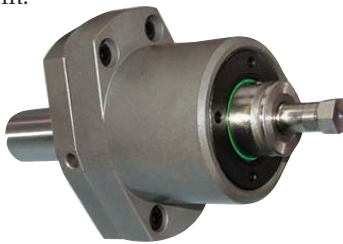


Adjustable Rotary Broaching

What are the differences between rotary, Swiss/wobble, punch and index?

Rotary

The tool shape is cut into the customer's part with spindle turning when using a rotary holder system.



The Rotary Holders:

With materials today that make up these component parts ranging from difficult to machine Titanium 6AL 4V and stainless steels like 17-4 PH or 18-8 PH, we offer solutions that maintain consistent process control and longer tool life in the running time. We offer rotary broaching holders in a range from typical commercial applications, to a high end Swiss made rotary holder system for Swiss type CNC machining.

The commercial grade system is an adjustable tool that has to be set-up for centerline by making the holder and spindle run on zero run-out at the point of the tool.

We offer holders that will do .060 (1,5mm) hex to 1.000" (25,4mm) hex holes in steel.

Hex Rotary Broaching can be performed on multiple machining applications, for instance CNC machining centers or transfer machines. For the purpose of this material the proce-

cedure will be performed on a Computer Numerical Control Turning Center.

The broaching holder serves two functions: It holds the broach tool in a free spinning bearing; and, it places the broach tool at a 1° angle relative to the centerline of the workpiece.

There are two types of commonly used holders:

- Adjustable Rotary Broach holder



Coaxial Indicator

Swiss Style or Wobble

- Swiss Non-Adjustable Rotary Broach Holder

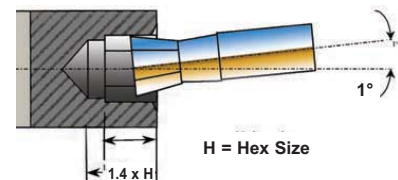
The tool shape is cut into the customer's part with spindle turning when using a rotary holder system. This is typical when used on a vertical machining center.

Punch/Index

The shape is cut with the spindle locked in a stationary position, and the broach is then punched into the customer's part.

Index- A broaching process that involves a stationary spindle and

a partial for of the shape that is to be generated. Once hole preparation is completed, the tool form is generated on a Swiss type CNC machine by making imprints of the tool to the proper depth while the part is indexed properly to create the full form desired.



Cutting Principle

The tool is held at a 1° angle relative to the part centerline and has a 1° 30" clearance angle built in. The face of the broach tool is the pivot of the 1° angle and is placed on centerline with the part. As the tool comes in contact with the part, friction drives the broach to rotate synchronously. The cutting edge is kept on center and the rest of the tool oscillates around the part centerline with a wobble effect. With the faces of the tool and part at a relative 1° angle, only the leading point of the tool is cutting and not the entire profile. The wobble effect moves the leading edge to rotate in and out of the cut like a cam. It shears the shape into the part with a scalloping effect as it advances forward. This reduces the required thrust force up to 80% when it is at the optimum feed.

How to Set Up Adjustable Rotary Broach Holder for CNC Machining

Adjustable Rotary Broach Holder Set Up

To complete this procedure you will need the required tooling: Broach Holder; Hex Broach or set up plug, Magnetic base adjustable indicator for bench set up; Coaxial indicator gauge for CNC machine set up

The set up can be completed on the machine, but for efficiency we recommend completing it off-line.

1. First position the shank of the holder into the end of the colleted fixture. If necessary, turn the handwheel on the fixture to increase or decrease the size of the opening to adjust to the size of the shank on the rear of the holder.



2. Insert the end of the holder into the fixture and turn the handwheel to secure the holder.

3. Loosen the two set screws on the front of the holder. Insert the hex broach into the front of the holder with the circular end facing out for ease of indicating, or use set-up plug.

4. Tighten the two set screws to secure the hex broach in place. Retrieve the indicator gauge and position the tip of the gauge on the end of the broach. Zero the indicator before gauging the set up.



5. Turn the handwheel on the fixture while watching the indicator to determine if the broach is aligned on center with the shank of the holder.

6. Readings between .001 and .002 are acceptable limits. Readings above .002 are unacceptable and will require additional adjustments to the holder.

7. There are several adjustment screws on the holder that may need to be adjusted to set the centerline.

8. There are two large allen screws that secure the face of the holder together. Using an allen wrench, loosen each of these.

9. Next to each of these large allen screws are three set

screws. Each one of these set screws acts as a pivot point for the face of the holder. Using an allen wrench, loosen or tighten each one accordingly.



10. Spin complete holder then regauge with the indicator and continue to make the necessary adjustments until the desired reading between .001 - .002 is met. Retighten the two larger allen screws.



11. Remove the hex broach from the holder by loosening the two set screws. Reposition the orientation of the broach with the hex head facing out. Tighten the set screws.



12. This completes the set up of the rotary broach holder. Now the holder can be installed into the appropriate CNC machine for operations.

Note: See our set-up procedure on our website course videos- "Hex rotary broaching."

