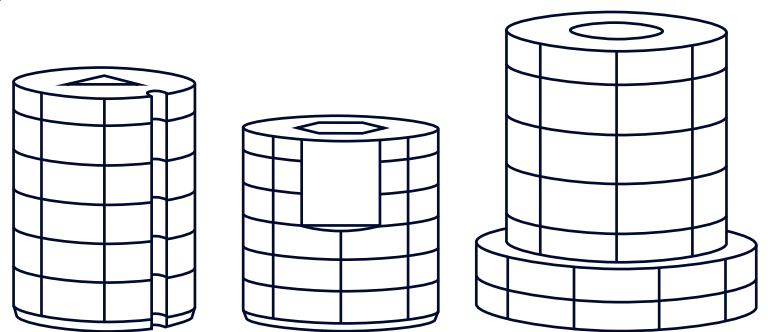
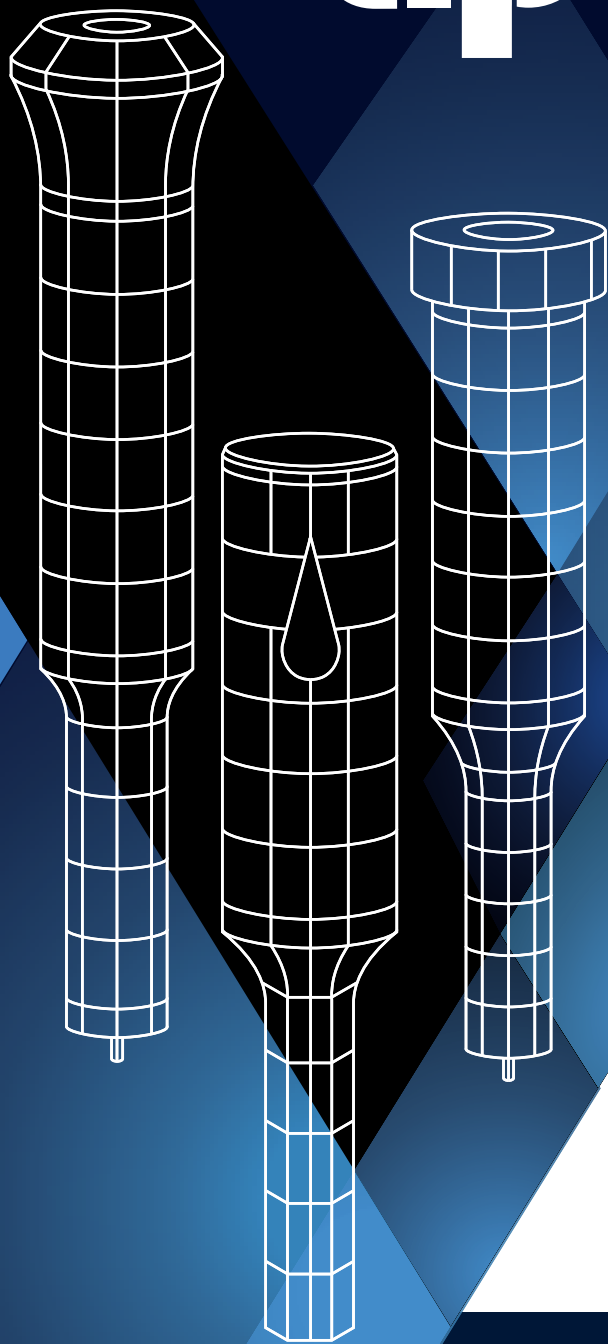


# tipco»



CATALOG • METRIC  
**PUNCHES & DIE BUTTONS**

[www.tipcopunch.com](http://www.tipcopunch.com)



Special Punches



Die Buttons



Precision Tooling



Threadform Tooling



Die Springs



Punches

Founded in 1959, Tipco has been providing companies with high-quality and innovative precision tooling products for over 60 years. Tipco started with one manufacturing facility in Toronto, Ontario, Canada; however, our company now has manufacturing facilities in the United States, Canada and United Kingdom.

