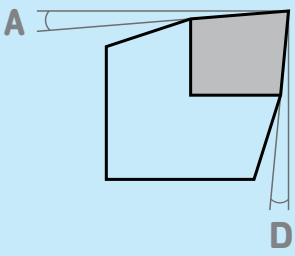
Machining instructions for self-lubricating blanks

Grades: BP25 – FP20 – SO16



Sintered materials are machined in the same way as the corresponding solid metal. However, to ensure the integrity of friction surface porosity (bore – flange face), we recommend complying with the following particular machining conditions.

Cutting conditions

Bronze BP 25

Angle	Blank/Finishd product
A	0 – 3
B	5 – 7
C	5 – 7
D	5 - 7

In degrees

	Blank	Finished product
Tool grade	K10/K20	K10/K20
Cutting speed (m/min)	120 – 200	140 – 200
Feed (mm/rev.)	0.1 – 0.2	0.1 max
Cutting depth (mm)	≤ 1	0.1 – 0.4

Iron alloy FP20 and SO16

Angle	Blank	Finished product
A	3 – 7	7 – 10
B	5	10
C	5 – 7	12 – 15
D	5 – 7	12 - 15

In degrees

	Blank	Finished product	
Tool grade	K10/K20	K10	5015 (cermet*)
Cutting speed (m/min)	140	160	200 - 250
Feed (mm/rev.)	0.2 – 0.3	0.035	0.035 – 0.06
Cutting depth (mm)	1 – 5	0.3 – 0.5	0.3 – 0.5

** In case of increased productivity*

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Turning

Clamping

To prevent any deformation, especially with respect to the thin walls, the bores must be machined by clamping the bearing with collets or soft jaws. For machining the outside diameter, blanks will be fitted to the mandrels in a cantilever set-up or placed between lugs (mandrel taper 0.01%).

Finalising the contact surfaces

After machining with a well-sharpened tool, it is recommended to provide an internal and external chamfer of the order of 0.5 mm at 45°.

Drilling

For through holes, the feed should be reduced as the drill exits.

› **Bronze BP25:** no particular conditions.

› **Iron FP20:** HSS drill bit with 5% cobalt, cutting speed: 25 to 30 m/min, feed 0.1 to 0.3 mm/min.

Tapping

› **Bronze BP25:** no particular conditions.

› **Iron FP20:** nitride-treated taps with 5% cobalt, cutting speed: 8 to 12 m/min.

Straightening

This operation must not be performed for finishing bores. This is because abrasive particles from the grinder may become embedded in the surface porosity, thereby leading to accelerated wear of the moving parts.

Cutting oil

When machining METAFRAM® blanks, the use of cutting oil is not necessary because of the penetrating oil present in the porosity of the sintered metal.

However, if additional cooling should become necessary, in particular when machining mass-produced parts, it is highly recommended to use of an oil having the same specification as that used for impregnation, or a jet of compressed air.

Any other cooling fluid must be avoided as there is a risk that it may be incompatible with the original impregnation oil.

Reimpregnation after machining

All standard METAFRAM® blanks are delivered impregnated with mineral oils having a viscosity index greater than 95. However, in order to compensate for oil losses due to machining and handling, reimpregnation is necessary according to the following procedure:

› To eliminate any chips or dust remaining from machining operations, the part must be rapidly rinsed with a volatile solvent (heptane or Biosane ECO 60R), and then dried.

› Depending on its weight, immerse the part for one or two hours in an oil bath at a temperature of 80°C.

› Leave the part to cool down in this bath to ensure optimum oil saturation of the porosity. Preferably, the oil used for the bath should have the same reference as the original impregnation oil or, failing this, it may be replaced by SAE 30 type motor oil which is easy to procure.

Impregnation oils

› For shaft rotation speeds greater than 0.3 m/s, use standard impregnation oil: Shell Turbo T100 oil – Viscosity index of 100.

› For linear alternating or pendular movement speeds of less than 0.3 m/s, use a special impregnation oil supplied on request (extreme pressure oil with molybdenum disulphide additive, etc.). Contact us for details.

Checking surface porosity

It is assumed that, in practice, any machining work will result in a small decrease in surface porosity which will have little effect on the performance of self-lubricating materials on condition that the above machining recommendations are respected.

The residual porosity after machining will be checked in the following manner:

› either by a comparative examination (preferably using a magnifying glass) of the machined and non-machined surfaces,

› or by raising the temperature of the machined part by some thirty degrees (using a heating plate, radiator, naked flame). Given the significant difference between the expansion coefficients of the sintered metal and the impregnation oil, this temperature rise causes the oil to exude. A uniform surface film of oil is thus formed and the self-lubricating qualities of the material are preserved.