

# Calendar

## 2 0 0 8

**JANUARY 1**

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

**FEBRUARY 2**

S	M	T	W	T	F	S
						1 2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	

**MARCH 3**

S	M	T	W	T	F	S
30	31					1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

**APRIL 4**

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

**MAY 5**

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

**JUNE 6**

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					

**JULY 7**

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

**AUGUST 8**

S	M	T	W	T	F	S
31						1 2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

**SEPTEMBER 9**

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

**OCTOBER 10**

S	M	T	W	T	F	S
		1	2	3	4	
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

**NOVEMBER 11**

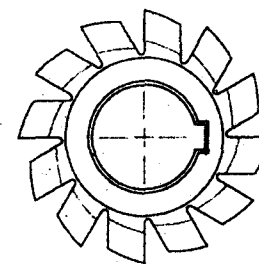
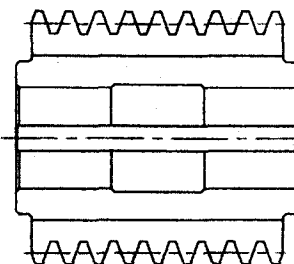
S	M	T	W	T	F	S
30						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29

**DECEMBER 12**

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			



### GEAR HOB



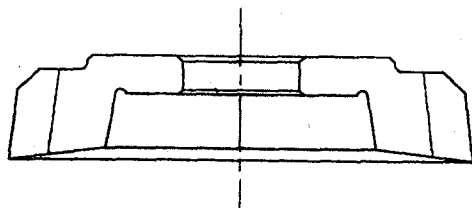
MODULE	DIAMETER	LENGTH	BORE
1.00	50	31	22
1.50	56	38	22
2.00	63	46	27
2.50	70	56	27
3.00	80	69	32
3.50	80	69	32
4.00	90	78	32
4.50	90	78	32
5.00	100	88	32
5.50	100	88	32
6.00	110	108	40
6.50	110	108	40
7.00	110	108	40
8.00	125	138	40
9.00	125	138	40
10.00	140	170	40
11.00	160	180	50
12.00	170	195	50
13.00	180	210	50
14.00	190	225	50
15.00	200	235	60
16.00	210	248	60
18.00	230	270	60
20.00	250	296	60

UNITS in mm



## GEAR SHAPING CUTTER

2



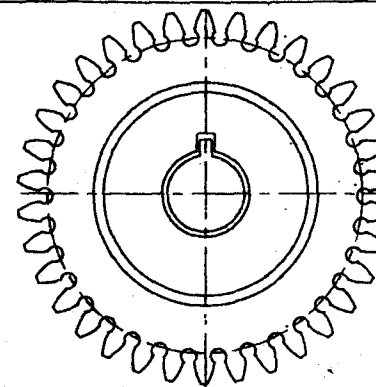
### HELICAL & SPUR SHAPER CUTTER

MODULE	NOMINAL DIAMETERS (in mm)			
	80	100	125	160
	NUMBER OF TEETH			
1.00	76	100	-	-
1.50	50	66	-	-
2.00	38	50	62	-
2.50	30	40	50	-
3.00	26	34	42	50
3.50	22	30	36	44
4.00	20	26	32	38
4.50	18	22	28	34
5.00	16	20	26	30
5.50	-	18	24	28
6.00	-	18	22	26
7.00	-	16	18	22
8.00	-	14	16	20
10.00	-	-	14	16



## GEAR SHAVING CUTTER

3



NORMAL MODULE (Mn)	NOMINAL DIAMETER (in mm)				
	175	200	225	250	300
	NUMBER OF TEETH				
1.50	113	137	149	157	-
1.75	97	113	131	137	-
2.00	89	97	113	131	-
2.25	79	89	97	113	-
2.50	67	79	89	97	-
2.75	61	73	79	89	-
3.00	59	67	73	83	-
3.25	53	61	67	73	-
3.50	47	59	61	71	-
3.75	47	53	59	67	-
4.00	43	47	53	61	73
4.50	-	43	47	53	67
5.00	-	41	43	51*	59
5.50	-	37	41	43	53
6.00	-	31	37	41	47
6.50	-	-	31	37	43
7.00	-	-	31	37	41
8.00	-	-	29	31	37
9.00	-	-	-	29	31
10.00	-	-	-	23	29
12.00	-	-	-	-	23

