



UDDEHOLM

CUTTING DATA RECOMMENDATIONS

DIEVAR

Annealed English Units

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Machining data are always dependent on the actual operation, the machine tool and the cutting data used. The machining data given in this datasheet are general guidelines that may have to be adjusted to the actual conditions of a specific machining operation.


Turning

Turning 	Cemented carbide		HSS
	Roughing	Finishing	
Cutting speed, v_c (ft/min)	490-655	655-820	50-65
Feed, f (in/rev)	0.008-0.016	0.002-0.008	0.002-0.012
Depth of cut, a_p (inch)	0.08-0.16	0.02-0.08	0.02-0.12
Suitable grades	C6-C5 Coated carbide	C7 Coated carbide or cermet	

Remarks:

1. Cutting fluid is recommended.
2. For turning with interrupted cut or face turning of large workpieces use a tougher cemented carbide grade.


Face milling

Face milling 	Cemented carbide	
	Roughing	Finishing
Cutting speed, v_c (ft/min)	490-590	590-720
Feed, f_z (in/tooth)	0.008-0.016	0.004-0.008
Depth of cut, a_p (inch)	0.08-0.20	-0.08
Suitable grades	C6-C5 Coated carbide	C7 Coated carbide or cermet

Remarks:

1. Use a milling cutter with a positive-negative or positive-positive geometry.
2. Climb milling should generally be used.
3. Milling should generally be done without coolant. If a high surface finish is required coolant may be used.
4. Cermets can be of use when finishing under stable conditions.

Square shoulder milling

Square shoulder milling with cemented carbide 			
	$a_e = 0.1 \times D$	$a_e = 0.5 \times D$	$a_e = 1 \times D$
Cutting speed, v_c (ft/min)	490-590	460-560	425-525
Feed, f_z (in/tooth)	0.010-0.012	0.006-0.008	0.004-0.006
Suitable grades	C6-C5 Coated carbide		

Remarks:

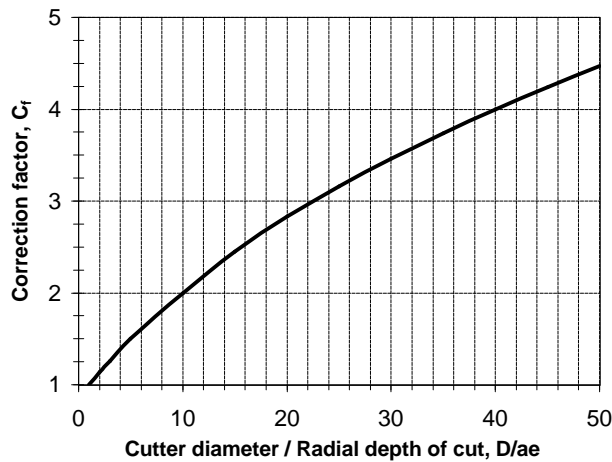
1. Climb milling should generally be used.
2. Choose the cutter diameter (D) and the radial depth of cut (a_e) so that at least two cutting edges are engaged simultaneously.
3. If the machine tool power is inadequate for the data given reduce the depth of cut, but do not reduce the feed.

End milling

Slot milling		Cutter diameter (inch)				
		$2/64 - 1/4$	$1/4 - 1/2$	$1/2 - 3/4$	$3/4 - 1 1/4$	$1 1/4 - 1 3/4$
Uncoated HSS ¹⁻⁴⁾	Cutting speed, v_c (ft/min)	80-100				
	Feed, f_z (in/tooth)	0.0004-0.0012	0.0012-0.0016	0.0016-0.0020	0.0020-0.0023	0.0023-0.0035
Coated HSS ¹⁻⁴⁾	Cutting speed, v_c (ft/min)	150-165				
	Feed, f_z (in/tooth)	0.0008-0.0016	0.0016-0.0020	0.0020-0.0023	0.0023-0.0027	0.0027-0.0039
Solid cemented carbide ⁵⁻⁸⁾	Cutting speed, v_c (ft/min)	425-560				
	Feed, f_z (in/tooth)	0.0002-0.0004	0.0004-0.0008	0.0008-0.0016		
Indexable insert ⁶⁻⁸⁾ (cemented carbide inserts)	Cutting speed, v_c (ft/min)	390-525				
	Feed, f_z (in/tooth)			0.0023-0.0031	0.0031-0.0039	0.0039-0.0045
	Suitable grades	C6-C5 Coated carbide				
Side milling		For side milling the same cutting speed as for slot milling can be used, but the feeds must be adjusted in order to obtain a suitable average chip thickness.				

