

**PILLOT**

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## A Reputation for Excellence

The duMONT and Hassay Savage Companies have been designing and manufacturing Precision Broaches for decades, and these Broaches are recognized all over the world for their quality, durability and engineering detail.

duMONT Minute Man® and Hassay Savage are proud to be the largest suppliers of Push-type Broaches in America, offering parts to a wide variety of businesses through a vast national and international distribution network. Our record of design ingenuity, fast delivery and courteous follow-up is unsurpassed.



### Materials

All duMONT Minute Man® and Hassay Savage Broaches are manufactured of the finest quality high speed steel. We are equipped to fabricate from a variety of grades to meet your specifications. Contact your industrial distributor or the duMONT Engineering Department for details.

### Call Your Industrial Distributor

Your industrial distributor is your best source for duMONT Minute Man® and Hassay Savage Broaches. If your regular distributor does not carry our products, call us and we will be happy to give you the name of the nearest distributor. For special technical assistance, call our Engineering Department at 413-350-5200.

### Fast Delivery

An order for stock items placed by your industrial distributor with us by 3:00 PM EST will almost always be shipped on the same working day.

### Material Safety Data Sheet

Available upon request or at [PilotPrecision.com](http://PilotPrecision.com).

### General Ordering Information

When ordering stock Pilot Precision Products Tools from your distributor, please specify EDP No., size and description to ensure proper fulfillment.

### Transportation

All shipments are made via UPS where weight limitations allow. Express shipments, both surface and air, are available at your request. Shipments are F.O.B. South Deerfield, MA, unless otherwise stated.

### Prices

Please contact us for current pricing or refer to the current price list for prices on all stock items. Prices are subject to change without notice.

### TiN or TiAIN Coating

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

**Warning:** Cutting tools may shatter. Eye protection should be worn wherever and whenever cutting tools are being used.

MADE in the USA



# Keyway Broach Sets

1/16 thru 3/8 inch sizes

## Applications: Short Run Production | General Maintenance

All of our Broach Sets are furnished in traditional boxes, either varnished wood or plastic, depending upon the set selected, and come complete with Precision Broaches, slotted Bushings and necessary Shims.

### No. 00 Precision Set / No. 1

3 Broaches and 5 Bushings = 15 Keyway combinations.  
Collared bushings only. **Wt. 1 lbs**

| Keyway Sizes<br>(inch) | Broach<br>Style | Bushing Diameters<br>(bore sizes, inch) | EDP No.<br>duMONT      | Hassay Savage |
|------------------------|-----------------|---|------------------------|---------------|
| 1/16, 3/32, 1/8        | A / I           | 1/4, 5/16, 3/8, 7/16, 1/2               | 11101 Std<br>11301 TiN | *15315        |

### Standard Set No. 30

3 Broaches and 9 Bushings = 15 Keyway combinations.  
Collared bushings only. **Wt. 8 lbs**

| Keyway Sizes<br>(inch) | Broach<br>Style | Bushing Diameters<br>(bore sizes, inch) | EDP No.<br>duMONT |
|------------------------|-----------------|---|-------------------|
| 1/8                    | B / II          | 1/2, 5/8, 3/4                           | 11112 Std         |
| 3/16, 1/4              | C / III         | 7/8, 1, 1-1/8, 1-1/4,<br>1-3/8, 1-1/2   | 11112 Std         |

### Standard Set No. 10

4 Broaches and 9 Bushings = 18 Keyway combinations.  
Collared bushings only. **Wt. 10 lbs**

| Keyway Sizes<br>(inch) | Broach<br>Style | Bushing Diameters<br>(bore sizes, inch) | EDP No.<br>duMONT |
|------------------------|-----------------|---|-------------------|
| 1/8, 3/16              | B / II          | 1/2, 5/8, 3/4, 7/8                      | 11104 Std         |
| 1/4, 3/8               | C / III         | 1, 1-1/8, 1-1/4, 1-3/8, 1-1/2           | 11304 TiN         |

### Standard Set No. C-10

4 Broaches and 18 Bushings = 36 Keyway combinations.  
Collared bushings only. **Wt. 13 lbs**

| Keyway Sizes<br>(inch) | Broach<br>Style | Bushing Diameters<br>(bore sizes, inch)  | EDP No.<br>Hassay Savage |
|------------------------|-----------------|--|--------------------------|
| 1/8, 3/16              | B / II          | 1/2, 9/16, 5/8, 11/16,<br>3/4, 13/16, 7/8  |                          |
| 1/4, 3/8               | C / III         | 15/16, 1, 1-1/16, 1-1/8,<br>1-3/16, 1-1/4, 1-5/16,<br>1-3/8, 1-7/16, 1-1/2, 1-9/16 | *15336                   |



### Standard Set No. 10A

4 Broaches and 9 Bushings = 18 Keyway combinations.  
Collared bushings only. **Wt. 10 lbs**

| Keyway Sizes<br>(inch) | Broach<br>Style | Bushing Diameters<br>(bore sizes, inch)         | EDP No.<br>duMONT |
|------------------------|-----------------|---|-------------------|
| 1/8, 3/16              | B / II          | 9/16, 11/16, 13/16                              |                   |
| 1/4, 3/8               | C / III         | 15/16, 1-1/16, 1-3/16<br>1-5/16, 1-7/16, 1-9/16 | 11108 Std         |



### Standard Set No. C-10A

3 Broaches and 18 Bushings = 36 Keyway combinations.  
Collared bushings only. **Wt. 13 lbs**

| Keyway Sizes<br>(inch) | Broach<br>Style | Bushing Diameters<br>(bore sizes, inch)  | EDP No.<br>Hassay Savage |
|------------------------|-----------------|--|--------------------------|
| 1/8                    | B / II          | 1/2, 9/16, 5/8, 11/16,<br>3/4, 13/16, 7/8  |                          |
| 3/16, 1/4              | C / III         | 15/16, 1, 1-1/16, 1-1/8,<br>1-3/16, 1-1/4, 1-5/16,<br>1-3/8, 1-7/16, 1-1/2, 1-9/16 | *15330                   |

\*Kit comes in a Dura Case

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

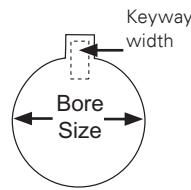


## Keyway Broach Sets

1/8 thru 3/8 inch sizes

**Applications: Short Run Production | General Maintenance**

All of our Broach Sets are furnished in traditional boxes, either varnished wood or plastic, depending upon the set selected, and come complete with Precision Broaches, slotted Bushings and necessary Shims.

**No. 10-10A Combination Set**

4 Broaches and 18 Bushings = 36 Keyway combinations.  
Collared bushings only. **Wt. 16 lbs**

| Keyway Sizes<br>(inch) | Broach<br>Style | Bushing Diameters<br>(bore sizes, inch)  | EDP No.<br>duMONT |
|------------------------|-----------------|--|-------------------|
| 1/8, 3/16              | B / II          | 1/2, 9/16, 5/8, 11/16,<br>3/4, 13/16, 7/8  | 11120 Std         |
| 1/4, 3/8               | C / III         | 15/16, 1, 1-1/16, 1-1/8,<br>1-3/16, 1-1/4, 1-5/16, 1-3/8,<br>1-7/16, 1-1/2, 1-9/16 |                   |

**No. 20 Combination Set**

5 Broaches and 18 Bushings = 47 Keyway combinations.  
Collared bushings only. **Wt. 16 lbs**

| Keyway Sizes<br>(inch) | Broach<br>Style | Bushing Diameters<br>(bore sizes, inch)  | EDP No.<br>duMONT      |
|------------------------|-----------------|--|------------------------|
| 1/8, 3/16              | B / II          | 1/2, 9/16, 5/8, 11/16,<br>3/4, 13/16, 7/8  | 11121 Std<br>11321 TiN |
| 1/4, 5/16, 3/8         | C / III         | 15/16, 1, 1-1/16, 1-1/8,<br>1-3/16, 1-1/4, 1-5/16, 1-3/8,<br>1-7/16, 1-1/2, 1-9/16 |                        |

**Standard Set C-1**

4 Broaches and 9 Bushings = 18 Keyway combinations.  
Collared bushings only. **Wt. 8 lbs**

| Keyway Sizes<br>(inch) | Broach<br>Style | Bushing Diameters<br>(bore sizes, inch) | EDP No.<br>Hassay Savage |
|------------------------|-----------------|---|--------------------------|
| 1/8, 3/16              | B / II          | 1/2, 5/8, 3/4, 7/8                      | *15318                   |
| 1/4, 3/8               | C / III         | 1, 1-1/8, 1-1/4, 1-3/8, 1-1/2           |                          |

## Keyway Broach Sets

1/8 thru 3/4 inch sizes

### Applications: Short Run Production | General Maintenance

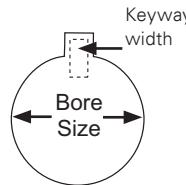
All of our Broach Sets are furnished in traditional boxes, either varnished wood or plastic, depending upon the set selected, and come complete with Precision Broaches, slotted Bushings and necessary Shims.



#### Standard Set No. 40A / 3-D

4 Broaches and 8 Bushings = 32 Keyway combinations.  
Plain bushings only. **Wt. 50 lbs**

| Keyway Sizes (inch)  | Broach Style | Bushing Diameters (bore sizes, inch)               | EDP No.   |               |
|----------------------|--------------|--|-----------|---------------|
|                      |              |  | duMONT    | Hassay Savage |
| 5/16, 3/8, 7/16, 1/2 | D / IV       | 1-1/2, 1-5/8, 1-3/4, 1-7/8, 2, 2-1/8, 2-1/4, 2-1/2 | 11127 Std | 15024         |



#### Standard Set No. 40 / 3-DA

4 Broaches and 8 Bushings = 32 Keyway combinations.  
Plain bushings only. **Wt. 50 lbs**

| Keyway Size (inch)   | Broach Style | Bushing Diameters (bore sizes, inch)                               | EDP No.   |               |
|----------------------|--------------|--|-----------|---------------|
|                      |              |  | duMONT    | Hassay Savage |
| 5/16, 3/8, 7/16, 1/2 | D / IV       | 1-7/16, 1-9/16, 1-11/16, 1-13/16, 1-15/16, 2-3/16, 2-7/16, 2-15/16 | 11129 Std | 15124         |

#### Heavy Duty Set No. 40 1/2 A / 4-E

2 Broaches and 6 Bushings = 12 Keyway combinations.  
Plain bushings only. **Wt. 74 lbs**

| Keyway Sizes (inch) | Broach Style | Bushing Diameters (bore sizes, inch) | EDP No.   |               |
|---------------------|--------------|--------------------------------------|-----------|---------------|
|                     |              |                                      | duMONT    | Hassay Savage |
| 5/8, 3/4            | E / V        | 2-3/8, 2-1/2, 2-5/8, 2-3/4, 2-7/8, 3 | 11131 Std |               |

#### Heavy Duty Set No. 50 / No. 5

3 Broaches and 17 Bushings = 29 Keyway combinations.  
Plain bushings only. **Wt. 175 lbs 3-4 Boxes**

| Keyway Sizes (inch) | Broach Style | Bushing Diameters (bore sizes, inch)   | EDP No.   |               |
|---------------------|--------------|--|-----------|---------------|
|                     |              |  | duMONT    | Hassay Savage |
| 1/2                 | D / IV       | 2, 2-1/16, 2-1/8, 2-3/16, 2-1/4, 2-5/16, 2-3/8, 2-7/16                         | 11135 Std |               |
| 5/8, 3/4            | E / V        | 2-5/16, 2-3/8, 2-7/16, 2-1/2, 2-9/16, 2-5/8, 2-11/16, 2-3/4, 2-7/8, 2-15/16, 3 |           |               |

#### No. 100 Heavy Duty Combination Set

9 Broaches and 44 Bushings = 102 Keyway combinations.  
Collared B / II and C / III bushings, plain D / IV and E / V bushing.  
**Wt. 250 lbs 5 Boxes**

| Keyway Sizes (inch) | Broach Style | Bushing Diameters (bore sizes, inch)   | EDP No.   |               |
|---------------------|--------------|--|-----------|---------------|
|                     |              |  | duMONT    | Hassay Savage |
| 1/8, 3/16           | B / II       | 1/2, 9/16, 5/8, 11/16, 3/4, 13/16, 7/8   | 11136 Std |               |
| 1/4, 5/16           | C / III      | 15/16, 1, 1-1/16, 1-1/8, 1-3/16, 1-1/4, 1-5/16, 1-3/8, 1-7/16, 1-1/2, 1-9/16                           |           |               |
| 3/8, 7/16, 1/2      | D / IV       | 1-7/16, 1-1/2, 1-9/16, 1-5/8, 1-11/16, 1-3/4, 1-13/16, 1-7/8, 1-15/16, 2, 2-1/16, 2-1/8, 2-3/16, 2-1/4 |           |               |
| 5/8, 3/4            | E / V        | 2-5/16, 2-3/8, 2-7/16, 2-1/2, 2-9/16, 2-5/8, 2-11/16, 2-3/4, 2-13/16, 2-7/8, 2-15/16, 3                |           |               |

\*NOTE: Shipped via freight truck only.

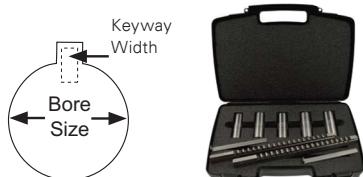


## Metric Keyway Broach Sets

2mm thru 18mm

### Applications: Short Run Production | General Maintenance

All of our Broach Sets are furnished in traditional boxes, either varnished wood or plastic, depending upon the set selected, and come complete with Precision Broaches, slotted Bushings and necessary Shims.