Tipco manufactures precision tooling products for a diverse range of industries, including the metal stamping and plastic molding sectors. Our customers include automotive, appliance, building, infrastructure, furniture, and pharmaceutical manufacturers and suppliers.

Tipco is committed to operational and customer service excellence. Our commitment extends to manufacturing superior products, providing invaluable customer support and service, and exceeding industry standards. Tipco's commitments to our various stakeholders include:

- Eliminating external defects and customer complaints;
- Providing on-time delivery of products;
- Hiring and promoting well-trained, knowledgeable staff;
- Providing a safe working environment;
- Providing efficient and productive facilities with state-of-the-art equipment; and,
- Adopting and implementing up-to-date information technology to ensure the precise and timely flow of information.

From a manufacturing perspective, Tipco is committed to producing best-in-class tooling products. To achieve our company's manufacturing objectives, Tipco is continually investing in new and innovative machinery, equipment, technologies, and processes.

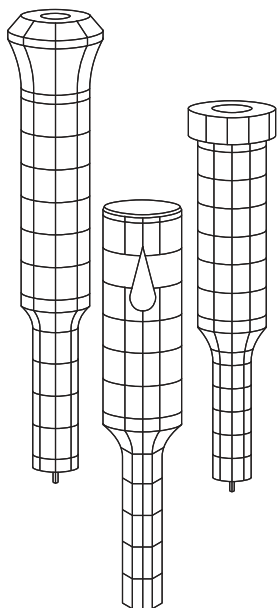
Tipco is also committed to supplying superior complementary products, including best-in-class die springs, marking stamps, automated tapping systems, tool and die accessories, and more.

Customer support and satisfaction is integral to our business. Tipco is continually focusing on adding and creating value for our customers. For customers, our company's value-add and value-creation capabilities include extensive design, machining, and application experience.

Tipco's knowledge and expertise includes working with customers to: review and analyze customer tooling requirements; design customer-specific tooling specifications; and, resolve external failure mechanisms. To optimize tooling performance, Tipco also works closely with customers to review and analyze material selection, heat treat requirements, and product coatings.

In addition, Tipco is continually working on meeting and exceeding statutory and regulatory standards. For example, Tipco's North American operations are ISO 9001 compliant.

**For more information, please visit our website at [www.tipcopunch.com](http://www.tipcopunch.com).**



|                                |   |
|--------------------------------|---|
| <b>Order Example</b> . . . . . | 6 |
|--------------------------------|---|

|                          |   |
|--------------------------|---|
| <b>Punches</b> . . . . . | 7 |
|--------------------------|---|

## Head Type Punches

|                   |                                     |    |
|-------------------|-------------------------------------|----|
| MT . . . . .      | Head Type Punches . . . . .         | 8  |
| ME . . . . .      | Head Type Ejector Punches . . . . . | 10 |
| MTA/MTP . . . . . | Head Type Pilot Punches. . . . .    | 12 |

## Ultimate Punches

|               |                                              |    |
|---------------|----------------------------------------------|----|
| MTU . . . . . | Ultimate Head Type Punches . . . . .         | 13 |
| MUE . . . . . | Ultimate Head Type Ejector Punches . . . . . | 14 |

## Center Dowel Punches

|                   |                                        |    |
|-------------------|----------------------------------------|----|
| MC . . . . .      | Center Dowel Punches. . . . .          | 15 |
| MCE . . . . .     | Center Dowel Ejector Punches . . . . . | 16 |
| MCA/MCP . . . . . | Center Dowel Pilot Punches . . . . .   | 17 |

## Bottle Neck Punches

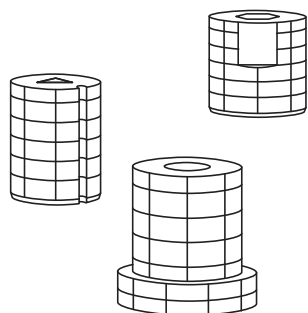
|                |                                       |    |
|----------------|---------------------------------------|----|
| MBN . . . . .  | Bottle Neck Punches . . . . .         | 18 |
| MBNE . . . . . | Bottle Neck Ejector Punches . . . . . | 19 |

