		izDf,							
		0.172	0.172		2.30			2.30	0.19
		0.345	0.345		1.99			1.99	0.22
		0.689	0.689		1.71			1.71	0.26
		1.030	1.030		1.55			1.55	0.28
		1,380	1.380	1	0.56	1.45	1	0.56	1.45
		2.070	2.070			1.31			1.31
		3.450	3.450			1.15			1.15
		5.170	5.170			1.04			1.04
		6.890	6.890			1.00			1.00
I 18 5 1 19 20	F» zDt -5* = 10*								
		0.173	0.172					2.78	3.74
		0.346	0.345					2.40	3.23
		0.692	0.689					2.07	2.70
		1.040	1.030					1.87	2.52
		1.380	1.3B0	1	0	X, Y .	1	1.75	0,78
		2.080	2.070			-		1.58	2.13
		3.460	3.450			-		1.39	1.87
		5.190	5.170					1.26	1.69
		6.920	6.890					1.21	1.63

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5.2.2

5.2.2.1

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X.

5.2.2.2

X

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X.

5.2.2.3

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X

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3)

 $F, F_a,$

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5.3

5.3.1

$$L_{10} = \left(\frac{C_r}{P_r} \right)^3$$

(4)

5.1 5.2.

5.1.2.

X 5.2.2.

5.3.2

6

6.1

6.1.1

$$C_s = b_m f_c Z^{2/3} D_w^{1.6}$$

<5>

$$O_w \approx 25.4 \quad = 90^\circ.$$

$$, \quad V_e(\cos a)^{0.7} tgaZ^{2.3} \quad (6)$$

* £ 25.4 * 90 .

$$= 3.647 \cdot 2^{2/4} \quad (7)$$

. > 25.4 - 90 .

$$_8 = 3.647 (\cos a)^{0.7} tgaZ^{2.3} \cdot i^4 \quad ()$$

0 < 25.4 * 90 .

Z , , 1,3.
 f_e 4
 0.54 ».

4— / -

	- 90'	$\frac{\text{£}}{\text{w}} \cos a^{d1}$			
			• 45'''	« » *	" 75*
0.01	36.7	0.01	42.1	39.2	37.3
0.02	452	0.02	51.7	48.1	45.9
0.03	51.1	0.03	582	54.2	51.7
0.04	55.7	0.04	63.3	58.9	56.1
0.05	59.5	0.05	67.3	62.6	59.7
0.05	62.9	0.06	70.7	65.8	62.7
0.07	65.8	0.07	73.5	68.4	65.2
0.08	68.5	0.08	75.9	70.7	67.3
0.09	71.0	0.09	78.0	72.6	69.2
0.10	73.3	0.10	79.7	74.2	70.7
0.11	75.4	0.11	81.1	75.5	-
0.12	77.4	0.12	82.3	76.6	-
0.13	79.3	0.13	83.3	77.5	-
0.14	81.1	0.14	84.1	78.3	-
0.15	82.7	0.15	84.7	78.8	-
0.16	84.4	0.16	85.1	79.2	-
0.17	85.9	0.17	85.4	79.5	-
0.18	87.4	0.18	85.5	79.6	-
0.19	88.8	0.19	85.5	79.6	-
0.20	90.2	0.20	85.4	79.5	-
0.21	91.5	0.21	85.2	-	-
0.22	92.8	0.22	84.9	-	-
0.23	94.1	0.23	84.5	-	-
0.24	95.3	0.24	64.0	-	-

	«90°	cos a ^{e*} CW	4		
			- 45**	» *	» 75*
0.25	96.4	0.25	83.4	-	-
0.26	97.6	-	82.8	-	-
0.27	98.7	0.27	82.0	-	-
0.26	99.8	0.28	81.3	-	-
0.29	100.8	0.29	80.4	-	-
0.30	101.9	0.30	79.6	-	-
0.31	102.9	-	-	-	-
0.32	103.9	-	-	-	-
0.33	104.8	-	-	-	-
0.34	105.8	-	-	-	-
0.35	106.7	-	-	-	-

“ f_t >/ >. .00S / , 8 , -

* 45*. 45*. 45* 60*. ,

45*. ,

90° f_c no ISO/TR 1281-1 [f_c (20)].

90*. — no ISO/TR 1281-1 [(25)].

6.1.2

$$C_a \cdot (Z_1 + Z_2 + \dots + Z_n) \left[\left(\frac{Z_1}{C_{a1}} \right)^{10/3} + \left(\frac{Z_2}{C_{a2}} \right)^{10/3} + \dots + \left(\frac{Z_n}{C_{an}} \right)^{10/3} \right]^{-3/10} \quad (9)$$

, &..... , Z_1, Z_2, \dots, Z_n

6.1.1.

6.2

90*

$$P_a X F_r Y F_a \quad (10)$$

X

5.

6.1.1.

ISO/R 1281-1 (

5.2).

5— X -

	1*)						e	
	*		So 6		^>0			
	X		X		X			
45^	0.66	1	1.18	0.59	0.66	1	1.25	
50°	0.73		1.37	0.57	0.73		1.49	
55	0.81		1.60	0.56	0.81		1.79	
60	0.92		1.90	0.55	0.92		2.17	
65	1.06		2.30	0.54	1.06		2.68	
70	1.28		2.90	0.53	1.28		3.43	
75	1.66		3.89	0.52	1.66		4.67	
80	2.43		5.86	0.52	2.43		7.09	
85	4.80		11.75	0.51	4.80		14.29	
«90	125tgi^1 - yStn aj		$\frac{20}{\text{tg} \alpha} \left\{ \frac{1}{1 - \sin \alpha} \right\}$	$\frac{10}{\frac{\text{tg} \alpha}{13} + 3} \left(\frac{1}{\sin \alpha} \right)$	$t25 \text{tg} \alpha^1 - \sin \alpha $		1.25lg<	

* X.

>

45*..

45*.

45'

60*.

, 90

(11)

6.3

6.3.1

$$\left(\frac{C_a}{P_a} \right)^3$$

(12)

6.1 6.2.

6.3.2

0.5

7

7.1

7.1.1

$$c_r = V_C (\wedge \circ \ll^* \gg)^{7!} z^{3!!} dF^{17}. \quad (13)$$

 f_e

6 7,

6—

*

,	1.10
	1.00
	1.15

7—

 \wedge

0» * @pw	
0.01	52.1
0.02	60.8
0.03	66.5
0.04	70.7
0.05	74.1
0.06	76.9
0.07	79.2
0.08	81.2
0.09	82.8
0.10	84.2
0.11	85.4
0.12	86.4
0.13	87.1
0.14	87.7
0.15	88.2
0.16	88.5
0.17	88.7
0.18	88.8
0.19	88.8
0.20	88.7
0.21	88.5
0.22	88.2
0.23	87.9

7

»* 0050 *	
0*.	
0.24	87,5
0.25	87,0
0.26	86,4
0.27	85,8
0.28	85,2
0.29	84,5
0.30	83,8

* / .. coWQ., .

 f_t

7.

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2.5

7.1.2

7.1.2.1

X

X.

7.1.2.2

7.1.2.1

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7.1.2.3

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X.

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7.1.2.4

7.1.2.3

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7.2.1

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$$P_r = X F_{r+} V F_a.$$

(14)

X

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7.2.2

7.2.2.1

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7.1.2.1.

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X

7.2.2.2

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X

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X

	fi-Sa F_t		F_r		
	X	0	X		
, at 0*	1	0	0.40	0.40 ctga	1.5 tga
, $t = 0^*$	1	0.45 ctga	0.67	0.67 ctga	1.5 tga

7.3

7.3.1

$$L_{10} = \left(\frac{C_r}{P_r} \right)^{10/3} \quad (16)$$

7.1 7.2.

7.1.2.

7.2.2.

7.3.2

0.5 ..

8

8.1

8.1.1

90*

$$C_1 = (U U^{7|9} Z^{3|4} \bar{E} \bar{E}^{9|27}) \quad (17)$$

90*

$$\langle \langle \text{---}^{(*)}, \langle \rangle a \rangle \rangle^{7|e} \text{flo} Z^{3|4} 0^{|||27} \quad (18)$$

Z—

L**.

(3.12).

9 10.

9—

	6»
	1,00
	1,10
	1,15

 f_e

10.