#### No. 40 Metric Set

6 Broaches and 18 Bushings = 36 Keyway Combinations  
Collared Bushings Only. **Wt. 10 lbs**

| Keyway Sizes (mm) | Broach Style | Bushing Diameters (bore sizes, mm)         | EDP No. Hassay Savage |
|-------------------|--------------|--|-----------------------|
| 2                 | A / I        | 8, 10                                      | *15440                |
| 3                 |              |  |                       |
| 4                 |              | 12, 14, 16, 18                             |                       |
| 6                 | C / III      | 18, 19, 20, 22, 24, 25, 26, 28, 30, 32, 34 |                       |
| 8                 |              |  |                       |

#### No. 60 Metric Set

2 Broaches and 3 Bushings = 6 Keyway combinations.  
Collared bushings only. **Wt. 1 lbs**

| Keyway Sizes (mm) | Broach Style | Bushing Diameters (bore sizes, mm) | EDP No. duMONT |
|-------------------|--------------|------------------------------------|----------------|
| 2                 | A / I        | 6, 8, 10                           | 44497 Std      |
| 3                 |              |                                    |                |

#### No. 70 Metric Set

4 Broaches and 13 Bushings = 26 Keyway combinations.  
Collared bushings only. **Wt. 15 lbs**

| Keyway Sizes (mm) | Broach Style | Bushing Diameters (bore sizes, mm) | EDP No. duMONT |
|-------------------|--------------|------------------------------------|----------------|
| 4                 | B / II       | 12, 14                             | 44498 Std      |
| 5                 |              | 15, 16                             |                |
| 6                 | C / III      | 18, 19, 20, 22                     |                |
| 8                 |              | 24, 25, 26, 28, 30                 |                |

#### No. 80 Metric Set

3 Broaches and 12 Bushings = 36 Keyway combinations.  
Plain bushings only. **Wt. 40 lbs**

| Keyway Sizes (mm) | Broach Style | Bushing Diameters (bore sizes, mm) | EDP No. duMONT |
|-------------------|--------------|------------------------------------|----------------|
| 10                | D / IV       | 32, 34, 35, 36                     | 44499 Std      |
| 12                |              | 38, 40, 42, 44                     |                |
| 14                |              | 45, 46, 48, 50                     |                |

#### No. 90 Metric Set

2 Broaches and 8 Bushings = 16 Keyway combinations.  
Plain bushings only. **Wt. 61 lbs**

| Keyway Sizes (mm) | Broach Style | Bushing Diameters (bore sizes, mm) | EDP No. duMONT |
|-------------------|--------------|------------------------------------|----------------|
| 16                | E / V        | 52, 54, 55, 56                     | 44500 Std      |
| 18                |              | 58, 60, 62, 65                     |                |

#### Precision Set 10

2 Broaches and 5 Bushings = 10 Keyway combinations.  
Collared bushings only. **Wt. 1 lbs**

| Keyway Sizes (mm) | Broach Style | Bushing Diameters (bore sizes, mm) | EDP No. Hassay Savage |
|-------------------|--------------|------------------------------------|-----------------------|
| 2                 | A / I        | 6, 7, 8, 9, 10                     | *15410                |
| 3                 |              |                                    |                       |

#### Metric Set 12

2 Broaches and 6 Bushings = 12 Keyway combinations.  
Plain bushings only. **Wt. 70 lbs**

| Keyway Sizes (mm) | Broach Style | Bushing Diameters (bore sizes, mm) | EDP No. Hassay Savage |
|-------------------|--------------|------------------------------------|-----------------------|
| 16                | E / V        | 54, 56, 58, 60, 62, 64             | 15212                 |
| 18                |              |                                    |                       |

#### Metric Set 18

4 Broaches and 9 Bushings = 18 Keyway combinations. Collared bushings only. **Wt. 7 lbs**

| Keyway Sizes (mm) | Broach Style | Bushing Diameters (bore sizes, mm) | EDP No. Hassay Savage |
|-------------------|--------------|------------------------------------|-----------------------|
| 4                 | B / II       | 12, 14, 16, 18                     | *15418                |
| 5                 |              |                                    |                       |
| 6                 | C / III      | 20, 22, 24, 26, 28                 |                       |
| 8                 |              |                                    |                       |

#### Metric Set 24

3 Broaches and 8 Bushings = 24 Keyway combinations.  
Plain bushings only. **Wt. 36 lbs**

| Keyway Sizes (mm) | Broach Style | Bushing Diameters (bore sizes, mm) | EDP No. Hassay Savage |
|-------------------|--------------|------------------------------------|-----------------------|
| 10                | D / IV       | 34, 36, 38, 40, 42, 44, 46, 48     | 15224                 |
| 12                |              |                                    |                       |
| 14                |              |                                    |                       |

\*Kit comes in a Dura Case

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

## A/I - Imperial - Keyway

1/16 thru 1/8 inch sizes

Applications: Short Run Production | General Maintenance



### Stock Keyway Broaches

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size<br>(inch) | Tolerances    | Broach<br>Dimensions | Shims<br>Required | Length of Cut |       | Pressure Required.<br>for Max. L/C (lbs.) | duMONT<br>Std | duMONT<br>TiN | duMONT<br>TiAIN | Hassay Savage | EDP No. |
|-----------------------|---------------|----------------------|-------------------|---------------|-------|---|---------------|---------------|-----------------|---------------|---------|
|                       |               |                      |                   | Min.          | Max.  |   |               |               |                 |               |         |
| 1/16-A                | .0625 - .0635 | 1/8 x 5              | 0                 | 13/64         | 1-1/8 | 390                                       | 22201         | 22301         | 22801           | 10104         |         |
| 3/32-A                | .0938 - .0948 | 1/8 x 5              | 0                 | 13/64         | 1-1/8 | 780                                       | 22202         | 22302         | 22802           | 10106         |         |
| 1/8-A                 | .1252 - .1262 | 1/8 x 5              | 1                 | 13/64         | 1-1/8 | 650                                       | 22203         | 22303         | 22803           | 10108         |         |

### A / I Bushings for A / I Broaches (colored only)

| Diameter<br>(inch) | Length | EDP No. |                  |
|--------------------|--------|---------|------------------|
|                    |        | duMONT  | Hassay<br>Savage |
| 1/4                |        | 33301   | 20116            |
| 5/16               |        | 33302   | 20120            |
| 3/8                | 1-1/8  | 33303   | 20124            |
| 7/16               |        | 33304   | 20128            |
| 1/2                |        | 33305   | 20132            |

### Extra Shims

Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size<br>(inch) | # / Set | Shim<br>Thickness | EDP No. |       |
|-----------------------|---------|-------------------|---------|-------|
|                       |         |                   |         |       |
| 1/8-A                 | 1       | .031              |         | 22250 |

## B/II - Imperial - Keyway

3/32 thru 3/16 inch sizes

### Stock Keyway Broaches

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size<br>(inch) | Tolerances    | Broach<br>Dimensions | Shims<br>Required | Length of Cut |         | Pressure Required.<br>for Max. L/C (lbs.) | duMONT<br>Std | duMONT<br>TiN | duMONT<br>TiAIN | Hassay Savage | EDP No. |
|-----------------------|---------------|----------------------|-------------------|---------------|---------|---|---------------|---------------|-----------------|---------------|---------|
|                       |               |                      |                   | Min.          | Max.    |   |               |               |                 |               |         |
| 3/32-B                | .0938 - .0948 | 3/16 x 6-3/4         | 0                 | 19/64         | 1-11/16 | 930                                       | 22204         | 22304         | 22804           | 10206         |         |
| 1/8-B                 | .1252 - .1262 | 3/16 x 6-3/4         | 1                 | 19/64         | 1-11/16 | 720                                       | 22205         | 22305         | 22805           | 10208         |         |
| 5/32-B                | .1564 - .1574 | 3/16 x 6-3/4         | 1                 | 19/64         | 1-11/16 | 1,320                                     | 22206         | 22306         | 22806           | 10210         |         |
| 3/16-B                | .1877 - .1887 | 3/16 x 6-3/4         | 1                 | 19/64         | 1-11/16 | 1,860                                     | 22207         | 22307         | 22807           | 10212         |         |

### B / II Bushings for B / II Broaches (colored only)

| Diameter<br>(inch) | Length  | EDP No. |                  |
|--------------------|---------|---------|------------------|
|                    |         | duMONT  | Hassay<br>Savage |
| 1/2                |         | 33313   | 20232            |
| 9/16               |         | 33314   | 20236            |
| 5/8                |         | 33315   | 20240            |
| 11/16              | 1-11/16 | 33316   | 20244            |
| 3/4                |         | 33317   | 20248            |
| 13/16              |         | 33318   | 20252            |
| 7/8                |         | 33319   | 20256            |

### Extra Shims

Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size<br>(inch) | # / Set | Shim<br>Thickness | EDP No. |       |
|-----------------------|---------|-------------------|---------|-------|
|                       |         |                   |         |       |
| 1/8-B                 | 1       | .031              |         | 22252 |
| 5/32-B                | 1       | .042              |         | 22253 |
| 3/16-B                | 1       | .050              |         | 22254 |

**SPECIAL ORDERS:** We are fully equipped to manufacture Special Bushings not listed. Please contact Pilot Precision Products for details.

## C/III - Imperial - Keyway

3/16 thru 3/8 inch sizes

## Stock Keyway Broaches

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size (inch) | Tolerances   | Broach Dimensions | Shims Required | Length of Cut | Pressure Required. for Max. L/C (lbs.) | duMONT Std | duMONT TiN | duMONT TiAIN | EDP No. Hassay Savage |
|--------------------|--------------|-------------------|----------------|---------------|--|------------|------------|--------------|-----------------------|
| 3/16-C             | .1877 -.1887 | 3/8 x 11-3/4      | 1              | 25/64         | 2-1/2                                  | 1,540      | 22208      | 22308        | 22808 10312           |
| 1/4-C              | .2502 -.2512 | 3/8 x 11-3/4      | 1              | 25/64         | 2-1/2                                  | 2,520      | 22209      | 22309        | 22809 10316           |
| 5/16-C             | .3127 -.3137 | 3/8 x 11-3/4      | 2              | 25/64         | 2-1/2                                  | 3,960      | 22210      | 22310        | 22810 10320           |
| 3/8-C              | .3755 -.3765 | 3/8 x 11-3/4      | 2              | 25/64         | 2-1/2                                  | 4,340      | 22211      | 22311        | 22811 10324           |

## C / III Bushings for C / III Broaches (collared only)

| Diameter (inch) | Length | EDP No. |               |
|-----------------|--------|---------|---------------|
|                 |        | duMONT  | Hassay Savage |
| 3/4             |        | 33334   | 20348         |
| 13/16           |        | 33335   | 20352         |
| 7/8             |        | 33336   | 20356         |
| 15/16           |        | 33337   | 20360         |
| 1               |        | 33338   | 20364         |
| 1-1/16          |        | 33339   | 20368         |
| 1-1/8           |        | 33340   | 20372         |
| 1-3/16          |        | 33341   | 20376         |
| 1-1/4           |        | 33342   | 20380         |
| 1-5/16          |        | 33343   | 20384         |
| 1-3/8           |        | 33344   | 20388         |
| 1-7/16          |        | 33345   | 20392         |
| 1-1/2           |        | 33346   | 20396         |
| 1-9/16          |        | 33347   | 20400         |

## Extra Shims

Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size (inch) | # / Set | Shim Thickness | EDP No. |
|--------------------|---------|----------------|---------|
| 3/16-C             | 1       | .050           | 22255   |
| 1/4-C              | 1       | .0625          | 22256   |
| 5/16-C             | 2       | .055           | 22257   |
| 3/8-C              | 2       | .0625          | 22258   |

## D/IV - Imperial - Keyway

5/16 thru 9/16 inch sizes

## Stock Keyway Broaches

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size (inch) | Tolerances   | Broach Dimensions | Shims Required | Length of Cut | Pressure Required. for Max. L/C (lbs.) | duMONT Std | duMONT TiN | duMONT TiAIN | EDP No. Hassay Savage |
|--------------------|--------------|-------------------|----------------|---------------|--|------------|------------|--------------|-----------------------|
| 5/16-D             | .3127 -.3137 | 9/16 x 13-7/8     | 2              | 1             | 6                                      | 8,000      | 22212      | 22312        | 22812 10420           |
| 3/8-D              | .3755 -.3765 | 9/16 x 13-7/8     | 2              | 1             | 6                                      | 7,000      | 22213      | 22313        | 22813 10424           |
| 7/16-D             | .4380 -.4390 | 9/16 x 13-7/8     | 3              | 1             | 6                                      | 9,400      | 22214      | 22314        | 22814 10428           |
| 1-1/2-D            | .5006 -.5016 | 9/16 x 13-7/8     | 3              | 1             | 6                                      | 9,800      | 22215      | 22315        | 22815 10432           |
| 9/16-D             | .5631 -.5641 | 9/16 x 13-7/8     | 4              | 1             | 6                                      | 8,900      | 10142      | 10342        | 10842 10436           |

## D / IV Bushings for D / IV Broaches (plain only)

| Diameter (inch) | Length | EDP No. |               |
|-----------------|--------|---------|---------------|
|                 |        | duMONT  | Hassay Savage |
| 1-7/16          |        | 33348   | 21492         |
| 1-1/2           |        | 33349   | 21496         |
| 1-9/16          |        | 33350   | 21500         |
| 1-5/8           |        | 33351   | 21504         |
| 1-11/16         |        | 33352   | 21508         |
| 1-3/4           |        | 33353   | 21512         |

## D / IV Bushings for D / IV Broaches (plain only)

| Diameter (inch) | Length | EDP No. |               |
|-----------------|--------|---------|---------------|
|                 |        | duMONT  | Hassay Savage |
| 1-13/16         |        | 33354   | 21516         |
| 1-7/8           |        | 33355   | 21520         |
| 1-15/16         |        | 33356   | 21524         |
| 2               |        | 33357   | 21528         |
| 2-1/16          |        | 33358   | 21532         |
| 2-1/8           |        | 33359   | 21536         |
| 2-3/16          |        | 33360   | 21540         |
| 2-1/4           |        | 33361   | 21544         |
| 2-5/16          |        | 33362   | 21548         |

## D / IV Bushings for D / IV Broaches (plain only)

| Diameter (inch) | Length | EDP No. |               |
|-----------------|--------|---------|---------------|
|                 |        | duMONT  | Hassay Savage |
| 2-3/8           |        | 33363   | 21552         |
| 2-7/16          |        | 33364   | 21556         |
| 2-1/2           |        | 33365   | 21560         |
| 2-9/16          |        | 33366   | 21564         |
| 2-5/8           |        | 33367   | 21568         |
| 2-11/16         |        | 33368   | 21572         |
| 2-3/4           |        | 33369   | 21576         |
| 2-13/16         |        | 33370   | 21580         |
| 2-7/8           |        | 33371   | 21584         |
| 2-15/16         |        | 33372   | 21588         |
| 3               |        | 33373   | 21592         |

## Extra Shims

Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size (inch) | # / Set | Shim Thickness | EDP No. |
|--------------------|---------|----------------|---------|
| 5/16-D             | 2       | .056           | 22259   |
| 3/8-D              | 2       | .0625          | 22260   |
| 7/16-D             | 3       | .056           | 22261   |
| 1-1/2-D            | 3       | .0625          | 22262   |
| 9/16-D             | 4       | .056           | 22269   |

## E/V - Imperial - Keyway

5/8 thru 3/4 inch sizes

### Stock Keyway Broaches

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size<br>(inch) | Tolerances    | Broach<br>Dimensions | Shims<br>Required | Length of Cut |      | Pressure Required.<br>for Max. L/C (lbs.) | EDP No.       |               |                 |               |
|-----------------------|---------------|----------------------|-------------------|---------------|------|---|---------------|---------------|-----------------|---------------|
|                       |               |                      |                   | Min.          | Max. |   | duMONT<br>Std | duMONT<br>TiN | duMONT<br>TiAIN | Hassay Savage |
| 5/8-E                 | .6260 – .6270 | 3/4 x 15-1/2         | 4                 | 1             | 6    | 9,600                                     | 22216         | 22316         | 22816           | 10540         |
| 3/4-E                 | .7515 – .7525 | 3/4 x 15-1/2         | 5                 | 1             | 6    | 11,900                                    | 22217         | 22317         | 22817           | 10548         |

