



9178-81
(642-77)

9178-81**(****642-77)**Basic requirements for interchangeability.
Cylindrical fine-pitch gears. Tolerances

9178—72

23

1981 . 3068

01.01.1982 .

400 (1,0 (0,5 — 200)
9587—81.

642—77,

643—77

644—77.

1.

1.1.

: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 12.
: 4- 1 2

1.2.

1.3.

©

, 1981

1.4.

;

1.5.

G, , , , **D**, , **F**,
 , f, g, h. **T_{jn}**

1.

1

	D					F	G	
,	0,1 0,5	0,5 <1,0	0,1 0,5	0,5 1,0	0,1 <1,0			
-	3—10	3-12	3—10	3—12	3—10	3—8	3—7	

<0,3

<0,2

1.6.

D, **F**, **G**, —, **f**,
 g, h

1.7.

II , VI.

G, **F**, **D** (III, IV, V, VI —II), ,

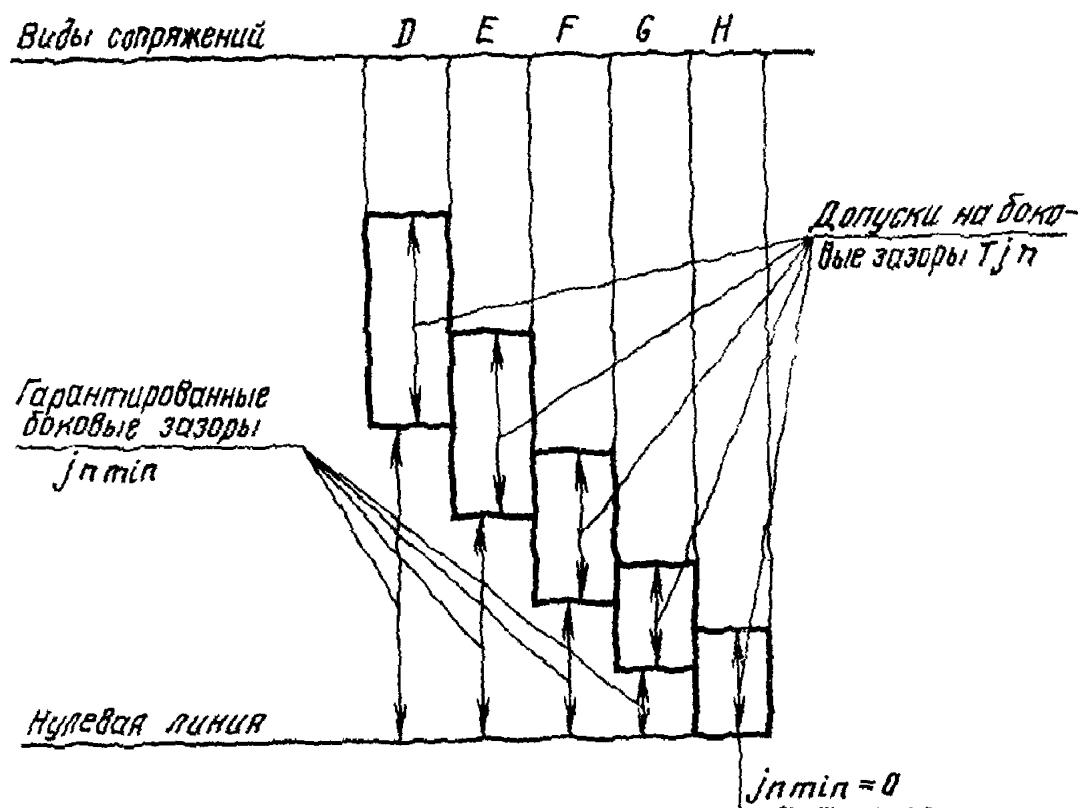
1.8.

,

—

7
G

7 — G 917 — 81



1.9.

8

, f

, G,

8

7—8—8—Gi

9178—81

, N.

1.10.

,

j;min = Jnm.n—0,68(f;/—W),

Jnmin f_a —

. 9;

inmm —

f_a —

7

F,

V (

aw =45 , j^min =4 .):

7_Fe/V—4 9178—81

9.

1.11.

,

643^77

644—77

1.

Vwr, vw, v_ptr v_pt—F_vwr,F_vw>

fvptr,

f_{vp}t

2.

2.1.

. 2.

2.1.1.

(. . . 2.8)

-											
		3	4	5	6	7	8	9	10	n	12
	F. ,	X	X	X	X	X	X	MM			+
	Fpr Fpicr	X	X	X	X	"----->	w				
						X	X				
	F _{cr} F _{rr}	X	X	X		"X	X			-	
	^vWr Frr	X	X	X	X	. X	X	—	-		
	F _{vWr^H} F _{jr}			X	X	X	X				
	F _{cr} F _{ir}			X	X	X	X	---	1'	----	T
	ⁿ Fir							X	X	X	X
	Frr	-	-		-		-.	X	X	X	X
	p _{ior}	X	X	X	X	X	X	-	-	-	-•

2.1.2.

2.2.

. 3.

2.2.1.

2.2.2.

2.2.3.

$f_p t_r$

f_{vptx} (. 2 . 6).

2.3.

2.3.1.

f_{yr}

		3	4	5	6	7	8	9	10	11	n
	4	X	X	1*	X	X	X	—	—	—	—
	fpbr ffr	X	X	! x	X	X	X	—	—	—	*—
	fpbr fpfr	X	X	X	X	X	X	—	—	—	—
	i _{ir} *	—	—	X	X	X	X	X	X	X	X
	fpbr	—	—	—	—	—	—	X	X	X	X
	*ptr	—f	—	—	—	—	—	X	X	X	X
	f _{Mor}	X	X	X	*1	X	X	—	—	—	—

		3	4	5	6	7	8	9	10	11	12
		X	X	X	X	X	X	X	X	X	X
*	fyt**	X	X	X	X	X	X	X	X	X	X
		X	X	X	X	X	*	—	—	—	—

*
**

5 . 7.

2.3.2.**2.3.3.****2.3.4.**

2.4.

,

. 5—7.

,

2 3.

,

2.5.

, , f",
, l* -fy ,F_r, F_vw. F,

2.6.

. 2.1—2.3

(. 3.2),

,

, (,)

: F_r'_{or}, f_j_{or}

2.7.

,

2.8.

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(

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2.9.

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),
)
)
(
,

).