Rotary and Index Broaching



Market and Process Updates

Improved Technologies for Medical Orthopedic Products & Components

Rotary and index broaching in our industry today is becoming a more consistent part of the manufacturing process as CNC machines become more sophisticated. The Swiss CNC equipment today can even compensate for concentricity of centerline to hole location, which is a major improvement over machines of only a few years ago. The components built in the medical fields today require incredibly close tolerances and strict quality controls like "6-sigma" to get their products to market

as well as a full array of other component equipment that is used to support the entire field of medicine. Our product is used to hold hex bone screw tolerances of $\pm .0005$ (0,012mm) for size-- which is difficult to maintain-- in conventional manufacturing environments. To do this, we will maintain a $\pm .0002$ (0,005mm) tolerance on the actual broach. Typical hex sizes range from: 1,5mm, 2,5mm, 3mm, 3,5mm, 4,5mm and 5mm. We have developed a medical hex broach full form range in cobalt based high-speed steel from stock inventories that will allow a customer to get his tools the next day



industry is **Special Tolerance** and **Special lengths** for a variety of solutions specific to our customer. 60% of our manufactured tooling is considered a special. The amount of "special" tools manufactured every day in our plant is more than our standard line in the orthopedic market. Hassay Savage special tooling is typically delivered in 5-7 days to our customer's specifications. Our CNC-CBN ground tools are always consistent tool to tool.



The Rotary Broach Tooling:

We have been instrumental in serving many sectors of the medical field today as a high quality manufacturer of precision broaching tools to make hex and square forms in orthopedic bone screws,

when delivery is critical.

In addition, the majority of our tooling supplied in this

Swiss Style Broach Hexagonal Rotary/Punch Broaches



.315 shank - American

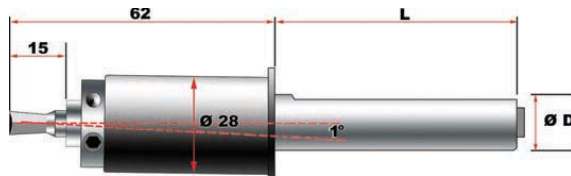
EDP No.	EDP No.	Hex Size	Depth of Cut	OAL
M-2	PM M-4			
76002	77002	.051	5/64	28mm
76004	77004	1/16	3/32	28mm
76005	77005	5/64	7/64	28mm
76006	77006	3/32	9/64	28mm
76007	77007	7/64	5/32	28mm
76008	77008	1/8	3/16	28mm
76009	77009	9/64	7/32	28mm
76010	77010	5/32	1/4	28mm
76012	77012	3/16	9/32	28mm
76014	77014	7/32	11/32	28mm
76016	77016	1/4	3/8	28mm

.315 shank - Metric

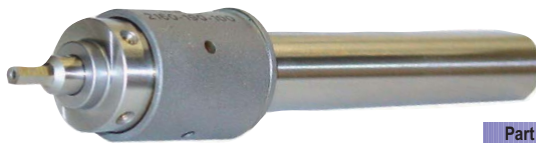
EDP No.	EDP No.	Hex Size	Depth of Cut	OAL
M-2	PM M-4			
762015	772015	1.5mm	3/32	28mm
76202	77202	2mm	7/16	28mm
762025	772025	2.5mm	5/32	28mm
76203	77203	3mm	3/16	28mm
762035	772035	3.5mm	3/16	28mm
76204	77204	4mm	1/4	28mm
762045	772045	4.5mm	1/4	28mm
76205	77205	5mm	5/16	28mm
76206	77206	6mm	3/8	28mm



Non-Adjustable Rotary Broach Holders



2160 Series



Swiss Style Holders

- No Center Indicating Required
- Smaller Head Diameter Eliminates Interference
- Longer Shank Can Be Cut To Proper Length
- Short Head Length For Limited Back Work Space
- Built In Wobble Cutting Feature 1° Angle
- Heavy Duty Bearing Takes 2250lbs. Pushing Force
- Swiss Made Quality High-Precision
- Fits Most For Swiss Type & Gang Machines

2160 Series Holders

Holds 8mm shank broaches, max. push force 2250 lbs.

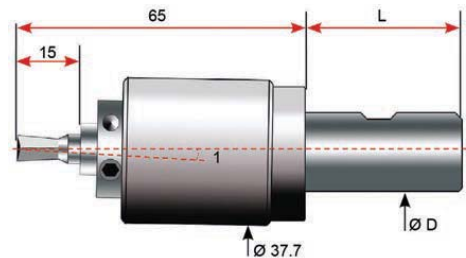
Part No. Inch	D	L
HSP-2160-158-038	.625	1.50
HSP-2160-190-100	.750	4.00
HSP-2160-254-120	1.00	4.75

Part No. Metric	D	L
HSP-2160-120-038	12	38
HSP-2160-140-038	14	38
HSP-2160-160-038	16	38
HSP-2160-200-100	20	100
HSP-2160-220-100	22	100
HSP-2160-250-120	25	175

Self Centering

Designed for CNC machines, the new 2100 Series Broach Holder meets the challenge for faster and easier setup by placing the broach tool on center and eliminating the need to indicate the holder.

The cylindrical shank design with Weldon Notch makes the 2100 Series perfect for lathe or machining center applications.



2100 Series



2100 Series Holders

Holds 8mm shank broaches, max. push force 900 lbs.

Part No. Inch	D	L
HSP-2100-58	15.87	38
HSP-2102	19.05	38
HSP-2104	25.4	58

Part No. Metric	D	L
HSP-2100-16	16	38
HSP-2101	20	38
HSP-2103	25	50

Besides the focus, effort and concentration that we have put into the medical field over the years working with most of the highly respected manufacturers, we have put that same undivided attention into other areas of micro-manufacturing including automotive and aircraft micro

components, and micro precision systems that require high precision tolerance and quality.

It is interesting to note here that all of our product line groups for Hassay Savage and Magafor companies: www.hassay-savage.com; www.magaforusa.com; play an

active and integral role in employing high performance results for those customers who demand not only quality, but also consistent tool life that keeps their machines running longer.

