

For Cylinder Heads / PCD Rotating Tool

As the engine performance continues improving, the cylinder head shapes of gasoline engines and diesel engines have become more complex and thinner. Because of many places to machine, tool design that enables composite machining and high-speed machining is needed to reduce machining cost. A.L.M.T. provides optimum tools created with extensive experience and performance.

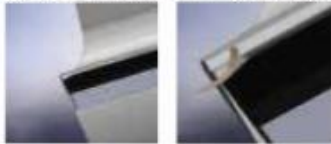


Features

- Multi-step combination bores can be finished using a single reamer, making it possible to reduce the number of processes.
- Not only can tool management be simplified, but the number of machines can also be reduced.
- Low cutting force and simplification of machine lead to the space saving.
- Provides well finished surfaces impossible to achieve using cemented carbide tools.
- As one would expect from diamond tools, dimensions remain precise and stable, and shape accuracy can be maintained over long periods of use.
- Increased rotational speed enables shorter machining times.
- Excellent performance can be achieved using environmentally friendly water-soluble cutting oil.

Data 1 Improvement of Productivity by Breaking Chips

Negative Land Specification Cutting Edge



The breaker function is enhanced to prevent a reduction in productivity due to problems caused by chips. Solutions are proposed according to the type of chip problem.

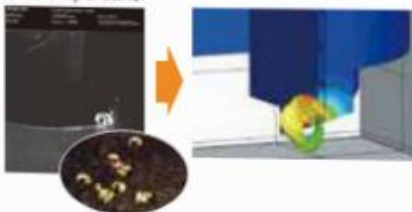
Without Chipbreaker



Chips do not curl but become stringy and long.

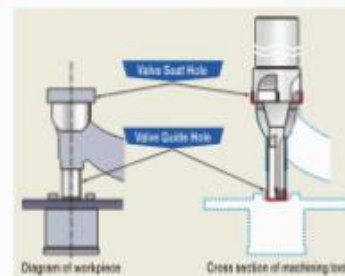
- Tangled around the cutting tool.
- Remained on the workpiece.

With Chipbreaker



Chips forced to curl and broken to pieces.

Data 2 Realization of Both High-Efficiency and High-Precision Machining



Precision diamond machining technology ensures cutting edge accuracy and concentricity degree to achieve high efficiency machining.

Parent Bore Finishing

Difference of Performance Between Shank Materials

| Results | 1 Tooth | 4 Teeth (Steel) | 4 Teeth (Carbide) |
|--------------------|---------|-----------------|-------------------|
| Machining Time (s) | 52 | 26 | 13 |
| Roundness (mm) | 0.01 | 0.05 | 0.03 |
| Coaxiality (mm) | 0.01 | 0.07 | 0.05 |

Machining Conditions

| Machine | Horizontal Machining Center |
|---------------------------------------|-----------------------------|
| Tool Size (mm) | φ11-φ36-L150 |
| Workpiece | Aluminum Alloy Casting AC4B |
| Coolant | Water-Soluble Oil Emulsion |
| Rotational Speed (min ⁻¹) | 3,500 |
| Cutting Speed (m/min) | 395 |
| Feed Per Revolution (mm/rev) | 0.3 |
| Stock Removal (mm/dia.) | 0.5 |

Tool Lineup for Machining Cylinder Heads (Upper Surface)



■ **PCD Reamer for Solenoid Holes**
Multi-flute, multi-step precision reamer ensures high coaxial accuracy.



■ **PCD Reamer for Spark Plug Holes**
Sleeve insert diameter can be finished with high precision thanks to making 2nd step of 1st contact to 4-flute geometry.



■ **PCD Cutter for Cam-Groove Milling**
Staggered flutes reduce cutting resistance and prevent chatter.



■ **1-Flute PCD Reamer for Valve Lifter Holes**
Improved roundness by giving full consideration to rotational balance of the tool body.



■ **PCD Endmill for Spring Seats**
Chip breaker improves evacuation of chips and prevents them from entering the water jacket.



■ **PCD Reamer for HLA Boring**
Unique 2-flute design for large transverse holes prevents misguiding of cutting edge.

■ Finishing of Hydraulic Lash Adjuster (HLA) Holes

Design to deal with thin wall and blind holes helps to improve chip evacuation which solves problems such as cylindricity.

■ Machining Conditions

| | |
|---------------------------------------|-----------------------------|
| Machine | Horizontal Machining Center |
| Coolant | Water-Soluble Oil Emulsion |
| Rotational Speed (min ⁻¹) | 5,000 |
| Feed Rate (mm/min) | 1,700 |
| Feed Per Revolution (mm/rev) | 0.34 |
| Stock Removal (mm/dia.) | 0.5 |



■ **Ball Nose PCD Mill for Cam Half-Round Milling**
PCD tip improves milling accuracy and reduces processing load in subsequent machining processes.

Tool Lineup for Machining Cylinder Heads (Deck Surface)



■PCD Reamer for Cam Sensor Holes

Reduced cutting resistance improves machining speed and accuracy.



■4-Flute PCD Reamer for Boring Parent Metal

A highly rigid body enables finishing of guide holes and seat holes with a high degree of coaxiality prior to press fitting.



■PCD Endmill for Valve Throats

Rough machining of the parent metal insert areas and machining of the throat can be done simultaneously.



■3-Flute PCD Reamer for Boring Parent Metal

3-flute reduce chatter.

■Parent Bore Finishing

The high rigidity of the shank and accuracy of the cutting edge achieves coaxiality and cylindricity.



■PCD Endmill for Valve Throats

Delivers long service life in throat machining.

■Machining Conditions

| | |
|---------------------------------------|-----------------------------|
| Machine | Horizontal Machining Center |
| Coolant | Water-Soluble Oil Emulsion |
| Rotational Speed (min ⁻¹) | 6,000 |
| Feed Rate (mm/min) | 2,880 |
| Feed Per Revolution (mm/rev) | 0.48 |
| Stock Removal (mm/dia.) | 0.6 |