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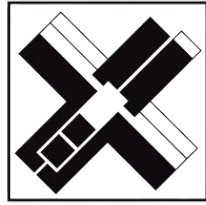
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Smart Guide for Poliangolar Rotary Broaching



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Smart Guide for Poliangolar Rotary Broaching

COMPANY PROFILE

The first rotary broaching device was the brainchild of Paolo Brema in 1965 in a mechanical workshop in Milan.

For some time, Brema had been looking for a device that would enable him to produce polygonal slots for the 'contract machining' of his machine shop using an innovative and fast method.

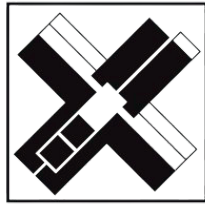
In fact, until then, the execution of square, hexagonal and special profile slots was a time-consuming, expensive and not always precise process.

This new invention revolutionised the way of broaching and immediately proved efficient and popular in the field of precision mechanics.

The Poliangolar device was immediately used in tool shops, lathe shops, mechanical and electromechanical workshops, hydraulic and microelectronic component workshops, shipyards and all precision workshops that required special polygonal figure slots.

To date, thousands of devices have been sold and are used by both small and large companies.

Poliangolar Srl, the company that manufactures and markets the Poliangolar and Polikey devices is based in Settimo Milanese and is now managed by his sons Sergio & Luciano Brema.



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WHAT IS THE ROTARY BROACHING?

The process of rotary broaching involves creating a non-circular shape on the inside or outside of a working piece.

HOW DOES ROTARY BROACHING WORK?

The reason rotary broaching is effective is due to the 2° offset of the broaching holder's head from the centerline of the shank. This offset creates a shearing effect along the edges of the shape being cut, so only a section of the form is cut at a time, reducing the required cutting pressure to produce the desired shape.

WHAT CAN YOU DO WITH ROTARY BROACHING?

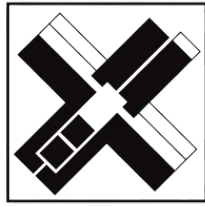
With rotary broaching machining you can make shapes in blind and through holes such as:

- Hexagons, squares, torxs, octagons, dodecagons, double squares, double hexagons, ...
- Special serrations, involutes, splines, as per the most common norms such as DIN, SAE, ANSI, CUNA, etc...

You can broach form from 0,5 to 50 mm of diameter and reaching up to 100 mm of woking depth.

You can machine forms to an accuracy of better than 0,015 mm.





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WHAT ARE THE ADVANTAGES TO USE ROTARY BROACHING?

Rotary broaching is a technique that quickly and precisely creates internal and external shapes on the end of a workpiece while it is spinning.

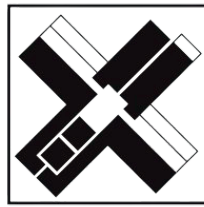
The shape is cut in one pass, eliminating the need for a separate machine operation and reducing costs.

Rotary broaching can be done simultaneously with other operations to increase efficiency and profitability without compromising accuracy.

The process requires only two components: a toolholder and a broach. The toolholder can be used on any CNC mill, lathe, or screw machine and the broaches can be easily switched to produce different shapes with minimal or no setup changes.

Broaches can be supplied with TIN or POLY coating for inox to improve performance.

Rotary broaching is commonly used in industries such as aerospace, automotive, plumbing, naval, medical-dental, textile, optical-goldsmith, electromechanical, maintenance and repair, high-tech, control systems and much more.



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Working capacity

The working capacities of the individual models, indicated below in the table, refer to the execution of internal and external profiles and slots with a hexagonal, torx or square section on steel parts with resistance $R=50/60 \text{ kg./mm}^2$.

Obviously, if using softer or non ferrous material, the capacities will be considerably higher.

Using the hexagonal section slots as a reference, the capacity of a Poliangolar device to produce a square slot will be reduced, whereas for the production of slots with a number of sides greater than a hexagon, the indicated capacity values may be increased.

Therefore, for producing a square 16 mm slot, for example, it is recommended to use device 2100N, whereas for square slots up to 12 mm, model 1100N may be used.

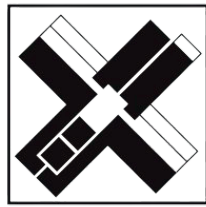
This does not mean that the devices can not be used more, but please note that beyond certain limits, the proper operation and duration of the devices themselves may be jeopardised.