2.5

10—

 f_c

	f_c	$\cos \gg 4^*$	f_e		
			$\bullet \text{SO}^{9**}$	$\text{---}^{*''}$	$\bullet \text{---}^{9*1}$
0.01	105.4	0.01	109,7	107.1	105,6
0.02	122.9	0.02	127.8	124.7	123
0.03	134.5	0.03	139.5	136.2	134.3
0.04	143.4	0.04	148.3	144.7	142.8
0.05	150,7	0.05	155.2	151.5	149,4
0.06	156.9	0.06	160,9	157.0	154,9

10

0-)	4	*	4		
	-90'		- 60°**	« 75°	» 80°
0.07	162,4	0.07	165.6	161.6	159.4
0.08	167.2	0.08	169.5	165.5	163.2
0.09	171.7	0.09	172.8	168.7	166.4
0.10	175.7	0.10	175.5	171.4	169.0
0.11	179.5	0.11	177.8	173.6	171.2
0.12	183.0	0.12	179.7	175.4	173.0
0.13	186.3	0.13	181.1	176.8	174.4
0.14	189.4	0.14	182.3	177.9	175.5
0.15	192.3	0.15	183.1	178.8	176.3
0.16	195.1	0.16	183.7	179.3	-
0.17	197.7	0.17	184.0	179.6	-
0.18	200.3	0.18	184.1	179.7	-
0.19	202.7	0.19	184.0	179.6	-
0.20	205.0	0.20	183.7	179.3	-
0.21	207.2	0.21	183.2	-	-
0.22	209.4	0.22	182.6	-	-
0.23	211.5	0.23	181.8	-	-
0.24	213.5	0.24	180.9	-	-
0.25	215.4	0.25	179.8	-	-
0.26	217.3	0.26	178.7	-	-
0.27	219.1	-	-	-	-
0.28	220.9	-	-	-	-
0.29	222.7	-	-	-	-
0.30	224.3	-	-	-	-

1*

0_ecosa

'9V

45*

60'

60*

75*

75*

90*

**

**

1

 f_c

8.1.2

$$* = (2IJ\text{-wei} + ^2Z^2 + .^n + Z, i_{\% \text{ire}},)$$

$$\left[\left(\frac{Z_1 L_{w01}}{C_{a1}} \right)^{9/2} + \left(\frac{Z_2 L_{w02}}{C_{a2}} \right)^{9/2} + \dots + \left(\frac{Z_n L_{w0n}}{C_{an}} \right)^{9/2} \right]^{2/9}. \quad (19)$$

»1, 2..... < 2|. 1 Z_n Uei, tv»*
 , 8.1.1.

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8.1.3
8.1.3.1

(,),
 , 7/9.

8.1.3.2
8.1.3.1 , ,

8.2

90

XF_r + YF_a, (20)

11. , 90 ,

(21)

11 —

X

	4				
	X		X		
90	—“i	*1	tg	1	1.5(
*90'	1.5(0.67	tg«	1	1.5(

> $F/F_c \text{, } \frac{\text{£}}{\text{£}}$

8.3

8.3.1

/

$\frac{\text{£}}{\text{£}}$

»

(22)

8.1 8.2.

8.1.3.

8.2

8.3.2

0.5

9

9.1

 L_{10}

90 %

/

 L_{10} L_{0}

8

 a_{SO^-} *
-* $\wedge SO \wedge io-$

(23)

9.2,
 a_{iso} .
 9.3.

9.2

3.2.

(23).

12.

12

>

95 % 99 %

m

12—

.	%		4i
90		i-to«	1.00
95		<i>Un</i>	0.64
96		<i>Un</i>	0.55
97		<i>t-3m</i>	0.47
98		<i>Ljn</i>	0.37
99.0		<i>Lx.Oa</i>	0.25
99.2		<i>L>n</i>	0.22
99.4		<i>Loon</i>	0.19
99.6		<i>L0.4(1</i>	0.16
99.8		<i>I<.2a</i>	0.12
99.90		<i>L>L</i>	0.093
99.92		<i>L) OMI</i>	0.087
99.94		<i>LiOtm</i>	0.080
99.95		<i>i-O.OVn</i>	0.077

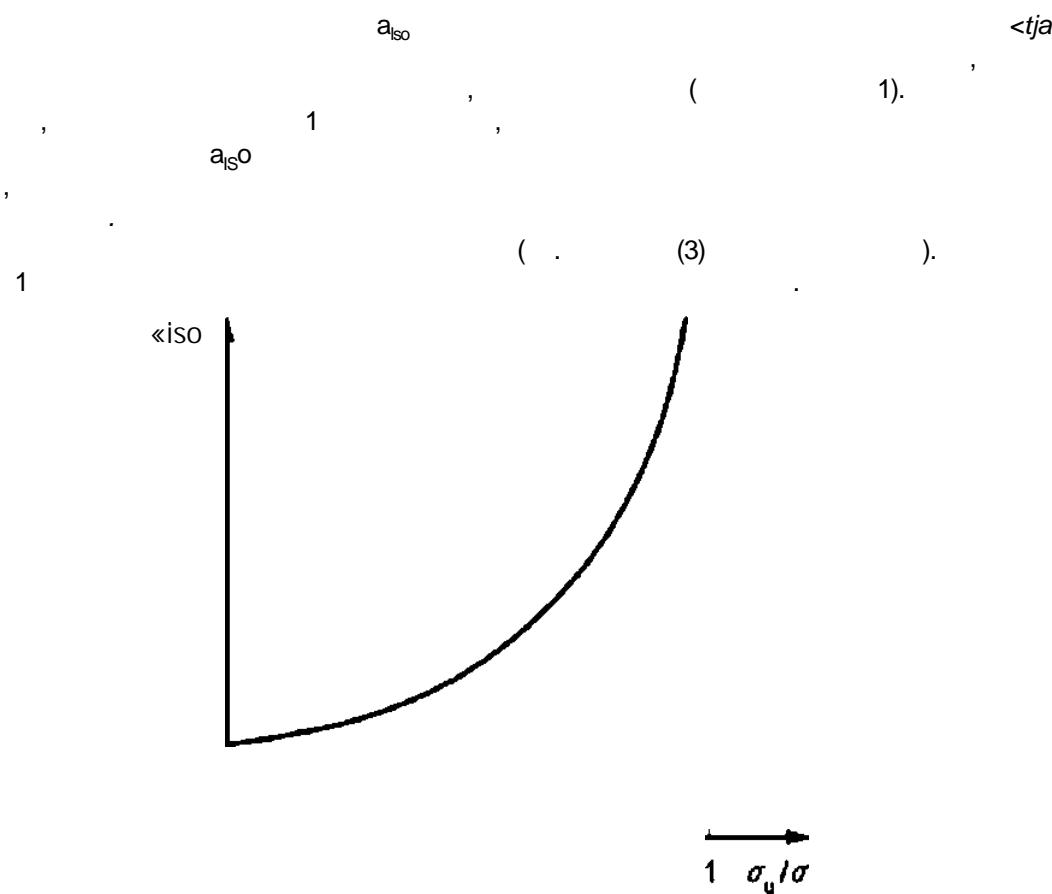
9.3

9.3.1

1500

1500

ISO/TS 16281 [1].



$$a_{SO} = f\left(\frac{\sigma_u}{\sigma}\right). \quad (24)$$

"([3]).

18854.

(. , *a_{iso}* ; *<rja*

CJP

$$a_{iso} = f\left(\frac{C_u}{\rho}\right). \quad (25)$$

9.3.3
9.3.3.1

Siso

, (); (,);
(,); (,);
(,);
().

ISO/TS 16281 [1].

a_{iso}

$$a_{iso} = f\left(\frac{\epsilon_c C_u}{\rho}; \kappa\right). \quad (26)$$

9.3.3.2 9.3.3.3.

a_{iso}
3-6.

(3). (10). (11). (14), (15), (20)

(21).

9.3.3.2

9.3.3.3);

<

no ISO 4406 [7].

13—

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	£>, $\ll 100$!00
	1	1
	0.6 0.8	0.8 0.9
	0.5 0.6	0.6 0.8
	0.3 0.5	0.4 0.6
	0.1 0.3	0.2 0.4
	0.1	0.1
	0	0

(«)

9.3.3.3
9.3.3.1

V.

»»,

V

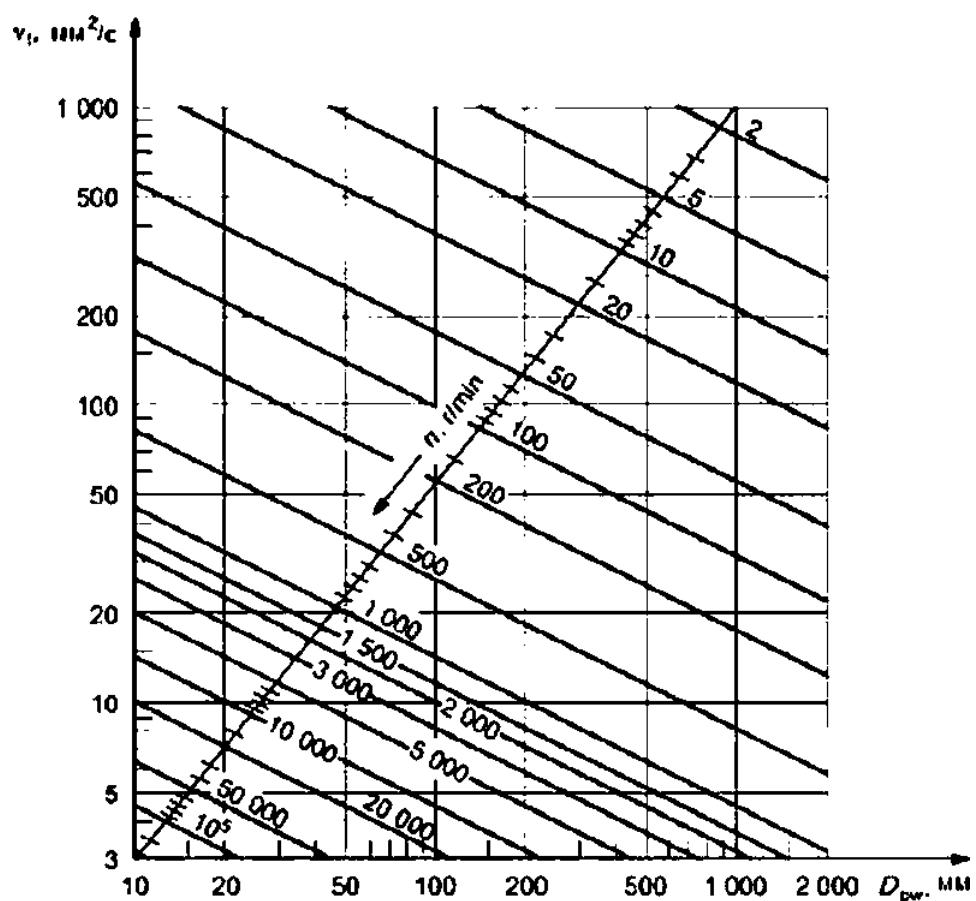
V
v1

(27)

$$V_r = 0.5 (+) \quad [\quad] \quad 2$$

$$v_r = 45000 \wedge *^{0.5} < 1000 \quad \backslash \quad (28)$$

$$v_r \ll 4500 \quad 1000 \quad \backslash \quad (29)$$



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9.3.3.3.2

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(28) (29)