### E / V Bushings for E / V Broaches (plain only)

| Diameter<br>(inch) | Length | EDP No. |                  |
|--------------------|--------|---------|------------------|
|                    |        | duMONT  | Hassay<br>Savage |
| 2-5/16             |        | 33374   | 21688            |
| 2-3/8              |        | 33375   | 21692            |
| 2-7/16             |        | 33376   | 21696            |
| 2-1/2              |        | 33377   | 21700            |
| 2-9/16             |        | 33378   | 21704            |
| 2-5/8              | 6      | 33379   | 21708            |
| 2-11/16            |        | 33380   | 21712            |
| 2-3/4              |        | 33381   | 21716            |
| 2-13/16            |        | 33382   | 21720            |
| 2-7/8              |        | 33383   | 21724            |
| 2-15/16            |        | 33384   | 21728            |

### E / V Bushings for E / V Broaches (plain only)

| Diameter<br>(inch) | Length | EDP No. |                  |
|--------------------|--------|---------|------------------|
|                    |        | duMONT  | Hassay<br>Savage |
| 3                  |        | 33385   | 21732            |
| 3-1/16             |        | 33386   | -                |
| 3-1/8              |        | 33387   | -                |
| 3-3/16             |        | 33388   | -                |
| 3-1/4              |        | 33389   | -                |
| 3-5/16             |        | 33390   | -                |
| 3-11/16            |        | 33396   | -                |
| 3-3/4              |        | 33397   | -                |
| 3-13/16            |        | 33398   | -                |
| 3-7/8              |        | 33399   | -                |
| 3-15/16            |        | 33400   | -                |
| 4                  |        | 33401   | -                |

### Extra Shims

Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size<br>(inch) | # / Set | Shim<br>Thickness | EDP No.       |               |
|-----------------------|---------|-------------------|---------------|---------------|
|                       |         |                   | duMONT<br>Std | duMONT<br>TiN |
| 5/8-E                 | 4       | .0625             | 22263         |               |
| 3/4-E                 | 5       | .0625             |               | 22264         |

## F/VI - Imperial - Keyway

7/8 thru 1 inch sizes

### Stock Keyway Broaches

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size<br>(inch) | Tolerances      | Broach<br>Dimensions | Shims<br>Required | Length of Cut |      | Pressure Required.<br>for Max. L/C (lbs.) | EDP No.       |               |                 |               |
|-----------------------|-----------------|----------------------|-------------------|---------------|------|---|---------------|---------------|-----------------|---------------|
|                       |                 |                      |                   | Min.          | Max. |   | duMONT<br>Std | duMONT<br>TiN | duMONT<br>TiAIN | Hassay Savage |
| 7/8-F                 | .8765 – .8775   | 1 x 19-3/4           | 6                 | 1             | 6    | 9,800                                     | 22218         | 22318         | 22818           | 10656         |
| 1-F                   | 1.0015 – 1.0025 | 1 x 19-3/4           | 7                 | 1             | 6    | 11,100                                    | 22219         | 22319         | 22819           | 10664         |

### F / VI Bushings for F / VI Broaches (plain only)

| Diameter<br>(inch) | Length | EDP No. |      |
|--------------------|--------|---------|------|
|                    |        | duMONT  | duVI |
| 3-1/16             |        | 33500   |      |
| 3-1/8              |        | 33501   |      |
| 3-3/16             |        | 33502   |      |
| 3-1/4              |        | 33503   |      |
| 3-5/16             | 6      | 33504   |      |
| 3-3/8              |        | 33505   |      |
| 3-7/16             |        | 33506   |      |
| 3-1/2              |        | 33507   |      |
| 3-9/16             |        | 33508   |      |
| 3-5/8              |        | 33509   |      |

### F / VI Bushings for F / VI Broaches (plain only)

| Diameter<br>(inch) | Length | EDP No. |      |
|--------------------|--------|---------|------|
|                    |        | duMONT  | duVI |
| 3-11/16            |        | 33510   |      |
| 3-3/4              |        | 33511   |      |
| 3-13/16            |        | 33512   |      |
| 3-7/8              |        | 33513   |      |
| 3-15/16            | 6      | 33514   |      |
| 4                  |        | 33515   |      |
| 4-1/16             |        | 33516   |      |
| 4-1/8              |        | 33517   |      |
| 4-3/16             |        | 33518   |      |
| 4-1/4              |        | 33519   |      |

### F / VI Bushings for F / VI Broaches (plain only)

| Diameter<br>(inch) | Length | EDP No. |      |
|--------------------|--------|---------|------|
|                    |        | duMONT  | duVI |
| 4-5/16             |        | 33520   |      |
| 4-3/8              |        | 33521   |      |
| 4-7/16             |        | 33522   |      |
| 4-1/2              |        | 33523   |      |
| 4-9/16             |        | 33524   |      |
| 4-5/8              | 6      | 33525   |      |
| 4-11/16            |        | 33526   |      |
| 4-3/4              |        | 33527   |      |
| 4-13/16            |        | 33528   |      |
| 4-7/8              |        | 33529   |      |
| 4-15/16            |        | 33530   |      |
| 5                  |        | 33531   |      |

### Extra Shims

Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size<br>(inch) | # / Set | Shim<br>Thickness | EDP No.       |               |
|-----------------------|---------|-------------------|---------------|---------------|
|                       |         |                   | duMONT<br>Std | duMONT<br>TiN |
| 7/8-F                 | 6       | .0625             | 22265         |               |
| 1-F                   | 7       | .0625             |               | 22266         |

**A/I - Metric - Keyway**

2 thru 3 mm sizes

Applications: **Short Run Production | General Maintenance****Stock Keyway Broaches / Optional Metric Keyway Broaches**

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size (mm) | Tolerances (Decimal Equiv.) | Broach Dimensions (inches) | Standard Millimeter Keys | Shims Req'd | Length of Cut (inches) | Pressure Required. for Max. L/C (lbs.)* | EDP No. | duMONT Std. | duMONT TiN | duMONT TiAIN | Hassay Savage |
|------------------|-----------------------------|----------------------------|--------------------------|-------------|------------------------|---|---------|-------------|------------|--------------|---------------|
| 2-A / I          | 0.0782 – 0.0791             | 1/8 x 5                    | 2 x 2                    | 0           | 13/64                  | 720                                     | 44401   | 44301       | 44801      | 44802        | 11102         |
| 3-A / I          | 0.1176 – 0.1185             |                            | 3 x 3                    | 1           | 1-1/8                  | 650                                     | 44402   | 44302       | 44802      | 44802        | 11103         |

| A / I Bushings for A / I Broaches (collared only) |                  |         |               |
|---|------------------|---------|---------------|
| Diameter (mm)                                     | (Decimal Equiv.) | EDP No. |               |
|   |                  | duMONT  | Hassay Savage |
| 6   | .2362            | 44501   | 22106         |
| 7   | .2756            | -       | 22107         |
| 8   | .3150            | 44431   | 22108         |
| 9   | .3543            | -       | 22109         |
| 10  | .3937            | 44432   | 22110         |
| 12  | .4724            | 44502   |               |
| 15  | .5905            | 44503   |               |

**Extra Shims**

Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size (mm) | # / Set | Shim Thickness | EDP No. duMONT |
|------------------|---------|----------------|----------------|
| 3-A / I          | 1       | 0.0310         | 44480          |

**B1/II - Metric - Keyway**

4 thru 5 mm sizes

**Stock Keyway Broaches / Optional Metric Keyway Broaches**

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size (mm) | Tolerances (Decimal Equiv.) | Broach Dimensions (inches) | Standard Millimeter Keys | Shims Req'd | Length of Cut (inches) | Pressure Required. for Max. L/C (lbs.)* | EDP No. | duMONT Std. | duMONT TiN | duMONT TiAIN | Hassay Savage |
|------------------|-----------------------------|----------------------------|--------------------------|-------------|------------------------|---|---------|-------------|------------|--------------|---------------|
| 4-B1 / II        | 0.1569 – 0.1579             | 1/4 x 6-3/4                | 4 x 4                    | 1           | 19/64                  | 1,140                                   | 44403   | 44303       | 44803      | 44803        | 11204         |
| 5-B1 / II        | 0.1963 – 0.1972             |                            | 5 x 5                    |             | 1-11/16                | 1,860                                   | 44404   | 44304       | 44804      | 44804        | 11205         |

| B1 / II Bushings for B1 / II Broaches (collared only) |                  |         |               |
|---|------------------|---------|---------------|
| Diameter (mm)   | (Decimal Equiv.) | EDP No. |               |
|   |                  | duMONT  | Hassay Savage |
| 11  | .4331            | 44510   | 22211HS       |
| 12  | .4724            | 44433   | 22212HS       |
| 13  | .5118            | 44511   | 22213HS       |
| 14  | .5512            | 44434   | 22214HS       |
| 15  | .5905            | 44504   | 22215HS       |
| 16  | .6299            | 44435   | 22216HS       |
| 17  | .6693            | 44505   | 22217HS       |
| 18  | .7087            | 44436   | 22218HS       |
| 19  | .7480            | 44506   | 22219HS       |

**Extra Shims**

Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size (mm) | # / Set | Shim Thickness | EDP No. duMONT |
|------------------|---------|----------------|----------------|
| 4-B1 / II        | 1       | 0.0380         | 44481          |
| 5-B1 / II        |         | 0.0500         | 44482          |

## C/III - Metric - Keyway

5 thru 8 mm sizes

### Stock Keyway Broaches / Optional Metric Keyway Broaches

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size (mm) | Tolerances (Decimal Equiv.) | Broach Dimensions (inches) | Standard        | Shims Req'd | Length of Cut (inches) |       | Pressure Required. for Max. L/C (lbs.)* | EDP No.     |            |              |               |
|------------------|-----------------------------|----------------------------|-----------------|-------------|------------------------|-------|---|-------------|------------|--------------|---------------|
|                  |                             |                            | Millimeter Keys |             | Min.                   | Max.  |   | duMONT Std. | duMONT TiN | duMONT TiAIN | Hassay Savage |
| 5-C / III        | 0.1963 - 0.1972             |                            | 5 x 5           | 1           |                        |       | 1,470                                   | 44405       | 44305      | 44805        | 11305         |
| 6-C / III        | 0.2356 - 0.2366             |                            | 6 x 6           | 1           | 25/64                  | 2-1/2 | 2,100                                   | 44406       | 44306      | 44806        | 11306         |
| 7-C / III        | 0.2749 - 0.2763             |                            | 7 x 6           | 1           |                        |       | 2,900                                   | 10232       | 10332      | 10832        | 11307         |
| 8-C / III        | 0.3143 - 0.3155             |                            | 8 x 7           | 2           |                        |       | 3,680                                   | 44407       | 44307      | 44807        | 11308HS       |

### C / III Bushings for C / III Broaches (collared only)

| Diameter (mm) | (Decimal Equiv.) | EDP No. |               |
|---------------|------------------|---------|---------------|
|               |                  | duMONT  | Hassay Savage |
| 17            | .6693            | 44512   | 22317HS       |
| 18            | .7087            | 44437   | 22318HS       |
| 19            | .7480            | 44438   | 22319HS       |
| 20            | .7874            | 44439   | 22320HS       |
| 22            | .8661            | 44440   | 22322HS       |
| 24            | .9449            | 44441   | 22324HS       |
| 25            | .9842            | 44442   | 22325HS       |
| 26            | 1.0236           | 44443   | 22326HS       |
| 27            | 1.0630           | -       | 22327HS       |
| 28            | 1.1024           | 44444   | 22328HS       |
| 30            | 1.1811           | 44445   | 22330HS       |
| 32            | 1.2598           | 44446   | 22332HS       |
| 34            | 1.3386           | 44447   | 22334HS       |
| 35            | 1.3779           | 44507   | 22335HS       |
| 36            | 1.4173           | 44448   | 22336HS       |

### Extra Shims

Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size (mm) | #   Set | Shim Thickness |           | EDP No. duMONT |
|------------------|---------|----------------|-----------|----------------|
|                  |         | 5-C / III      | 6-C / III |                |
| 5-C / III        | 1       | 0.0470         |           | 44483          |
| 6-C / III        | 1       | 0.0625         |           | 44484          |
| 7-C / III        | 1       | 0.0625         |           | 44577          |
| 8-C / III        | 2       | 0.0500         |           | 44485          |

## D/IV - Metric - Keyway

10 thru 14 mm sizes

### Stock Keyway Broaches / Optional Metric Keyway Broaches

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size (mm) | Tolerances (Decimal Equiv.) | Broach Dimensions (inches) | Standard        | Shims Req'd | Length of Cut (inches) |      | Pressure Required. for Max. L/C (lbs.)* | EDP No.     |            |              |               |
|------------------|-----------------------------|----------------------------|-----------------|-------------|------------------------|------|---|-------------|------------|--------------|---------------|
|                  |                             |                            | Millimeter Keys |             | Min.                   | Max. |   | duMONT Std. | duMONT TiN | duMONT TiAIN | Hassay Savage |
| 10-D / IV        | 0.3930 - 0.3942             |                            | 10 x 8          |             |                        |      | 6,500                                   | 44408       | 44308      | 44808        | 11410         |
| 12-D / IV        | 0.4716 - 0.4730             |                            | 12 x 8          | 2           | 1                      | 6    | 8,400                                   | 44409       | 44309      | 44809        | 11412         |
| 14-D / IV        | 0.5503 - 0.5517             |                            | 14 x 9          |             |                        |      | 11,100                                  | 44410       | 44310      | 44810        | 11414         |

### D / IV Bushings for D / IV Broaches (plain only)

| Diameter (mm) | (Decimal Equiv.) | EDP    |               |
|---------------|------------------|--------|---------------|
|               |                  | duMONT | Hassay Savage |
| 32            | 1.2598           | 44449  | 22432         |
| 34            | 1.3386           | 44450  | 22434         |
| 35            | 1.3779           | 44451  | 22435         |
| 36            | 1.4173           | 44452  | 22436         |
| 38            | 1.4961           | 44453  | 22438         |
| 40            | 1.5748           | 44454  | 22440         |
| 42            | 1.6535           | 44455  | 22442         |
| 44            | 1.7323           | 44456  | 22444         |

### D / IV Bushings for D / IV Broaches (plain only)

| Diameter (mm) | (Decimal Equiv.) | EDP    |               |
|---------------|------------------|--------|---------------|
|               |                  | duMONT | Hassay Savage |
| 45            | 1.7716           | 44457  | 22445         |
| 46            | 1.8110           | 44458  | 22446         |
| 48            | 1.8898           | 44459  | 22448         |
| 50            | 1.9685           | 44460  | 22450         |
| 52            | 2.0472           | 44461  | 22452         |
| 54            | 2.1260           | 44462  | 22454         |
| 55            | 2.1653           | -      | 22455         |
| 56            | 2.2047           | 44463  | 22456         |