## Ball Lock Punches

|                     |                                      |    |
|---------------------|--------------------------------------|----|
| MBL . . . . .       | Light Duty Punches. . . . .          | 20 |
| MBLE. . . . .       | Light Duty Ejector Punches . . . . . | 21 |
| MBLA/MBLP . . . . . | Light Duty Pilot Punches . . . . .   | 22 |
| MBH . . . . .       | Heavy Duty Punches. . . . .          | 23 |
| MBHE . . . . .      | Heavy Duty Ejector Punches. . . . .  | 24 |
| MBHA/MBHP . . . . . | Heavy Duty Pilot Punches . . . . .   | 25 |

## Knob Style Punches

|                |                                                 |    |
|----------------|-------------------------------------------------|----|
| MBLK. . . . .  | Knob Style Light Duty Punches . . . . .         | 26 |
| MBLEK. . . . . | Knob Style Light Duty Ejector Punches . . . . . | 27 |
| MBHK . . . . . | Knob Style Heavy Duty Punches . . . . .         | 28 |
| MBHEK. . . . . | Knob Style Heavy Duty Ejector Punches . . . . . | 29 |



|                              |    |
|------------------------------|----|
| <b>Die Buttons</b> . . . . . | 30 |
|------------------------------|----|

### **Die Buttons**

|                    |                                          |    |
|--------------------|------------------------------------------|----|
| MTD . . . . .      | Stepped Relief . . . . .                 | 31 |
| MFD . . . . .      | Tapered Relief . . . . .                 | 32 |
| MH . . . . .       | Head Type with Stepped Relief. . . . .   | 34 |
| MFH . . . . .      | Head Type with Tapered Relief. . . . .   | 35 |
| MDW/MFDW . . . . . | Blank with Start Hole . . . . .          | 37 |
| MHW/MFHW . . . . . | Blank Head Type with Start Hole. . . . . | 38 |

### **Ball Lock Die Buttons**

|                 |                                         |    |
|-----------------|-----------------------------------------|----|
| MBLD. . . . .   | Ball Lock with Stepped Relief . . . . . | 39 |
| MFBLD . . . . . | Ball Lock with Tapered Relief. . . . .  | 40 |

|                                   |    |
|-----------------------------------|----|
| <b>Qualified Shapes</b> . . . . . | 41 |
|-----------------------------------|----|

|                                       |    |
|---------------------------------------|----|
| <b>Standard Alterations</b> . . . . . | 42 |
|---------------------------------------|----|

### **Locating Methods**

|                                        |    |
|----------------------------------------|----|
| Locating Method, Punches. . . . .      | 43 |
| Locating Method, Die Buttons . . . . . | 44 |

|                                         |    |
|-----------------------------------------|----|
| <b>Perforating Technology</b> . . . . . | 45 |
|-----------------------------------------|----|

|                             |    |
|-----------------------------|----|
| <b>Components</b> . . . . . | 49 |
|-----------------------------|----|

|                              |    |
|------------------------------|----|
| Ejector Components . . . . . | 50 |
|------------------------------|----|

|                                  |    |
|----------------------------------|----|
| <b>Standard Lengths.</b> . . . . | 51 |
|----------------------------------|----|

|                          |    |
|--------------------------|----|
| <b>Coatings.</b> . . . . | 52 |
|--------------------------|----|

