ACO Eurobar® machining recommendation

ACO

Continuous cast ductile iron: **EN-GJS-500-7C**

Turning

The parameters tabulated result in a tool life of approx. 15 min. Cutting fluid recommended especially for internal turning (not cermet or ceramics).

	Tool material (tip angle ≥80°)	Cutting speed, V_c [m/min] [1]	Depth of cut, a_p [mm]	Feed, f [2] [mm/rev]	Power [kW] [3]
Rough turning	- Coated carbide, ISO K10-K20 - Si_3N_4-based ceramic	220 - 320 500 - 700	2.0 - 4.0 2.0 - 4.0	0.2 - 0.6 0.15 - 0.6	2 - 15 3 - 34
Fine turning	- Coated carbide, ISO K01-K05 - Cermet - Al_2O_3-based mixed ceramic	320 - 470 320 - 470 550 - 750	0.2 - 1.0 0.2 - 1.0 0.2 - 1.0	0.05 - 0.2 0.05 - 0.2 0.05 - 0.2	0.1 - 2 0.1 - 2 0.1 - 3

[1] $V_c = (\pi \times D \times N)/1000$ where D is the workpiece diameter and N the spindle speed in r.p.m.
[2] Arithmetic mean surface finish, Ra (micrometres) ≈ $50 \times f^2/r$ where r is the cutting-edge radius. Likewise, the profile depth, Rt, can be approximated as $125 \times f^2/r$. Surface finish is improved further via use of a so-called wiper tool.
[3] To convert kW to horsepower multiply by 1.341.

For conditions other than as specified above, adjust as follows:

- Intermittent rough turning – use a tougher grade of carbide, e.g. K30
- Tool change after 30 min. – multiply speed by 0.85
  Change after 60 min. – multiply speed by 0.7
- Tip angle less than 80° - multiply speed by 0.9
- No cutting fluid – multiply speed by 0.9 (does not apply for turning with cermet or ceramic tool)
- Unstable conditions, e.g. long tool-holder – multiply speed by 0.8-0.9
- Outer chill zone of continuous-cast bar – multiply speed by 0.7

Drilling

The parameters tabulated give a drilled length to failure of approx. 2 m for HSS and 50 m for carbide. Short holes, depth ≤ 5 x D. Cutting fluid supplied at sufficiently high pressure is essential; internal cooling for carbide drills, external for HSS.

Drill material	Cutting speed, V_c [m/min]	Spindle speed, N [r.p.m.] [1]	Feed, f [mm/rev]	Time to failure or regrind [2] [min]
High-speed steel, uncoated D=1-10 mm	40 - 70	2,500 - 4,500 for D=5 mm	0.1 - 0.2	2.2 - 8 for D=5 mm
Solid carbide, coated D=5-20 mm	100 - 180	3,200 - 5,700 for D=10 mm	0.4 - 0.8	11 - 39 for D=10 mm
Indexable insert drill, coated D > 20 mm	120 - 200	1,900 - 3,200 for D=20 mm	0.4 - 0.8	20 - 65 for D=20 mm

[1] $N = (1000 \times V_c)/(\pi \times D)$ where D is the drill diameter and N the spindle speed in r.p.m.
[2] Time to failure in minutes is (drilled length to failure in mm)/(N x f).

For conditions other than as specified above, adjust as follows:

- Drilled length to failure doubled – multiply speed (and r.p.m.) by 0.7
- Drilled length to failure halved – multiply speed (and r.p.m.) by 1.2
- HSS tool coated – multiply speed (and r.p.m.) by 1.5
- External cooling (carbide only) – multiply speed by 0.9
- Unstable conditions e.g. long drill holder – multiply speed by 0.8-0.9
- Outer chill zone of continuous-cast bar – multiply speed by 0.7

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Face milling

The parameters tabulated result in a tool life of approx. 15 min. Down-milling is recommended whenever possible. Milling cutters with double positive or positive/negative geometry work best but double negative geometry can be used if machine power and stability are sufficient. Milling with cermet and ceramic tools should be performed dry. Even carbide can, if preferred, be used dry but coolant brings the advantage that graphite dust is reduced.

	Tool material	Cutting speed, V_c [m/min] [1]	Depth of cut, a_p [mm]	Feed, f_z [2] [mm/tooth]
Rough milling	- Coated carbide, ISO K20-K30 - Si_3N_4-based ceramic[3]	140 - 220 600 - 800	2.0 - 5.0 2.0 - 5.0	0.2 - 0.4 0.15 - 0.3
Fine milling	- Coated carbide, ISO K05-K10 - Cermet [3] - Si_3N_4-based ceramic[3]	200 - 350 200 - 350 600 - 800	< 2.0 < 2.0 0.2 - 1.0	0.05 - 0.2 0.05 - 0.2 0.05 - 0.2

[1] $V_c = (\pi \times D \times N)/1000$ where D is the tool diameter and N the spindle speed in r.p.m.
[2] $f_z = V_f/(N \times z)$ where V_f is the table speed and z the number of teeth/inserts in the cutter.
[3] A stable machine is a prerequisite for milling with a cermet or ceramic tool.

For conditions other than as specified above, adjust as follows:

- Intermittent rough milling – use a tougher grade of carbide, e.g. K40
- Tool change after 30 min. – multiply speed by 0.85
  Change after 60 min. – multiply speed by 0.7
- Unstable conditions, e.g. poorly-clamped workpiece – multiply speed by 0.8-0.9
- Outer chill zone of continuous-cast bar – multiply speed by 0.7

Parting and grooving

The parameters tabulated result in a tool life of approx. 15 min. in intermittent operation. Note that the spindle r.p.m. must as far as possible be increased as the workpiece diameter decreases so as to maintain the specified V_c. Cutting fluid is strongly recommended especially for internal grooving; tools with internal cooling channels perform best.

Tool material	Cutting speed, V_c [m/min] [1]	Feed, f [mm/rev]
Coated carbide, ISO K20-K30	200 - 300	0.05 - 0.2

[1] $V_c = (\pi \times D \times N)/1000$ where D is the workpiece diameter (decreases during the operation) and N the spindle speed in r.p.m.

Optimisation of machining data for a given material is always strongly dependent upon the combination of operation, machine and tool characteristics. The data given in this sheet are to be regarded as indicative only and will in some instances require modification in parity with the actual conditions which prevail in a specific machining operation.

ACO Eurobar GmbH

Am Gusswerk 8
67663 Kaiserslautern
Germany
Tel.: +49 631 2011-0

www.aco-eurobar.com
info@aco-eurobar.com