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9.3.3.3.3

2 (28) (29)

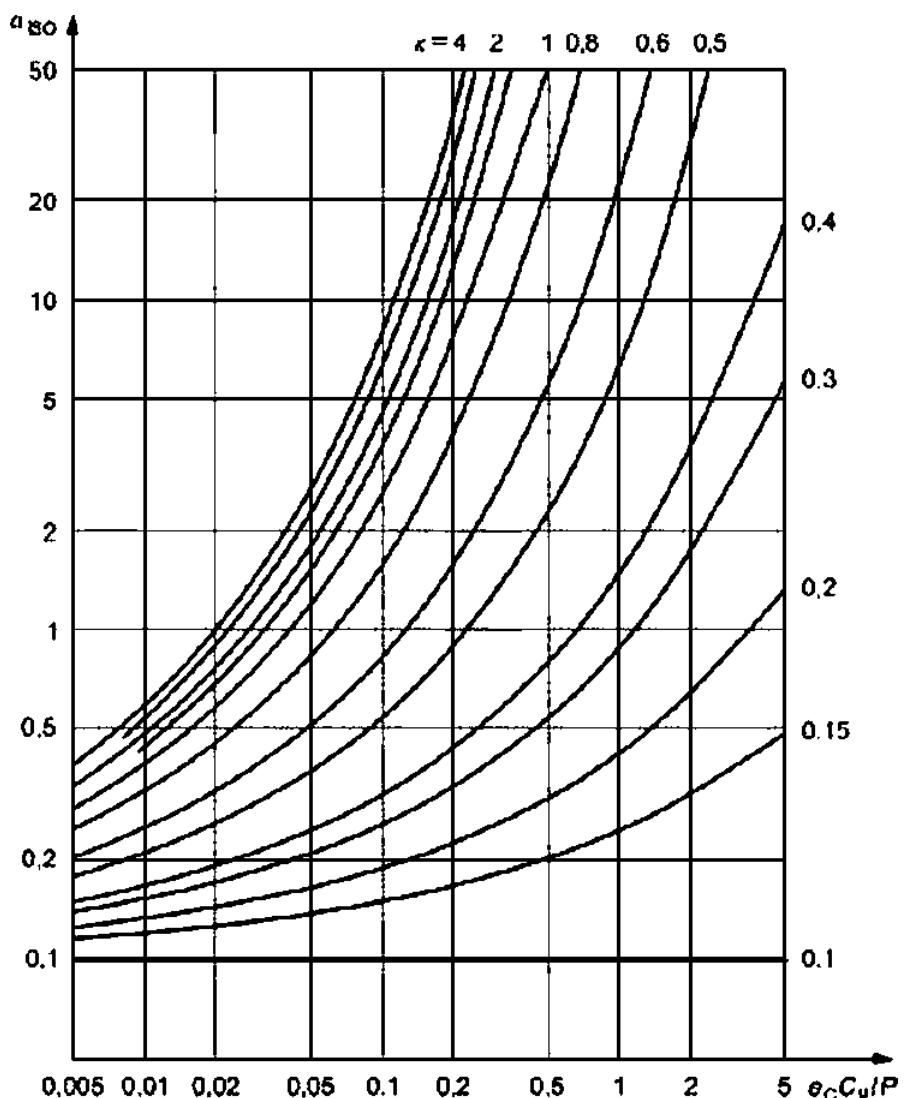
9.3.3.3.4

£ 0.2 , * - < 1
 $\$_{80}$, , $\star = 1$ ©
& 3 , also, 180
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, , (< 0.2)
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9.3.3.4

6 , also, 3. 4.5
, , (31) — (42).
9.3.2. 9.3.3.2 9.3.3.3. „
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diso £ 50.
 $e_c CJP > 5.$
 $* > 4$.4.
 $< 0.1.$
 $\$80 \quad a_{SO} < 0.1$



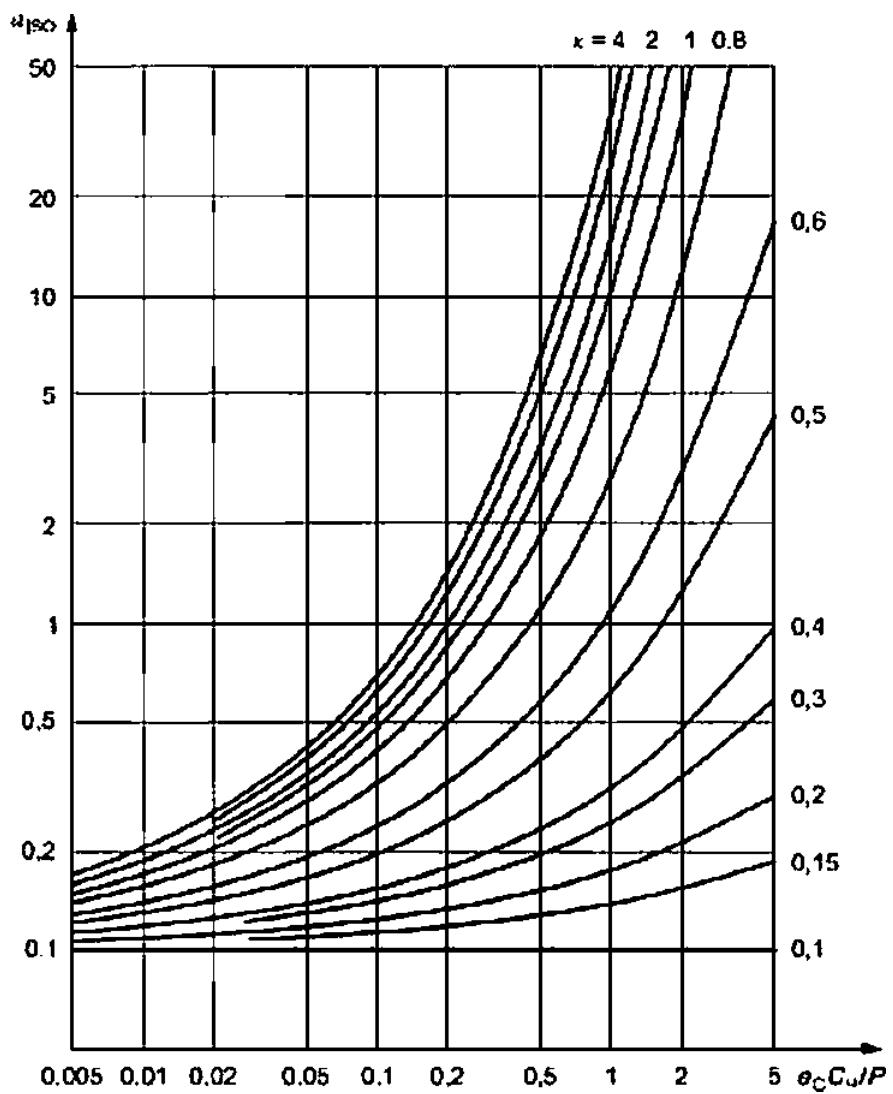
$$\% = 0.1 \left[1 - \left(Z_{5671} - \frac{2.2649}{.0054381} \right)^{1/9.3} \right]^{(")} \quad 0.1 \leq < 0.4, \quad (31)$$

nso 0.1 1-Z5671- t9987 \0.B3 , -9.3
0.19097 0.4 £ < X

(32)

% = $\frac{vO.ea}{1.9987} \cdot 10^3$
 1-1 Z5671-
 0.739

(33)