(

($F_{J_r}, F_{rr} \gg F_{v^r}, F_{J_r}, F_{cr}, F_{pr^*} F_{p^r}$)

										200 ^d		
t_u	Bt				8	32	50	80	*			
x_v	g_a			12	«	.20	.32	.50	3	.125	IO	cog)
r_A	ta								\triangle		«	»
C_4	f^s											
u												
	F_{\ll}	0,1	<1,0								2)	
	F_r	0,1	0,5	2	3	4	4	5	6	6	—	—
3		.0,5	<1,0	4	4	4	5	6	6	8	9	9
	F_{vW}	0,1	<1,0	2	2	2	2	3	4	5	6	7
	F_c	0,1	<1,0	2	2	2	2	3	4	5	6	7
	F_p	0,1	<1,0	4	4	5	6	6	8	9	10	11
	F_{pk}^{**}	0,1	<1,0	3	4	4	5	6	6	8	9	10
	F_t	0,1	<1,0									
	F_r	0,1	0,5	4	5	6	7	8	9	10	—	*—
		.0,5	<1,0	6	6	7	8	9		12	14	15
4	F_{vw}	0,1	<1,0	3	3	3	3	4	6	₈	10	12
	F_c	0,1	<1,0	3	3	3	3	4	₆	8	10	12
	F_p	0,1	<1,0	6	7	8	9		12	14	16	18
	F_{pk}	0,1	<1,0	5	6	17	8	9	10	12	14	16
	$f;$	0,1	<1,0									
		0,1	0,5	7	8	9	10	12	14	16	—	—
	F_r	.0,5	<1,0	9	10	11	12	14	16	19	22	22
5		0,1	<1,0	4	4	4	5	7	9	12	16	18
	F_t	0,1	0,5	11	12	13	15	17	19	22		
		.0,5	<1,0	14	15	16	17	19	21	24	28	32
	F_c	0,1	<1,0	4	4	4	5	7	9	12	16	18
	F_p	0,1	<1,0	10	11	12	14	16	19	22	25	30

		m,	d%									
			12	12	20	8 1=1 3	80 .60	.80	125 .125 200	“	”	& §
5	$\bar{F}_{Pk}^{*#}$	0,1 <1,0	7	10	11	12	14	16	19	22	25	
		0,1 <1,0										Fp+ff (. 2)
	*	0,1 0,5	11	12	14	16	19	22	26	—	—	
		. 0,5 <1,0	15	16	18	20	22	25	30	35	36	
	F_{VW}	<1,0	5	5	6	8	11	15	20	26	28	
6		0,1 0,5	17	19	21		26	30	35	—	—	
	F^*	. 0,5 <1,0	22	24	26	28	30	34	40	45	50	
	F_c	0,1 <1,0	5	5	6	8	11	15	20	26	28	
		0,1 <1,0	16	17	19	22	25	30	36	40	45	
	${}^{**}_{hPk}$	0,1 <1,0	11	16	17	19	22	25	30	35	40	
	p|	0,1 <1,0										Fp+ff (. 2)
		0,1 0,5	16	18	20	22	26	30	36	—	—	
	F_r	. 0,5 <1,0	21	22	24	26	30	36	42	48	50	
	F_{VW}	<1,0	6	7	9	11	15	21	28	36	40	
7	π	0,1 0,5	24	26	30	34	38	42	48	—	—	
	P_i	. 0,5 <1,0	30	32	34	38	42	48	55	63	70	
	F_e	0,1 <1,0	6	7	9	11	15	21	28	36	40	
	P_p	0,1 <1,0	22	24	26	30	35	42	50	56	63	
	F_{Fl}	0,1 <1,0										Fp+ff (. 2)
	F_7	0,1 0,5	19	21	25	28	32	38	45	—	—	
	F_r	. 0,5 <1,0	26	28	30	34	38	45	50	55	63	
	F_{VW}	0,1 <1,0	7	9	11	14	20	26	35	45	50	
		0,1 0,5	30	34	38	42	45	53	60	—	—	
	pi	. 0,5 <1,0	38	40	45	48	53	60	70	80	9»	

$$-F_{|k|}$$

$$F > F_{pk} + f_f;$$

Fpk —

. 5.

F_{i0}

$$(1, 2, 3),$$

25%

4.

$$[F_i'']_{\text{komb}} = [F_i'' - f_i'']_F + [f_i'']_t,$$

(F),

(f),

5.

Fpk

6.

F_j.

6

($f, . f_{ptr}, f_{pbr} . f_{,r} . f_{,,}$)

		S ₄₅ > 0											
		m,		3	4		6	7	8	9	10		12
*;	0,1	4	6	9	14	20	26	—	—	—	—		
	. 0,5 <1,0	5	7	1°	16	22	30	—	—	—	—	—	
*pt	0,1 0,5	±3	±4	±6	±8		±16	±22	±32	—	—		
	. 0,5 <1,0	±3	±4	±6	±9	±13	±18	±25	±34	±48	±7		
fpb	0,1	±2	±	±5	±7	±10	±14	±20	dr30	—	—		
	. <1,0	± 2	±3	±5	±8	±11	4-16	±22	±32	±45	4~63		
ff	0,1	2	3	5	7	9	11	—	—	—	—		
	. 0,5 <1,0	3	4	6	8	10	13	—	—	—	—		
i;	0,1	—	—	7	9	13	17	22	28	—	—		
	. <1,0	w		9	12	17	22	28	35	45	56		

$$3. \quad 1,6 (f_p t). \quad f_{10}$$

1,25 fj

4. ()

0,5 f j .

3.1. |brain

3.2. ,

$$E''_a, \quad : \quad 8 \quad Ew^M$$

$$f_{ar} \quad ,$$

3.3. $j_{(imin)}$.

$$H_s = 10 \text{ (} E_{wm} = 12 \text{)}$$

12 Ews

"₈ 8)

3.4. $(\dots, 1.5)$.

11 (14 TV

15,

 E_a "i — 8)

(. . 1.9).

7

»

(F_{g_r} , f_{x_r} , f_{y_r} ,)

	$f_{>_w}$	3	4		6	7	8	9	10		$|^2$
	10	4	5	6	7	9		₁₃	18	25	
	. 10 20	4	5	7	9	11	15	22	30	45	60
	. 20 40	5	6	7	9	11	17	24	34	48	70
	10	4	5	6	7	9	13	18	25	36	50
	. 10 20	4	5	7	9		15	22	30	45	60
	. 20 40	5	6	7	9	11	17	24	34	48	70
	10	2	2	3	4	5	7	9	12	18	25
f_y	. 10 20	2	3	3	4	5	8	11	15	22	30
	. 20 40	2	3	4	5	6	19	12	17	24	35
	,						%				
-			55		50		40		—		—
	,		75		70		50				—

1.

