EURAL
GNUTTI S.p.A.

6026 & 2033 & 2077 by Eural

LEAD FREE

ALUMINUM ALLOYS

HOW TO MACHINE
USEFUL TIPS FOR EXCELLENT PERFORMANCES

COMMON ALUMINUM ALLOY

- Many machine stops required to clean working area
- Poor productivity
- Higher production costs
- Machine busy for longer period

FREE-CUTTING ALUMINUM ALLOY

- 24hr machining with limited attendance of operator
- More parts in less time
- Reduced production costs
- Machine available for extra orders

FREE-CUTTING ALUMINUM ALLOYS by Eural

6026 & 2033 & 2077

LEAD FREE

HOW TO GET SMALL CHIPS WITH LEAD FREE ALLOYS by Eural

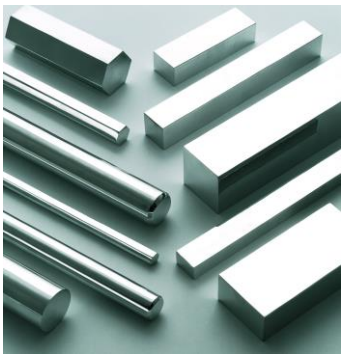
Getting small chips during machining is the result of the combination of four factors:

1. Raw material quality
2. Lubricants & coolants
3. Inserts
4. Machining parameters

All the above are equally important.

We therefore want to provide a short and useful guide on how to get the best results from machining alloys 6026 & 2033 & 2077 LEAD FREE by Eural.

1. RAW MATERIAL QUALITY



The choice of raw material quality has a crucial importance, as several factors contribute to the determination of a bar that can create a small chip.

Chip breaking elements: they 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.

Such elements are three:

LEAD (Pb)

TIN (Sn)

BISMUTH (Bi).

Among all free-cutting alloys, they can be present either individually or in combination.

For years, lead has been subject of attention by European regulatory bodies as it is considered dangerous for human health and for the environment. For this reason in the last few years, Eural has developed **LEAD FREE** aluminum alloys.
Eural also decided not to use tin (Sn), because due to its brittle nature, it melts at a relatively low temperature (140°C) and can generate porosity and weakness on machined parts.

2. LUBRICANTS & COOLANTS

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

Eural recommends to use pure oil when possible. The use of the emulsion, may negatively influence the chip forming and breaking, therefore it would be necessary a reduction of the cooling percentage.

The lubricant should facilitate the chips evacuation by clearing the working area.
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

TORNITURA – TURNING – DREHEN – TOURNAGE – TORNEADO

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

Eural recommends for turning operations:

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

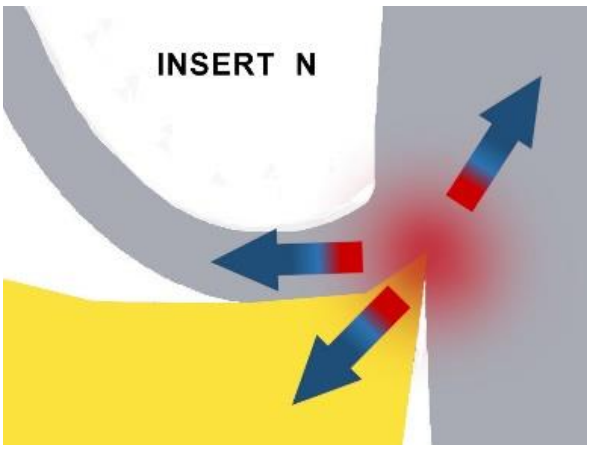
POSITIVE INSERTS

(type B / C 5-7° as per ISO 1832)