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4 : 0.9-185

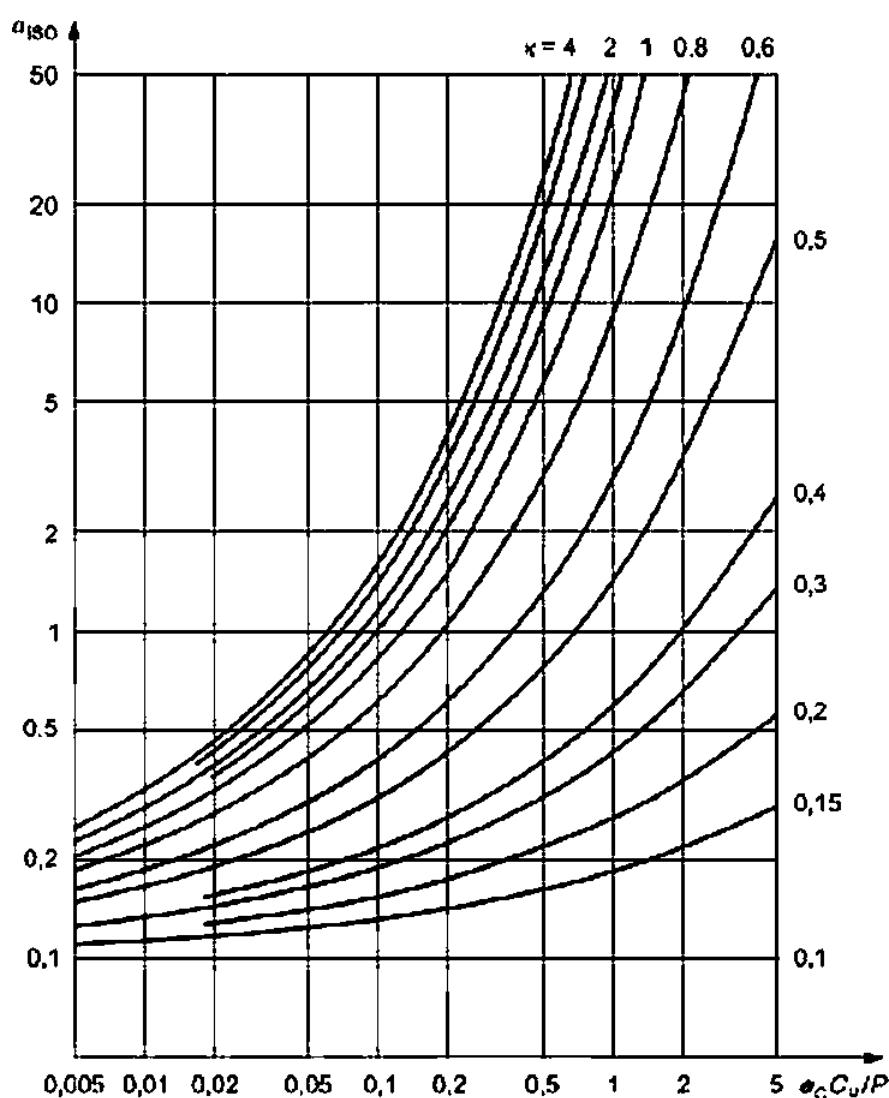
$$\% = 0.1 - (5, -^{\wedge})(^{\wedge}) \quad 0.1 \leq < 0.4, \quad (34)$$

$$3\text{SO}^{5+1} \quad 1^- 1,5859 \quad \frac{12348}{\kappa_{0.19087}} \left(\frac{\epsilon_c C_u}{P} \right)^{0.4}]^{-9.185} \quad 0.4 \leq <$$

(35)

$$\$ = 0.1 \quad 1 - 15859 - \frac{12348}{0.071799} \quad -9,185 \quad 1 \leq 4.$$

(36)



5—

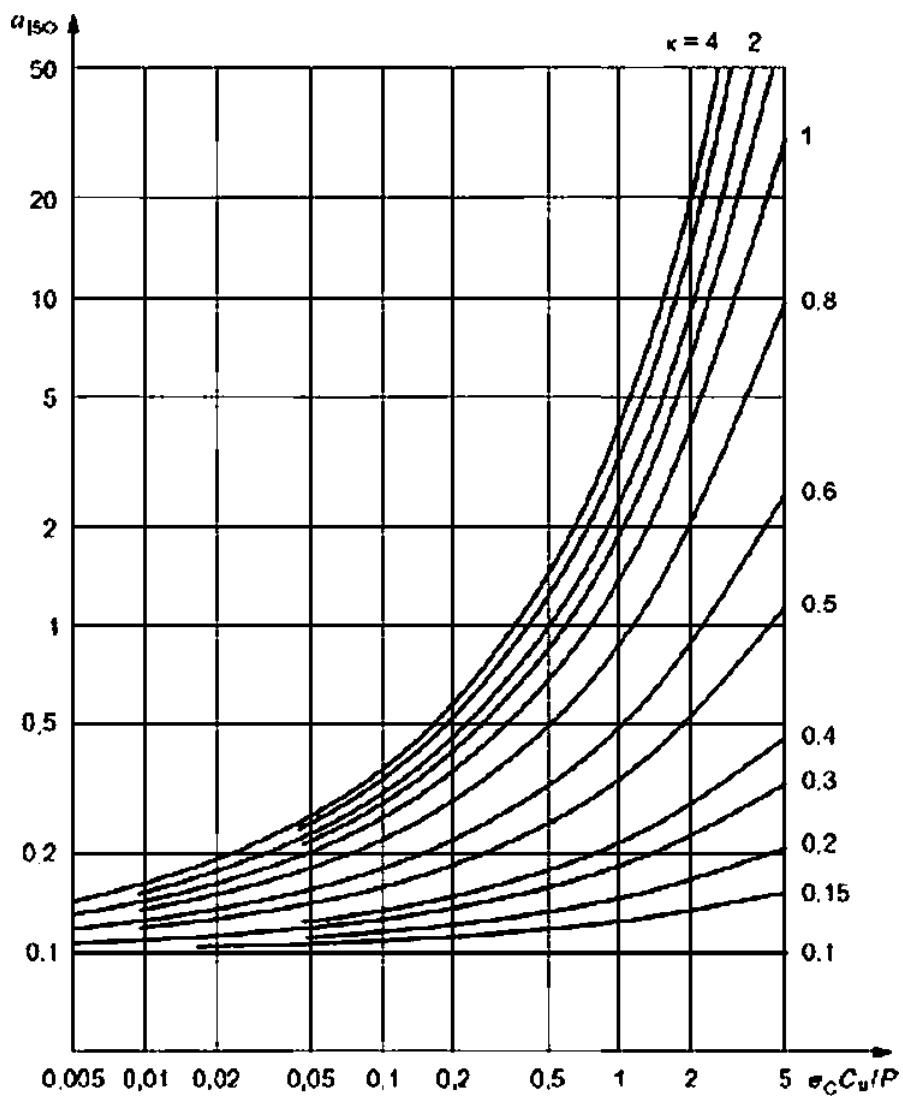
5

$$\% = 0.1 - \left(2'5671 \cdot \frac{1}{\kappa^3} \right) \quad \text{if } \kappa < 0.4. \quad (37)$$

$$\% = 0.1 - [2'5671 - \frac{1}{\kappa^3}]^{1/3} \quad \text{if } \kappa > 1,$$

(38)

$$\% = 0.1 - \left(\frac{19987}{15071739} \right)^{1/3} \quad \text{if } \kappa > 1.5. \quad (39)$$



6

:

$$\% \quad \text{Z5859-} \frac{13993 \text{ V}}{00 \quad , \quad 2.5} \quad 0.1 \leq < 0.4. \quad (40)$$

$$\frac{1.2348 \text{ fecC}''}{,0.190*7 \text{ J} \quad 0.5} \quad .\ll 9-185 \quad 0.4 \leq < 1, \quad (41)$$

$$\frac{12348}{^0.071739} \quad u \quad 0.4^{1-9.185} \quad 1 \leq \leq 4. \quad (42)$$