:

 F_p —

;

 f_{ie} —

;

 f_y —

()

,

3.

*

. 7.

4.

. 2.3.1—2.3.4.

5.

 f_y f_x \wedge f_y

$$(E_a)_{ft}^* \}$$

* $\pm f$

. 6

. U

^ — * . 11
— f ^ . 6.

9

(J_{nmjn}, f_{..})

CJ		X		-		-		w		,		,	
12 |	12	20	32	50	8	«	2	125	180	180	250	«	«
0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	8	9		13	15	18	20	23	25				
9	11	13	16	19	22	25	29	32	35				
15	18	21	25	30	35	40	46	52	57				
22	27	33	39	46	54	63	72	81	89				
±8	±9	±	±14	±16	±lg	±20	±22	±25	±28				
±11	±14	±16	±20	±22	±23	±30	±35	±40	±45				
±18	±22	±25	±32	±35	±4	±50	±55	±60	±70				
±30	±36	±40	±50	±60	±70	±80	±90	±100	±110				
±45	±55	±63	±80	±90	±110	±120	±140	±160	±180				

*

(. . . 1. 7 J.10).

jnmin"*

3.5.

9

 f_a

(. . 1.10),

3.6.

, 8.

" 8

 $E_a * i$

3.7.

,

,

3.8.

7Vm

8

wms

$$E_{ms} = \frac{-W_{ms}}{\sin ct_D \cdot \cos}$$

$$\sim \frac{W_{ms}}{M^{\wedge} \sin a_D - \cos} *$$

c & d —

,

;

;

—

3.9.

4.

5.

(
 + E_{Hi} —)

							d.				
		12	.12	.20	.32	.50	.80	.125	.125	.180	.250
									.180	.250	.315
	3—7	5	6	7	8	9		13	14	16	18
	3—6	12	14	16	18	22	25	28	38	40	45
G	7	16	18	20	22	26	28	30	40	40	45
	8	22	24	26	28	30	32	34	45	50	50
	3-6	18	22	26	30	35	40	45	55	60	63
	7	22	24	28	32	36	42	48	55	60	63
F	8	26	30	34	38	42	45	53	60	63	70
	9	36	40	45	48	53	55	60	63	70	75
	10	48	53	55	60	60	63	70	75	80	85
	1	28	32	38	45	53	60	70	80	90	100
	8	35	40	45	50	55	63	75	85	95	105
F	9	42	48	55	60	63	70	80	90	100	
	10	55	60	63	70	75	80	90	100	105	120
	11	70	75	80	85	90	100		1	120	130
	12	100	105	110	118	120	125	130	130	140	150
	3-7	40	55	60	70	80	90		130	150	160
	8	50	55	60	70	80	95	118	130	150	160
D	9	55	60	70	80	90	100	120	130	150	160
	10	63	70	80	90	100	105	125	130	150	160
	11	80	85	95	105		120	140	150	170	180
	12	105	110	118	125	132	150	160	1170	180	190

E_{Hs} —

: 1.

();

2.

E_{Hs} 1

().

3.

) ,

11 12

(

D

>0,5
G

4.

*

11

(—)

Q_{Σ}^{*}		$($		F_f												8_{*}	
				1		6		1		$.6$		8		1			
G	h	14	16	18	20	25	30	34	40	50	60	70	90	1	140	170	190
		16	J8	20	22	28	32	38	45	53	67	75	100	120	150	190	210
F	f	18	20	22	25	30	36	42	50	60	70	85	110	130	160	200	230
		20	22	25	30	34	40	48	56	70	80	100	125	150	190	240	260
D																	

*

(. . 1.0 . 1.9).

F_r . 5.

		— Wm8		+E _{Wm}(		1		—E _{Ws}		-fE _{Wi})											
										d.											
		12	.12	20	.20	32	.32	60	.50	80	.80	126	.125	180	.180	260	.260	315	.315	1	400
		3-7	3	4	5	6	7	8	9	9	10	10	10	10	10	10	10	10	10	10	10
G	3-6	8	9	11	13	13	15	17	19	19	25	28	28	28	28	28	28	28	30	30	32
	7	11	12	13	15	16	17	18	19	22	21	24	26	26	26	26	26	26	28	28	32
	8	15	16	19	22	25	28	32	36	36	40	42	42	42	42	42	42	42	45	45	45
	9	18	20	22	25	28	32	35	38	42	42	45	45	45	45	45	45	45	50	50	55
	10	25	28	30	32	35	38	40	40	45	48	50	53	53	53	53	53	53	55	55	55
F	3-7	19	22	26	30	36	42	48	55	55	63	70	70	70	70	70	70	70	70	70	70
	8	24	26	30	35	40	45	50	60	60	63	63	63	63	63	63	63	63	63	63	70
	9	28	32	40	42	45	50	55	60	60	63	63	63	63	63	63	63	63	63	63	70
	10	38	40	42	45	50	55	60	63	70	75	75	75	75	75	75	75	75	75	75	75
	11	48	50	55	60	63	70	75	80	85	90	90	90	90	90	90	90	90	90	90	95
	12	63	70	75	80	85	90	100	100	100	110	110	110	110	110	110	110	110	110	110	100
D	3-7	28	34	40	48	55	63	75	85	85	95	95	95	95	95	95	95	95	95	95	105
	8	34	38	42	48	55	63	80	85	85	95	95	95	95	95	95	95	95	95	95	105
	9	38	42	48	55	60	70	80	90	90	100	100	100	100	100	100	100	100	100	100	110
	10	45	50	55	60	70	70	85	90	90	100	100	100	100	100	100	100	100	100	100	120
	11	55	60	63	70	75	80	95	100	100	110	110	110	110	110	110	110	110	110	110	130
	12	70	75	80	85	90	100	100	100	100	110	110	110	110	110	110	110	110	110	110	130

wins"

l)
);E_{Ws} —

();

(-

(

E_{i-Wmi} —l)
);E_{wl} —

().

