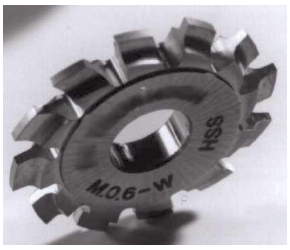
CYCLOIDAL CLOCK & WATCH WHEEL & PINION CUTTERS



A range of finest quality cutters made from high speed steel hardened and treble tempered under vacuum. This steel, with a hardness circa 68 Rockwell C. maintains a good cutting edge which offers long periods between sharpenings.
Brass for wheels should be hard or half-hard, with a typical composition of 61-64% copper, 1-2% lead and the balance zinc. Soft brass will clog the cutter.
Steel for pinions should be free cutting silver steel with a typical composition including 1% Carbon, 0.55% Manganese and 0.20% Selenium

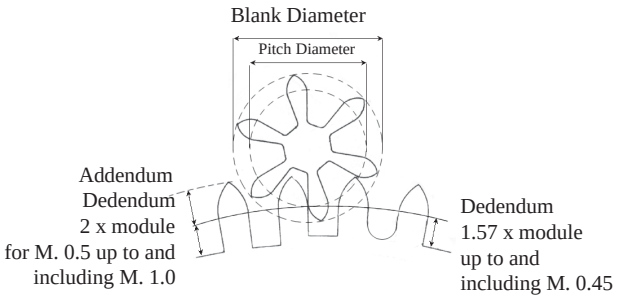


Table of addendum allowances

No. of leaves	Ogive	Ratio Tooth / space	Add to number of teeth or leaves
6	Full	1/2	1.71
7	Full	1/2	1.71
8	Full	1/2	1.71
10	1/3	2/3	1.61
12	1/3	2/3	1.61
16	1/3	2/3	1.61
Wheel	-	1/1	2.76

CALCULATION OF THE MODULE

Module M = Pitch circle diameter in mm (D) / No. of teeth in wheel or leaves in the pinion (N)
Also M = Twice the centre distance in mm / Sum of teeth in wheel and pinion

CALCULATION OF BLANK DIAMETER

Blank diameter = Module x (N + addendum allowance from table above).

Example: for a pinion of 6 leaves and a Module of 0.7,
Blank diameter = 0.7 x (6 + 1.71) = 5.397 mm.

Note that this enables the module of a wheel or pinion to be found when the centre distance is not known.
For Module M = Tip diameter / N + Addendum allowance.
For odd pinions of say 7 leaves use a hole gauge to measure the tip diameter

PROFILE DIMENSIONS FOR CLOCK & WATCH WHEEL & PINION CUTTERS

PINIONS

All dimensions as ratios of the module. M millimetres BS 978 : part 2. As Swiss Standard NHS 56703 except for*

Number of leaves	6	7	8	10	12	16
Pitch circle diameter	6 x M	7 x M	8 x M	10 x M	12 x M	16 x M
Outside or Tip diameter (diameter of blank)	7.71 x M	8.71 x M	9.71 x M	11.61 x M	13.61 x M	17.61 x M
Root diameter*	2.5 x M	3.3 x M	4.2 x M	5.9 x M	7.8 x M	11.8 x M
Leaf thickness	1.05 x M	1.05 x M	1.05 x M	* 1.25 x M	1.25 x M	1.25 x M
Addendum radius	1.05 x M	1.05 x M	1.05 x M	0.82 x M	0.82 x M	0.82 x M
Form of addendum	Full Ogive , profile “C” (r = leaf thickness)			1/3 ogive, profile “B” (r = 2/3 of a leaf thickness)		
Angle of cutter flank	20°	17°- 9'	15°	10° - 48'	9°	6°-45'
Tooth/pitch ratio	1/3	1/3	1/3	2/5	2/5	2/5
Addendum	0.855 x M	0.855 x M	0.855 x M	0.805 x M	0.805 x M	0.805 x M
Dedendum	1.75 x M	1.85 x M	1.90 x M	2.05 x M	2.10 x M	2.10 x M
Full tooth depth (depth of feed)	2.605 x M	2.705 x M	2.755 x M	2.855 x M	2.905 x M	2.905 x M
Length of cutting edge or profile for M. = 1.0	6.58 x M	6.90 x M	7.11 x M	7.38 x M	7.59 x M	7.75 x M

Appendix

WHEELS
All dimensions as ratios of the module. M millimetres BS 978 : part 2. As Swiss Standard NHS 56702 except for*:

Module M.	**Up to and including 0.45, and 1.1 to 1.5**	**0.5 and up to and including 1.0**	**Short Form 0.2 to 1.0**
Number of teeth	N	N	N
Pitch circle diameter	N.x M	N x M	N x M
Outside or Tip diameter (diameter of blank)	(N + 2.76) x M	(N + 2.76) x M	(N + 2.76) x M
Root diameter	(N - 3.14) x M	* (N - 4) x M	(N - 2.14) x M
Tooth thickness	1.57 x M	1.57 x M	1.57 x M
Addendum radius	1.93 x M	1.93 x M	1.93 x M
Angle of cutter flank	2°	2°	2°
Addendum	1.38 x M	1.38 x M	1.38 x M
Dedendum	1.57 x M	* 2 x M	1.07 x M
Full tooth depth (depth of feed)	2.95 x M	3.38 x M	2.45 x M
Length of cutting edge or profile for M. = 1.0	8.18 x M	9.01 x M	7.18 x M

PINIONS SHOULD NEVER BE CUT DRY:
A copious stream of cutting oil should be used to keep the cutter cool and remove the chips. (Mobilnet 745 or equivalent).

For cutting pinions for old work with thicker leaves, use cutter 0.05 module smaller than calculated. The addendum allowance is unchanged.

RECOMMENDED CUTTING SPEEDS:
For cutting carbon steel pinions with high speed steel cutters:
Cutter diameter 14 mm 430-500 rpm
Cutter diameter 20 mm 300-350 rpm
Cutter diameter 24 mm 250-290 rpm
Cutter diameter 26 mm 230-270 rpm

For cutting brass a speed of 3-400 rpm should be used.