### Extra Shims

Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size (mm) | #   Set | Shim Thickness |           | EDP No. duMONT |
|------------------|---------|----------------|-----------|----------------|
|                  |         | 10-D / IV      | 12-D / IV |                |
| 10-D / IV        | 1       | 0.0560         | 0.0560    | 44486          |
| 12-D / IV        | 2       | 0.0560         | 0.0625    | 44487          |
| 14-D / IV        | 2       | 0.0625         |           | 44488          |

**E/V - Metric - Keyway****16 thru 18 mm sizes****Stock Keyway Broaches / Optional Metric Keyway Broaches**

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size (mm) | Tolerances (Decimal Equiv.) | Broach Dimensions (inches) | Standard        | Shims Req'd | Length of Cut (inches) |      | Pressure Required. for Max. L/C (lbs.)* | EDP No.     |            |              |               |
|------------------|-----------------------------|----------------------------|-----------------|-------------|------------------------|------|---|-------------|------------|--------------|---------------|
|                  |                             |                            | Millimeter Keys |             | Min.                   | Max. |   | duMONT Std. | duMONT TiN | duMONT TiAIN | Hassay Savage |
| 16-E / V         | 0.6290 – 0.6304             | 3/4 x 15-1/2               | 16 x 10         | 3           | 1                      | 6    | 9,400                                   | 44411       | 44311      | 44811        | 11516         |
| 18-E / V         | 0.7078 – 0.7092             |                            | 18 x 11         |             |                        |      | 10,600                                  | 44412       | 44312      | 44812        | 11518         |

**E / V Bushings for E / V Broaches (plain only)**

| Diameter (mm) | (Decimal Equiv.) | EDP No. |               |
|---------------|------------------|---------|---------------|
|               |                  | duMONT  | Hassay Savage |
| 52            | 2.0472           | 44464   | 22552         |
| 54            | 2.1260           | 44465   | 22554         |
| 55            | 2.1653           | 44466   | 22555         |
| 56            | 2.2047           | 44467   | 22556         |
| 58            | 2.2835           | 44468   | 22558         |
| 60            | 2.3622           | 44469   | 22560         |
| 62            | 2.4409           | 44470   | 22562         |
| 63            | 2.4803           | 44471   | -             |
| 64            | 2.5197           | 44472   | 22564         |
| 65            | 2.5590           | 44473   | 22565         |
| 66            | 2.5984           | 44474   | 22566         |
| 68            | 2.6772           | 44475   | 22568         |
| 70            | 2.7559           | 44476   | 22570         |
| 72            | 2.8346           | 44477   | 22572         |

**Extra Shims**

Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size (mm) | # / Set | Shim Thickness | EDP No. duMONT |
|------------------|---------|----------------|----------------|
|                  |         | 16-E / V       | 18-E / V       |
| 16-E / V         | 3       | 0.0560         | 44489          |
| 18-E / V         |         | 0.0560         | 44490          |

**F/VI - Metric - Keyway****20 thru 25 mm sizes****Stock Keyway Broaches / Optional Metric Keyway Broaches**

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size (mm) | Tolerances (Decimal Equiv.) | Broach Dimensions (inches) | Standard        | Shims Req'd | Length of Cut (inches) |      | Pressure Required. for Max. L/C (lbs.)* | EDP No.     |            |              |               |
|------------------|-----------------------------|----------------------------|-----------------|-------------|------------------------|------|---|-------------|------------|--------------|---------------|
|                  |                             |                            | Millimeter Keys |             | Min.                   | Max. |   | duMONT Std. | duMONT TiN | duMONT TiAIN | Hassay Savage |
| 20-F / VI        | 0.7864 – 0.7880             |                            | 20 x 12         | 3           |                        |      | 8,800                                   | 44413       | 44313      | 44813        | 11620         |
| 22-F / VI        | 0.8651 – 0.8667             |                            | 22 x 14         | 4           |                        |      | 9,400                                   | 44414       | 44314      | 44814        | 11622         |
| 24-F / VI        | 0.9439 – 0.9455             |                            | 24 x 14         | 4           |                        |      | 10,600                                  | 44415       | 44315      | 44815        | 11624         |
| 25-F / VI        | 0.9832 – 0.9848             |                            | 25 x 14         | 4           |                        |      | 12,300                                  | 44494       | 44394      | 44894        | 11625         |

**F / VI Bushings for F / VI Broaches (plain only)**

| Diameter (mm) | (Decimal Equiv.) | EDP No. duMONT |               |
|---------------|------------------|----------------|---------------|
|               |                  | duMONT         | Hassay Savage |
| 70            | 2.7559           | 44539          |               |
| 75            | 2.9527           | 44540          |               |
| 80            | 3.1496           | 44541          |               |
| 85            | 3.3464           | 44542          |               |
| 90            | 3.5433           | 44543          |               |
| 95            | 3.7401           | 44544          |               |
| 100           | 3.9370           | 44545          |               |
| 105           | 4.1338           | 44546          |               |
| 110           | 4.3307           | 44547          |               |
| 115           | 4.5275           | 44548          |               |
| 120           | 4.7244           | 44549          |               |

**Extra Shims**

Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size (mm) | # / Set | Shim Thickness | EDP No. duMONT |       |       |
|------------------|---------|----------------|----------------|-------|-------|
|                  |         | 20-F           | 22-F           | 24-F  | 25-F  |
| 20-F             | 3       | 0.0625         | 44491          |       |       |
| 22-F             | 4       | 0.0560         |                | 44492 |       |
| 24-F             | 5       | 0.0625         |                |       | 44493 |
| 25-F             | 4       | 0.0560         |                |       | 44496 |

## Additional Sizes - Imperial - Keyway

1-1/8 thru 2 inch sizes

### Stock Keyway Broaches

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size<br>(inch) | Tolerances      | Broach Dimensions | Shims Required | Length of Cut |      | Pressure Required.<br>for Max. L/C (lbs.) | EDP No.       |               |                 |               |
|-----------------------|-----------------|-------------------|----------------|---------------|------|---|---------------|---------------|-----------------|---------------|
|                       |                 |                   |                | Min.          | Max. |   | duMONT<br>Std | duMONT<br>TiN | duMONT<br>TiAIN | Hassay Savage |
| 1-1/8                 | 1.1265 - 1.1275 | 1-1/8 x 20-1/4    | 8              | 1             | 6    | 14,750                                    | 10171         | -             | -               | 10666HS       |
| 1-1/4                 | 1.2520 - 1.2530 | 1-1/4 x 20-1/4    | 9              | 1-1/2         | 8    | 22,100                                    | 10172         | -             | -               | 10668HS       |
| 1-3/8                 | 1.3770 - 1.3780 | 1-3/8 x 20-1/4    | **             | 1-1/2         | 8    | 23,500                                    | 10173         | -             | -               | 10670HS       |
| 1-1/2                 | 1.5020 - 1.5030 | 1-1/2 x 20-1/4    | **             | 1-1/2         | 8    | 26,500                                    | 10174         | -             | -               | 10672HS       |
| 1-3/4                 | 1.7520 - 1.7530 | 1-3/4 x 20-1/4    | **             | 1-1/2         | 8    | 31,400                                    | 10175         | -             | -               | -             |
| 2                     | 2.003 - 2.004   | 1-3/4 x 20-1/16   | **             | 1-1/2         | 8    | 35,900                                    | 10176         | -             | -               | -             |

\*Based on mild steel \*\*Shims are not supplied with these broaches, sold as Progressive Shims only, see below

■ 1-1/8" to 2" broaches need special order bushings. Please provide bore diameter to quote.

### Extra Shims

**Extra Shims are provided in necessary Shim Sets only.** For Broaches larger than 1-1/4" progressive Shims are available as special items. Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size<br>(inch) | # / Set | Shim<br>Thickness | EDP No. |
|-----------------------|---------|-------------------|---------|
| 1-1/8                 | 8       | .0625             | 22267   |
| 1-1/4                 | 9       | .0625             | 22268   |

### Progressive Shims

| Broach Size<br>(inch) | # / Set | Shim<br>Thickness            | EDP No. |
|-----------------------|---------|------------------------------|---------|
| 1-3/8                 | 4       | .062, .125, .250, .375       | 22270   |
| 1-1/2                 | 4       | .062, .125, .250, .375       | 22271   |
| 1-3/4                 | 4       | .062, .125, .250, .375       | 22272   |
| 2                     | 5       | .062, .125, .250, .375, .500 | 22273   |

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

## Additional Sizes - Metric - Keyway

28 thru 45mm sizes

### Stock Keyway Broaches / Optional Metric Keyway Broaches

Broaches are supplied with necessary Shims unless otherwise noted. For extra or replacement Shims see the table below.

| Broach Size (mm) | Tolerances<br>(Decimal Equiv.) | Broach Dimensions<br>(inches) | Standard<br>Millimeter<br>Keys | Shims<br>Req'd | Length of Cut (inches) |      | Pressure Required.<br>for Max. L/C (lbs.)* | EDP No.     |            |              |               |
|------------------|--------------------------------|-------------------------------|--------------------------------|----------------|------------------------|------|--|-------------|------------|--------------|---------------|
|                  |                                |                               |                                |                | Min.                   | Max. |  | duMONT Std. | duMONT TiN | duMONT TiAIN | Hassay Savage |
| 28               | 1.1025 - 1.1035                | 1-1/8 x 20-1/4                | 28 x 16                        | 5              | 1                      | 6    | 12,000                                     | 10233       | -          | -            | 11628         |
| 32               | 1.2600 - 1.2610                | 1-1/4 x 20-1/4                | 32 x 18                        | 5              | 1-1/2                  | 8    | 20,600                                     | 10234       | -          | -            | 11632         |
| 36               | 1.4175 - 1.4185                | 1-7/16 x 20-1/4               | 36 x 20                        | **             | 1-1/2                  | 8    | 24,200                                     | 10235       | -          | -            | 11636         |
| 40               | 1.5753 - 1.5760                | 1-9/16 x 20-1/4               | 40 x 22                        | **             | 1-1/2                  | 8    | 22,500                                     | 10236       | -          | -            | -             |
| 45               | 1.7718 - 1.7728                | 1-3/4 x 20-1/4                | 45 x 25                        | **             | 1-1/2                  | 8    | 27,200                                     | 10237       | -          | -            | -             |

\*Based on mild steel \*\*Shims are not supplied with these broaches, sold as Progressive Shims only, see below

### Extra Shims

**Extra Shims are provided in necessary Shim Sets only.** Shims are available as special items for Broaches larger than 32mm progressive. Please specify EDP No. when ordering extra or replacement Shims. Shims correspond to Broach size, not to Bushing type.

| Broach Size<br>(mm) | # / Set | Shim<br>Thickness | EDP No.<br>duMONT |
|---------------------|---------|-------------------|-------------------|
| 28                  | 5       | 0.0560            | 44478             |
| 32                  |         | 0.0625            | 44479             |

■ 1-1/8" to 2" & 28 mm to 45 mm broaches need special order bushings. Please provide bore diameter to quote.



### Progressive Shims

| Broach Size<br>(mm) | # / Set | Shim<br>Thickness       | EDP No.<br>duMONT |
|---------------------|---------|-------------------------|-------------------|
| 36                  | 3       | .062, .125, .250        | 44578             |
| 40                  | 3       | .062, .125, .250        | 44579             |
| 45                  | 4       | .062 (2pcs), .125, .250 | 44580             |

**SPECIAL ORDERS:** We are fully equipped to manufacture Special Bushings not listed above. Please contact Pilot Precision Products for details.

**One-Pass Keyway Broaches**

1/8 thru 3/8 inch sizes

3mm thru 14mm

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

One-Pass Keyway Broaches are designed for smaller production runs of identical keyways in varying bores. Used with the appropriate Bushing size (American Standard or Metric) and Style (see pages 10 and 12) to cut to full width and depth in one-pass, no shimming required. Reminder – Broach and Bushing Style must match – "A / I" Broaches with "A / I" Bushings, "B / II" Broaches with "B / II" Bushings, etc. A special chamfering feature that will deburr the keyway while it is being broached is also available.

**TiN or TiAlN coatings available.**

**Stock One-Pass Broaches – Inch**

| Broach Size (inch) | Broach Dimensions | Tolerances (Decimal Equiv.) | Tooth Pitch | Length of Cut* (inches) | Pressure Required. for Max. L/C (lbs.)* | EDP No. duMONT |
|--------------------|-------------------|-----------------------------|-------------|-------------------------|---|----------------|
| 1/8-B / II         | 3/16 x 10-3/4     | .1252 – .1262               |             |                         | 800                                     | 55507          |
| 5/32-B / II        | 3/16 x 10-3/4     | .1564 – .1574               | 1/4         | 19/64                   | 1,450                                   | 55508          |
| 3/16-B / II        | 3/16 x 10-3/4     | .1877 – .1887               |             |                         | 2,050                                   | 55509          |
| 1/8-C / III        | 3/8 x 14-1/8      | .1252 – .1262               |             |                         | 900                                     | 55501          |
| 5/32-C / III       | 3/8 x 14-1/8      | .1564 – .1574               |             |                         | 1,360                                   | 55502          |
| 3/16-C / III       | 3/8 x 17          | .1877 – .1887               |             |                         | 1,570                                   | 55503          |
| 1/4-C / III        | 3/8 x 17          | .2502 – .2512               | 9/32        | 19/64                   | 2,560                                   | 55504          |
| 5/16-C / III       | 3/8 x 18-1/2      | .3127 – .3137               |             |                         | 3,900                                   | 55505          |
| 3/8-C / III        | 3/8 x 18-1/2      | .3755 – .3765               |             |                         | 5,300                                   | 55506          |

**Stock One-Pass Metric Keyway Broaches**

| Broach Size (mm) | Broach Dimensions | Tolerances (Decimal Equiv.) | Tooth Pitch | Length of Cut* (inches) | Pressure Required. for Max. L/C (lbs.)* | EDP No. duMONT | EDP No. Hassay Savage |              |
|------------------|-------------------|-----------------------------|-------------|-------------------------|---|----------------|-----------------------|--------------|
| 3-A / I          | 1/8 x 7-3/4       | 0.1176 – 0.1185             | 3/16        | 13/64                   | 1                                       | 675            | 55510                 | 11103-OP**   |
| 4-B1 / II        | 1/4 x 10-3/4      | 0.1569 – 0.1579             | 1/4         | 3/8                     | 1-5/8                                   | 1,550          | 55511                 | 11204-COP*** |
| 5-B1 / II        |                   | 0.1963 – 0.1972             |             |                         |   | 2,430          | 55512                 | 11205-COP*** |
| 6-C / III        | 3/8 x 17          | 0.2356 – 0.2366             | 9/32        | 3/8                     | 1-3/4                                   | 2,240          | 55513                 | 11306-COP*** |
| 8-C / III        | 3/8 x 18-1/2      | 0.3143 – 0.3155             | 5/16        |                         | 2                                       | 3,485          | 55514                 | 11308-COP*** |
| 10-D / IV        |                   | 0.3930 – 0.3942             |             |                         |   | 3,410          | 55515                 | -            |
| 12-D / IV        | 9/16 x 24         | 0.4716 – 0.4730             | 3/8         | 25/64                   | 2                                       | 4,220          | 55516                 | -            |
| 14-D / IV        |                   | 0.5503 – 0.5517             |             |                         |   | 5,670          | 55517                 | -            |

\*Based on mild steel

OP\*\* designates one-pass, no chamfer

COP\*\*\* designates chamfer one pass

**Note:** 4mm—12mm keyway broaches have deburring feature

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 One-Pass Broaches to your specifications. A special chamfering feature that will deburr the keyway while it is being broached is also available. TiN or TiAlN coatings are available. Please contact Pilot Precision Products for details.