($\sim E_{Wms}$ $+ E_{Wmi} —$ II)

F_f															
*	$\frac{\$}{0}$	00	10	12	(0 $\frac{**}{**}$	8 to	8	8 S3	3 4	3 4	8 $\frac{3}{3}$	3 $\frac{3}{3}$	. 80	100	125
1	2	2	3	3	4	5	7	9	11	14	18	22	25	35	45

:

1. $E \backslash —$; (—
 $W_{mi} —$ II); (—

$W_{mi} —$ II); (—
 E_{Wms} — (—

2. , . 12 (—
 F_r). . 13 (—
 E_{Wms} G 7 : . 12—17 —
 $d=52$, / ==0,5 —
 $13—7$, . 5 26 . —
 E^s —

, $E^s_{ms} = (-17) + (-7) = -24$ ($E^s_{mi} = 4-24$).
 E^s —
. 12. — 17

(T_{Wm} ~ ~

)

1

"		"	F _r																	
			00	«	! . 8 10	. 10 12	(N »	. 16 20	CS	. 25 32	« *	. 40 60	. 50 60	. 60 80	. 80 100	, 100 126	8 t-			
	tl	6	7	7	8	9	10	11	12	14	15	16	18	21	25	28	35	38		
G	g	8	8	9	9	11	12	14	15	16	17	20	21	28	32	40	48	50		
F	f	9	10	10	11	12	14	16	19	21	22	22	28	35	38	45	56	63		
, D	e	11	11	12	14	15	17	21	22	26	30	38	45	53	67	80	85			

"

(. . L6 1.9).

F_r
5.(T_W —

)

"		"	F _r																	
			00	* . 8 10	. 10 12	. 12 16	. 16 20	. 20 25	. 25 32	. 32 40	\$	. 50 60	. 60 80	U * 8	, 100 125	. 125 160	. 160 1			
	h	10	11	12	14	17	20	22	26	34	40	48	60	75	95	2	130			
G	g	11	12	14	15	19	22	26	30	36	45	50	67	80	100	130	140			
F	f	12	14	15	17	20	24	28	34	40	48	56	75	90		140	160			
, D		14	15	17	20	22	28	32	38	48	53	67	85	100	130	160	180			

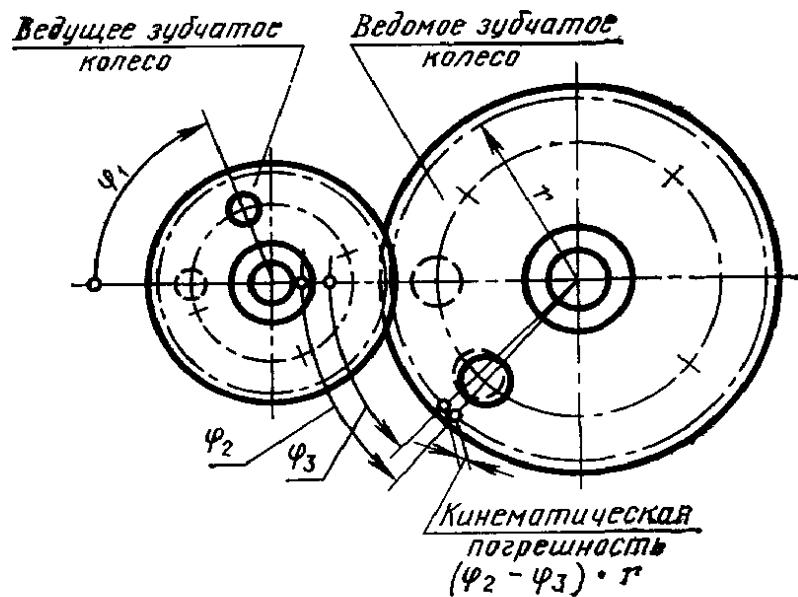
"

(. . 1.6 1.9).

F_r
5.

(. .)

(. . 1).



$$\varphi_3 = \varphi_1 \frac{z_1}{z_2} ,$$

afi—

; <pi—

; z2—

; —

. 1

1.1.

Fjor

(. .)

) (. 2).

Ft*0

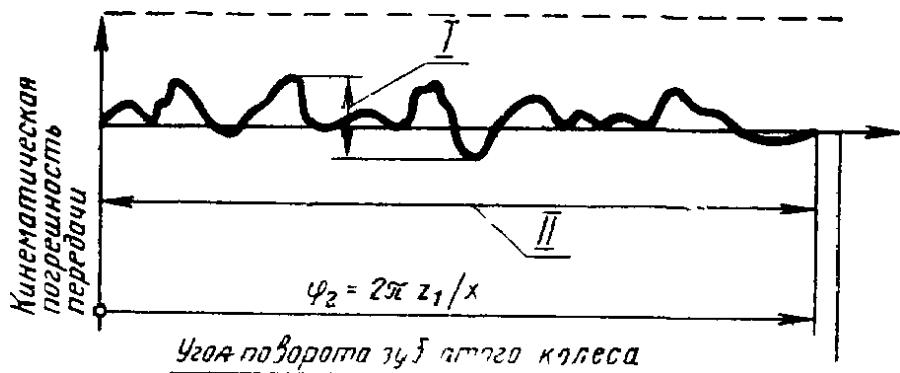
1.2.

2.

(. .)

1.

2,

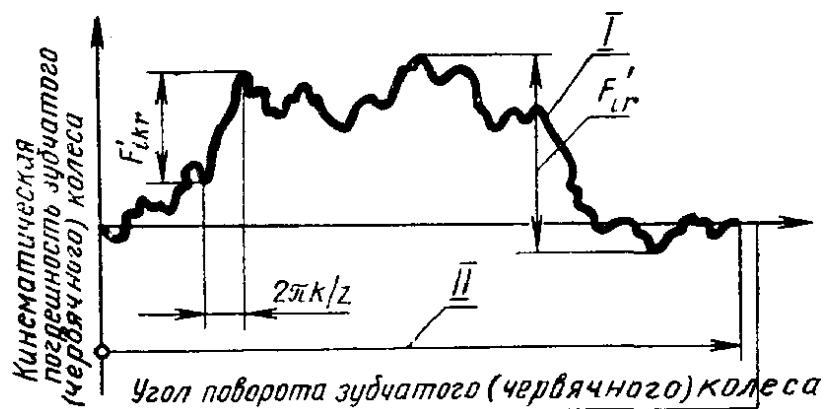
21 Zt F_{or}^A ; II—

2

2.1.

 F_{ir} .

(. . 3).



II—

3

2.2.

$$k \quad F_{ikr}.$$

$$(\quad)$$

3.

(. . 21).

3.1.