Poliangolar holders for internal broaching

Models	MICRO	0100N	0200N	0500N	1100N 1100S	2100N 2100S	3100N 2100S	4100XS
Capacity (mm) for hexagonal profiles	≤3	≤5	≤10	≤12	≤14	≤24	≤40	≤50
Capacity (mm) for square profiles	≤2,5	≤4	≤8	≤10	≤12	≤16	≤30	≤40
Capacity (mm) for Torx profiles	≤T8	≤T15	≤T40	≤T60	≤T60	≤T100	≤T100	≤T100

Poliangolar holders for external broaching

Models	0200E	0500E	5100E	7100E	8100E	9100E
Capacity (mm) for hexagonal profiles	≤10	≤12	≤15	≤24	≤30	≤40
Capacity (mm) for square profiles	≤8	≤10	≤10	≤16	≤24	≤32
Capacity (mm) for Torx profiles	≤T30	≤T40	≤T50	≤T60	≤T80	≤T100



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Working parameters

No. of RPM: (based on the used device and not on the type of machining)

Poliangular for internal broaching

Models	MICRO	0100N	0200N	0500N	1100N 1100S	2100N 2100S	3100N 2100S	4100XS
RPM	2000	1500	1500	1500	1200	1000	800	800

Poliangular for external broaching

Models	0200E	0500E	5100E	7100E	8100E	9100E
RPM	1500	1500	1200	1000	800	600

Recommended feed for internal profile (halving the feed for external profile)

Materials to be machined	Recommended feed (mm/rpm) for hex. profiles Halving the feed for square and torx
Steel up to 1000 kg/mm ² (AVP, C40, ...)	0,10
Steel over than 1000 kg/mm ² (k100, k720...)	0,06
Stainless Steel	0,07
Cast Iron	0,10
Aluminium	0,15
Brass	0,15
Bronze	0,10
Titanium	0,02

A pre-broaching machining is always required for internal rotary broaching.

Pre-drill hole diameter

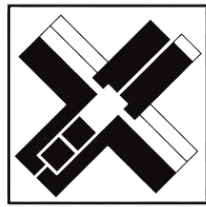
Pre-hole for hexagons: MUST be minimum as the diameter inscribed, but recommended 5% increased

Pre-hole for squares or other: MUST be minimum as the diameter inscribed, but recommended 10% increased

Pre-drill hole depth

The depth of the pre-drill hole must be greater than the broaching depth to allow for swarf to accumulate.

It is recommended to have a pre-drill depth of 1.3-1.7 times the depth of broached area.



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Special rotary broaches

Poliangolar offers custom rotary broaches for internal and external shapes to meet various needs as described below.

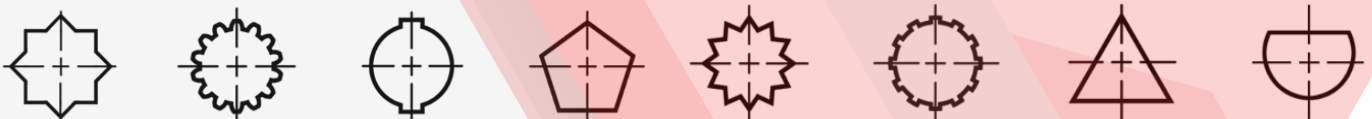
Common special broaches include serrations, splines, involute splines, double hex, double D, double square, double keyway, missing teeth, rectangle and triangle...

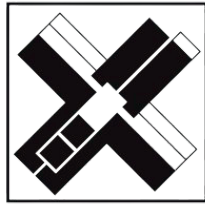
Serrations (DIN5481 / DIN5482) are often found on the ends of shafts, as internal or external knurls, or as locking features for fasteners or washers and can be produced using rotary broaching tools in a lathe, mill, or turning machine.

Spline and involute spline (SAEJ500, ANSI B 92, 1st CUNA) rotary broaches are widely used to join driving components in machines and vehicles. Examples of these include motorcycle gear shifters and engine shaft clamps.

Involute Spline rotary broaching tools can be manufactured to conform to international standards or custom-made to meet specific requirements. Examples of their usage include clamps for engine shafts and gear shifters in motorcycles.

'D' and Double 'D' rotary broach shapes are used for creating holes to connect shafts, for example in motor-driven shafts or door handle hardware, and the flat can be easily added to the end of a shaft.





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FAQ

How does Poliangolar rotary broaching differ from conventional broaching?

In conventional broaching, a series of polygon forms that increase in size are pushed through a hole until the desired form is achieved.

In contrast, rotary broaching cuts the full form, one corner at a time, in one pass even in blind holes.

How accurate is Poliangolar rotary broaching?

Rotary broaching is a very accurate method of producing precision polygon forms in a variety of metal work pieces. Broaches are precision ground to insure accuracy, and the rotary broach holder is designed to help machinists make repeatable accurate forms on nearly all turning machines.

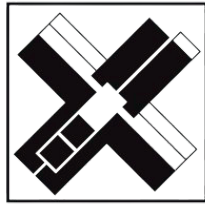
What materials can I broach?