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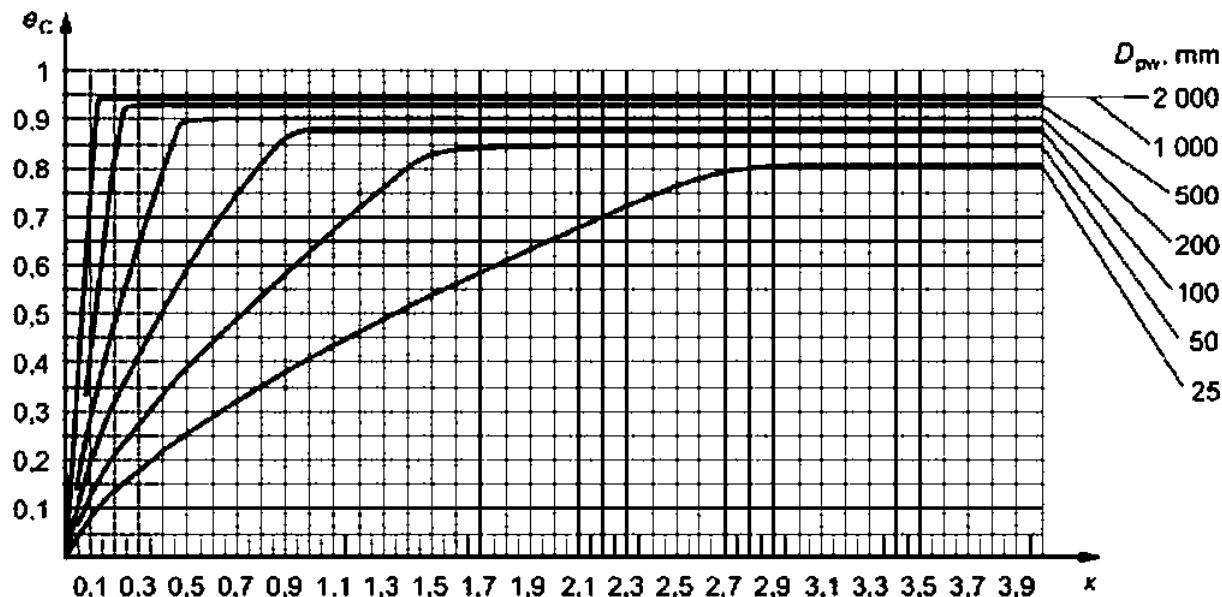
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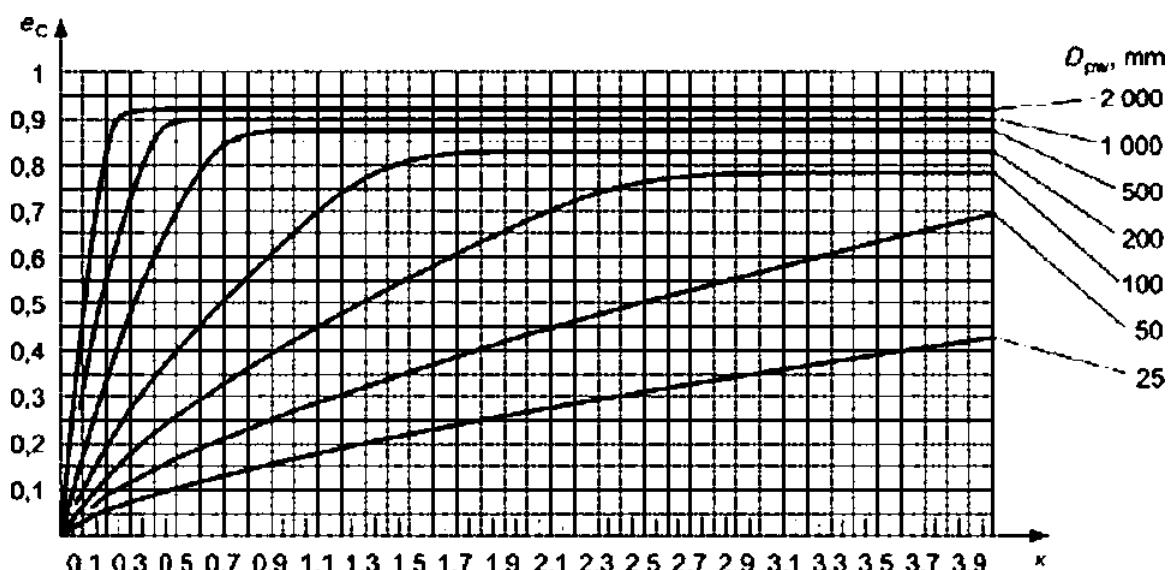


#4 <1 — 0.5663/). 0.0844 " „4"** it s 1
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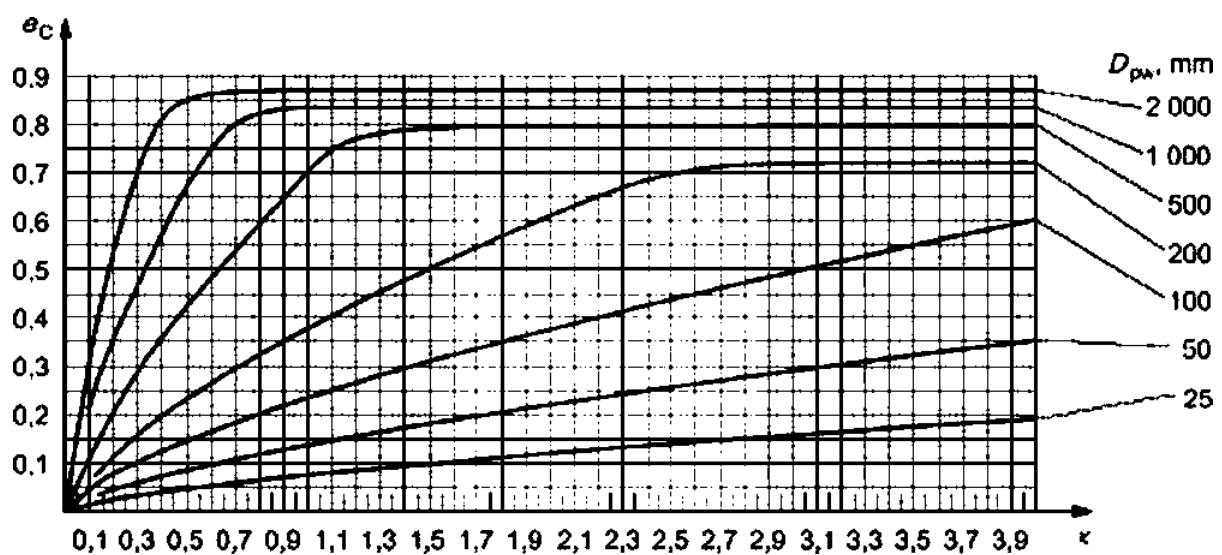
• <1 — 0.9987/0."."). * 0.0432 *** @*,*** ait
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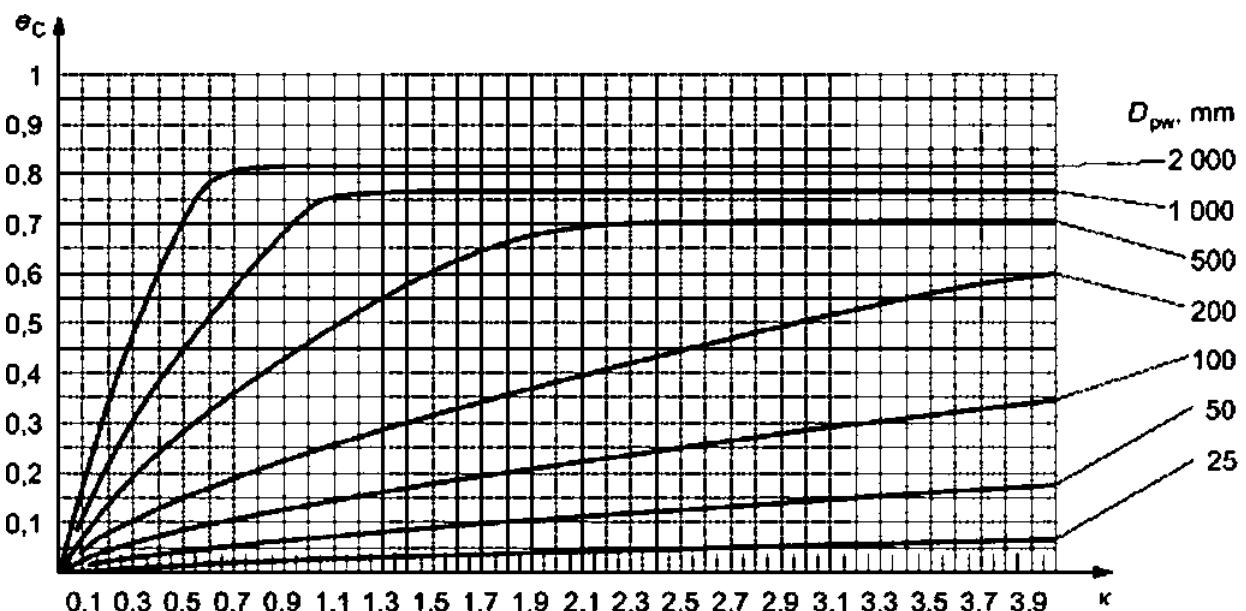
= 200.

ISO 4406 -/15/12



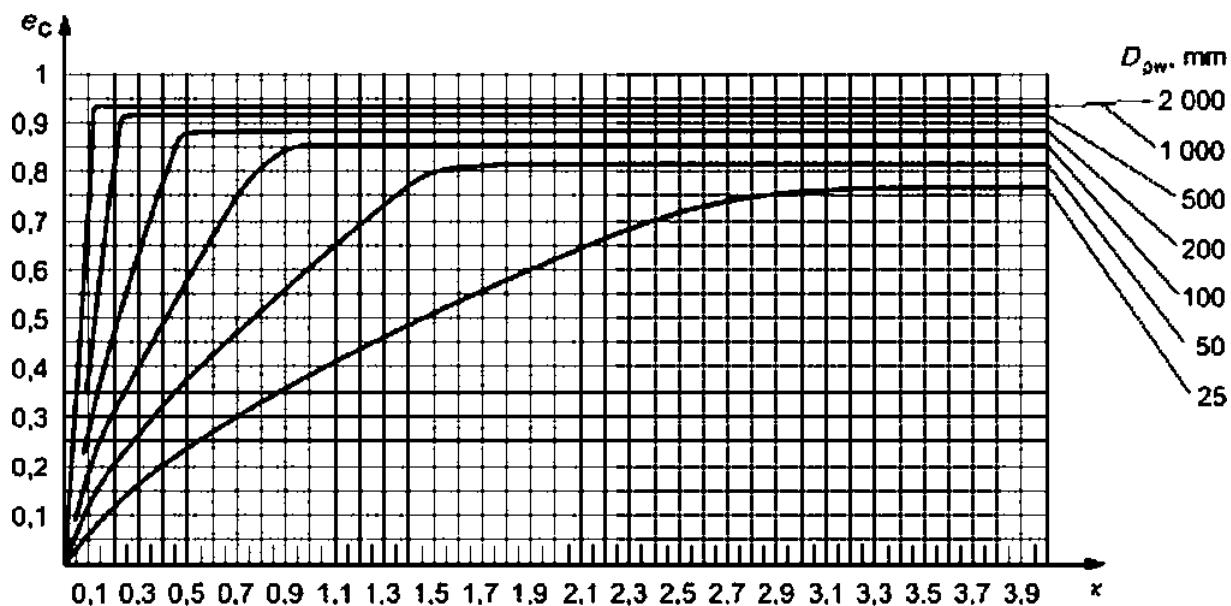
$\text{os}^* (1 - t_{6329}/\text{Op}^*) \cdot 0.0288$ ISO 4408: -/17/14. -/8/14. -/18/15. -/19/1\$