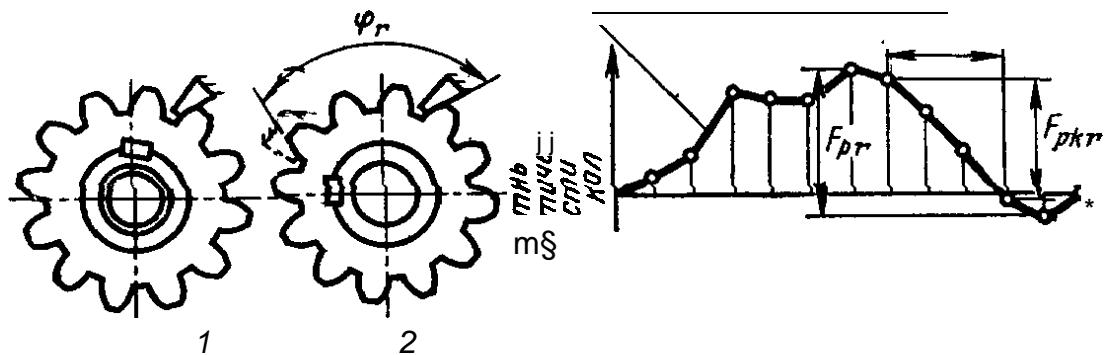
k

Kk

4.

k F_{ir}

(, 4).



$$F_{\text{pkr}} = (2 - k) 2p - r,$$

(p_f— ; k—

. 4

4.1.

$$k \quad F_{\text{pkr}} \\ 5. \quad F_{\text{pr}}.$$

5.1.

(, . . . 4). Fp.

6.

$$F_{rr}.$$

6.1.

(). F_r.
7. F_{cr}.

2.

7.1.

$$F^*. \\ 8. \quad F_{vyp_r}.$$

8.1.

$$F_{vw}.$$

9.

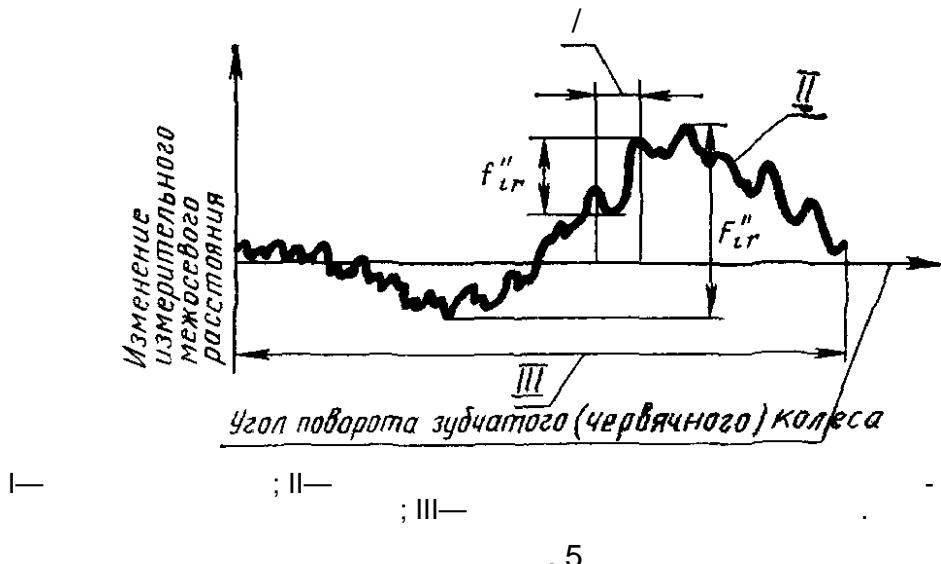
—

$$F_{ir};$$

—

f.

(,).



9.1.

—

F ;

—

f J .

10.

f_{ior} •

(

)

f_i.

11.

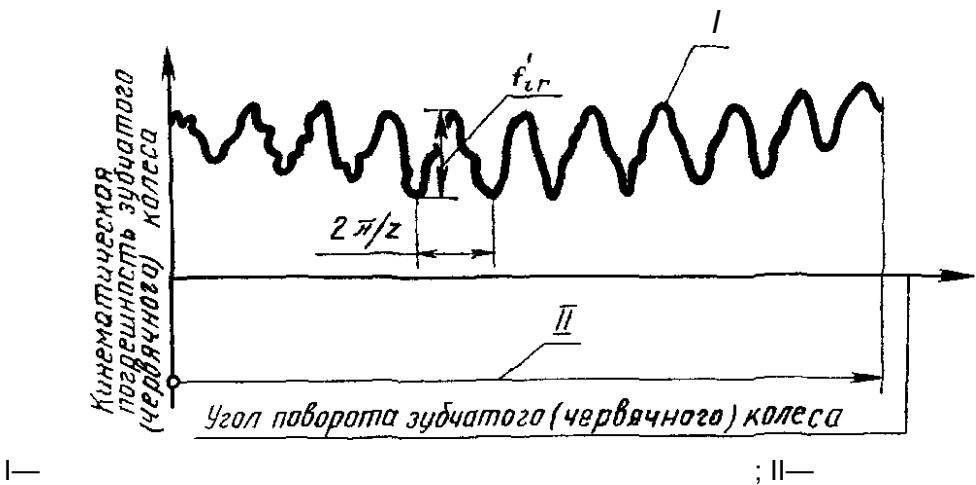
f. (

I_r)

(

)

(. 6),



^;

11.1.

^

(

12.

 $i_{P_{tr}}$

(

 $i_{P_{tr}})_*$ $P_t \ll$

12.1.

 $\pm f_{P_t}$

(

 $\pm i_{P_t}$)

13.

 $f_{oP_{tr}}$

13.1.

 I_{vP_t}

14.

1 ^ .

[

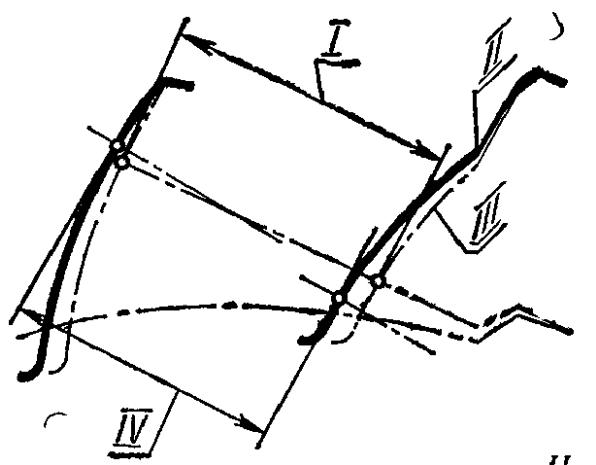
(. 7).