A wide variety of materials commonly cut during machining operations can also be rotary broached with Poliangolar tools. Common materials include aluminum, brass, alloy metals, stainless steel, plastics and titanium. By opening up your pre-drill hole diameter or by using a roughing and finishing broaching tool, you can broach tougher materials.

How long does one rotary broach last?

Calculating tool life is very difficult due to the number of variables in the rotary broaching operation. However, controlling the following variables will give you a good start to maximize the tool life of your rotary broaches:

- Minimize broaching depth
- Plenty of room for chips is required
- An oversize pilot hole is key for reducing chip size and separating curling chips
- Machine rigidity.



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FAQ

Do rotary broaches work in stainless steel?

Yes. Rotary Broaching works in all sorts of Stainless Steel including 303, 304, 316, 416 and even 17-4. It may be limited by size and depth, but always recommended using sintered + coated tools.

What should I prepare before starting broaching?

Poliangolar broaching tool holders are always supplied centered ready to broach.

It is a plug & play system.

Nothing is more important than having the cutter centered as close as possible to the center of the workpiece.

Improper machine center setting will cause uneven hole configurations, oversize holes, spiraling and a short tool life.

Do rotary broaches cut undersize or oversize?

Rotary broaches are precision ground to very tight tolerances. The holes that are cut will be nearly the exact same size as the broach. For this reason, most broaches are made to the high side of tolerance, so that as they wear, they will stay within the tolerance as long as possible.

What type of fluid should I use during the broaching process?

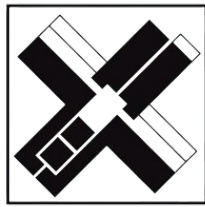
Fluids play a minor role in rotary broaching. Any conventional water or oil based fluid is acceptable. Many customers choose to turn off the coolant during the rotary broaching cycle. Just remember that using cutting oil improves the finishing of the working piece.

How do I remove the chips from my part after rotary broaching?

Swarf may be cleared out from the bottom of the part

by going back in with the same drill used to pre drill the pilot hole.

A small undercut may be added at the end of the broaching depth prior to broaching the form.



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FAQ

How can I orient my shape to a reference point?

The rotary broaching orientation lever is used to index the broach to the workpiece.

In lathe application the equipment synchronized the rotation of the broach and the working piece while the tool holder stationary against the stop rod as the tool holder body rotates.

What information is required to provide a Poliangolar quotation?

Type of shape to be broached: If it is standard (hexagonal, square, torx) or if it is special (special serrations, involutes, splines, etc.)

Size: If standard shape we need to know the major diameter.

If special shape: major diameter, minor diameter, number of teeth, module, pressure angle are fundamental information. It is also very important to receive a technical drawing.

Requested tolerances.

Working depth.

Hardness of material to be broached.

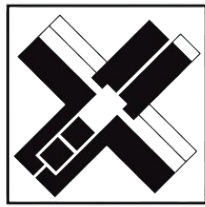
Type of attachment to your machine (Cylindrical, MT, VDI, Weldon, etc.).

What is the delivery time for receiving Poliangolar materials?

The holders in the catalogue have a delivery time ranging from 2-3 days for the most common (cylindrical) connections to 2 weeks maximum.

All standard tools in the catalogue have a delivery time from stock or of 2-3 days max., while coated tools take a week.

For special tools, a one-week delivery time will be required after approval of the drawing.



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Polikey slotting program

What is it and What it does?

Polikey slotting tools are suitable for the production of internal and external keyways on blind or through holes. It offers greater versatility thanks to the re-usable tool body and the replaceable carbide inserts with TIN coating.

Polikey inserts are available in various sizes (from 3 to 22 mm keyways) and each insert size can have various tolerance classes.

Special insert measurements or tool shapes can be produced very rapidly, on customer demand.

On which materials?

The materials that can be processed are:

- High and low-alloy low-carbon steel, and non-alloy steel;
- Stainless steel, quenched and tempered steel, cast iron, AVP;
- Non-ferrous materials such as aluminium alloys and titanium;
- Copper alloys, bronze, and engineering plastics.

How it works?

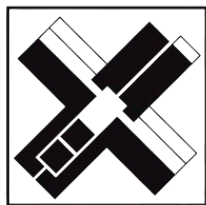
Polikey tools mounted on slotting machine or CNC machine move in reciprocating action to perform the operation and shed the additional material from the work item. In the slotting machine cutting action is executed at the downward stroke to cut the extra piece of material from the work piece.

How it is made?

PLKIN inserts are made of carbide with TIN coating, unlike the most of the inserts available on the market. This guarantees our inserts the maximum resistance to compression and to the stresses that occur during processing.

On what machines?

Our slotting program is supplied as two versions: for Slotting machine (single cutting edge and double cutting edge) and for CNC lathe machine. (single cutting edge).



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**For any request of information or clarification,
you can contact us here:**



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