



COMETAL

6026 & 2033 & 2077
HOW TO MACHINE
USEFUL TIPS FOR EXCELLENT PERFORMANCE

LEAD - FREE

FREE-CUTTING ALUMINIUM ALLOYS

LEAD-FREE

HOW TO ACHIEVE SMALL CHIPS WITH LEAD-FREE ALLOYS

Achieving small chips during machining is the result of four factors:

- ❖ Raw material quality
- ❖ Lubricants & coolants
- ❖ Inserts
- ❖ Machining parameters

All the above are equally important.

The following provides a short and useful guide on how to achieve the best results from machining alloys 2033 & 2077 & 6026 LEAD-FREE

1. RAW MATERIAL QUALITY

The choice and quality of raw material is crucially important as several factors contribute to the determination of a bar that can create a small chip.

CHIP BREAKING ELEMENTS: these are low-melting temperature intermetallic elements. If properly sized and distributed in the alloy, they represent an element of discontinuity which, thanks to their different response to the heat generated by the friction of machining tools, ensure the breaking of the chips.

These elements are:

- ❖ LEAD (Pb)
- ❖ TIN (Sn)
- ❖ BISMUTH (Bi)

These elements can be present in all free-cutting alloys, either individually or in combination.

For years, lead has been the subject of attention by European regulatory bodies as it is considered dangerous for human health and for the environment. For this reason COMETAL has developed LEAD-FREE aluminium alloys. COMETAL also decided not to use TIN (Sn) as due to its brittle nature, it melts at a relatively low temperature (160°C) and can generate porosity and weakness in machined parts.



2. LUBRICANTS & COOLANTS

The role of lubricants and coolants is critical for machining performance.

COMETAL recommends to use pure oil whenever possible. The use of the emulsion may negatively influence the chip formation and breaking therefore it would be necessary to reduce the cooling percentage by increasing the quote of oil.

The appropriate lubricant should facilitate the efficient evacuation of chips and clearing of the working zone. An excessive presence of water however could increase the cooling effect limiting a proper heat propagation, which is necessary for the low-melting elements to break the chip.

3. INSERTS

TURNING

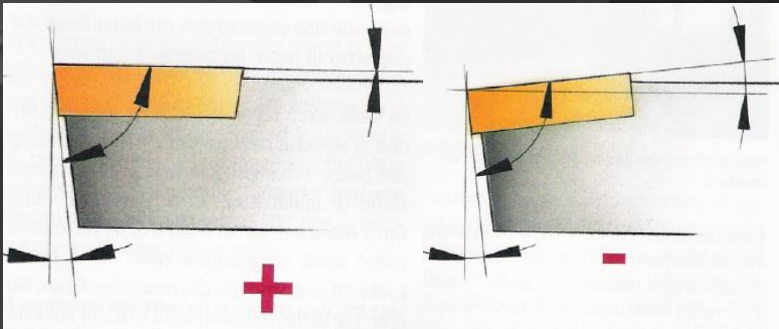
The offer of tools for machining aluminum is rather modest and in many cases are not suitable for extruded and drawn bars in aluminum alloys.

COMETAL recommends for turning operations on our LEAD-FREE alloys:

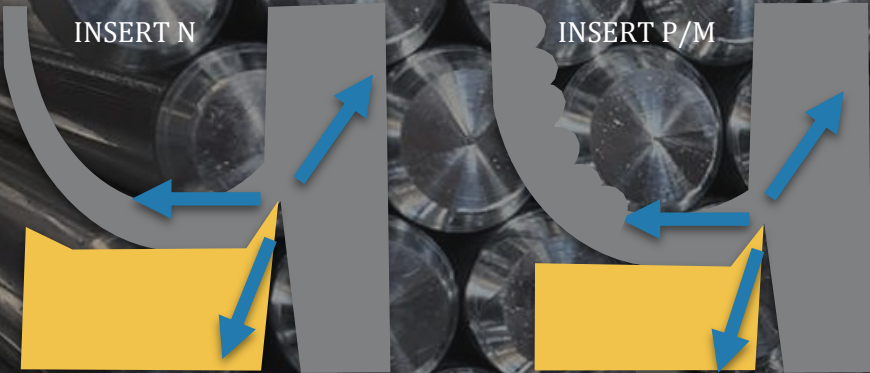
- ❖ positive turning insert
- ❖ inserts for steel and stainless steel (P/M)

Positive inserts (type B / C 5-7° as per ISO 1832)

- ❖ lower cutting forces and vibrations
- ❖ better finishing



The best rake angle is the one that allows a greater and more homogeneous distribution of the heat generated during turning. If it is well distributed between the part, the insert and the chip, it will enable the chip to break into small fragments.



The insert commonly called N and designed specifically for machining aluminium have a rake angle that does not allow an appropriate and sufficient distribution of heat during turning. Therefore, chip breaking is compromised, forming long and curled chips.

The P/M inserts, which should be more suitable for machining steel and stainless steel, are perfect for turning LEAD-FREE aluminium alloys bars by COMETAL. The heat generated by the friction of the tool is greater and well distributed, facilitating the breaking of the chips into small pieces.

P	M	N
2 – 10°	8 – 18°	15 – 30°

RAKE ANGLE

DRILLING

LEAD-FREE alloys by COMETAL demonstrate excellent characteristic for drilling performance allowing significantly higher feed rates.

Cutting speed (V_c)	150 — 600 m/min
Feed rate (f)	0,2 — 0,8 mm/rev

Cometal recommends, when possible, the use of indexable insert drills because, as for turning, they leave the freedom to mount the most suitable ones for an adequate chip evacuation and therefore better overall performance

MILLING

Face and profile milling performance are never a big issue when machining aluminium alloys.

The advantage of LEAD-FREE alloys by COMETAL is mostly with side milling or making closed slots thanks to its excellent chip forming attitude and easy evacuation.

For good results, COMETAL recommends the use of suitable lubricants and coolants.

4. MACHINING PARAMETERS

LEAD-FREE alloys by COMETAL allow to increase machining parameters and to reduce cycle times, without losses on machinability and part finishing.

TURNING	V_c	150 — 600 m/min
	f	0,15 — 0,8 mm/rev
DRILLING	V_c	150 — 600 m/min
	f	0,15 — 0,8 mm/rev
MILLING (face & side milling)	V_c	150 — 300 m/min
	f_z	0,08 — 0,45 mm/tooth
MILLING (closed slots)	V_c	250 — 2.000 m/min
	f_z	0,08 — 0,3 mm/tooth

V_c cutting speed
 f feed rate
 f_z feed rate per tooth

(general parameters)

COMETAL

Sede legale

Via F.lli Buttinoni, 4 -
24047 Treviglio (BG) - Italy
P.IVA 01650540162
COD. FISC. E N° REG.
IMPRESE BG 06580390158

Amministrazione, uffici e magazzino

Via F. Ferri, 2 - 26019
Vailate (CR) - Italy
Tel. +39 0363 848950
Fax +39 0363 340985
Email: info@cometal.it

Filiale

Via dell'Industria, 1 - 60020
Castelferretti - Falconara M.
(AN) - Italy
Tel. +39 071 9188521
Fax +39 071 9188786
Email: ancona@cometal.it

www.cometal.it