Cutter width in mm : Minimum 16 & maximum 40

Bore in mm : 44.45 or 63.5 or 100

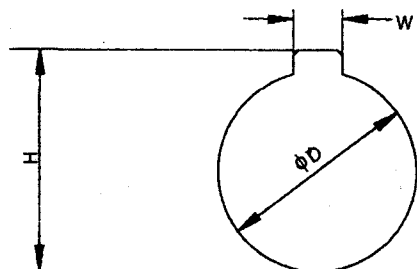
\*Not Prime

Check up with Gear NT before selecting



## STANDARD KEYWAY OF HOB

4



ALL DIMENSIONS ARE IN MM

### DIN 138 STANDARD

### BS-2062-1959 STD.

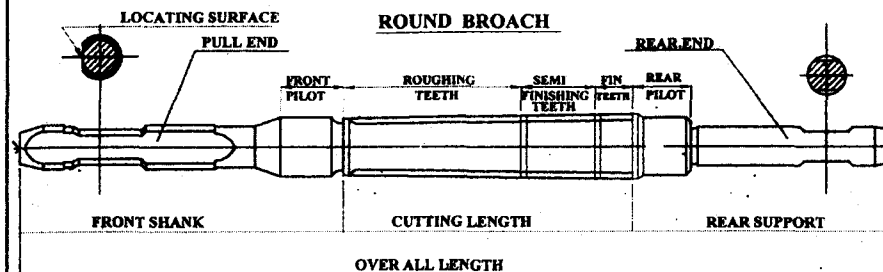
### ANSI B94.7 STD.

BORE	KEYWAY WIDTH	HEIGHT OF KEYWAY + BORE	BORE	KEYWAY WIDTH	HEIGHT OF KEYWAY + BORE	BORE	KEYWAY WIDTH	HEIGHT OF KEYWAY + BORE
$\phi D$	W	H	$\phi D$	W	H	$\phi D$	W	H
16	4.07 4.14	17.7 17.8	15.875 [5/8"]	3.35 3.22	17.72 18.11			
			19.05 [3/4"]	3.35 3.22	20.87 21.26	19.05 [0.75"]	3.480 3.302	21.158 20.904
22	6.07 6.14	24.1 24.3	22.225 [7/8"]	3.35 3.22	24.07 24.46			
27	7.08 7.17	29.8 30.0	25.4 [1"]	6.41 6.53	28.04 28.42			
32	8.08 8.17	34.8 35.0	31.75 [5/4"]	7.98 8.11	35.56 35.18	31.75 [1.25"]	6.655 6.477	35.433 35.179
40	10.08 10.17	43.5 43.7	38.1 [3/2"]	9.58 9.70	42.32 42.70	38.1 [1.5"]	10.16 9.799	43.383 43.129
50	12.095 12.205	53.6 53.8	50.8 [2"]	12.75 12.87	55.83 56.21	50.8 [2"]	13.335 12.954	57.658 57.404
60	14.095 14.205	64.2 64.4				63.5 [2.5"]	16.510 16.129	72.085 71.831