## Production Push-type Keyway Broaches

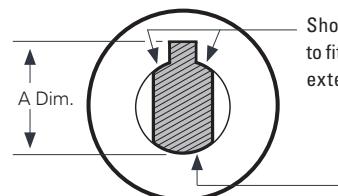
Applications: **High Speed Operation | Accurate Long Run Production**



### 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



Shoulders and back are form-ground to fit bore. These 3 supporting surfaces extend the full length of the broach.

#### 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 |
|--------------|---------------|-------------|---------------|-------------|----------------|-------|--|----------------|
| 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"       |               |             |                |       |  | 55526          |
|              | 3/4"          | .844"       | 14-3/4        | 3/8         | 25/64          | 2-1/2 | 2,170                                  | 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

\*\* Includes Chamfer

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.



**Square Push Broaches**

1/8 thru 1 inch sizes

4mm thru 25mm sizes

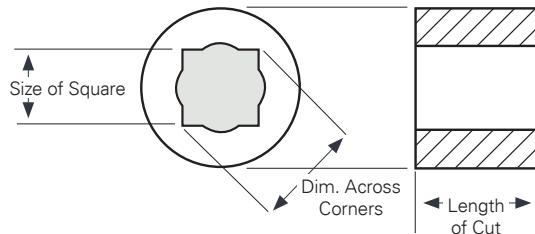
Applications: Drives, jigs, fixtures and other square broaching operations

**Square Push Broaches**

Our Standard Square Broaches are designed to generate in one-pass a Standard Square hole in a previously cast or drilled round hole. Standard Square Broaches begin in an oversized pilot hole and generate the square hole while leaving small radii on the flats. Available from stock in the most

common American Standard / Metric sizes (1/8–1" & 4mm–25mm).

**TiN or TiAlN coatings available.**

**American Standard / Metric Square Broach****Stock Standard Square Broaches**

| Square Size (inch) | Tolerances     | Broach Length | Pilot Diameter | Drill Size | Dimension Across Corners | Tooth Pitch | Length of Cut |       | Pressure Required. for Max. L/C (lbs.) | duMONT        | EDP No. |
|--------------------|----------------|---------------|----------------|------------|--------------------------|-------------|---------------|-------|--|---------------|---------|
|                    |                |               |                |            |                          |             | Min.          | Max.  |  | Hassay Savage |         |
| 1/8                | .1255 – .1265  | 4-1/8         | .1285          | No. 30     | .1750 – .1770            | 1/8         | 3/16          | 1/2   | 700                                    | 66601         | 13008   |
| 5/32               | .1565 – .1575  | 5-1/8         | .1590          | No. 21     | .2180 – .2200            | 5/32        | 1/4           | 1/2   | 600                                    | 66602         | 13010   |
| 3/16               | .1880 – .1890  | 5-9/16        | .1935          | No. 10     | .2620 – .2640            |             | 1/4           | 5/8   | 1,080                                  | 66603         | 13012   |
| 7/32               | .2190 – .2200  | 6-3/8         | .2280          | No. 1      | .3060 – .3080            | 3/16        | 1/4           | 3/4   | 1,410                                  | 66604         | 13014   |
| 1/4                | .2505 – .2515  | 6-1/2         | .2656          | 17/64      | .3510 – .3530            |             |               |       | 1,740                                  | 66605         | 13016   |
| 9/32               | .2815 – .2825  | 7-3/4         | .2969          | 19/64      | .3930 – .3950            | 7/32        | 5/16          | 1     | 2,130                                  | 66606         | 13018   |
| 5/16               | .3130 – .3140  | 7-7/8         | .3281          | 21/64      | .4370 – .4390            |             | 3/8           | 1     | 2,100                                  | 66607         | 13020   |
| 11/32              | .3440 – .3450  | 9-3/8         | .3594          | 23/64      | .4830 – .4850            | 1/4         | 3/8           | 1-1/4 | 3,480                                  | 66608         | 13022   |
| 3/8                | .3755 – .3765  | 9-3/8         | .3906          | 25/64      | .5240 – .5260            |             |               |       | 3,720                                  | 66609         | 13024   |
| 13/32              | .4065 – .4075  | 10-5/8        | .4219          | 27/64      | .5690 – .5710            | 9/32        | 1/2           | 1-3/8 | 4,080                                  | 66610         | 13026   |
| 7/16               | .4380 – .4390  | 10-7/8        | .4531          | 29/64      | .6110 – .6130            |             |               |       | 4,500                                  | 66611         | 13028   |
| 15/32              | .4690 – .4700  | 12            | .5000          | 1/2        | .6570 – .6590            | 5/16        | 1/2           | 1-3/8 | 4,000                                  | 66612         | 13030   |
| 1/2                | .5005 – .5015  | 12            | .5312          | 17/32      | .6990 – .7010            |             |               |       | 4,500                                  | 66613         | 13032   |
| 9/16               | .5630 – .5640  | 14-3/4        | .5938          | 19/32      | .7870 – .7890            | 3/8         | 1/2           | 1-1/2 | 5,700                                  | 66614         | 13036   |
| 5/8                | .6260 – .6270  | 16-5/16       | .6562          | 21/32      | .8730 – .8750            |             |               |       | 5,920                                  | 66615         | 13040   |
| 11/16              | .6885 – .6895  | 17-3/4        | .7500          | 3/4        | .9630 – .9650            | 7/16        | 5/8           | 1-5/8 | 4,800                                  | 66616         | 13044   |
| 3/4                | .7510 – .7520  | 17-3/4        | .8125          | 13/16      | 1.0450 – 1.0470          |             |               |       | 5,940                                  | 66617         | 13048   |
| 7/8                | .8765 – .8775  | 22-3/4        | .9375          | 15/16      | 1.2270 – 1.2290          | 7/16        | 5/8           | 2     | 9,200                                  | 66618         | 13056   |
| 1                  | 1.002 – 1.0030 | 24-1/8        | 1.0938         | 1-3/32     | 1.4030 – 1.4050          |             |               |       | 9,200                                  | 66619         | 13064   |

**Stock Metric Standard Square Broaches**

| Square Size (mm) | Tolerances (Dec. Equiv.) | Broach Length | Pilot Diameter | Drill Size | Dimension Across Corners | Tooth Pitch | Length of Cut |       | Pressure Required. for Max. L/C (lbs.) | duMONT        | EDP No. |
|------------------|--------------------------|---------------|----------------|------------|--------------------------|-------------|---------------|-------|--|---------------|---------|
|                  |                          |               |                |            |                          |             | Min.          | Max.  |  | Hassay Savage |         |
| 4                | .1575 – .1580            | 5-1/8         | .1614          | 4.1        | .2205 – .2220            | 5/32        | 1/4           | 1/2   | 480                                    | 66630         | 17001   |
| 5                | .1968 – .1973            | 6-1/2         | .2047          | 5.2        | .2765 – .2780            |             |               |       | 800                                    | 66631         | 17002   |
| 6                | .2362 – .2370            | 6-11/16       | .2519          | 6.4        | .3300 – .3320            | 3/16        | 1/4           | 3/4   | 1,300                                  | 66632         | 17003   |
| 7                | .2756 – .2764            | 7-3/4         | .2913          | 7.4        | .3850 – .3870            | 7/32        | 3/8           | 1     | 1,800                                  | 66633         | -       |
| 8                | .3150 – .3158            | 7-7/8         | .3307          | 8.4        | .4400 – .4420            |             |               |       | 2,300                                  | 66634         | 17004   |
| 9                | .3543 – .3551            | 9-3/8         | .3701          | 9.4        | .4970 – .4990            | 1/4         | 3/8           | 1-1/4 | 3,500                                  | 66639         | -       |
| 10               | .3937 – .3945            | 10-1/4        | .4094          | 10.4       | .5530 – .5550            |             |               |       | 3,600                                  | 66635         | 17005   |
| 12               | .4724 – .4732            | 12            | .5039          | 12.8       | .6620 – .6640            | 5/16        | 1/2           | 1-3/8 | 4,200                                  | 66636         | 17006   |
| 14               | .5512 – .5520            | 14-3/4        | .5826          | 14.8       | .7730 – .7750            | 3/8         | 1/2           | 1-1/2 | 5,600                                  | 66637         | 17007   |
| 16               | .6302 – .6310            | 16-5/16       | .6614          | 16.8       | .8790 – .8810            |             |               |       | 6,000                                  | 66638         | 17008   |
| 18               | .7090 – .7097            | 17-7/8        | .7716          | 19.6       | .9930 – .9950            | 7/16        | 5/8           | 1-5/8 | 5,200                                  | 66640         | 17009   |
| 20               | .7874 – .7882            | 20-7/8        | .8504          | 21.6       | 1.1030 – 1.1050          |             |               |       | 6,600                                  | 66641         | 17010   |
| 22               | .8663 – .8671            | 22-3/4        | .9291          | 23.6       | 1.2130 – 1.2150          | 7/16        | 5/8           | 2     | 8,900                                  | 66642         | 17011   |
| 24               | .9453 – .9460            | 24            | 1.0079         | 25.6       | 1.3230 – 1.3250          |             |               |       | 9,200                                  | 66643         | 17012   |
| 25               | .9845 – .9852            | 24-1/8        | 1.0630         | 27.0       | 1.3790 – 1.3810          |             |               |       | 9,200                                  | 66644         | 17013   |

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 Full Square Broaches and Special Metric Square Broaches not listed above to your specifications. Please contact Pilot Precision Products for details.

## Full Square Push Broaches

3/16 thru 1/2 inch

Applications: Drives, jigs, fixtures, sizing and finishing

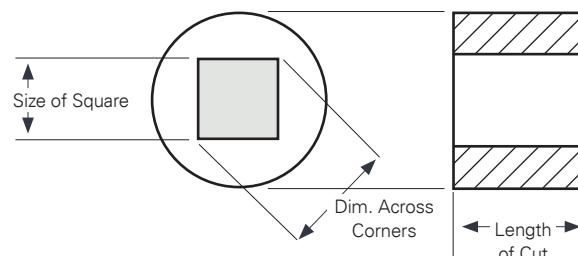
## Full Square Broaches

Our Full Square Broaches are designed to generate in one-pass a Full Square hole in a previously cast or drilled round hole. The Broach leaves no radii on the flats of the broached piece and the pilot diameter equals the finished full square size.

TiN or TiAlN coatings available.



## Dimensions of Standard Full Square Broach Holes



## Stock Full Square Broaches

| Full Square Size (inch) | Tolerances (Dec. Equiv.) | Broach Length | Pilot Diameter | Drill Size | Dimension Across Corners | Tooth Pitch | Length of Cut |      | Pressure Required. for Max. L/C (lbs.) | EDP No. |               |
|-------------------------|--------------------------|---------------|----------------|------------|--------------------------|-------------|---------------|------|--|---------|---------------|
|                         |                          |               |                |            |                          |             | Min.          | Max. |  | duMONT  | Hassay Savage |
| 3/16                    | .1880 – .1890            | 6             | 3/16           | 3/16       | .2630 – .2650            | 1/8         | 3/16          | 1/2  | 870                                    | 66403   | 14012         |
| 1/4                     | .2505 – .2515            | 8-1/2         | 1/4            | 1/4        | .3510 – .3530            | 5/32        | 1/4           | 5/8  | 1,310                                  | 66405   | 14016         |
| 5/16                    | .3130 – .3140            | 10-1/2        | 5/16           | 5/16       | .4390 – .4410            | 3/16        | 5/16          | 7/8  | 1,895                                  | 66407   | 14020         |
| 3/8                     | .3755 – .3765            | 13-1/8        | 3/8            | 3/8        | .5260 – .5280            | 7/32        | 5/16          | 1    | 2,410                                  | 66409   | 14024         |
| 7/16                    | .4385 – .4395            | 14-1/4        | 7/16           | 7/16       | .6140 – .6160            |             |               |      | 3,090                                  | 66411   | 14028         |
| 1/2                     | .5005 – .5015            | 14-3/4        | 1/2            | 1/2        | .7010 – .7030            | 1/4         | 3/8           | 1    | 3,860                                  | 66413   | 14032         |

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

## Round Push Broaches

1/4 thru 1 inch

Applications: Drives, jigs, fixtures, sizing and finishing

\*Non-Stock Standards - Made to Order

## Round Broaches

duMONT Minute Man® and Hassay Savage Round Broaches are designed to generate in one-pass a precision round hole in a previously cast, drilled or reamed round hole. These Internal Hole Broaches are ideal for precise tolerances, sizing and finish for those applications demanding precision and finish. Broaches are finished with variable pitch teeth and available in American Standard sizes. A burnishing section can be furnished. Metric sizes available upon request.

TiN or TiAlN coatings available.



## Stock Round Broaches

| Nominal Diameter (inch) | Tolerances      | Broach Length | Pilot Diameter | Drill Size | Length of Cut |       | Pressure Required. for Max. L/C (lbs.) | EDP No. duMONT |
|-------------------------|-----------------|---------------|----------------|------------|---------------|-------|--|----------------|
| 1/4                     | .2505 – .2510   | 5-7/8         | .2344          | 15/64      | 5/16          | 3/4   | 840                                    | 77730          |
| 5/16                    | .3130 – .3135   |               | .2469          | 19/64      |               |       | 1,050                                  | 77731          |
| 3/8                     | .3755 – .3760   | 6-7/8         | .3594          | 23/64      | 3/8           | 1     | 1,440                                  | 77732          |
| 7/16                    | .4380 – .4385   |               | .4219          | 27/64      |               |       | 1,680                                  | 77733          |
| 1/2                     | .5005 – .5010   | 8             | .4844          | 31/64      | 1/2           | 1-1/4 | 2,240                                  | 77734          |
| 5/8                     | .6255 – .6260   | 8-1/2         | .6094          | 39/64      |               |       | 2,500                                  | 77736          |
| 3/4                     | .7505 – .7510   | 9-1/8         | .7344          | 47/64      | 5/8           | 1-1/2 | 3,720                                  | 77738          |
| 7/8                     | .8755 – .8765   | 9-1/4         | .8594          | 55/64      |               |       | 4,340                                  | 77740          |
| 1                       | 1.0005 – 1.0015 | 10-1/4        | .9844          | 63/64      | 5/8           | 1-3/4 | 4,970                                  | 77742          |

**Hexagon Push Broaches**

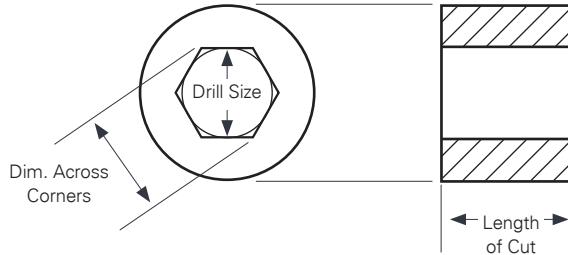
1/8 thru 1 inch sizes

4mm thru 25mm sizes

Applications: **Drives, jigs, fixtures and other hexagonal broaching operations****Hexagon Broaches**

Our Hexagon Broaches are designed to generate in one-pass a Hexagon hole in a previously cast or drilled round hole. Available from stock in the most common American Standard / Metric sizes (1/8–1" & 4mm–25mm).

