

## RECOMMENDED CUTTING CONDITIONS

### Overhang below 5D (D is end mill diameter)

Work material	Alloy steel, Tool steel, Pre-hardened steel				Hardened steel (45–55HRC)				Hardened steel (55–62HRC)									
	X40CrMoV51				X40CrMoV51				X210Cr12									
	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut ap (mm)	Depth of cut ae (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut ap (mm)	Depth of cut ae (mm)	$\alpha \leq 15^\circ$		$\alpha > 15^\circ$		Depth of cut ap (mm)	Depth of cut ae (mm)
Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )			Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )			Feed rate (mm/min)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Revolution (min <sup>-1</sup> )		
R 0.5	40000	5200	36000	2300	0.10	0.25	40000	5200	36000	2300	0.10	0.25	40000	5000	40000	2400	0.05	0.10
R 1	40000	6000	36000	3500	0.20	0.50	40000	6000	36000	3500	0.20	0.50	36000	5000	24000	2400	0.10	0.20
R 1.5x3	29000	4600	19000	2400	0.20	0.50	25000	4000	16000	2000	0.20	0.50	17000	2400	11000	1000	0.12	0.30
R 1.5	37000	7000	24000	3000	0.30	0.75	37000	7000	24000	3000	0.30	0.75	25000	6000	16000	2200	0.12	0.30
R 2x4	24000	4300	15000	2200	0.25	0.70	19000	3400	13000	1700	0.25	0.70	12000	1900	8200	900	0.13	0.40
R 2	30000	6500	19000	2800	0.40	1.00	28000	6000	19000	2600	0.40	1.00	18000	4800	12000	2000	0.13	0.40
R 2.5	25000	6000	16000	2600	0.50	1.30	22000	5000	16000	2300	0.50	1.25	15000	4200	9500	1700	0.15	0.50
R 3	22000	6000	14000	2400	0.60	1.80	18000	4500	12000	1900	0.60	1.50	12000	3500	8000	1600	0.20	0.60
R 4	19000	5200	12000	2200	0.80	2.40	15000	3800	9500	1700	0.80	2.00	9800	3000	6500	1300	0.20	0.80
R 5	15000	4300	9500	2000	1.00	3.00	11000	3000	7000	1500	1.00	2.50	7500	2400	5000	1000	0.20	1.00
R 6	12000	3400	8000	1800	1.20	3.60	9000	2400	6000	1400	1.20	3.00	6000	1900	4000	800	0.30	1.20
R 8	9000	2600	6000	1500	1.60	4.80	7000	1900	4500	1100	1.60	4.00	4500	1500	3000	600	0.30	1.60
R10	7500	2200	4800	1200	2.00	6.00	5500	1500	3600	900	2.00	5.00	3600	1200	2500	500	0.30	2.00

The diagram illustrates the cutting process with a tool cutting a workpiece. The depth of cut is labeled as 'ap' (axial) and 'ae' (radial). The axial depth of cut 'ap' is shown as the distance between the tool's entry and exit points along the axial direction. The radial depth of cut 'ae' is shown as the distance from the centerline to the edge of the cut. A note indicates that the axial depth of cut 'ap' is less than or equal to the radial depth of cut 'ae' (ap ≤ ae).

- 1)  $\alpha$  is the inclination angle of the machined surface.
- 2) If the depth of cut is shallow, the revolution and feed rate can be increased.
- 3) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.

### Overhang 7D (D is end mill diameter)

Work material	Alloy steel, Tool steel, Pre-hardened steel				Hardened steel (45–55HRC)			
	X40CrMoV51				X40CrMoV51			
R (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)	Revolution (min <sup>-1</sup> )	Feed rate (mm/min)	Depth of cut ap (mm)	Depth of cut ae (mm)
R 1.5x3	16000	2000	0.10	0.30	13000	1500	0.10	0.30
R 2x4	13000	2000	0.15	0.50	10000	1500	0.15	0.50
R 3	10000	2000	0.20	1.00	8000	1600	0.20	0.80
R 4	8000	1800	0.30	1.50	6400	1400	0.40	1.20
R 5	6000	1600	0.40	2.00	4800	1200	0.40	1.60
R 6	5000	1300	0.45	2.40	4000	1000	0.45	2.00
R 8	3800	1000	0.60	3.00	3100	800	0.60	2.50
R10	3000	800	0.80	4.00	2500	650	0.80	3.00

The diagram illustrates the cutting process with a tool cutting a workpiece. The depth of cut is labeled as 'ap' (axial) and 'ae' (radial). The axial depth of cut 'ap' is shown as the distance between the tool's entry and exit points along the axial direction. The radial depth of cut 'ae' is shown as the distance from the centerline to the edge of the cut.

- 1) If the rigidity of the machine or the work materials installation is very low, or chattering and noise are generated, reduce the revolution and feed rate proportionately.