— $f_{\text{os}}(k) \cdot 75.$ ISO 4406 —/17/14



$\epsilon \gg 0(1 - 2\%) \cdot \sqrt{k} \quad </> 0.0218$ ISO 4408: -/19/18. -/20/17. -/21/18. -/22/18

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— $40<, \quad 75.$ ISO 4406 -/19/16



at » 41 — 0.6796/0, "*) . - 0.0864 «** ?' a/1
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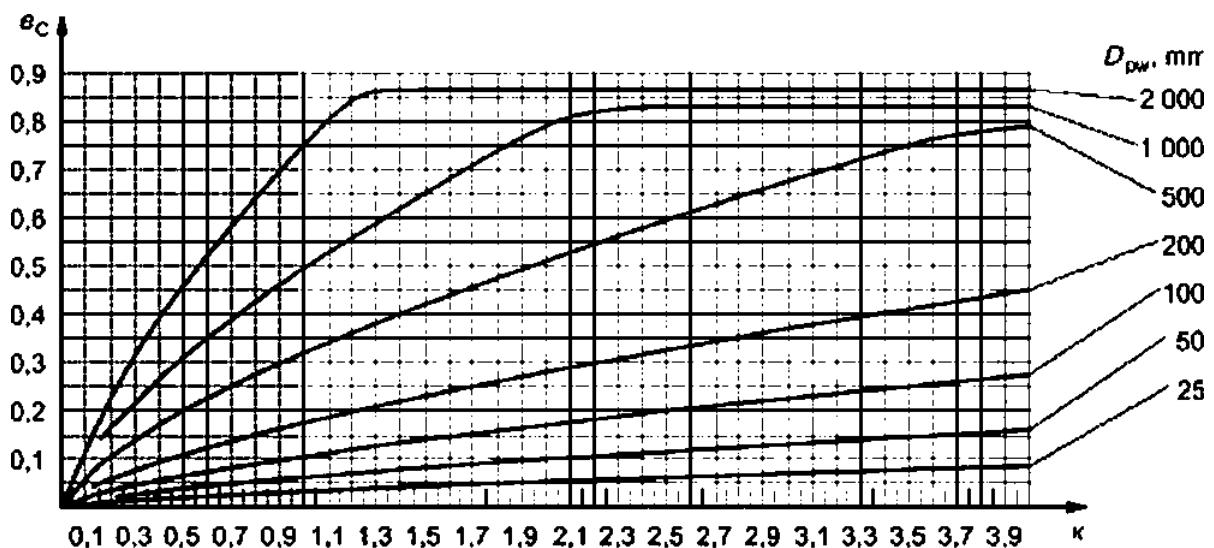


" < 1 — 1.141/Op.w). »» 0.0288 ***' 0, »* * a i 1
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, -/15/12 no ISO 4406

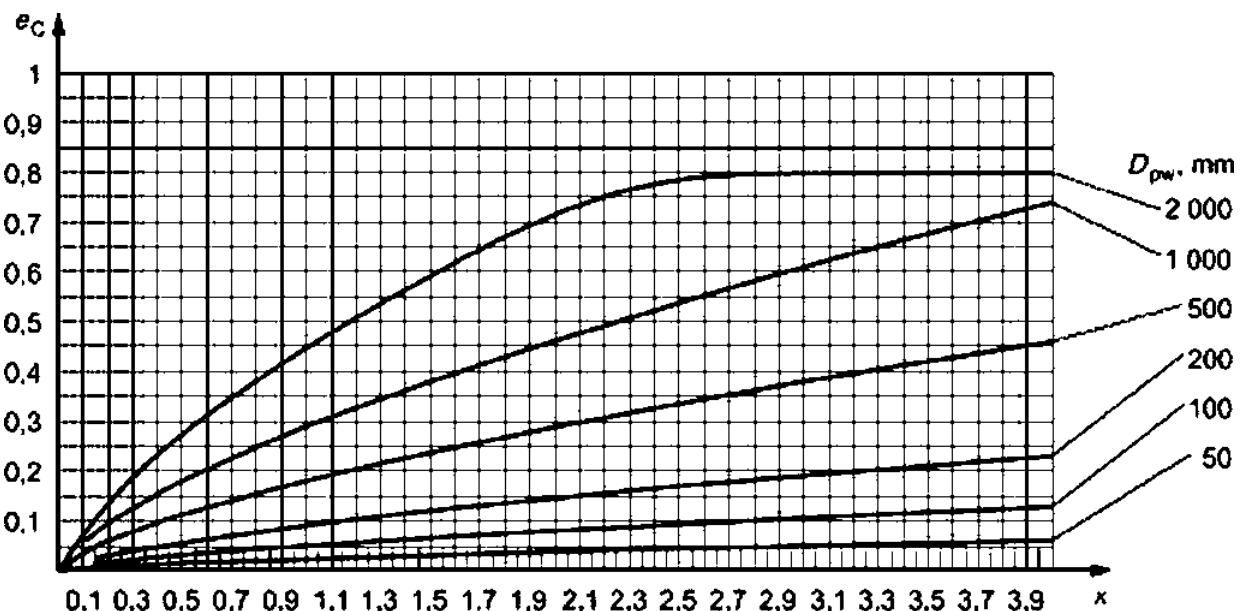
18855—2013



« $s = <1 - 1.1 \cdot 7/0,^0>$. $<> 0.0133 <0^u - 1^e - 4^1$
no ISO 4406: -/17/14. -/18/14. -VI6/15. -/16/16

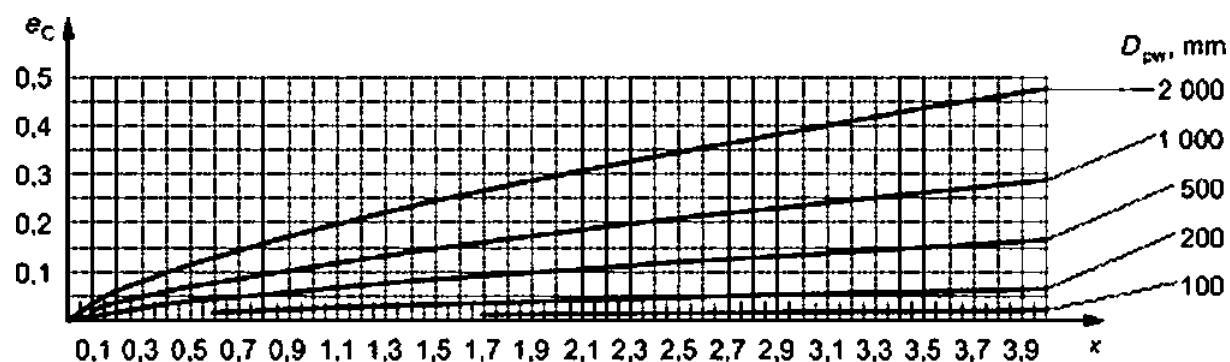
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, -/17/14 ISO 4406



*« - < $41 - 2.5164/0^u>$. * $0.00664 **0 . ai 1$
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, -/19/16 ISO 4406