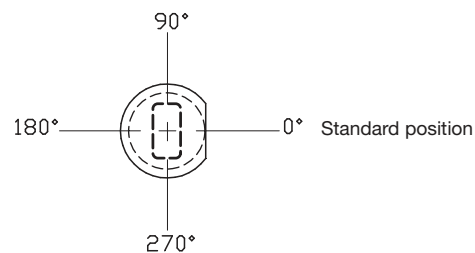
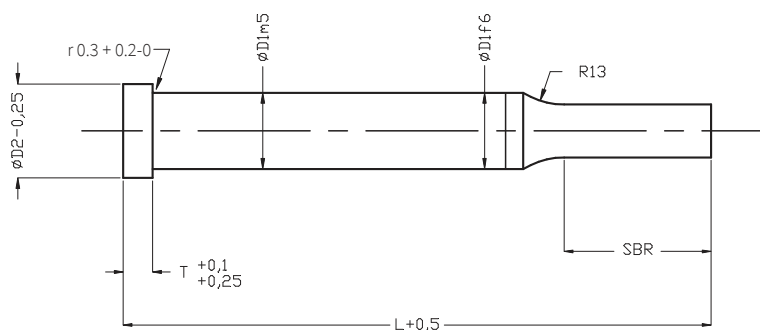
|                                                 |    |
|-------------------------------------------------|----|
| <b>Inches/Metric Conversion Chart</b> . . . . . | 53 |
|-------------------------------------------------|----|

## STANDARD ALTERATIONS

To obtain different sizes compared to the standard sizes table, write the size you need directly into the description, adding possible missing codes (for example H and D2 that normally are not in the description) after the SBR code for the punch, or P/P+W for the die.

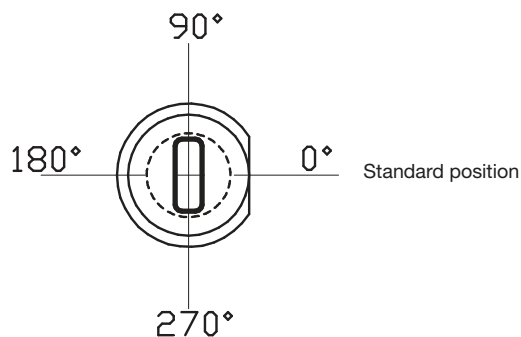
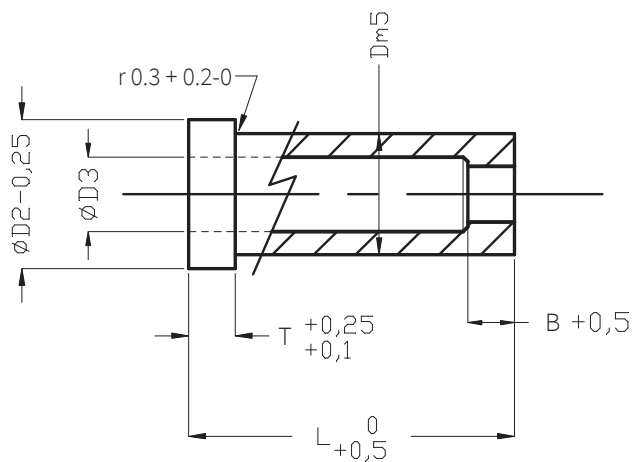
See below:

### 1 - PUNCHES

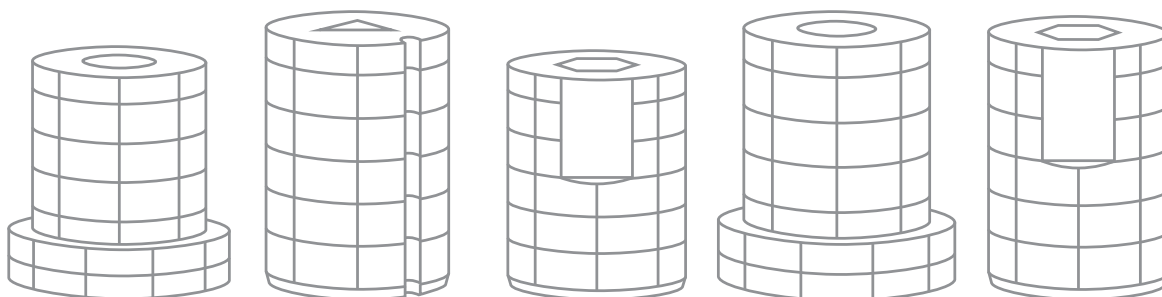
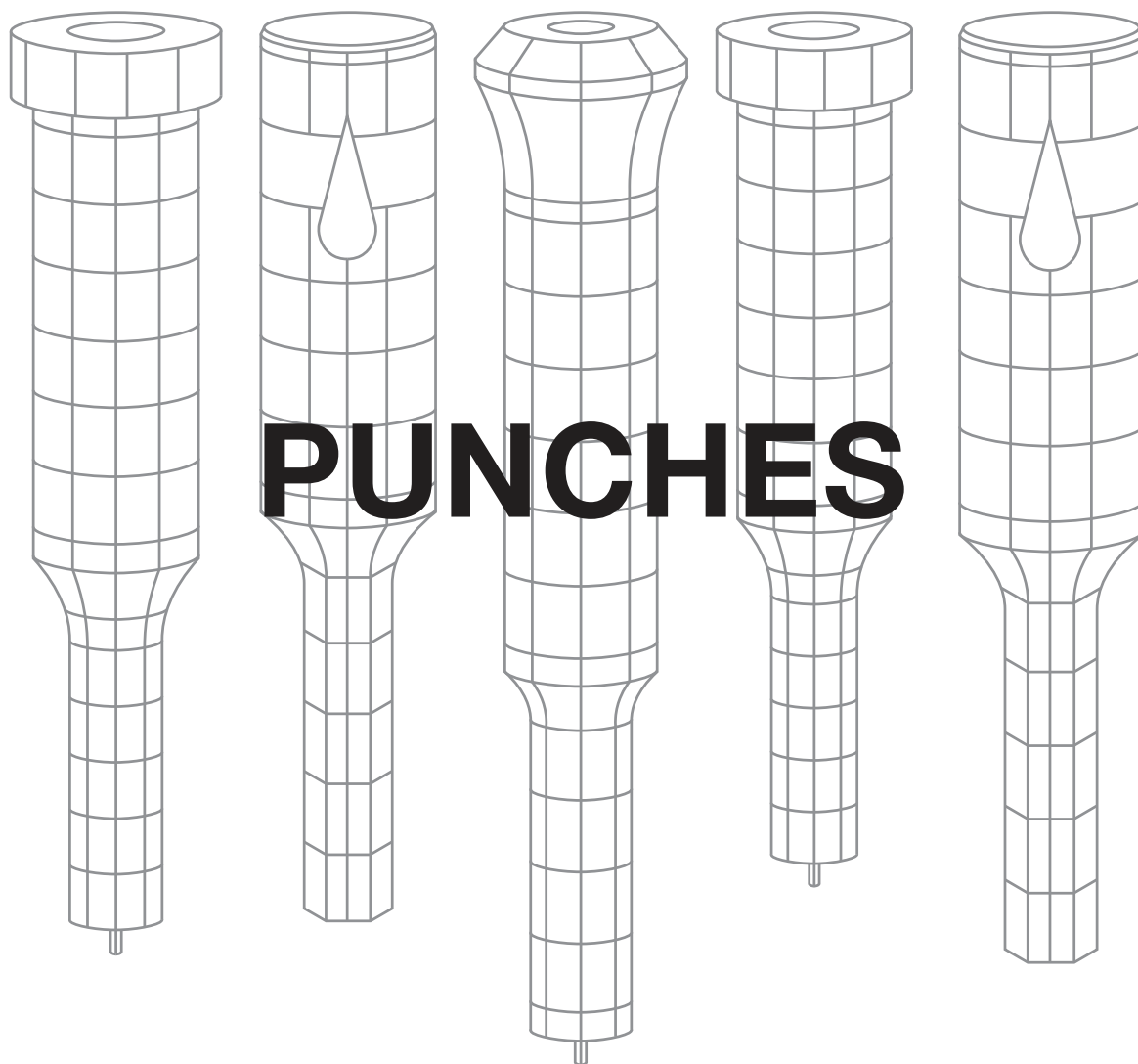


| Qty | Type | D1 x L  | P   | W   | R   | SBR | Locating Method | Material |
|-----|------|---------|-----|-----|-----|-----|-----------------|----------|
| 10  | MTL  | 12 x 81 | 7.0 | 5.0 | 1.0 | 17  | SF 0°           | M2       |