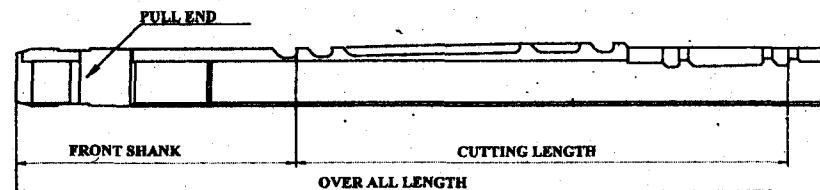


## BROACH NOMENCLATURE

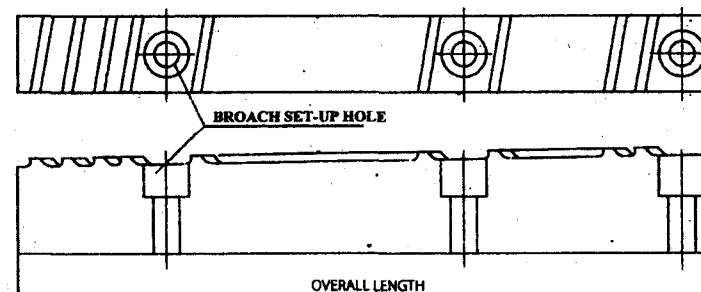
5



### KEY WAY BROACH

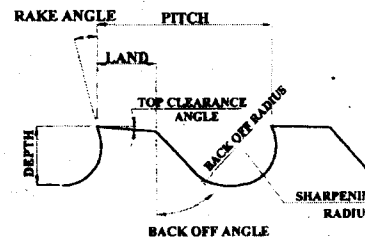


### SURFACE BROACH

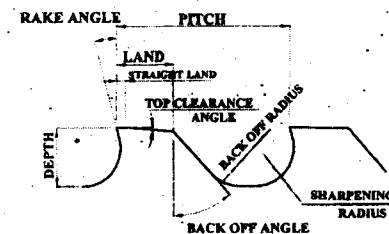


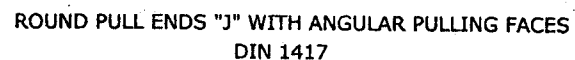
### TOOTH NOMENCLATURE

#### ROUGHING TOOTH FORM



#### FINISHING TOOTH FORM

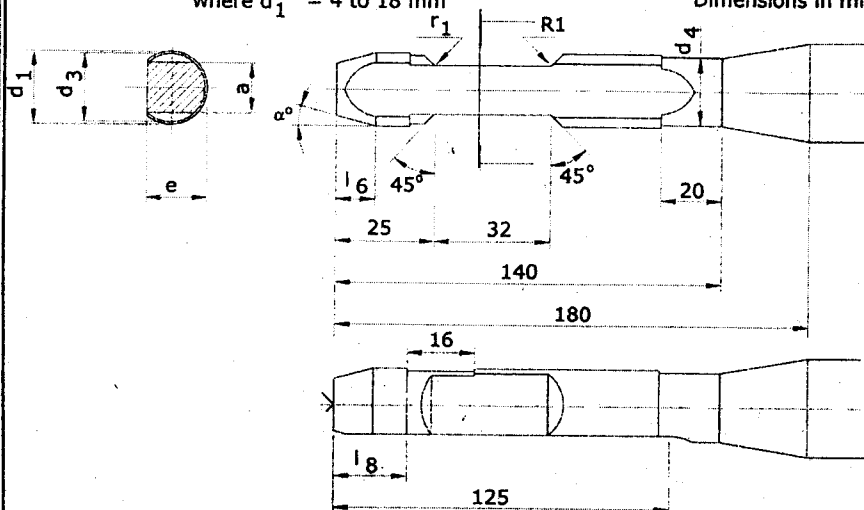




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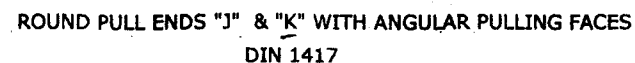
Form J with prevention against turning in the pulling chuck,  
where  $d_1 = 4$  to 18 mm

**Dimensions in mm**



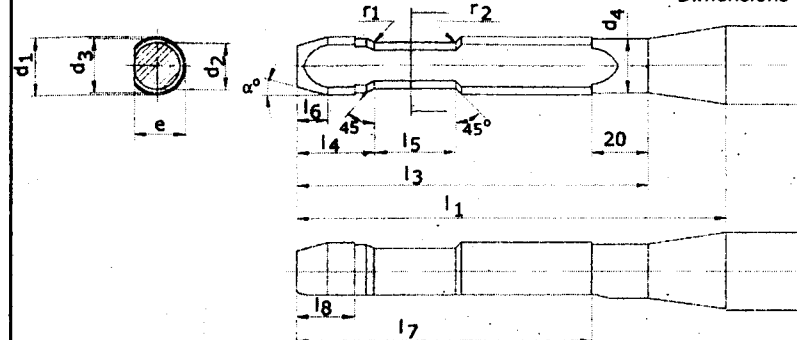
FORM "J" FOR  $d_1 = 4$  TO 18 mm

$d_1$	$a$	$d_3$	$d_4$	$e$	$l_6$	$l_8$	$r_1$	$\alpha^\circ$
$d_8$	$c_{11}$		Permissible variation	$e_8$				
4	2.3	3.8	4	3.25	0.6	21	0.2	45°
4.5	2.6	4.3	4.5	3.65				
5	3	4.8	5	4.1				
5.5	3.3	5.3	5.5	4.5				
6	3.6	5.8	6	5	1	20	0.2	45°
7	4.2	6.8	7	5.8				
8	4.8	7.8	8	6.7				
9	5.4	8.8	9	7.6				
10	6	9.8	10	8.3	10	20	0.2	10°
11	6.6	10.8	11	9.1				
12	7.2	11.8	12	10				
14	8.5	13.7	14	11.75	10	19	0.3	20°
16	10	15.7	16	13.5				
18	11.5	17.7	18	15.25				