« * (1 — .974/ Δ) », « • 0.00411 $^{+0.4}_{-0.4}$ * a_1 »
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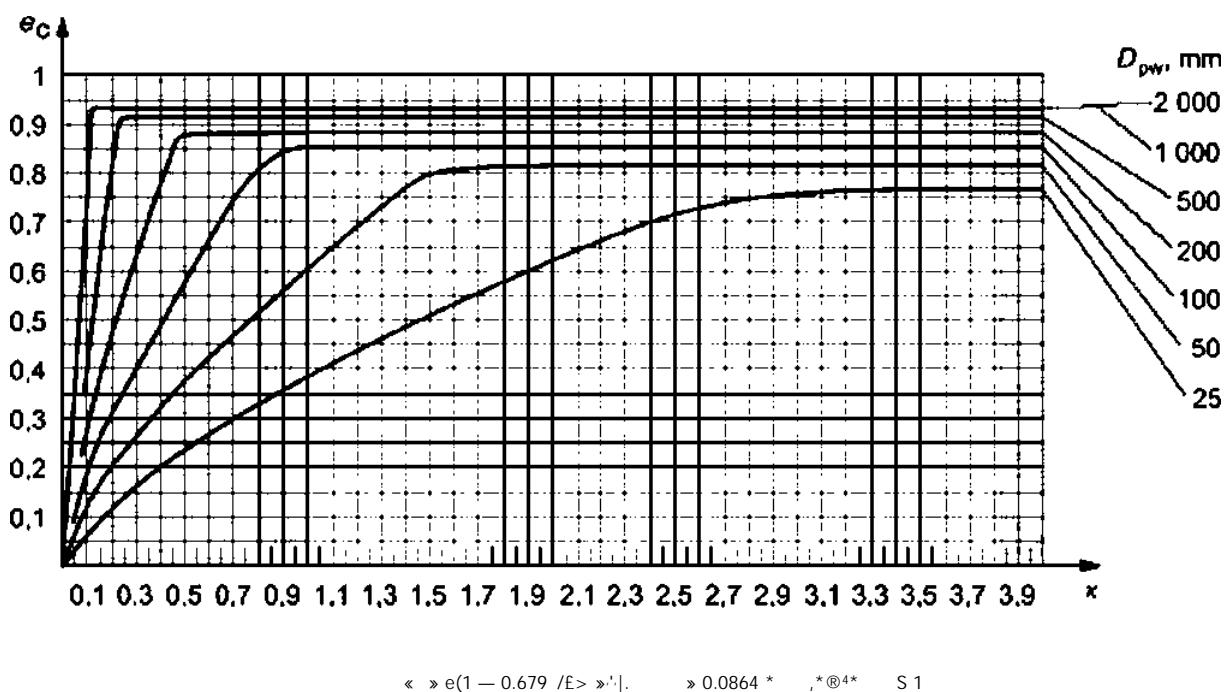
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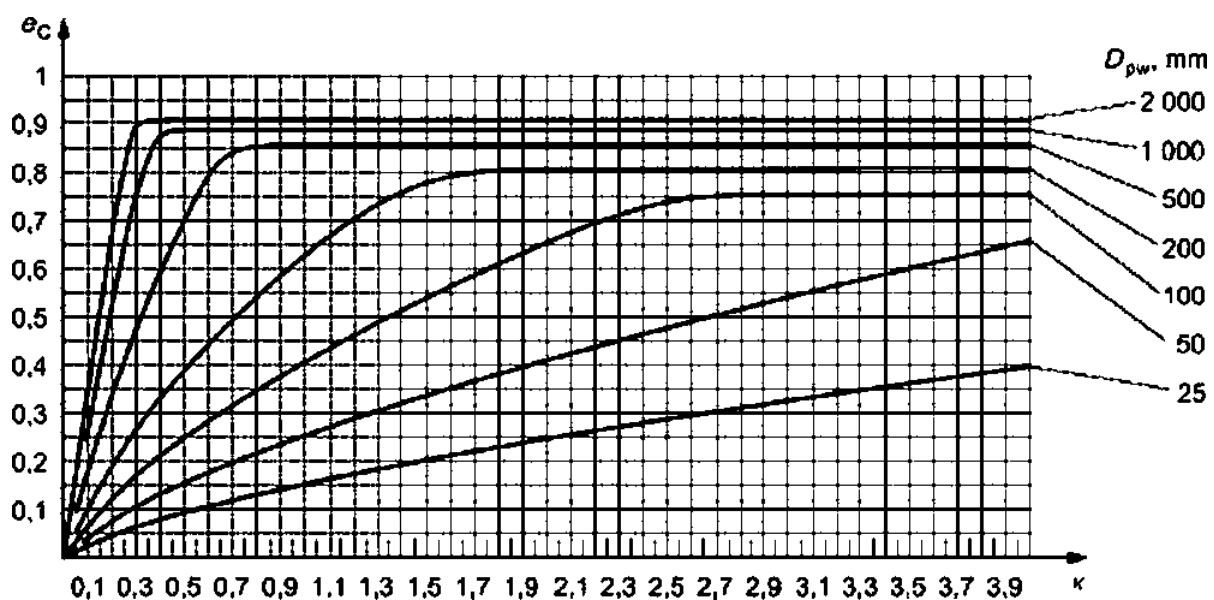
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$$\ll \rightarrow e(1 - 0.679 / \kappa) \gg^{\prime \prime} . . . 0.0864 * \cdot \cdot \cdot ^{\circ 4} \cdot \cdot \cdot S 1$$

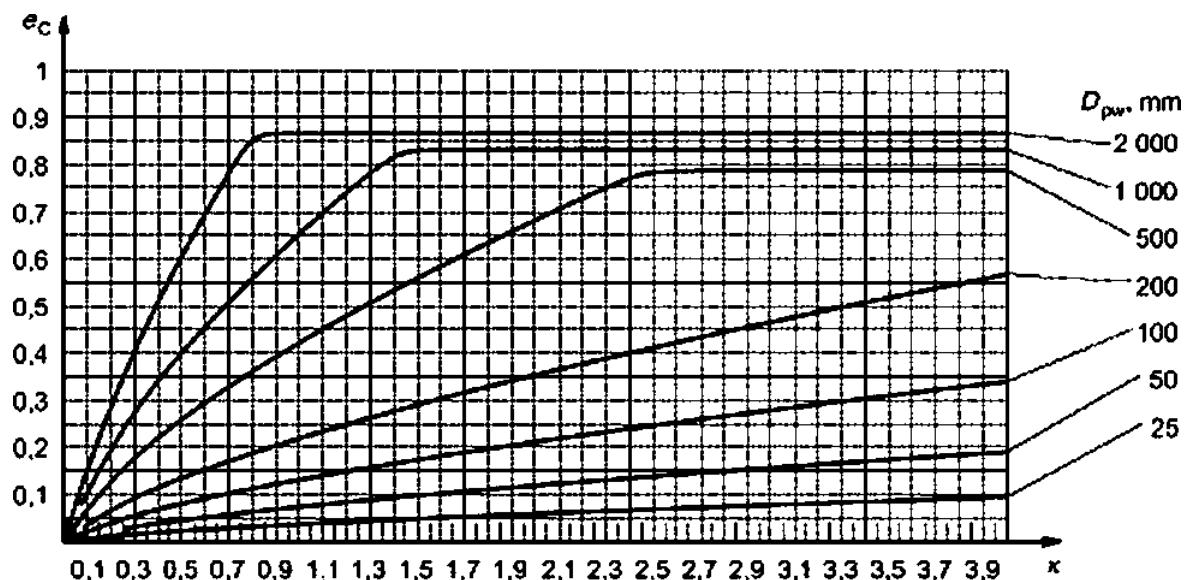
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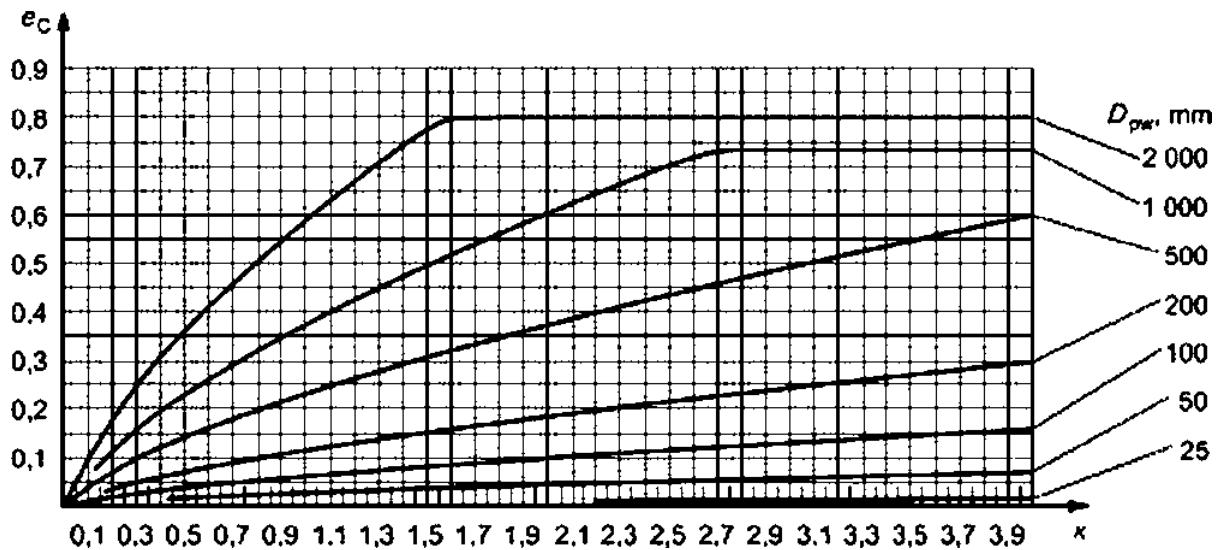
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$$\begin{aligned} \bullet & \quad D_{pw} < 500 \quad . \quad * \quad 0(1 - 1.MT/Df)^0 \quad 0.0177 \times 0, \quad a \quad i \quad 1 \\ \bullet & \quad , \quad 500 \quad . \quad * \quad (1 - 1.677/0, 1 \quad \odot \quad -0.0177)***\odot, \quad a \quad i \quad 1 \end{aligned}$$