### 2 - DIES

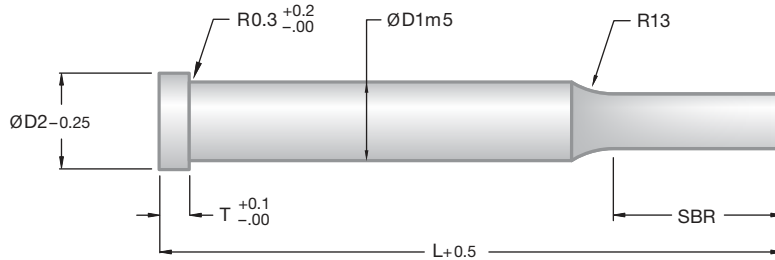


| Qty | Type | D x L   | P   | W   | B   | Locating Method | Material |
|-----|------|---------|-----|-----|-----|-----------------|----------|
| 10  | MHL  | 27 x 33 | 7.0 | 5.0 | 7.0 | SF 0°           | M2       |





## MT series Head Type Punch

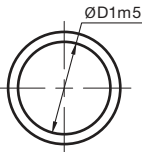
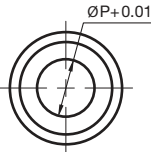
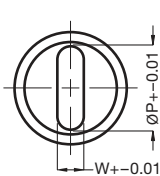
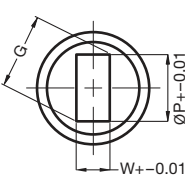
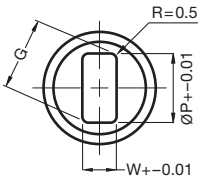
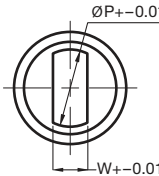
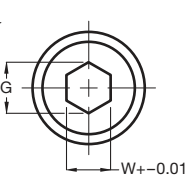


### 3D CONFIGURATOR



### Material Hardness

M2 60-62

| MTB                                                                               | MTC                                                                               | MTD                                                                               | MTR                                                                               | MTL                                                                                | MTF                                                                                 | MTH                                                                                 |                                                                                                                                  |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
|  |  |  |  |  |  |  |                                                                                                                                  |
| For qualified shapes see page 41.                                                 |                                                                                   |                                                                                   | $G = \sqrt{W^2 + P^2}$                                                            |                                                                                    | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$                                           |                                                                                     |                                                                                                                                  |
|                                                                                   |                                                                                   |                                                                                   | $G = W \times 1.1547$                                                             |                                                                                    |                                                                                     |                                                                                     |                                                                                                                                  |
| BODY Ø<br>D1                                                                      | HEAD Ø<br>D2                                                                      | T                                                                                 | SBR                                                                               | ROUND RANGE<br>P                                                                   | SHAPE<br>MIN W   G/P MAX                                                            |                                                                                     | LENGTHS<br>(L)<br><br><b>Available Lengths:</b><br><br><b>50mm<br/>to<br/>200mm</b><br><br><b>Standard Lengths<br/>(page 51)</b> |
| 5.0                                                                               | 8.0                                                                               | 5.0                                                                               | 7 / 13 / 19                                                                       | 1.5 - 4.99                                                                         | 1.5                                                                                 | 4.99                                                                                |                                                                                                                                  |
| 6.0                                                                               | 9.0                                                                               | 5.0                                                                               | 13 / 19                                                                           | 1.5 - 5.99                                                                         | 1.5                                                                                 | 5.99                                                                                |                                                                                                                                  |
| 8.0                                                                               | 11.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 2.5 - 7.99                                                                         | 2.5                                                                                 | 7.99                                                                                |                                                                                                                                  |
| 10.0                                                                              | 13.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 4.0 - 9.99                                                                         | 3.5                                                                                 | 9.99                                                                                |                                                                                                                                  |
| 13.0                                                                              | 16.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 5.0 - 12.99                                                                        | 4.5                                                                                 | 12.99                                                                               |                                                                                                                                  |
| 16.0                                                                              | 19.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 8.0 - 15.99                                                                        | 6.0                                                                                 | 15.99                                                                               |                                                                                                                                  |
| 20.0                                                                              | 23.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 12.0 - 19.99                                                                       | 8.0                                                                                 | 19.99                                                                               |                                                                                                                                  |
| 25.0                                                                              | 28.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 16.0 - 24.99                                                                       | 10.0                                                                                | 24.99                                                                               |                                                                                                                                  |
| 32.0                                                                              | 35.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 20.0 - 31.99                                                                       | 10.0                                                                                | 31.99                                                                               |                                                                                                                                  |