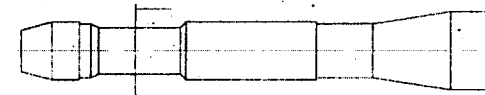


Form J with prevention against turning in the pulling chuck,  
where  $d_1 = 20$  to 160 mm Dime

**Dimensions in mm**

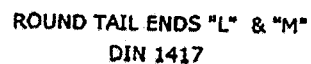


Form K without prevention against turning in the pulling chuck,  
where  $d_1 = 20$  to 160 mm



**FORMS "J" & "K" FOR  $d_1 = 20$  TO 160 mm**

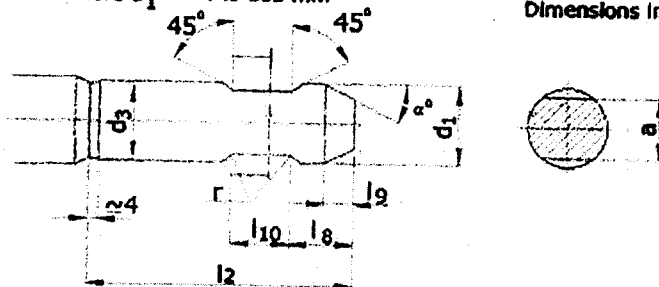
[illegible]



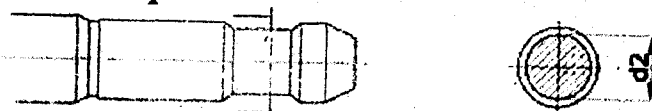
8

Form L with prevention against turning in the retrieving chuck,  
where  $d_1 = 4$  to 100 mm

**Dimensions in mm**



Form M without prevention against turning in the retrieving chuck,  
where  $d_1 = 20$  to 100 mm



FORM "L" & "M" FOR  $d_1 = 4$  TO 100 mm

FORM	d <sub>1</sub> e <sub>8</sub>	a=d <sub>2</sub> C <sub>11</sub>	d <sub>3</sub> 0 -1	l <sub>2</sub>	l <sub>8</sub>	l <sub>9</sub>	l <sub>10</sub>	r max	α°
L	4	2.3	4	63	16	0.6	16	0.2	45°
	5	3	5						
	6	3.6	6						
	8	5.5	8	80	20	8	20	0.3	10°
	10	7	10						
	12	9	12						
	✓ 16	12	16						
L, M	20	15	20	80	20	10	20	0.4	20°
	25	20	25						
	32	26	32	100	25	12	20	0.5	30°
	40	34	40						
	50	42	50	100	32	16	20	0.6	30°
	63	53	63						
	80	68	80	125	40	20	20	0.8	30°
	100	86	100						

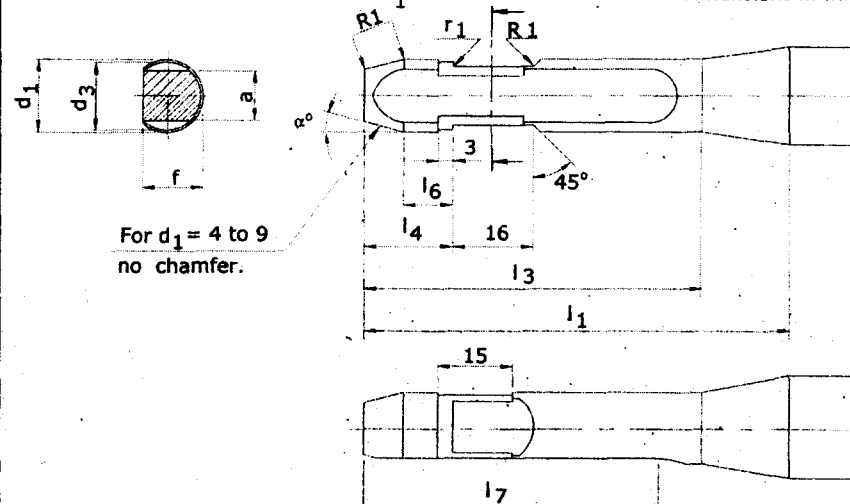


ROUND PULL ENDS "A"  
DIN 1415

C

Form A with prevention against turning in the pulling chuck,  
where  $d_1 = 4$  to 18 mm

**Dimensions in mm**



FORM "A" FOR  $d_1 = 4$  TO 18 mm

[illegible]