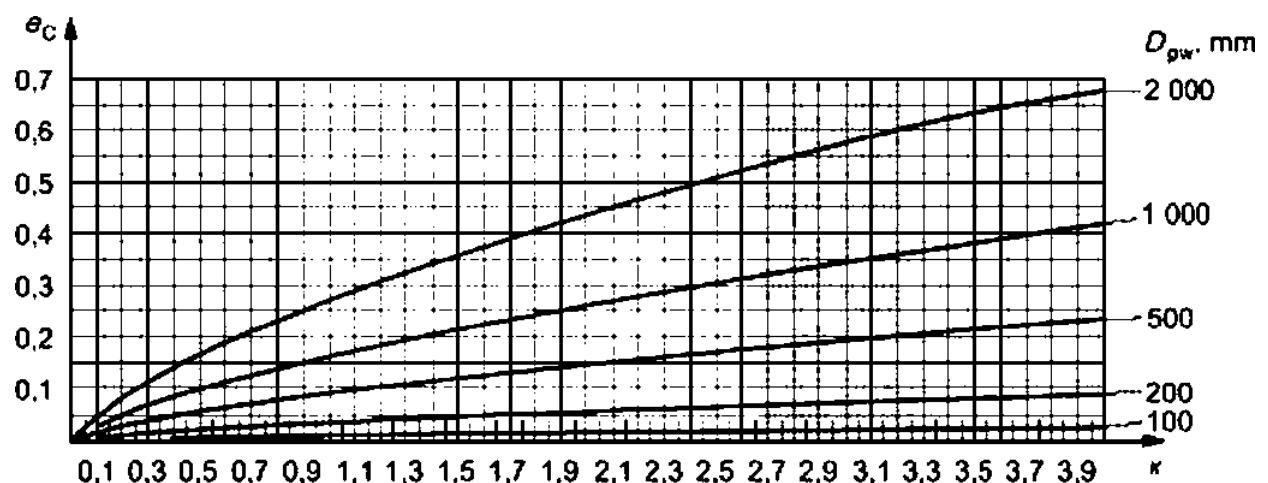
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$$, \odot \quad * \quad (1 - 2.6 \quad 2 \quad <) \quad 0,0115 \quad * \quad * \quad * \quad a \quad S \quad 1$$

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$$: * \rightarrow (1 - 4.06 / , 1^*) \quad 0.00617 \text{ Op}^{\text{ot}} \text{ as } 1$$

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$$[\quad] \quad [\quad]$$

$$Q_{\text{ultra}} = \sigma_{\text{Hu}}^3 \times \frac{32\pi k_{\text{L}}}{3} \left(\frac{1 - v_E^2}{E} \times \frac{E(z_{\text{L}})}{\sum p_{\text{L}}} \right)^2. \quad (.1)$$

$$1 - \frac{2}{\chi^2 - 1} \left(\frac{K(\chi)}{E(\chi)} - 1 \right) - F(\rho) = 0. \quad (.2)$$

(.2)

$$K(\chi) = \int_0^{\frac{\pi}{2}} \left[1 - \left(1 - \frac{1}{\chi^2} \right) (\sin \phi)^2 \right]^{\frac{1}{2}} d\phi. \quad (.3)$$

$$E(\chi) = \int_0^{\frac{\pi}{2}} \left[1 - \left(1 - \frac{1}{\chi^2} \right) (\sin \phi)^2 \right]^{\frac{1}{2}} d\phi. \quad (.4)$$

$$[\quad] \quad (.1)$$

$$\Sigma_{\text{R}} = \frac{2}{D_w} \left(2 + \frac{\gamma}{1-\gamma} - \frac{D_w}{2r_i} \right) \quad (.5)$$

[]

$$\Sigma_{\text{P}} = \frac{2}{D_w} \left(2 - \frac{\gamma}{1+\gamma} - \frac{D_w}{2r_e} \right) \quad (.6)$$

[]

$$F_i(\rho) = \frac{\frac{\gamma}{1-\gamma} + \frac{D_w}{2r_i}}{2 + \frac{\gamma}{1-\gamma} - \frac{D_w}{2r_i}} \quad (.7)$$

[]

$$F_e(\rho) = \frac{\frac{-\gamma}{1+\gamma} + \frac{D_w}{2r_e}}{2 - \frac{\gamma}{1+\gamma} - \frac{D_w}{2r_e}}. \quad (.8)$$

Q_{u1} Q_u

$$O_u - \text{mm (0^0)}$$
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3.2.2.1

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3.2.2.2

$$,, * 0,22882 \quad s 100$$
(.10)

$$C_u = 0,2288 Z Q_u j \cos \alpha \left(\frac{100}{D_{pw}} \right)^{0,5} \quad \text{для } D_{pw} > 100 \text{ мм}$$
(.11)

3.2.2.3

$$,, - 20, \text{sinn} \quad * \pm 100$$
(.12)

$$C_u = Z Q_u \sin \alpha \left(\frac{100}{D_{pw}} \right)^{0,5} \quad \text{для } D_{pw} > 100 \text{ мм}$$
(.13)

3.2.2.4

$$C_u - 0,2453 Z Q_u > c o 8_u \quad . s 100$$
(.14)

$$C_u = 0,2453 Z Q_u j \cos \alpha \left(\frac{100}{D_{pw}} \right)^{0,3} \quad \text{для } D_{pw} > 100 \text{ мм}$$
(.15)

3.2.2.5

$$,, = Z O_u \text{smu} \quad * s 100$$
(.16)

$$C_u = Z Q_u \sin \alpha \left(\frac{100}{D_{pw}} \right)^{0,3} \quad \text{для } D_{pw} > 100 \text{ мм}$$
(.17)

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.3.3.2

$$C_u = \frac{C_0}{22} \text{ для } CO_{pw} \leq 100 \quad (.1)$$

$$C_u = \frac{C_0}{22} \left(\frac{100}{D_{pw}} \right)^{0.3} \quad CO_{pw} > 100 \quad (.19)$$

.3.3.3

$$\leq 100 \quad (.20)$$

$$C_u = \frac{C_0}{8.2} \left(\frac{100}{D_{pw}} \right)^{0.4} \text{ для подшипников с } D_{pw} > 100 \text{ мм} \quad (.21)$$

$$QJC_V = 8.2$$

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 $= 45^*$ F_r

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 F_r

$$*10 \left(\frac{C_a}{F_a} \right)^3 = \left(\frac{C_a}{F_a} \right)^3$$

$$= 0.9. \quad \text{tfOu S } 0.54, \quad \& 0.54.$$

 $(. = .).$

$$= \frac{0.4 \operatorname{ctg} \alpha}{1 - 0.333 \sin \alpha} \quad (.1)$$

6)

$$*10 * \left(\frac{C_r}{F_r} \right)^3 = \left(\frac{C_r}{Y F_a} \right)^3 = \left(\frac{C_a}{F_a} \right)^3 \quad (.2)$$

$$= 0.95. \quad rJCL \quad 0.52 \quad rJD_m \quad 0.53.$$

 $(.1)$

$$1 - 0.333 \sin \alpha$$

 $(.1)$ U

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$$1 - \frac{0.333}{3} \sin\alpha$$

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& 45*

> 45*

$$\begin{array}{cccccc} & & (.) & (.4) & (.7) & (.8) \\ & & \hline & & 85.1 & 6.1.1. \end{array}$$

.4.2

(, S 0.52 rJD. & 0.53)

$$, * 2.37 \operatorname{iga}(1-0.333 \sin\alpha) C,$$

(.)

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(.4)

$$L_{10} = \left(\frac{C_{aa}}{F_a} \right)^3$$

$$L_{10} = \left(\frac{C_{aa}}{F_a} \right)^3$$

(.6)

.4.3

(& 0.54 rJD. & 0.54)

$$, \sim 1.91 \operatorname{igu}(1-0.333 8 \operatorname{lfta}) C,$$

(.7)

$$C_{aa} \ll q,$$

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$$(\dot{E}, \cos\alpha)/\text{Op.} = 0.16 = 1.$$

$$(1), \dots, = (\ll,$$

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 $U = 59.6$.

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$$\wedge 2.37 * \tan 45^\circ * (1 - 0.333 \sin \alpha) * 59.6 * 108 *$$

$$(6). \dots, = / \lg \ll. \quad (< = 85.1 \quad 4. \\ (.4)$$

$$,, = 1.24 * 85.1 * \tan 45^\circ * 106$$

.5.2

$$\ll = 40^\circ$$

$$= 0.091. \quad a = 40^\circ. \quad 0/D_p \\ . = 7.5 \quad Z = 27. \\ 2. \quad \cos 40^\circ = 0.707. \quad = 51.1. \\ (1)$$

$$, = t^3 r_e (eosa)^{0.7} Z^{2.3} O_w^{\#} = 3 \times 5 \times 1 \times (\cos 40^\circ)^{0.7} \times 27^{2.3} \times 7.5^{\#} = 18651.$$

(.7)

$$,, \ll 1.91 * \tan 40^\circ * (1 - 0.333 \cos 40^\circ) 16651 - 23493$$

$$= 23500 \text{N}$$

.5.3

$$= 60^\circ$$

$$0 \ll = 0.091, \quad a = 60^\circ. \quad 0 \\ . = 7.5 \quad Z = 27. \\ 4. \quad (O_w \cos 60^\circ)^{0.7} - 0.091 \cos 60^\circ - 0.046. \quad k = 61, 12. \\ (6)$$

$$= t^3 r_e (\cos a)^{0.7} (t^9 a) Z^{2.3} O_w^{\#} = 3 \times 61.12 \times (\cos 60^\circ)^{0.7} \times \lg 60^{\#} \times 27^{2.3} \times 7.5^{\#} = 28663.$$

$$\{ .8), \\ , = , = 28700 .$$

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2 5.2.1. 9.3.3	3	ISO 76 « 18354-2013» « »
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1			5.2.2		,
2		(5.2.2)			,
3		,			-

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[2] 1281 - 281.
2:2008 (ISO/TR 1281:2008) 2:
(Rolling bearings — Explanatory notes on ISO 281 — Part 2: Modified rating life calculation, based on a systems approach of fatigue stresses)

[3] (toannides, .. Bergjeng, G., Gabelli, A. An analytical formulation for the life of rolling bearings. Acta Polytechnica Scandinavica, Mechanical Engineering Series No. 137, The Finnish Academy of Technology, 1999)

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[6] 16889:2011

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