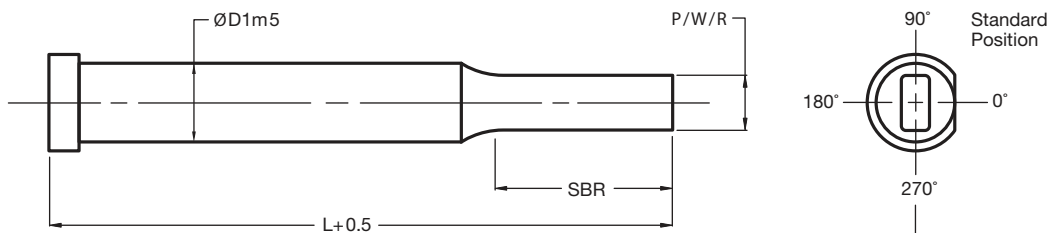
Qualified Shapes (Page 41).

Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

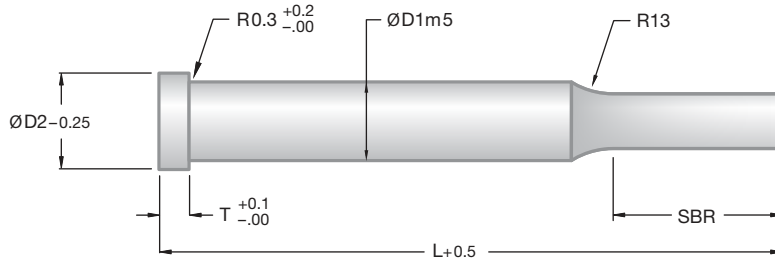
### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MT   | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |



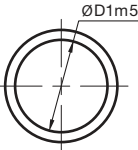
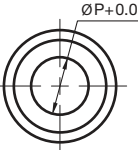
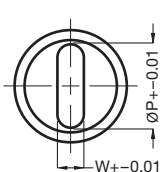
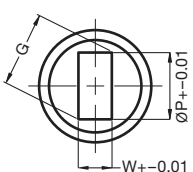
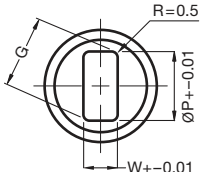
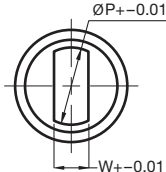
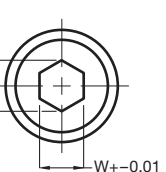
## MT series Head Type Punch



### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MTB                                                                               | MTC                                                                               | MTD                                                                               | MTR                                                                               | MTL                                                                                | MTF                                                                                 | MTH                                                                                 |                                           |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------|
|  |  |  |  |  |  |  |                                           |
| For qualified shapes see page 41.                                                 |                                                                                   |                                                                                   | $G = \sqrt{W^2 + P^2}$                                                            |                                                                                    | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$                                           |                                                                                     |                                           |
|                                                                                   |                                                                                   |                                                                                   | $G = W \times 1.1547$                                                             |                                                                                    |                                                                                     |                                                                                     |                                           |
| BODY Ø<br>D1                                                                      | HEAD Ø<br>D2                                                                      | T                                                                                 | SBR                                                                               | ROUND RANGE<br>P                                                                   | SHAPE<br>MIN W   G/P MAX                                                            |                                                                                     | LENGTHS<br>(L)                            |
| 40.0                                                                              | 43.0                                                                              | 5.0                                                                               | 25 / 30                                                                           | 20.0 - 39.99                                                                       | 8.0                                                                                 | 39.99                                                                               |                                           |
| 45.0                                                                              | 48.0                                                                              | 5.0                                                                               | 25 / 30                                                                           | 25.0 - 44.99                                                                       | 9.0                                                                                 | 44.99                                                                               |                                           |
| 50.0                                                                              | 53.0                                                                              | 5.0                                                                               | 25 / 30                                                                           | 30.0 - 49.99                                                                       | 10.0                                                                                | 49.99                                                                               |                                           |
| 56.0                                                                              | 59.0                                                                              | 5.0                                                                               | 25 / 30                                                                           | 35.0 - 55.99                                                                       | 11.0                                                                                | 55.99                                                                               |                                           |
| 63.0                                                                              | 66.0                                                                              | 5.0                                                                               | 25 / 30                                                                           | 40.0 - 62.99                                                                       | 12.0                                                                                | 62.99                                                                               |                                           |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | Available Lengths:<br>50mm<br>to<br>200mm |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                           |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                           |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                           |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | Standard Lengths<br>(page 51)             |