**TiN or TiAlN coatings available.**

**American Standard / Metric Square Broach****Stock Hexagon Broaches**

| Hex Size (inch) | Tolerances      | Broach Length | Pilot Diameter | Drill Size | Dimension Across Corners | Tooth Pitch | Length of Cut |       | Pressure Required. for Max. L/C (lbs.) | EDP No. |               |
|-----------------|-----------------|---------------|----------------|------------|--------------------------|-------------|---------------|-------|--|---------|---------------|
|                 |                 |               |                |            |                          |             | Min.          | Max.  |  | duMONT  | Hassay Savage |
| 1/8             | .1255 – .1265   | 4-1/8         | 1/8            | 1/8        | .1445 – .1455            | 1/8         | 3/16          | 3/8   | 200                                    | 77701   | 12008         |
| 5/32            | .1565 – .1575   | 4-15/16       | 5/32           | 5/32       | .1800 – .1815            | 1/8         | 1/4           | 1/2   | 300                                    | 77702   | 12010         |
| 3/16            | .1880 – .1890   | 5-1/16        | 3/16           | 3/16       | .2160 – .2180            | 5/32        | 1/4           | 5/8   | 560                                    | 77703   | 12012         |
| 7/32            | .2190 – .2200   | 5-3/8         | 7/32           | 7/32       | .2500 – .2520            | 5/32        | 1/4           | 3/4   | 775                                    | 77704   | 12014         |
| 1/4             | .2505 – .2515   | 6             | 1/4            | 1/4        | .2870 – .2890            | 3/16        | 7/32          | 1     | 1,025                                  | 77705   | 12016         |
| 9/32            | .2815 – .2825   | 7-1/4         | 9/32           | 9/32       | .3230 – .3250            | 3/16        | 5/16          | 1     | 1,290                                  | 77706   | 12018         |
| 5/16            | .3130 – .3140   | 7-3/4         | 5/16           | 5/16       | .3590 – .3610            | 3/16        | 3/8           | 1     | 1,510                                  | 77707   | 12020         |
| 11/32           | .3440 – .3450   | 7-3/4         | 11/32          | 11/32      | .3950 – .3970            | 7/32        | 3/8           | 1-1/4 | 2,280                                  | 77708   | 12022         |
| 3/8             | .3755 – .3765   | 8-1/2         | 3/8            | 3/8        | .4310 – .4330            | 7/32        |               |       | 2,400                                  | 77709   | 12024         |
| 13/32           | .4065 – .4075   | 9-5/8         | 13/32          | 13/32      | .4670 – .4690            | 1/4         | 1/2           | 1-3/8 | 2,790                                  | 77710   | 12026         |
| 7/16            | .4380 – .4390   | 10-1/2        | 7/16           | 7/16       | .5040 – .5060            | 9/32        | 1/2           | 1-3/8 | 2,700                                  | 77711   | 12028         |
| 15/32           | .4690 – .4700   | 11-7/8        | 15/32          | 15/32      | .5390 – .5410            | 3/8         | 5/8           | 2     | 2,700                                  | 77712   | 12030         |
| 1/2             | .5005 – .5015   | 11-7/8        | 1/2            | 1/2        | .5750 – .5770            |             |               |       | 3,025                                  | 77713   | 12032         |
| 9/16            | .5630 – .5640   | 13-3/4        | 9/16           | 9/16       | .6480 – .6500            | 5/16        | 1/2           | 1-5/8 | 4,800                                  | 77714   | 12036         |
| 5/8             | .6260 – .6270   | 16-1/4        | 5/8            | 5/8        | .7200 – .7220            |             |               |       | 5,400                                  | 77715   | 12040         |
| 11/16           | .6885 – .6895   | 16-3/4        | 11/16          | 11/16      | .7920 – .7940            |             |               |       | 6,000                                  | 77716   | 12044         |
| 3/4             | .7510 – .7520   | 17-1/4        | 3/4            | 3/4        | .8650 – .8670            |             |               |       | 6,960                                  | 77717   | 12048         |
| 7/8             | .8765 – .8775   | 18-1/2        | 7/8            | 7/8        | 1.0080 – 1.0100          |             |               |       | 8,400                                  | 77718   | 12056         |
| 1               | 1.0020 – 1.0030 | 19-3/4        | 1              | 1          | 1.1520 – 1.1540          |             |               |       | 11,100                                 | 77719   | 12064         |

**Stock Metric Hexagon Broaches**

| Hexagon (mm) | Tolerances (Dec. Equiv.) | Broach Length | Pilot Diameter | Drill Size | Dimension Across Corners | Tooth Pitch | Length of Cut |       | Pressure Required. for Max. L/C (lbs.) | EDP No. |               |
|--------------|--------------------------|---------------|----------------|------------|--------------------------|-------------|---------------|-------|--|---------|---------------|
|              |                          |               |                |            |                          |             | Min.          | Max.  |  | duMONT  | Hassay Savage |
| 4            | .1575 – .1580            | 4-15/16       | .1575          | 4.0        | .1810 – .1825            | 1/8         | 1/4           | 1/2   | 300                                    | 77750   | 12104         |
| 5            | .1968 – .1973            | 5-3/8         | .1968          | 5.0        | .2260 – .2275            | 5/32        | 1/4           | 3/4   | 775                                    | 77751   | 12105         |
| 6            | .2362 – .2370            | 6             | .2362          | 6.0        | .2710 – .2730            | 3/16        | 1/4           | 3/4   | 1,025                                  | 77752   | 12106         |
| 7            | .2756 – .2764            | 7-1/4         | .2756          | 7.0        | .3170 – .3190            | 7/32        | 1/4           | 1     | 1,290                                  | 77753   | 12107         |
| 8            | .3150 – .3158            | 7-3/4         | .3150          | 8.0        | .3620 – .3640            | 3/8         | 3/8           | 1     | 1,510                                  | 77754   | 12108         |
| 9            | .3545 – .3555            | 8-1/2         | .3543          | 9.0        | .4090 – .4110            | 1/4         | 3/8           | 1-1/4 | 2,300                                  | 77759   | -             |
| 10           | .3937 – .3945            | 9-5/8         | .3937          | 10.0       | .4530 – .4550            | 9/32        | 1/2           | 1-3/8 | 2,790                                  | 77755   | 12110         |
| 12           | .4724 – .4732            | 11-7/8        | .4724          | 12.0       | .5430 – .5450            | 5/16        | 1/2           | 1-3/8 | 2,700                                  | 77756   | 12112         |
| 14           | .5512 – .5520            | 13-3/4        | .5512          | 14.0       | .6350 – .6370            | 3/8         | 1/2           | 1-5/8 | 4,800                                  | 77757   | 12114         |
| 16           | .6302 – .6310            | 16-1/4        | .6299          | 16.0       | .7250 – .7270            | 3/8         | 5/8           | 2     | 5,400                                  | 77758   | 12116         |
| 18           | .7092 – .7097            | 16-3/4        | .7087          | 18.0       | .8170 – .8190            |             |               |       | 6,400                                  | 77760   | 12118         |
| 20           | .7876 – .7886            | 17-5/8        | .7874          | 20.0       | .9050 – .9070            |             |               |       | 7,200                                  | 77761   | 12120         |
| 22           | .8664 – .8674            | 18-1/2        | .8661          | 22.0       | .9990 – 1.0010           |             |               |       | 8,200                                  | 77762   | 12122         |
| 24           | .9450 – .9460            | 19-1/2        | .9449          | 24.0       | 1.0890 – 1.0910          |             |               |       | 9,700                                  | 77763   | 12124         |
| 25           | .9845 – .9855            | 19-3/4        | .9842          | 25.0       | 1.1350 – 1.1370          |             |               |       | 11,000                                 | 77764   | 12125         |

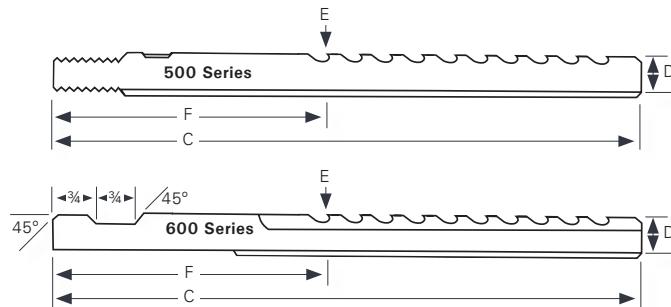
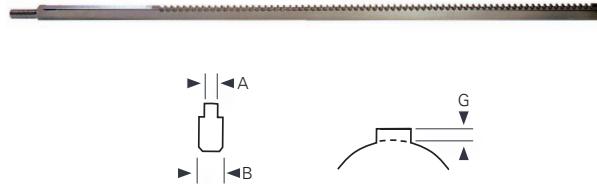
## Pull-Type Keyway Broaches

1/16 thru 1 inch sizes

Applications: For high volume production pull-type machines

\*Non-Stock Standards - Made to Order

## Industry Standard 500 and 600 Series



## Industry Standard 500 and 600 Series

duMONT Minute Man® and Hassay Savage brands offer the most common American Standard (1/16–1") Pull-Type Keyway Broaches for use in high volume production. Available either as Industry Standard 500 Series with threaded pull end or 600 Series with notched pull end.

| Nom. Dim. | A Decimal Dim.t | Min. Hole Size | Min Length Cut# | Max Length Cut* | B      | C  | D     | E     | F        | G    | No.of Passes | Thread Size | EDP No.           |                   |                   |                   |
|-----------|-----------------|----------------|-----------------|-----------------|--------|----|-------|-------|----------|------|--------------|-------------|-------------------|-------------------|-------------------|-------------------|
|           |                 |                |                 |                 |        |    |       |       |          |      |              |             | duMONT 500 Series | duMONT 600 Series | Hassay 500 Series | Hassay 600 Series |
| 1/16      | .0635           | 3/8            | 3/8             | 1-1/4           | .1552  | 20 | .313  | .271  | 7-13/16  | .042 | 1            | 1/4–20      | 10501S            | 10601S            | -                 | 33601             |
| 3/32      | .0948           | 7/16           | 1/2             | 1-1/2           | .1865  | 24 | .367  | .309  | 8-1/4    | .058 | 1            | 5/16–18     | 10502S            | 10602S            | -                 | 33602             |
| 3/32      | .0948           | 9/16           | 5/8             | 2-1/2           | .2490  | 33 | .491  | .433  | 10       | .058 | 1            | 3/8–16      | 10503S            | 10603S            | -                 | 33603             |
| 1/8       | .1260           | 1/2            | 1/2             | 1-1/2           | .2490  | 30 | .438  | .364  | 9        | .074 | 1            | 3/8–16      | 10504S            | 10604S            | -                 | 33604             |
| 1/8       | .1260           | 11/16          | 5/8             | 2-1/2           | .3115  | 33 | .594  | .520  | 10       | .074 | 1            | 1/2–13      | 10505S            | 10605S            | -                 | 33605             |
| 5/32      | .1572           | 19/32          | 1/2             | 1-1/2           | .2490  | 30 | .525  | .436  | 9        | .089 | 1            | 3/8–16      | 10506S            | 10606S            | -                 | 33606             |
| 5/32      | .1572           | 23/32          | 5/8             | 2-1/2           | .3115  | 33 | .625  | .536  | 10       | .089 | 1            | 1/2–13      | 10507S            | 10607S            | -                 | 33607             |
| 3/16      | .1885           | 11/16          | 5/8             | 2-1/2           | .3740  | 36 | .581  | .476  | 10       | .105 | 1            | 1/2–13      | 10508S            | 10608S            | -                 | 33608             |
| 3/16      | .1885           | 7/8            | 11/16           | 3-1/2           | .3740  | 36 | .796  | .691  | 10-11/16 | .105 | 1            | 1/2–13      | 10509S            | 10609S            | -                 | 33609             |
| 7/32      | .2198           | 11/16          | 5/8             | 2-1/2           | .3740  | 33 | .557  | .437  | 10       | .120 | 1            | 1/2–13      | 10510S            | 10610S            | -                 | 33610             |
| 7/32      | .2198           | 15/16          | 11/16           | 3-1/2           | .3740  | 42 | .813  | .693  | 11-1/16  | .120 | 1            | 1/2–13      | 10511S            | 10611S            | -                 | 33611             |
| 1/4       | .2510           | 3/4            | 5/8             | 2-1/2           | .3740  | 36 | .612  | .476  | 10       | .136 | 1            | 1/2–13      | 10512S            | 10612S            | -                 | 33612             |
| 1/4       | .2510           | 1              | 11/16           | 4               | .4990  | 45 | .877  | .741  | 12       | .136 | 1            | 5/8–11      | 10513S            | 10613S            | -                 | 33613             |
| 1/4       | .2510           | 1-3/8          | 7/8             | 6               | .6240  | 51 | 1.250 | 1.114 | 13-3/4   | .136 | 1            | 3/4–10      | 10514S            | 10614S            | -                 | 33614             |
| 9/32      | .2828           | 7/8            | 11/16           | 4               | .4990  | 42 | .716  | .564  | 11-5/8   | .152 | 1            | 5/8–11      | 10515S            | 10615S            | -                 | 33615             |
| 9/32      | .2828           | 1-1/4          | 7/8             | 6               | .4990  | 51 | 1.093 | .941  | 13-1/2   | .152 | 1            | 5/8–11      | 10516S            | 10616S            | -                 | 33616             |
| 5/16      | .3140           | 1-1/16         | 11/16           | 4               | .4990  | 45 | .908  | .741  | 12       | .167 | 1            | 5/8–11      | 10517S            | 10617S            | -                 | 33617             |
| 5/16      | .3140           | 1-5/16         | 7/8             | 6               | .4990  | 51 | 1.158 | .991  | 13-3/4   | .167 | 1            | 5/8–11      | 10518S            | 10618S            | -                 | 33618             |
| 3/8       | .3765           | 1-9/16         | 11/16           | 4               | .4990  | 45 | .938  | .739  | 12       | .199 | 1            | 5/8–11      | 10519S            | 10619S            | -                 | 33619             |
| 3/8       | .3765           | 1-5/16         | 7/8             | 6               | .4990  | 54 | 1.189 | .990  | 13-1/2   | .199 | 1            | 5/8–11      | 10520S            | 10620S            | -                 | 33620             |
| 7/16      | .4390           | 1-9/16         | 11/16           | 4               | .6240  | 48 | 1.390 | 1.160 | 12       | .230 | 1            | 3/4–10      | 10521S            | 10621S            | -                 | 33621             |
| 7/16      | .4390           | 1-3/4          | 1               | 8               | .6240  | 48 | 1.611 | 1.496 | 15-5/8   | .230 | 2            | 3/4–10      | 10522S            | 10622S            | -                 | 33622             |
| 1/2       | .5015           | 1-1/2          | 11/16           | 4               | .6240  | 48 | 1.312 | 1.051 | 12       | .261 | 1            | 3/4–10      | 10523S            | 10623S            | -                 | 33623             |
| 1/2       | .5015           | 1-9/16         | 1               | 8               | .6240  | 48 | 1.377 | 1.246 | 16-1/2   | .261 | 2            | 3/4–10      | 10524S            | 10624S            | -                 | 33624             |
| 9/16      | .5645           | 1-11/16        | 11/16           | 4               | .6865  | 54 | 1.438 | 1.146 | 11-13/16 | .292 | 1            | 1–8         | 10525S            | 10625S            | -                 | 33625             |
| 9/16      | .5645           | 1-5/8          | 1               | 8               | .6865  | 51 | 1.391 | 1.245 | 16       | .292 | 2            | 1–8         | 10526S            | 10626S            | -                 | 33626             |
| 9/16      | .5645           | 1-15/16        | 1-1/8           | 12              | .8740  | 60 | 1.641 | 1.495 | 20       | .292 | 2            | 1–8         | 10527S            | 10627S            | -                 | 33627             |
| 5/8       | .6270           | 1-7/8          | 1-1/16          | 4               | .7490  | 60 | 1.625 | 1.301 | 12       | .324 | 1            | 1–8         | 10528S            | 10628S            | -                 | 33628             |
| 5/8       | .6270           | 1-15/16        | 1               | 8               | .8740  | 54 | 1.657 | 1.495 | 16-3/8   | .324 | 2            | 1–8         | 10529S            | 10629S            | -                 | 33629             |
| 5/8       | .6270           | 1-15/16        | 1-1/8           | 12              | .8740  | 60 | 1.657 | 1.495 | 20       | .324 | 2            | 1–8         | 10530S            | 10630S            | -                 | 33630             |
| 3/4       | .7520           | 1-15/16        | 11/16           | 4               | .8740  | 60 | 1.625 | 1.239 | 12       | .386 | 1            | 1–8         | 10531S            | 10631S            | -                 | 33631             |
| 3/4       | .7520           | 2-1/16         | 1               | 8               | .9990  | 60 | 1.688 | 1.495 | 16-1/4   | .386 | 2            | 1-1/4–7     | 10532S            | 10632S            | 33532             | 33632             |
| 3/4       | .7520           | 2-1/16         | 1-1/8           | 12              | .9990  | 60 | 1.688 | 1.560 | 20       | .386 | 3            | 1-1/4–7     | 10533S            | 10633S            | 33533             | 33633             |
| 7/8       | .8770           | 2-1/4          | 11/16           | 4               | 1.1240 | 63 | 1.875 | 1.426 | 12-3/8   | .449 | 1            | 1-1/4–7     | 10534S            | 10634S            | 33534             | 33634             |
| 7/8       | .8770           | 2-1/8          | 1               | 8               | 1.1240 | 63 | 1.719 | 1.494 | 15-3/4   | .449 | 2            | 1-1/4–7     | 10535S            | 10635S            | 33535             | 33635             |
| 7/8       | .8770           | 2-1/8          | 1-1/8           | 12              | 1.1240 | 63 | 1.719 | 1.569 | 20       | .449 | 3            | 1-1/4–7     | 10536S            | 10636S            | 33536             | 33636             |
| 1         | 1.0020          | 2-1/4          | 5/8             | 2-1/2           | 1.2490 | 63 | 1.750 | 1.239 | 10-1/2   | .511 | 1            | 1-1/2–6     | 10537S            | 10637S            | 33537             | 33637             |
| 1         | 1.0020          | 2-1/4          | 7/8             | 6               | 1.2490 | 63 | 1.750 | 1.494 | 14-1/4   | .511 | 2            | 1-1/2–6     | 10538S            | 10638S            | 33538             | 33638             |
| 1         | 1.0020          | 2-1/4          | 1-1/8           | 12              | 1.2490 | 63 | 1.750 | 1.580 | 20       | .511 | 3            | 1-1/2–6     | 10539S            | 10639S            | 33539             | 33639             |

