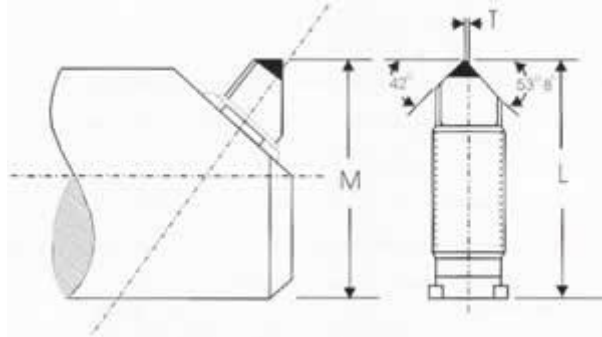


MILLING INSERTS:



T= Tool Point Offset is on the Right of centre of cartridge

Note: * All dimension in mm, * 12° top rake can be used Aluminium. * All specifications subject to change without notice. * All left cartridges will have same tool Geometry. * Ordering please specify PCD or CBN

Microbore No.	M. Min Bore	Length	T
M1 A2	16.1	14.2	0.4
M1 B2	13.4	11.4	0.4
M2 A2	21.1	19.9	0.4
M2 B2	18.8	16.8	0.4
M3 A2	26.1	25.5	0.8
M3 B2	23.1	21.5	0.8
M5 A2	41.4	39.8	1.2
M5 B2	35.8	33.4	1.2
M7 A2	58.8	55.7	1.6
M7 B2	53.3	49.3	1.6

A Special Note on Milling with PCD/CBN Tools and Inserts

It is a well-known fact that in the modern industrial scenario of higher productivity, milling is one of the most popular methods of machining.

With the break through of CNC machines, milling operations are increasingly replacing other conventional machining operations in industries like the mould and die making industries, the automotive industries and the mining and machine tool industries. These modern machines are capable of removing heavy stock at rates faster than any other known method and also with considerably tighter tolerance. Moreover, PCD/CBN Cutting Tools have enabled many difficult-to-machine applications to be performed with greater ease. Thus, operations such as high speed milling of die blanks with form generation and high speed milling of Aluminium alloys, achieving surface finishes of 0.4 to 0.8 μ in Ra value, are much more feasible with the use of these tools on rigid machinery. Machine tool manufacturers, working along with the tool manufacturer, have made it possible for machines to be available with more rigidity and higher spindle speed.

The goal of all the manufacturing industries is to achieve minimum cost per piece or maximum production rate on a given machining operation. This can be achieved first by the correct selection of the application process and having chosen the process, the next step involves the correct selection of tooling and parameters.

PCD/CBN Tools have helped in making this second step of selection much easier, requiring only a simple economic analysis of the machining operation to determine the optimum cutting speed yields minimum cost per piece or maximum production rate.

PCD Tools compete directly against carbide in milling operations. Ceramic or silicon nitride is attempting to bridge the gap between PCD and carbide, but PCD has a clear advantage over all other tooling material. The benefit seen in milling with PCD versus carbide on non-ferrous and non-metallic applications is enormous. An increase in tool life of up to 100 times is common. Additional benefits include better tolerance control on the component, better surface finish and minimal burring. This translates into less scrap, more machine uptime and better tool cost justification.

PCD is gaining and will continue to gain in importance with the introduction of new composite materials that are being used in the aerospace, automotive and other industries. Face milling, end milling, drilling and reaming are the operations popularly performed on this material. PCD is found to have tremendous advantages in performance while machining the complex microstructures of the new composite materials.

The key to success when designing the PCD milling insert is paying close attention to the milling cutter and insert geometries. In many instances, when carbide is used in milling operations, high rake angles ($>20^\circ$) and high clearance angles ($>25^\circ$) are required. These geometries are no longer necessary when using PCD. In fact, in many cases, the reduced rake angle of 5° and clearance angles of 10° have provided a more rigid setup allowing for successful applications in milling of tough material with severe interrupted cuts.

All in all, PCD Milling inserts offer excellent economy through an increase in tool life and by making it possible to achieve high quality at high speeds. Cutting speeds as high as 3000 mts/min, with feed of 2500 mm and depth of cut per pass -2.5 mm are possible. Dry

running can easily be applied and the results are excellent with surface finish of 0.8 to 0.4 in Ra and flatness within 30 microns. The economic benefits of using PCD are further contributed to when considering the time saved by eliminating frequent machine-downtime processes such as tool changing and indexing.

PCBN Milling inserts are generally used on cast iron and steel. The geometry of the milling cutter has a significant impact on the performance of the PCBN tool. As regards the rake angle, which is measured from the center of the tool, negative axial-negative radial rake milling cutters are preferred for PCBN applications. An important advantage of such double negative cutter is that the tools are able to withstand higher cutting forces without fracturing.

The edge preparation of the cutting tools is also important. An edge chamfer of 15° -20° for widths of 0.20-0.25 mm along with edge honing of the radius is a must, depending on the application and job materials. The combination of negative cutter geometry and chamfer will produce higher cutting forces and require more horsepower, generating very high temperatures. Although these types of machining conditions may not seem ideal, they are, in fact, exactly the right conditions while machining with PCBN. This is because PCBN works better near the eutectic temperature of the material and removes metal more efficiently. The results demonstrate that one has to reevaluate the machine processes in the context of the capabilities of PCBN tools. The use of PCBN tools in milling can be an effective method of increasing material removal rates and productivity while reducing overall machining cost.

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