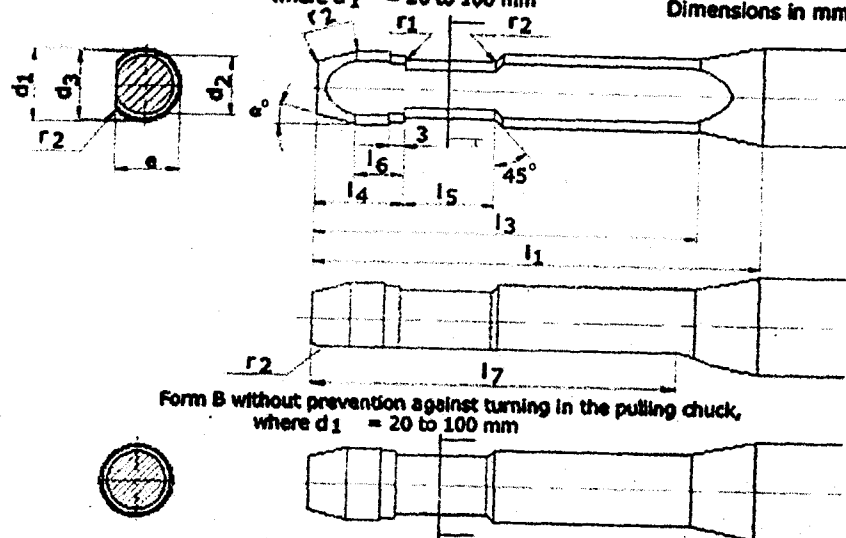


# ROUND PULL ENDS "A" & "B" DIN 1415

10

Form A with prevention against turning in the pulling chuck,  
where  $d_1 = 20$  to  $100$  mm

Dimensions in mm



Form B without prevention against turning in the pulling chuck,  
where  $d_1 = 20$  to  $100$  mm

FORMS "A" & "B" FOR  $d_1 = 20$  TO  $100$  mm

$d_1$ $d_8$	$d_2$ $c_{11}$	$d_3$	$e$ $e_8$	$l_1$	$l_3$	$l_4$	$l_5$	$l_6$	$l_7$	$r_1$	$r_2$	$\alpha^\circ$
20	15	19.7	17	210	170	25	16	12	160	0.3	1	20°
22	16.5	21.7	18.75									
25	19	24.7	21.5									
28	21	27.6	24									
32	24	31.6	27.5	220	180	32	20	16	170	0.4	1.6	20°
36	27	35.6	31									
40	30	39.5	34.5									30°
45	34	44.5	39									
50	38	49.5	43.5	230	190	40	25	20	180	0.5	2.5	30°
56	42	55.4	48.5									
63	48	62.4	55									
70	53	69.4	61									
80	60	79.2	69.5	270	230	50	32	25	220	0.6	4	30°
90	68	89.2	78.5									
100	75	99.2	87									
				315	275	63	40	32	265	0.8	6	30°

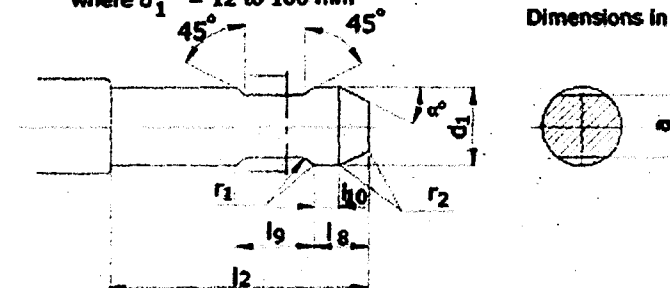


# ROUND TAIL ENDS "C" & "D" DIN 1415

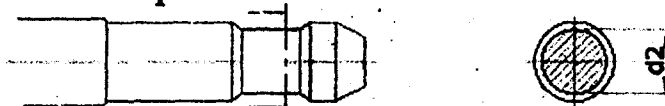
11

Form C with prevention against turning in the retrieving chuck,  
where  $d_1 = 12$  to  $100$  mm

Dimensions in mm



Form D without prevention against turning in the retrieving chuck,  
where  $d_1 = 20$  to  $100$  mm