<sup>†</sup> Tolerance - Based on +/-0.0005 # Minimum length of part recommended to prevent part from dropping in between broach teeth \*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.

Note: All items can be made with deburring feature as specials.



**Pull-Type Keyway Broaches**

2mm thru 25mm

Applications: For high volume production pull-type machines

**Metric 2–25mm Pull-type Keyway Broaches**

duMONT Minute Man® and Hassay Savage brands offer the most common Metric (2–25mm) Pull-Type Keyway Broaches for use in high volume production. Available either as Industry Standard 500 Series with threaded pull end or 600 Series with notched pull end. See image on page 16.

| Nom. Dim. | A Decimal Dim. <sup>†</sup> | Min. Hole Size (mm) | Min Length Cut# | Max Length Cut* |                 |            |                |                |                 |              | No.of Passes | Thread Size | EDP No.            |                    |
|-----------|-----------------------------|---------------------|-----------------|-----------------|-----------------|------------|----------------|----------------|-----------------|--------------|--------------|-------------|--------------------|--------------------|
|           |                             |                     |                 |                 | B               | C          | D              | E              | F               | G            |              |             | duMONT 500M Series | duMONT 600M Series |
| 2         | .0792                       | 9<br>.354           | 9.5<br>3/8      | 31.8<br>1-1/4   | 3.942<br>.1552  | 508<br>20  | 7.95<br>.313   | 6.60<br>.260   | 197<br>7-3/4    | 1.35<br>.053 | 1            | 1/4 – 20    | 10561S             | 10661S             |
| 3         | .1186                       | 11<br>.433          | 12.7<br>1/2     | 38<br>1-1/2     | 4.737<br>.1865  | 610<br>24  | 9.32<br>.367   | 7.49<br>.295   | 197<br>7-3/4    | 1.83<br>.072 | 1            | 5/16 – 18   | 10562S             | 10662S             |
| 4         | .1581                       | 13<br>.512          | 12.7<br>1/2     | 38<br>1-1/2     | 6.325<br>.2490  | 838<br>33  | 11.13<br>.438  | 8.81<br>.347   | 229<br>9        | 2.31<br>.091 | 1            | 3/8 – 16    | 10563S             | 10663S             |
|           | .1581                       | 13<br>.512          | 15.9<br>5/8     | 63.5<br>2-1/2   | 6.325<br>.2490  | 915<br>36  | 11.07<br>.436  | 8.76<br>.345   | 254<br>10       | 2.31<br>.091 |              |             | 10564S             | 10664S             |
| 5         | .1974                       | 14<br>.551          | 14.3<br>9/16    | 44.5<br>1-3/4   | 7.91<br>.3115   | 915<br>36  | 11.07<br>.436  | 8.18<br>.322   | 248<br>9-3/4    | 2.89<br>.114 | 1            | 1/2 – 13    | 10565S             | 10665S             |
|           | .1974                       | 23<br>.906          | 15.9<br>5/8     | 76.2<br>3       | 9.5<br>.3740    | 1067<br>42 | 2.65<br>.813   | 17.75<br>.699  | 279<br>11       | 2.89<br>.114 |              |             | 10566S             | 10666S             |
| 6         | .2368                       | 18<br>.709          | 15.9<br>5/8     | 63.5<br>2-1/2   | 9.5<br>.3740    | 915<br>36  | 15.54<br>.612  | 11.96<br>.471  | 254<br>10       | 3.58<br>.141 | 1            | 1/2 – 13    | 10567S             | 10667S             |
|           | .2368                       | 26<br>1.024         | 17.5<br>11/16   | 102<br>2-1/2    | 12.67<br>.4990  | 1143<br>45 | 22.28<br>.877  | 18.69<br>.736  | 305<br>12       | 3.58<br>.141 |              |             | 10568S             | 10668S             |
| 8         | .3157                       | 27<br>1.063         | 17.5<br>11/16   | 102<br>4        | 12.67<br>.4990  | 1143<br>45 | 23.06<br>.908  | 18.77<br>.739  | 305<br>12       | 4.29<br>.169 | 1            | 5/8 – 11    | 10569S             | 10669S             |
|           | .3157                       | 33<br>1.299         | 22.2<br>7/8     | 152<br>6        | 12.67<br>.4990  | 1295<br>51 | 29.41<br>1.158 | 25.12<br>.989  | 353<br>13-7/8   | 4.29<br>.169 |              |             | 10570S             | 10670S             |
| 10        | .3944                       | 27<br>1.063         | 17.5<br>11/16   | 102<br>4        | 12.67<br>.4990  | 1143<br>45 | 23.27<br>.916  | 18.77<br>.739  | 305<br>12       | 4.49<br>.177 | 1            | 5/8 – 11    | 10571S             | 10671S             |
|           | .3944                       | 36<br>1.417         | 22.2<br>7/8     | 152<br>6        | 15.85<br>.6240  | 1295<br>51 | 31.75<br>1.250 | 27.25<br>1.073 | 353<br>13-7/8   | 4.49<br>.177 |              |             | 10572S             | 10672S             |
| 12        | .4733                       | 39<br>1.535         | 17.5<br>11/16   | 102<br>4        | 15.85<br>.6240  | 1219<br>48 | 34.06<br>1.341 | 29.46<br>1.160 | 302<br>11-7/8   | 4.60<br>.181 | 1            | 3/4 – 10    | 10573S             | 10673S             |
|           | .4733                       | 39<br>1.535         | 25.4<br>1       | 203<br>8        | 15.85<br>.6240  | 1524<br>60 | 34.06<br>1.341 | 29.46<br>1.160 | 406<br>16       | 4.60<br>.181 |              |             | 10574S             | 10674S             |
| 14        | .552                        | 40<br>1.575         | 17.5<br>11/16   | 102<br>4        | 17.44<br>.6865  | 1372<br>54 | 34.39<br>1.354 | 29.11<br>1.146 | 295<br>11-5/8   | 5.28<br>.208 | 1            | 1 – 8       | 10575S             | 10675S             |
|           | .552                        | 44<br>1.732         | 25.4<br>1       | 203<br>8        | 19.02<br>.7490  | 1524<br>60 | 38.33<br>1.509 | 33.04<br>1.301 | 400<br>15-3/4   | 5.28<br>.208 |              |             | 10576S             | 10676S             |
| 16        | .6308                       | 47<br>1.850         | 17.5<br>11/16   | 102<br>4        | 19.02<br>.7490  | 1524<br>60 | 41.28<br>1.625 | 35.46<br>1.396 | 305<br>12       | 5.82<br>.229 | 1            | 1 – 8       | 10577S             | 10677S             |
|           | .6308                       | 48<br>1.890         | 28.6<br>1-1/8   | 305<br>12       | 22.2<br>.8740   | 1524<br>60 | 41.28<br>1.625 | 38.35<br>1.510 | 508<br>20       | 5.82<br>.229 |              |             | 10578S             | 10678S             |
| 18        | .7095                       | 48<br>1.890         | 17.5<br>11/16   | 102<br>4        | 22.2<br>.8740   | 1524<br>60 | 41.28<br>1.625 | 35.26<br>1.388 | 305<br>12       | 6.02<br>.237 | 1            | 1 – 8       | 10579S             | 10679S             |
|           | .7095                       | 51<br>2.008         | 28.6<br>1-1/8   | 305<br>12       | 25.37<br>.9990  | 1524<br>60 | 42.88<br>1.688 | 39.85<br>1.569 | 513<br>20-3/16  | 6.02<br>.237 |              |             | 10580S             | 10680S             |
| 20        | .7884                       | 56<br>2.205         | 17.5<br>11/16   | 102<br>4        | 28.55<br>1.1240 | 1600<br>63 | 47.63<br>1.875 | 4.94<br>1.612  | 302<br>11-7/8   | 6.68<br>.263 | 1            | 1-1/4 – 7   | 10581S             | 10681S             |
|           | .7884                       | 53<br>2.087         | 28.6<br>1-1/8   | 305<br>12       | 28.55<br>1.1240 | 1600<br>63 | 43.66<br>1.719 | 4.31<br>1.587  | 503<br>19-13/16 | 6.68<br>.263 |              |             | 10582S             | 10682S             |
| 22        | .8672                       | 57<br>2.244         | 17.5<br>11/16   | 102<br>4        | 28.55<br>1.1240 | 1600<br>63 | 47.63<br>1.875 | 4.39<br>1.590  | 302<br>11-7/8   | 7.24<br>.285 | 1            | 1-1/4 – 7   | 10583S             | 10683S             |
|           | .8672                       | 53<br>2.087         | 28.6<br>1-1/8   | 305<br>12       | 28.55<br>1.1240 | 1600<br>63 | 44.45<br>1.750 | 36.98<br>1.456 | 508<br>10-5/8   | 7.24<br>.294 |              |             | 10584S             | 10684S             |
| 25        | .9853                       | 56<br>2.205         | 17.5<br>11/16   | 102<br>4        | 31.72<br>1.2490 | 1600<br>63 | 44.45<br>1.750 | 36.98<br>1.456 | 270<br>10-5/8   | 7.47<br>.294 | 1            | 1-1/2 – 6   | 10585S             | 10685S             |
|           | .9853                       | 56<br>2.205         | 28.6<br>1-1/8   | 305<br>12       | 31.72<br>1.2490 | 1600<br>63 | 44.45<br>1.750 | 4.72<br>1.603  | 508<br>20       | 7.47<br>.294 |              |             | 10586S             | 10686S             |

<sup>†</sup> Tolerance - Based on +/- .0005 # Minimum length of part recommended to prevent part from dropping in between broach teeth \*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.

Note: All items can be made with deburring feature as specials.

## Keyseating Broaches

1/16 thru 1-1/2 inch sizes

2mm thru 25mm

Applications: **Hansford Davis Keyseating Machine Models 4, 5, and 15**

### Type AF – Inch

Keyseating Broaches feature superior tooth design and are ground to precision keyway tolerances. Sizes for cutting the most common keyway widths are available.