: 1.

^

,

2.



I—номинальный шаг зацепления; II—номинальный профиль зуба; III—активный профиль зуба; IV—действительный профиль зуба;

14.1.

{

15.

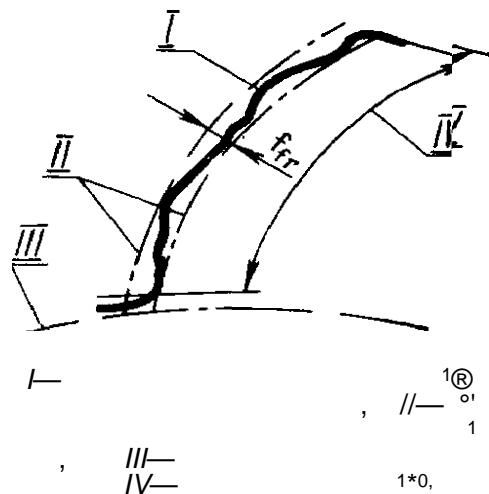
 $ff_r (. 8).$

^

15.1.

if.

^



.8

16.

17

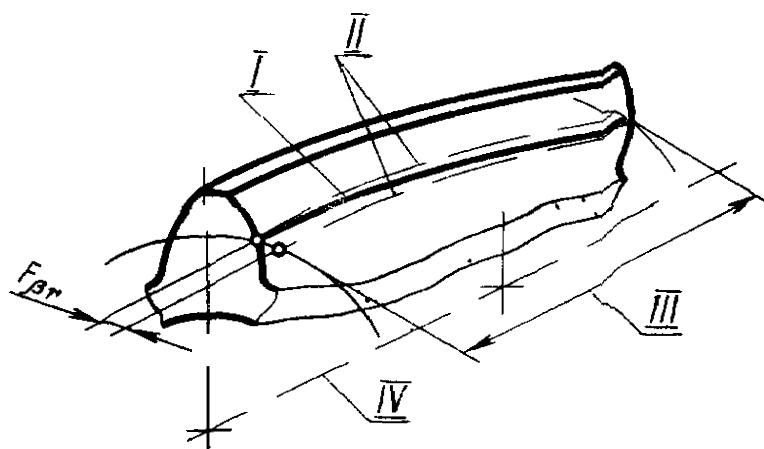
(5) ^

Fp_r. ^ ^

, 0 1

(. 9). ^

, ^ #

I — ^ » ^ " $\# > // -$
IV — <?**

9

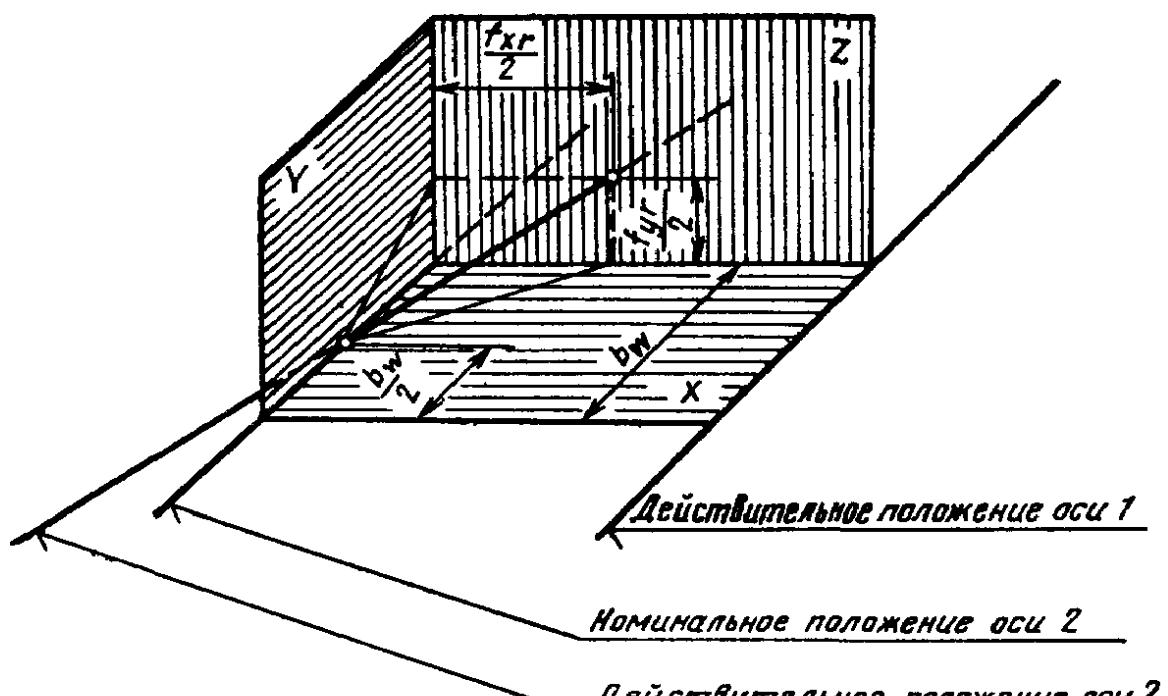
17 1
18

Fp . f^.. .

(10)

1.

2.



Черт. 10

18.1.

 f^* .

19.

1

19.1.

 f_y .

f

(. . . 18).

20.

20.1.

21.

 $j_n \min^*$ $\pm f_a$.

21.1.

22.

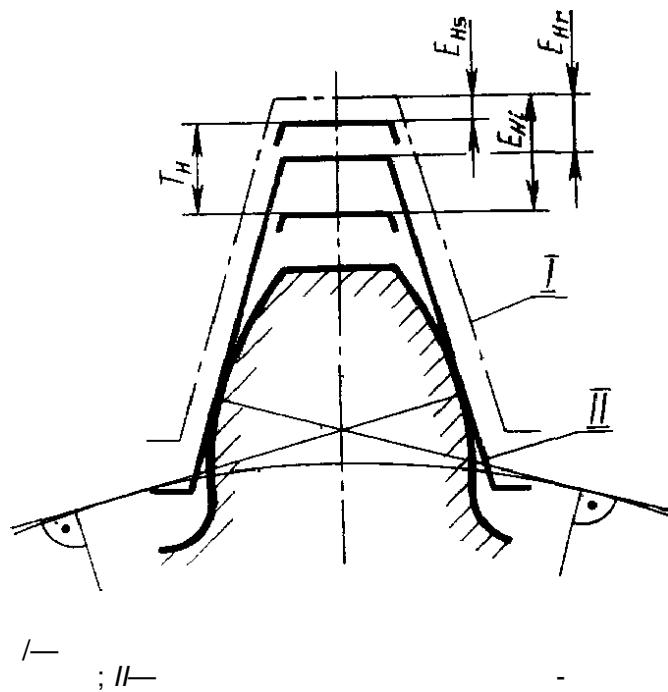
(. . .)

