

Production Push-type Keyway Broaches

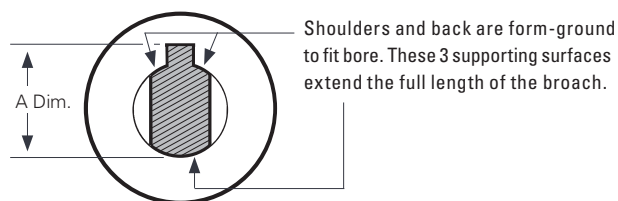
Applications: **High Speed Operation | Accurate Long Run Production**



Production Keyway Broaches

Production Keyway Broaches offer maximum speed and accuracy in production runs of identical bores, using either hydraulic or hand-operated presses. These Broaches are self-supporting—no Shims or Bushings are required.

Production Broach Construction



Stock Production Keyway Broaches

Production Keyway Broaches are designed for large production runs of identical keyways with identical bores. No Shims or Bushings required. A special chamfering feature that will deburr the keyway while it is being broached is also available.

TiN or TiAlN coatings available.

Keyway Width	Body Diameter	A Dimension	Broach Length	Tooth Pitch	Length of Cut*		Pressure Required. for Max. L/C (lbs.)	EDP No. duMONT
					Min.	Max.		
1/16"	3/16"	.224"	5-5/8	3/16	13/64	1	390	55520
	1/4"	.287"	6-3/16	3/16	13/64	1	390	55521
1/8"	3/8"	.437"	8-1/2	1/4	17/64	1-1/4	850	55522
	1/2"	.565"	11-3/4	3/8	25/64	2-1/2	1,440	55523
	9/16"	.630"	11-3/4	3/8	25/64	2-1/2	1,440	55524
	5/8"	.693"	11-3/4	3/8	25/64	2-1/2	1,440	55525
3/16"	5/8"	.716"	14-3/4	3/8	25/64	2-1/2	2,170	55526
	3/4"	.844"						55528
	7/8"	.970"						55530
1/4"	1"	1.121"	18	3/8	25/64	2-1/2	2,870	55532
4mm	10mm	11.9mm	12	9/32	19/64	1-7/8	1,550	55533
		.468"						

*Based on mild steel

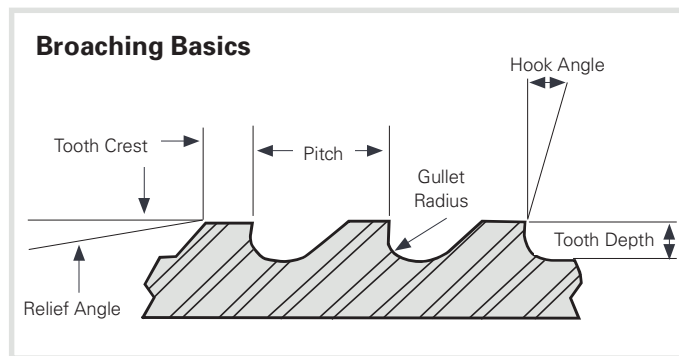
All standard items are available with TiN or TiAlN coating from stock or short delivery. Please contact Pilot Precision Products for details.

SPECIAL ORDERS: We are fully equipped to manufacture Special Production Style Broaches to your specifications. A special chamfering feature that will deburr the keyway while it is being broached is also available. Please contact Pilot Precision Products for details.

Applications: **Standard Push Broaching Procedures | Broaching Basics**

Standard Broaching Procedures

duMONT Minute Man® and Hassay Savage Broaches are designed for fast, accurate, and convenient broaching with arbor or hydraulic presses. A study of the Broaching Procedures presented in this section will familiarize the operator with proper broaching procedures and troubleshooting practices. Following proper broaching fundamentals, paying attention to technique and Broach maintenance will help prevent drifting, deflection and even breakage while providing greater efficiencies in the cutting of your parts. If you have a specific question or problem, contact our Engineering Department at 413-350-5200 or by email at info@pilotprecision.com.



chip load allows for smooth cutting, and improved tool life. All individual stock Broaches have recommended Minimum and Maximum Length of Cut guidelines which should be followed. The required force necessary to achieve the Maximum Length of Cut is also provided with the individual Broach specifications. Workpieces may be stacked to establish the Minimum Length of Cut, or to improve the efficiencies of the operation as long as Maximum Length of Cut is not exceeded. Proper nesting and clamping of stacked parts is vital when this approach is taken. The Maximum Length of Cut with Push-type Keyway Broaches should not exceed the length of the Bushing being used.

Reminder: "A/I" Style Broaches are used with "A/I" Style Bushings, "B/II" Style Broaches with "B/II" Style Bushings, etc. Pilot Precision Products Push-type and Pull-type Broaches often can be designed to accommodate your specific length of cut requirements.