**TiN or TiAlN coatings available.**

| Broach Size (inch) | Overall Length | Tooth Height | Tooth Pitch | EDP No. |               |
|--------------------|----------------|--------------|-------------|---------|---------------|
|                    |                |              |             | duMONT  | Hassay Savage |
| 1/16*              | 16             | 3/8          | 3/8         | 55550   | 10701         |
| 3/32*              |                |              |             | 55551   | 10702         |
| 1/8*               |                |              |             | 55552   | 10703         |
| 5/32*              |                |              |             | 55553   | 10704         |
| 3/16               |                |              |             | 55554   | 10705         |
| 1/4                |                | 7/16         | 17/32       | 55555   | 10707         |
| 5/16               |                |              |             | 55557   | 10709         |
| 3/8                |                |              |             | 55559   | 10711         |
| 7/16               |                |              |             | -       | 10713         |
| 3/16               | 20             | 1            | 17/32       | -       | 10706         |
| 1/4                |                |              |             | 55556   | 10708         |
| 5/16               |                |              |             | 55558   | 10710         |
| 3/8                |                |              |             | 55560   | 10712         |
| 7/16               |                |              |             | 55561   | 10714         |
| 1/2                |                | 7/8          | 11/32       | 55562   | 10715         |
| 9/16               |                |              |             | 55563   | 10716         |
| 5/8                |                |              |             | 55564   | 10717         |
| 3/4                |                |              |             | 55565   | 10718         |
| 7/8                |                |              |             | 55566   | 10719         |
| 1                  |                | 1            | 17/32       | 55567   | 10720         |

\*Reinforced body width 3/16" thick



### Type AF Metric Standard

| Broach Size (mm) | Overall Length | Tooth Height | Tooth Pitch | EDP No. |               |
|------------------|----------------|--------------|-------------|---------|---------------|
|                  |                |              |             | duMONT  | Hassay Savage |
| 2*               | 16             | 3/8          | 3/8         | 55570   | 11701         |
| 3*               |                |              |             | 55571   | 11702         |
| 4*               |                |              |             | 55572   | 11703         |
| 5                |                |              |             | 55573   | 11704         |
| 6                |                |              |             | 55574   | 11706         |
| 7                |                | 7/16         | 17/32       | 55576   | -             |
| 8                |                |              |             | 55578   | 11708         |
| 9                |                |              |             | 55580   | -             |
| 10               |                |              |             | -       | 11710         |
| 11               |                |              |             | -       | 11705         |
| 12               | 20             | 1            | 17/32       | 55575   | 11707         |
| 13               |                |              |             | 55577   | -             |
| 14               |                |              |             | 55579   | 11709         |
| 15               |                |              |             | 55581   | -             |
| 16               |                |              |             | 55582   | 11711         |
| 17               |                | 7/8          | 11/32       | 55583   | -             |
| 18               |                |              |             | 55584   | 11712         |
| 19               |                |              |             | 55585   | -             |
| 20               |                |              |             | 55586   | 11713         |
| 21               |                |              |             | 55587   | -             |
| 22               | 1              | 1            | 17/32       | 55588   | 11714         |
| 23               |                |              |             | 55589   | -             |
| 24               |                |              |             | 55590   | 11715         |
| 25               |                |              |             | 55591   | -             |
| 26               |                |              |             | 55592   | 11716         |
| 27               | 1              | 1            | 17/32       | 55593   | 11717         |
| 28               |                |              |             | 55594   | 11718         |
| 29               |                |              |             | 55595   | 11719         |

\*Reinforced body width 3/16" thick

### Type AFS – Inch

Staggered Tooth AFS Type Keyseating Broaches provide a stagger tooth design, promoting an efficient cut.

**TiN or TiAlN coatings available.**

| Broach Size (inch) | Overall Length | Tooth Height | EDP No. duMONT |
|--------------------|----------------|--------------|----------------|
|                    |                |              |                |
| 3/8                | 20             | 1            | 55601          |
| 7/16               |                |              | 55603          |
| 1/2                |                |              | 55604          |
| 9/16               |                |              | 55605          |
| 5/8                |                |              | 55606          |
| 3/4                |                | 1-1/8        | 55607          |
| 7/8                |                |              | 55608          |
| 1                  |                |              | 55609          |
| 1-1/8              |                |              | 55610          |
| 1-1/4              |                |              | 55611          |
| 1-1/2              |                |              | 55612          |

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 Keyseating Broaches not listed above. Please contact Pilot Precision Products for details.



**Arbor Presses and PressLube Broaching Oil****Hand Operated****Arbor Presses**

duMONT Minute Man® Arbor Presses are easy to operate Manual Broaching Machines designed for Push Broaching with Keyways and Internal Hole Broaches. These Hand Operated Presses are available in 3- and 6-ton models and provide the pressure required to Push Broaches through the work piece. Both Arbor Presses provide these essential features:

- Ratchet operation with compound leverage for minimum operator effort.
- Pawl between lever and pinion permits positioning lever for most convenient reach and pull.
- Ram positioned by handwheel reduces travel, tests Broach alignment, supports the Broach and workpiece assembly.
- Round ram with rack teeth cut to center concentrates force along the center line to avoid cramping.



|                        | <b>Dake 1 1/2 Arbor Press</b> | <b>Dake 1 1/2 B Arbor Press</b> | <b>Dake 2 1/2 Arbor Press</b> |
|------------------------|-------------------------------|---------------------------------|-------------------------------|
| <b>EDP No.</b>         | <b>55004</b>                  | <b>55006</b>                    | <b>55008</b>                  |
| <b>Stroke</b>          | 11-1/2                        | 18-1/4                          | 21-1/2                        |
| <b>Tonnage</b>         | 3                             | 3                               | 6                             |
| <b>Horsepower</b>      | Manual                        | Manual                          | Manual                        |
| <b>Shipping Weight</b> | 220 lbs.                      | 325 lbs.                        | 450 lbs.                      |

**Broaching Oil That Keeps Your Tooling Sharp & Disposal Costs Down**

Our PressLube™ Broaching Oil\* is a proprietary formulation created to improve the performance of your broaching tools without the use of chlorine (Cl) and phosphorous (P). Our environmentally safe lubricant contains a special electrostatic precipitator (EP) additive that combines with active and inactive sulfurized lubricity agents to produce a high-performance broach cutting oil product.

- Improves Part Quality, Surface Finish & Operational Efficiency
- Provides Excellent Rust Protection
- Extends Tool Life

| <b>EDP #</b> | <b>Description</b>                     |
|--------------|--|
| 99960        | duMONT Broaching Oil 12 x 1 quart/case |
| 99961        | duMONT Broaching Oil 4 x 1 gallon/case |
| 99962        | duMONT Broaching Oil 5 gallon pail     |
| 99963        | duMONT Broaching Oil 55 gallon drum    |
| 99964        | duMONT Broaching Oil 275 gallon tote   |

\*California Proposition 65 - This product does not contain any substances known to the State of California to cause cancer and/or reproductive harm.

- Minimizes Built-Up Edge
- Increases Rates of Turning
- Easy to Filter
- Environmentally Friendly
- Recyclable
- Reduces Disposal Costs



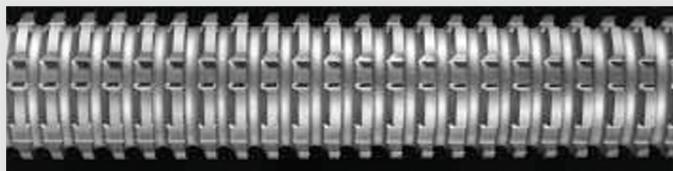
## Custom Broaches

### Push and Pull Types

Applications: For high volume production pull-type machines

## Spline Broaches

Spline Broaches specifically designed and manufactured for your application, duMONT Minute Man® and Hassay Savage offer straight sided, Involute Spline, and Serration Broaches in both Push or Pull-type designs. Due to the complex nature of these tools a customer part print is required. Pull-type Broaches are available with a variety of pull ends—Threaded, Notched, Pin and Automatic, to name a few.



## Keyway Broaches

duMONT Minute Man® and Hassay Savage manufacture Special Keyway Broaches in either Push or Pull-type in both American Standard and Metric Sizes. Special Application Multi-pass Push Keyway Broaches and One-Pass Keyway Broaches which require the appropriate guide Bushing can often be manufactured from an existing blank for quick delivery. One-Pass Push Keyway Broaches are also available in a self-guiding Production Style that require no guide Bushing. Both One-Pass Push-type styles as well as their Pull-type counterparts are available with a special chamfer feature that will deburr the keyway bore interface. Double-Keyway and Keyseating Broaches are also available. Pull-type Broaches are available with a variety of pull ends—Threaded, Notched, Pin, and Automatic, to name a few.



## Firearms Custom Broaches

Our Breechface Broaches are easily assembled into a standard CNC holder. They are for use with the pistol brands: Glock, Smith & Wesson, H&K, Walther, CZ and Canik. Calibers include: 9mm, .40, .45, .380 and 10mm. Our Breechface broaches are internal to machine cycle and do not require subcontracting / offline operation. We also offer custom linear Push or Pull broaches made for all firearms broaching applications.



### Custom Breechface Broaches for the Following Brands:

- Glock
- Smith & Wesson
- H&K
- Walther
- CZ
- Canik

### Firearm Broaches we can support:

- Magwells
- Rifling
- Receiver
- Frame Broaches
- Slotters - Revolver
- Revolver Finishing



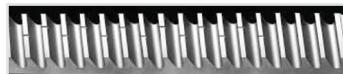
## Custom Broaches and Re-Sharpening

Push and Pull Types

Applications: Virtually any broaching operation | Short- and long-run production

### Surface Broaches

Surface Broaches are available as either individual Broaches or as inserts for broaching flat surfaces, irregular shapes, external forms, concave or convex surfaces, serrations, cam shapes, corner squaring and dovetails.



### Internal Hole Broaches

Internal Hole Broaches in Push and Pull-type including Square, Hexagon, Round, Rectangular, Keyway, and irregularly shaped Broaches are all readily available. Broaches for Burnishing, Sizing and Combination or Cut and Finish applications are also manufactured as either Push or Pull-type. Pull-type Broaches are available with a variety of pull ends—Threaded, Notched, Pin and Automatic, to name a few.



### Let Us Meet Your Custom Broach Requirements

Along with the extensive assortment of Stock Broaches listed in this catalog, we offer short delivery of Special Broaches custom-designed for your application or manufactured from your prints.

Our engineering staff has years of experience designing Special Broaches to replace time-consuming and costly machining operations. Whenever possible, we will meet your Special Broach requirements by using our extensive supply of hardened blank stock, thereby reducing both the cost and delivery time ordinarily associated with ordering Specials. With our extensive stock and expertise in designing and manufacturing specials, we are able to serve our customers as a single complete source for all of their broaching needs.

We are fully equipped to manufacture both Standard and Custom Broaches in either Push or Pull Styles, including all types of Keyway, Internal Hole, and Surface Broaches.

**TiN or TiAlN coatings available.**

### Broach Re-Sharpening

Broaches, regardless of type, should never be used when dull. The use of a dull Broach may result in poor finish or cause drifting, damage to the teeth or breakage. Correct and timely re-sharpening will increase Broach life and quality of parts. The necessity to sharpen a Broach is dependent on numerous factors; material, tolerance, and required finish, etc. A number of conditions indicate the need for sharpening:

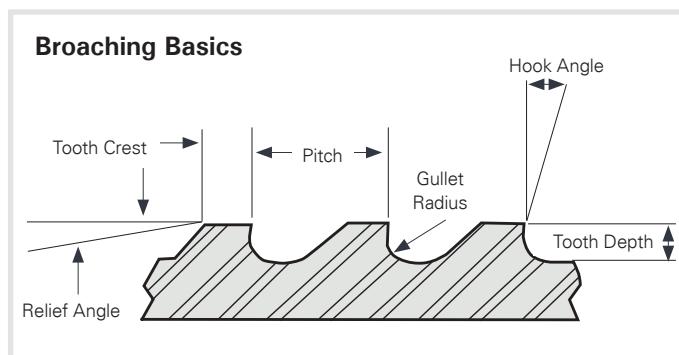
- Poor finish, tears, galling, etc. on the workpiece.
- Cutting edges showing signs of rollover and teeth dull to the touch.
- When using a Hydraulic Press, the pressure gauge showing an increase in pressure required to complete the cut.
- Nicks, gouges, etc. in the teeth from improper handling.
- Broach sticking in the workpiece, pick-up on tops of teeth.
- Holes gauging undersize.

duMONT Minute Man® and Hassay Savage offer expert Broach re-sharpening services, with the goal to restore the cutting edges of the Broach to its original condition. Broaches returned for this service are each individually examined and specific regrind instructions are generated for the reconditioning of the tool.

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](mailto:info@pilotprecision.com).



### 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

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.

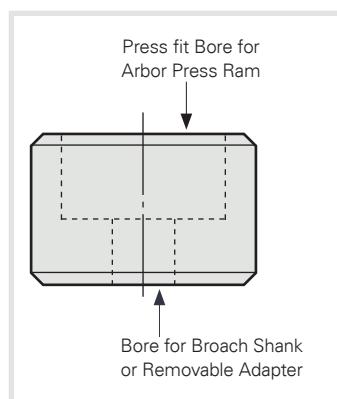
Suggestions for a drifting or "hogging" Push-type Keyway Broach:

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.

### 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 is preferred but water-soluble coolant is ok. Apply 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** – Can be broached dry, but Oil is preferred.

**Bronze** – Works best with oil.

**Cast Iron** – Is almost always broached dry.

**Aluminum** – A good quality cutting oil is preferred but water-soluble coolant is OK. Apply on the teeth and back side of the broach.

\*Find our Oil on Page 25



### Coatings Available

duMONT Minute Man® and Hassay Savage Broaches are available with TiN, and TiAIN 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.

**TiAIN** – 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.

## Engineering Section

### How to Use Broaches

#### 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.



## To the Distributor

duMONT Minute Man® and Hassay Savage broaches offer your customers the benefits of advanced design and the latest market technology in manufacturing. Our strict quality controls and skilled group of toolmakers ensure that Pilot Precision Products broaches cut more precisely, last longer and wear better to make money for you and your customers.

### duMONT Minute Man® and Hassay Savage offer:

- Unsurpassed high-quality products made by experienced toolmakers
- Consistent product mix
- Excellent profit structure
- Timely service
- Pride in what we do
- Experienced craftsmanship



(Industrial Supply Association) we are organized by the ISA standard numbering system. Pilot Precision Products Code - 615948 (Uniform Code Council).

## Warranty

Pilot Precision Products, warrants to original equipment manufacturers, distributors and industrial and commercial users of its products that each new product manufactured or supplied by Pilot Precision Products, shall be free from defects in material and workmanship. Pilot Precision Products, obligation under this warranty is limited to furnishing without additional charge a replacement or, at its option, repairing or issuing credit for any product which shall within one year from the date of sale be returned freight prepaid to the plant designated by Pilot Precision Products, representative and which upon inspection is determined by Pilot Precision Products, to be defective in materials or workmanship. Complete information as to operating conditions, machine setup, and application of cutting fluid should accompany any product returned for inspection. The provisions of this warranty shall not apply to any Pilot Precision Products Tools, product which has been subjected to misuse, improper operating conditions, machine setup or application of cutting fluid or

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**Warning:** 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.

EST.1979



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