(. . .),

(. . 11),

22.1.

— \$;
+ :



22.2.

23.

—

+ ^ ;
— , \

—“

— $E_a \wedge s$;
+ $a r_{fi}$

(. 12).

24.

 W_{mr} .

(. 13).

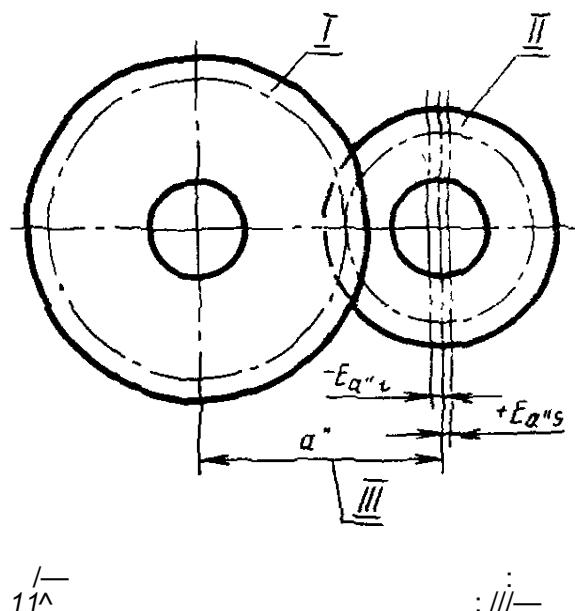
 $W_{mr} \bar{w} + + ..$

24.1,

 E_{Wmr} .

24.2.

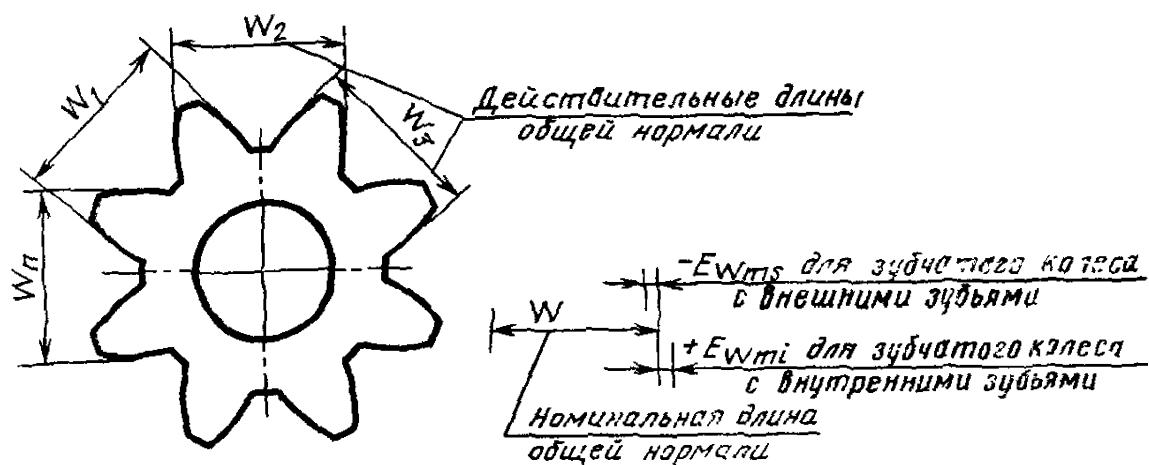
— E^{\wedge}_{ms} ,
+



11^

; //—

. 12



Черт. 13

24.3.

 T_{Wm}

25.

W.

25.1.

^

25.2.

— E_s¹,
+ ,

25.3.

 T_w

26. () , *

(26).

— E_s^{\wedge} ,
+ .

26 2. () * s

,

6

1.

$$F_p = 2V^r T + 9; F_{pk} = 1,6yT + 9$$

$$F_r = 7,5m + 1,4 \quad 4/1 \quad +5$$

$$F_{vw} = 0,6]/-d'' + 0,065d + 1,5$$

$$F| = 9m + 1,6]/7 + 0,01rf + 10$$

:

$$F_r, F_{rf} F_{vw}$$

1.58 —	6	5, 4	3	;
1.4 —	6	7		;
1.26 —	7			;
				$F_p \quad F_{pk}$
1.58 —	6	5, 4	3	;
1.4 —	6			;

2.

$$1 \quad 1=2 \quad +7,4$$

$$if=2m+6,4$$

$$f \quad j=5,5m+8$$

:

1.58 —	6	5, 4	3	;
1.4 —	6			;
1.4 —	6	5, 4	3	;
1.26 —	6			;
				$f_p t \quad fpb$
1.4 —	6	5,	7 8	;
1.26 —	8			;

3.

$$Fp " \quad ^w+5$$

:

1.26 —	6	5, 4	3,	7	,
1.4 —	7				;

:

:

<i>d</i> —				;
------------	--	--	--	---

<i>b</i> _w —				;
-------------------------	--	--	--	---

<i>L</i> —				;
------------	--	--	--	---

2.	<i>d</i> ,	<i>b</i> _w ,	<i>L</i>	
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:

:

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3.

R20 R40.