Set-Up and Alignment

Successful broaching begins with proper set-up, and alignment of the Broach, workpiece and ram. Attention to these details will provide a stable workpiece, and prevent drifting, deflection or even breakage caused by misalignment. The workpiece must be solidly fixed or nested perfectly square with the baseplate and ram face. Make sure all square and parallel surfaces on the face of the ram and baseplate remain true. It is essential to maintain a rigid set-up at all times and caution should be taken when stacking parts to maintain the integrity of the set-up. Never attempt to exceed the Broach's specified Maximum Length of Cut. At the beginning of a cut, be sure the Broach is centered under the ram. Proper alignment is important. After the Broach starts to cut, back off pressure on the ram to allow the Broach to center itself, if not in perfect alignment. If Broach moves out of alignment after starting cut, back off the pressure on the ram and align the broach itself. Repeat this procedure during successive cuts. This will assure a perfectly straight broached hole.

Suggestions for a drifting or "hogging" Push-type Keyway Broach:

1. Reverse workpiece or turn Broach so teeth face toward the back of the press.
2. Let the Bushing protrude above the workpiece to give more support to the back of the Broach, thereby helping to keep it aligned. If a collared Bushing is used, place it upside down under the workpiece.

Warning Information

Cutting tools may shatter or break, therefore **eye protection should be worn wherever and whenever cutting tools are being used.** Government Regulations require use of safety glasses and other appropriate safety equipment at all times in the vicinity of cutting tool use.

Workpiece Material

duMONT Minute Man® and Hassay Savage stock Broaches can be used on a variety of workpiece materials. It is not practical to Broach material having a Rockwell hardness higher than Rc35. When broaching **Iron or Steel**, use the standard Broach as supplied. **Brass** and **Free Machining Bronze** may require stoning of a slight land on the top of the teeth to prevent drifting (pulling into the work). Custom Broaches are designed and engineered to provide the correct tooth form, pitch and rake angles for the material specified.

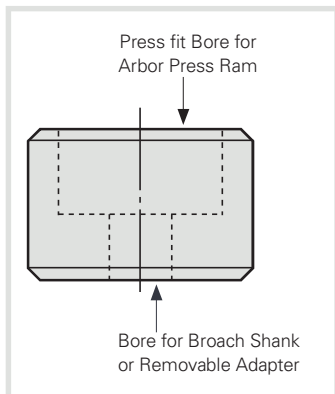
Length of Cut

Our Broaches are designed to be used in operations where a minimum of two teeth are engaged at all times. Tooth engagement is required to maintain a smooth cutting action promoting a clean finish. The chip generated during the cutting process must be contained within the gullet of the tooth to avoid binding of the tool. This could cause potential damage to the Broach, the workpiece and injury to the operator. Appropriate

Ram Adapter Use

Ram Adapters are used for broaching applications that require Round, Custom Shapes such as Rectangular as well as Square, and Hexagon Broaches 1/4" and 6mm or smaller. A Ram Adapter would also be recommended in situations where an extraordinary high degree of accuracy is required.

Applications: **Standard Push Broaching Procedures | Broach Re-Sharpening**



These Adapters are also referred to as rear guides and provide support and guidance for the Broach at the shank end, minimizing the possibility of deflection or breakage. When an Adapter is used as a rear guide for the Broach, the hole in the Ram Adapter must be in alignment with the pilot hole in the workpiece. It is important a Ram Adapter provides a tight, true fit to both the press ram and to the Broach shank. An adapter may also be used to allow the shanks of smaller Internal Hole Broaches to be gripped to avoid deflection and breakage.

Cutting Fluids and Lubrication

Broach lubrication is crucial to tool life and the quality of the finish produced. Lubrication enables chips to slide freely and curl in the tooth gullets minimizing frictional heat. This cuts down on Broach wear and prevents build up on the cutting edge of the teeth. Push-type Keyway Broaches, regardless of the material to be broached, require lubrication on the back side of the Broach in order to reduce friction. Proper lubrication will increase Broach life and produce a cleaner finish. Various materials require different lubricants.

Mild Steel – A good quality cutting oil or water-soluble coolant brushed on the teeth and back side of the Broach.

Tough Steels such as Nickel Alloys – A good grade of a sulfur-based cutting oil.

Brass – Typically is broached dry.

Bronze – Works well with an oil or soluble oil.

Cast Iron – Is almost always broached dry but requires lubrication for the backside of the Broach.

Aluminum – Straight kerosene may be used but special lubricants are available.

You may wish to contact your cutting fluid dealer for additional recommendations and availability.

Coatings Available

duMONT Minute Man® and Hassay Savage Broaches are available with TiN, and TiAlN coatings. The coatings provide enhanced performance for specific applications, delivering greater value and tool life on your more challenging materials.