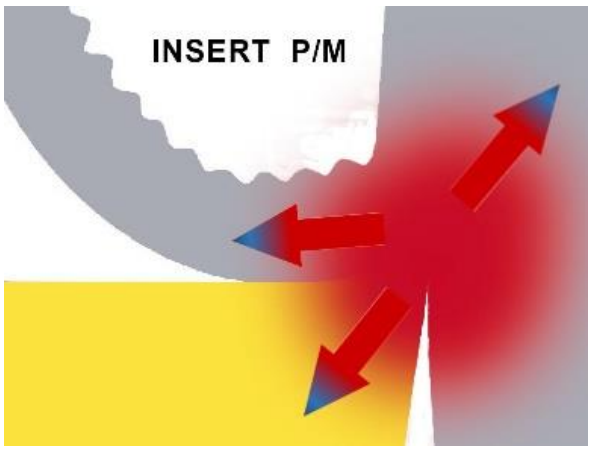
- lower cutting forces and vibrations
- better finishing

RAKE ANGLE

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



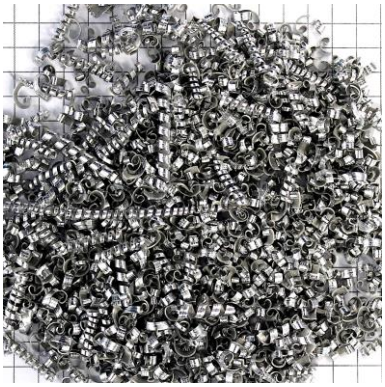
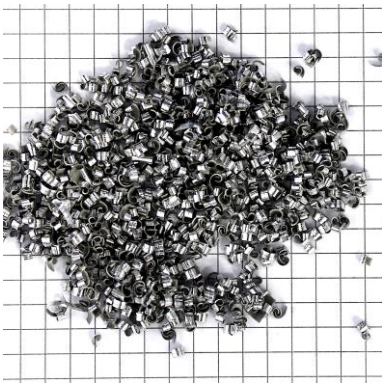
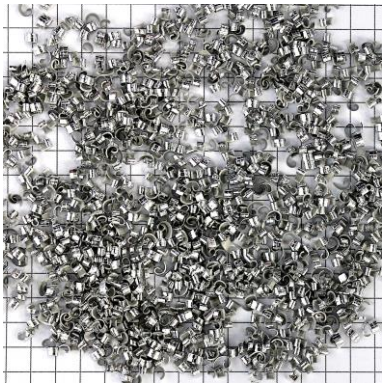
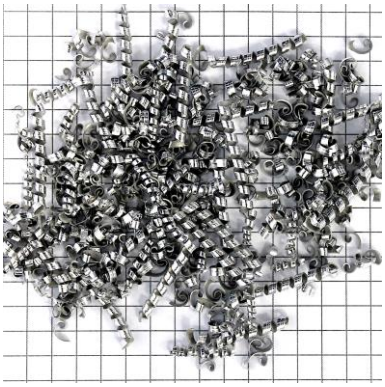
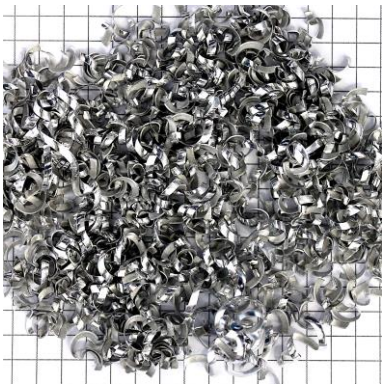
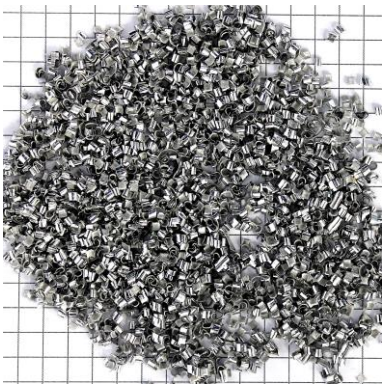
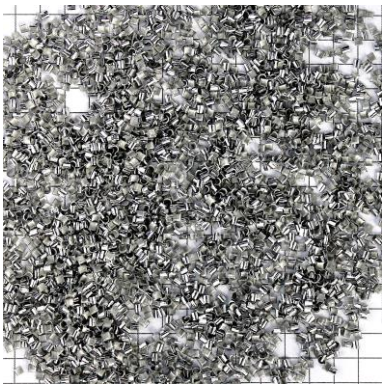
The P / M inserts, which should be more suitable for machining steel and stainless steel, are perfect for turning **LEAD FREE** aluminum alloys bars by Eural.
The heat generated by the friction of the tool is greater and well distributed, facilitating the breaking of the chips into small pieces.