FORM "C" & "D" FOR  $d_1 = 12$  TO  $100$  mm

FORM	$d_1$ $d_8$	$a$ $c_{11}$	$l_2$	$l_8$	$l_9$	$l_{10}$	$r_1$	$r_2$	$\alpha^\circ$
C	12	9	70	16	16	8	0.3	1	10°
	14	10							20°
	16	12							
	18	14							
C, D	20	15	90	20	20	10	0.3	1	20°
	22	17							
	25	20							20°
	28	22							
	32	26	125	25	25	12	0.4	1.6	20°
	36	30							
	40	34							30°
	50	42							
	63	53	160	28	28	16	0.6	4	30°
	80	68							
	100	86							
			200	32	40	20	0.8	6	30°



## QUICK GLANCE INFORMATION OF DIFFERENT SHAVING PROCESS

12

a. Work gear				
b. Shaving cutter				
c. Traverse motion				
d. Pivot point				
Shaving process	Conventional [Parallel or Traverse]	Diagonal [Angular Traverse]	Underpass [Right angle Traverse]	Plungecut [Plunge feed]
Traverse Angle	0°	>0° TO 45°	90°	Work upfeed only
Direction of Traverse	Parallel to work gear axis	At an angle to work gear axis	At right angle to work gear axis	
Length of Traverse motion	Larger than work gear width	Smaller than work gear width dependent on angle	Smaller than work gear width	
Crossed axis Angle α	10° to 15° ① For shaving next to shoulder interference > 3°			
Cutter face width	Independent of work gear	Dependent on work gear width	Larger than work gear width	
Arrangement of cutter serration	Normal		Staggered ②	
Form of pitch surface of cutter	Cylindrical	Cylindrical or Hyperboloid	Hyperboloid	
Cutter utilisation	Poor	Good		
Longitudinal crowning	By machine	By machine	By modification of cutter teeth	
Crowning along involute	By modification of cutter teeth			
Shaving time	Relatively long	Short	Very short	
NOTE: ① Applies to medium grade steel for grey cast iron, light alloys and plastics upto 20°. ② Protected by patents.				



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## GRADES OF HIGH SPEED STEEL

GRADE	C	W	Mo	Cr	V	Co	PROCESS
M2	0.9	6.4	5.0	4.2	1.8		CONVENTIONAL
M3 TYPE 2	1.2	6.2	5.0	4.1	3.0		CONVENTIONAL
M35	0.93	6.4	5.0	4.2	1.8	4.8	CONVENTIONAL
ASP 2023	1.28	6.4	5.0	4.1	3.1		POWDER METALLURGY
ASP 2030	1.28	6.4	5.0	4.2	3.1	8.5	POWDER METALLURGY
ASP 2052	1.6	10.5	2.0	4.8	5.0	8.0	POWDER METALLURGY

## RECOMMENDED SHAVING ALLOWANCES

Normal Module	Normal Diametral Pitch	Shaving stock on span measurement (in mm)	Stock allowed over two pins (in mm)		
			14.5°	20°	25°
1.50 to 2.00	16.93 to 12.70	0.06	0.14	0.14	0.12
2.01 to 3.25	12.64 to 7.82	0.08	0.22	0.19	0.16
3.26 to 4.25	7.79 to 5.98	0.09	0.29	0.23	0.18
4.26 to 6.25	5.96 to 4.06	0.10	0.32	0.26	0.21



## CUTTER MATERIALS USED

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Hob	-	M35 / ASP 2030 / ASP 2052
Shaping cutter	-	M35 / ASP 2030
Master Gear	-	M2
Shaving Cutter	-	M2 / ASP 2023 / SKH - M
Spline Broach	-	M2 / M35 / ASP 2023 / ASP 2030 / M3 Type 2 / SKH - M
Round Broach / Keyway Broach	-	M2
Surface Broach	-	M2
Rotary Cutter	-	M2 / ASP 2023
Milling Cutter	-	M35 / ASP 2030

## MEMORANDA

NAME PRAMO  
ADDRESS SHREE  
NEW SANGVI

TELEPHONE (020)

FAX

MOBILE 93877

E-MAIL p.p.palkar

PASSPORT NO.

DRIVING LICENCE NO.

BANK / ATMA / C NO.

CREDIT CARD NO.

INCOME TAX PAN NO.

BLOOD GROUP O+

VEHICLE INSURANCE R

LIC INSURANCE

MEDICAL INSURANCE F

PHYSICIAN

SERVICE STATION

AMBULANCE

BANK MANAGER

INSURANCE AGENT

TRAVEL AGENT

AIRPORT

RAILWAY STATION

TAXI SERVICE

GAS AGENCY