TiN – provides increased lubricity and wear resistance when broaching abrasive materials such as fiberglass and some aluminum alloys.

TiAlN – offers significant increase in surface hardness (Rc low 90s). Applications would include broaching in most stainless steels, alloy steels and harder materials.

Broaching with Keyway Sets or Individual Broaches



Use of Individual Push-type Keyway Broaches or Keyway Broaches from a Broach Set requires the use of a Bushing and Shim(s). The Bushing size and style are determined by the bore diameter of the workpiece as well as the Style of Broach to be used. "A / I" Style Broaches are used with "A / I" Style Bushings, "B / II" style Broaches with "B / II" Style Bushings, etc. The smallest Broaches cut in one pass and require no Shim. Multiple pass Keyway Broaches

are furnished with all necessary Shim(s) unless otherwise noted. A Shim is required to compensate for the thickness removed following a Keyway Broach's cutting pass. The addition of a Shim to the bottom of the bushing's slot serves to move the Broach forward toward its standard finished cutting depth. Subsequent passes require the stacking of Shims.

1. Select the right Broach for the bore (sizes are plainly marked).
2. Insert Broach (which is also plainly marked for size) and check alignment.
3. Place this assembly in the press.
4. Lubricate.
5. Apply pressure to the Broach—back off pressure on Ram to allow the Broach to center itself if not in perfect alignment—reapply pressure to push Broach through the work.
6. Clean Broach using a stiff brush to remove chips from cutting section.
7. Insert shim and repeat steps 3 through 6 as required to obtain exact keyway depth.

Applications: **Broaching with Keyway Sets and Production Keyway Broaches**

Broaching with One-Pass Keyway Broaches



Broaching with One-Pass Keyway Broaches requires the use of a Bushing. The Bushing size and Style are determined by the bore diameter of the workpiece as well as the Style of Broach to be used. "A/I" Style Broaches are used with "A/I" Style Bushings, "B/II" Style Broaches with "B/II" Style Bushings, etc. No Shims are required. The Broach cuts to full width and depth in one pass.

1. Select the right Bushing for the bore (sizes are plainly marked) and insert in the bore of work.
2. Insert Broach (which is also plainly marked for size) for the desired width of keyway into the Bushing slot and check alignment.
3. Place this assembly in the press.
4. Lubricate.
5. Apply pressure to the Broach—back off pressure on Ram to allow the Broach to center itself, if not in perfect alignment—reapply pressure to push Broach through the work.
6. Clean Broach using a stiff brush to remove chips from cutting section.
7. Repeat steps 2 thru 6 for subsequent parts.

Broaching with Production Keyway Broaches

Broaching with Production Style Keyway Broaches requires no Shims or Bushings. The back and shoulders of the Broach are ground to fit the diameter of the bore, supporting and guiding itself while cutting the keyway in one pass.

1. Select desired Broach and insert pilot into bore of part.
2. Lubricate.
3. Apply pressure to the Broach—back off pressure on Ram to allow the Broach to center itself, if not in perfect alignment.
4. Clean Broach using a stiff brush to remove chips from cutting section.
5. Repeat steps 2 through 4 for subsequent passes.

Broaching with Internal Hole Broaches



Broaching with Internal Hole Broaches requires no Shims or Bushings. Round, Square, Hexagon and many Custom Shapes are designed to finish in one pass, in cast or drilled bores requiring a thru hole finish. The starting hole must be drilled square with the face of the work. Square and Hexagon Broaches, 1/4" and 6mm or smaller, should be gripped by the shank in an adapter to prevent deflection and breakage.

1. Pilot Holes: Properly drilled pilot holes are essential for a true and clean cut. Never use a dull or poorly sharpened drill to make pilot holes.
2. Select desired Broach. Confirm the bore of workpiece is equal to pilot diameter of broach. (The use of a ram adapter is advised with all Round Broaches and for Square and Hexagon Broaches 1/4" and 6mm or smaller).
3. Insert pilot into bore of part.
4. Ram Speed: Always use proper ram speed to prevent chatter marks and edge wear. (See Metals Handbook – Vol. 3 "Machining".)
5. Lubricate.
6. Apply pressure to the Broach—back off pressure on Ram to allow the Broach to center itself, if not in perfect alignment—reapply pressure to push Broach through the work.
7. Clean Broach using a stiff brush to remove chips from cutting section.
8. Repeat steps 3 through 7 for subsequent parts.

Troubleshooting

We aim to make your broaching experience efficient, effective and trouble-free. Most broaching failures (poor finish, drifting, deflection, breakage, chatter marks or edge wear) can be attributed to deficiencies in alignment, lubrication, Broach sharpness, tooth configuration or design, material hardness and incorrect broaching speed or pressure as detailed in this section. If you have specific questions or problems not covered on these pages, contact our Engineering Department.