P	M	N
2 – 10°	8 – 18°	15 – 30°
RAKE ANGLE		

With the same machining parameters, here below we show how the chip changes on **LEAD FREE** alloys by Eural according to the type of inserts used.

Cutting speed (v_c)	656 f/min
Feed rate (f)	0.00787 in/rev
Depth of cut (a)	0.0394 in

INSERT

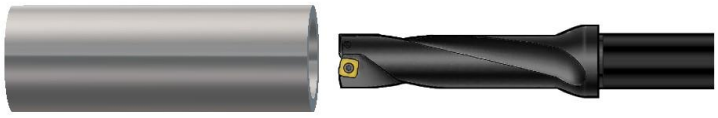
	N	M	P
6026 by Eural LEAD FREE			
2033 by Eural LEAD FREE			
2077 by Eural LEAD FREE			

EURAL RECOMMENDS

ROUGHING/ MEDIUM TURNING	P / M
FINISHING	M

FORATURA – DRILLING – BOHRUNG – FORAGE – BARRENADO

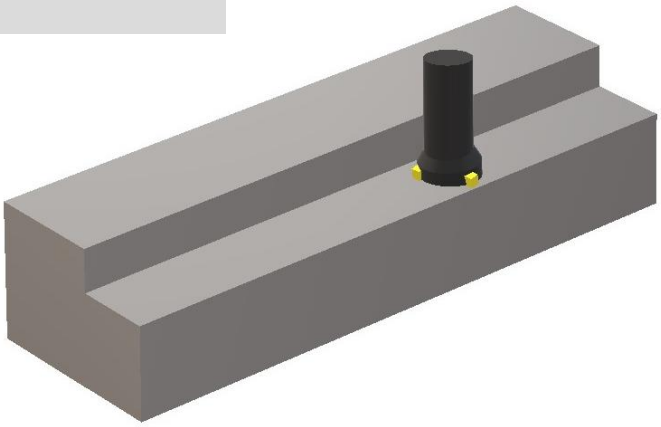
LEAD FREE alloys by Eural emerge for their excellent drilling performance, allowing significant higher feed rates.



Cutting speed (v_c)	492 – 1968 f/min
Feed rate (f)	0.00787 – 0.0315 in/rev

Eural 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 a better overall performance.

FRESATURA – MILLING – FRÄSEN – FRAISAGE – FRESADO



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

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

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

4. MACHINING PARAMETERS

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

TURNING	v_c	492 – 1968 f/min
	f	0.0059 – 0.0315 in/rev
DRILLING	v_c	492 – 1968 f/min
	f	0.00787 – 0.0315 in/rev
MILLING (Face & side milling)	v_c	492 – 984 f/min
	f_z	0.00315 – 0.0177 in/tooth
MILLING (closed slots)	v_c	820 – 6562 f/min
	f_z	0.00315 – 0.0118 in/tooth

(general parameters)

v_c cutting speed

f feed rate

f_z feed rate per tooth

EURAL
GNUTTI S.p.A.

EURAL GNUTTI S.p.A
25038 Rovato (BS) Italy
Via S. Andrea, 3
Company's capital € 10.000.000
VAT reg. IT 00566100988

Ph. +39 030 7725011
eural@eural.com

www.eural.com

Eural USA Inc.
212 West Washington St. Unit 1108
60606 Chicago, IL - USA
usa@eural.com
Ph. +1 (312) 888.05.78

Eural Deutschland Gmbh
Tübinger Strasse 26
D-70178 Stuttgart - Germany
germany@eural.com
Ph. +49 (173) 6155362