1

		D					
		0 1	IT5	IT6	IT7	IT8	
jnmin							
- -		0.51 7 (II)		0.51 8 (III)		0.51 9 (IV)	
±f.							
- -		1 + !		1 6 - »		1 7+ 3	
- -		F _r +9 ()		1, 1Fr+10 (8)		1,2F _r +11 (*)	
* -							

1. jnm'in —f_a

, , 8

Hs

2

C_{2t} 3, ,

-	, « 1 ci}; · · · | d*	3-6	7	8	9	10		
Ci	400	4	4	—	—	—	—	—
2	400	3	8	14	—	—	—	—
	50 50 400	5 5	8 7	14 12	23 19	36 29	—	—
w ±	50 50 180 180 400	5 5 8	7 11 8	12 17 14	20 27 18	32 25	51 45 38	79 71 57
	100 180 180 400	4 3 15	6 4 15	10 7 15	16 10 15	26 19 20	44 33 35	68 56 50

*	&	$f_{;0} = f_{;1} + F'_{;2}$ $F = F_p + f$
»		$F_{lc} = F_{pk} + f_t$
!4		F_P
as	k	F_{pk} F_r
		$F_c = F_{vW}$ F_{yW}
		$f T * 1.4 F_r$
VD		$f_0 = 1.25 f_{12}$
(		$\gg pt$ $f_{vp} = 1.6 / f_{pt}$
		$|f_{pb}| = |f_{pt}| \cos \theta$
		ff

g ,> >>		$f^* = F_p$ $f_y = 0,5 F_e$
*		$j_{n\min}$ $p = \frac{2j_{n\min}}{H_s \sqrt{4 \sin a}}$ $T_H > F_r$ $E_{Wms} = \frac{4-0,35F_r}{2 \sin a} 2 \sin a$ $E_{ws} = E_H \cdot 2 \sin a$ $T_W = T_H \cdot 2 a$ $E_{a'} = -f_l$ $E_{Wms} = \frac{\sin a_D \cdot \cos b}{T} \cdot 2 \sin a$ $J = \frac{1}{Wm}$ $M = \sin a_D - \cos b$ $j_{n\max} = 1 \cdot 1$ $+ V 0.5(T^2 + T f_l^2) + 2 f_l^2$
1. 2. k_j	1, 2 0	,

$$k_j = V(f \cdot 2 \sin a)^2 4 - 2 f p_b + 2 F_p + (f_x \sin a)^* - (f_y \cos a)^*.$$

$$\& E_{Hs} (H_i)_s$$

$$= -4 J_{n\max} (j_{n\min}^2 - k_j)$$

$$.10 \quad 1 \quad 0,7$$

4.

 $E_{Hs} > E_{Ms} \cdot E_{Wms}$
 $\gg E_{IPrns}$

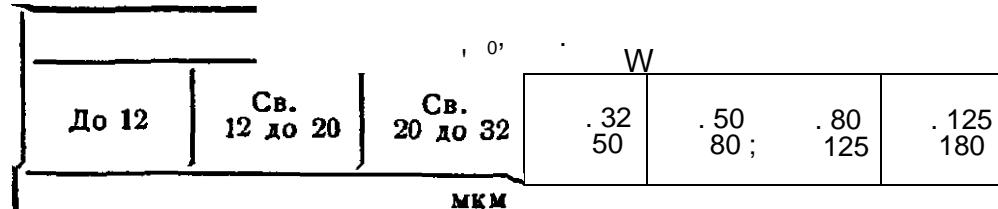
s i

6 1

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-	-	-	a _w ,							
			12	12 20	20 32	32 50	50 80	80 126	126 125	
3, 4		17	18	20	22	26	30	34		
	G	28	32	36	42	50	60	70		
	F	40	45	55	63	75	85	100		
		60	70	85	100	120	140	160		
	D	90	105	125	150	180	210	240		
5		20		%	2	1		40		
	G	30	35	40	45	53	60	70		
	F	40	45	55	63	75	90	105		
		63	70	85	100	125	140	160		
	D	90	110	130	150	180	210	240		
6		22	24	26	30	35	40	48		
	G	32	38	45	50	56	63	80		
	F	45	50	60	70	80	95			
		63	75	90	105	130	140	160		
	D	90		130	150	180	210	240		
7		25	28	32	38	42	48	55		
	G	34	42	48	55	63	70	85		
	F	48	55	63	75	85	95	110		
		70	80	95		130	150	170		
		95	110	130	160	190	220	250		
8	G	40	45	50	60	70	80	95		
	F	50	60	70	80	95	105	125		
		70	85	)	120	140	160	180		
	D	95			160	190	220	250		
	F	55	64	75	85	105	110	130		
9		80	90	105	120	140	160	180		
	D	100	120	140	160	190	220	260		
	F	63	75	80	95		125	140		
10		80	95		125	150	170	20U		
		D 1 105	125	140	170	210	240	2 >		

(0,5</ <1,0)



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	17	19	22	25	28	32	36
G	28	32	38	45	53	56	63
F	40	45	55	63	75	85	105
	60	70	85	100	120	140	160
D	90	105	125	150	180	210	240
	21	22	24	26	30	34	40
G	22	25	J 42	48	55	60	
F	45	50	60	70	80	90	100
	63	75	90	100	130	140	160
D	90	110	130	160	190	210	240
	25	26	30	34	38	42	48
G	35	40	45	53	60	63	80
F	48	53	60	70	85	95	
	63	75	95	105	130	140	160
D	95	>	130	160	) 20/	240	
	32	34	38	42	45	50	55
G	45	48	53	60	63	75	85
F	55	60	63	80	90	105	120
	75	85	95	110	130	150	170
D	100	110	130	160	190	220	250
G	50	55	60	63	70	85	95
F	60	63	75	85	95		125
	80	90	100	120	140	160	180
D	105	120	140	160	190	220	250

8

-	-	a _w *						
		12	» 12 20	20 32	32 50	50 80	80 125	125 180
9	F	70	75	80	90	100	120	140
		90	95	110	125	150	170	190
	D		125	140	170	200	240	280
10	F	80	85	90	100		130	150
		100	105	120	140	160	180	220
	D	120	130	150	180	200	240	280
11			120	140	150	170	200	240
	D	130	140	170	200	220	260	300
12		130	140	150	170	190	240	280
	D	150	160	180	220	240	280	340

^ —jnmin+ ^ ^

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			w > b_w	£_w=24		6_w=6			
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1	-	5	F'i	3!	39	—	—	—	—
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	-	5	^vW	—	—	6	11	—	—
	-	5	f ;	—	—	—	—	24	34
	-			20	20	—	*—	—	—
	-	6	fpb	—	—	±14	±14	—	
	-	6		—	—	11	11	—	
	-	6	f.	—	—	—*	—	17	17
	-	7	5.0	13	13	13	13	—	—
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	-	9	Λ				¹³ ±25	
	-	10	E _{Hs}	—22	-32	—	—	—
		11		30	42	—	—	—
	-	12, 13	E _{Wm8}	—	—	-21	-30	-21
		14	T _{Wm}	—	—	12	16	15
	-	12	Λ _{Ws}	—	—	-18	-25	-18
	-	15	T _w	—	—	20	28	22
	-	8 6	E _{a's}	TM		—	—	+ 17
	-	8	E _{a*j}			—	'—	- 7 —34 —48

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