Correction factor for side milling

Divide the cutter diameter with the radial depth of cut. See in the chart below which correction factor, C_f , this corresponds to, and multiply the chosen feed in the table for slot milling with this factor.



Example:

Tool:
CC insert

Cutter diameter:
 $D = 1.57$ inch

Radial depth of cut:
 $a_e = 0.08$ inch

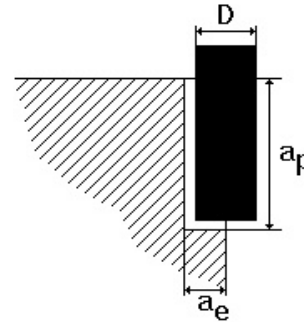
$$D/a_e = 1.57/0.08 = 20$$

Feed acc. to table slot milling = 0.004 ft/tooth

Correction factor acc. to chart: $C_f = 2.8$

Feed for side milling:

$$f_z = 2.8 \times 0.004 = 0.011 \text{ in/tooth}$$



Remarks: (slot and side milling)

1. Climb milling is generally recommended.
2. Use a cutter with chipbreaker when side milling with radial depths of cut, $a_e > 0.3 \times D$.
3. When side milling with small radial depths of cut (a_e) the cutting speed can be increased by up to 15%.
4. Use liberal amounts of cutting fluid.
5. It is recommended to use a TiCN coated cutter when milling with solid cemented carbide tools.
The axial depth of cut should not exceed the cutter diameter.
6. Climb milling is generally recommended.
7. When side milling with small radial depths of cut (a_e) the cutting speed can be increased by up to 30%.
8. The radial run-out, at the cutting edges, must be small and not exceed 0.001 inch.

Drilling

Drilling		Drill diameter (inch)				
		$\frac{2}{64} - \frac{1}{4}$	$\frac{1}{4} - \frac{1}{2}$	$\frac{1}{2} - \frac{3}{4}$	$\frac{3}{4} - 1\frac{1}{4}$	$1\frac{1}{4} - 1\frac{3}{4}$
Uncoated HSS ¹⁻²⁾	Cutting speed, v_c (ft/min)	50-65				
	Feed, f (in/rev)	0.002-0.006	0.006-0.010	0.010-0.014	0.014-0.016	0.016-0.018
Coated HSS ¹⁻²⁾	Cutting speed, v_c (ft/min)	115-130				
	Feed, f (in/rev)	0.003-0.007	0.007-0.012	0.012-0.016	0.016-0.018	0.018-0.020
Indexable insert ³⁻⁴⁾ (cem. carbide inserts)	Cutting speed, v_c (ft/min)				590-720	
	Feed, f (in/rev)				0.002-0.004	0.004-0.006
Solid cemented carbide ⁵⁻⁷⁾	Cutting speed, v_c (ft/min)	390-490				
	Feed, f (in/rev)	0.003-0.004	0.004-0.008	0.008-0.012	0.012-0.014	
Brazed cemented carbide ⁵⁻⁷⁾	Cutting speed, v_c (ft/min)	195-295				
	Feed, f (in/rev)	0.006-0.010		0.010-0.014	0.014-0.016	

Remarks:

1. The cutting fluid should be ample and directed at the tool.
2. When drilling with short "NC drills" the feed may be increased by up to 20%.
For extra long drills the feed must be decreased.
3. Use insert grades in the range C6 - C5
Under unstable conditions a tougher carbide grade should be used for the centre position.
4. Use a high cutting fluid pressure and flow rate for a good chip removal.
5. If machining with solid or brazed cemented carbide drills, a rigid set-up and stable working conditions are required.
6. The use of drills with internal cooling channels is recommended.
7. Use a cutting fluid concentration of 15-20 %.

Tapping with HSS

Cutting speed, v_c =26-44 ft/min

Remarks:

1. Fluteless tap (non-cutting) can with advantage be used
2. Threading compound gives a longer tool life than emulsion.