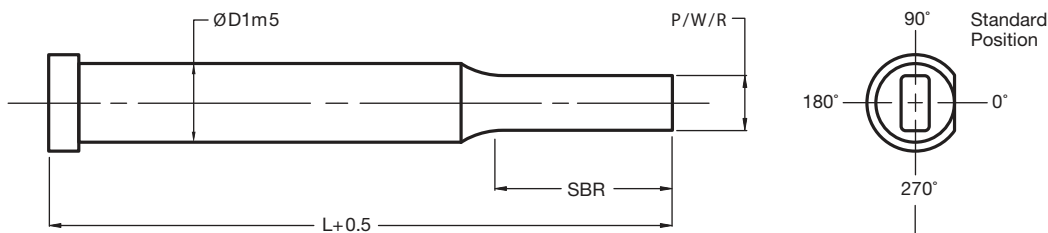
Qualified Shapes (Page 41).

Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

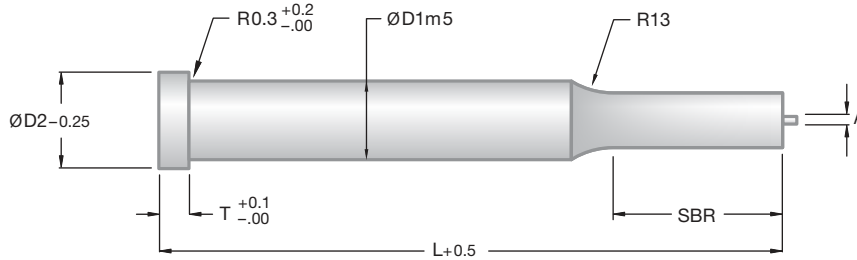
### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method |    | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----|----------------|---------|
| 10  | M2       | MT   | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF              | 0° | Roof Top Shear | TIN     |

## ME series

### Head Type Ejector Punch



#### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MEB                               | MEC          | ME0 | MER                    | MEL          | MEF                                       | MEH                      |                                                                       |
|-----------------------------------|--------------|-----|------------------------|--------------|-------------------------------------------|--------------------------|-----------------------------------------------------------------------|
|                                   |              |     |                        |              |                                           |                          |                                                                       |
| For qualified shapes see page 41. |              |     | $G = \sqrt{W^2 + P^2}$ |              | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$ |                          |                                                                       |
|                                   |              |     |                        |              | $G = W \times 1.1547$                     |                          |                                                                       |
| BODY Ø<br>D1                      | HEAD Ø<br>D2 | T   | A*                     | SBR          | ROUND RANGE<br>P                          | SHAPE<br>MIN W   G/P MAX | LENGTHS<br>(L)                                                        |
| 5.0                               | 8.0          | 5.0 | 0.025                  | 7 / 13 / 19  | 1.5 - 4.99                                | 1.5 4.99                 | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b> |
| 6.0                               | 9.0          | 5.0 | 0.031                  | 13 / 19      | 1.5 - 5.99                                | 1.5 5.99                 |                                                                       |
| 8.0                               | 11.0         | 5.0 | 0.047                  | 13 / 19 / 25 | 2.5 - 7.99                                | 2.5 7.99                 |                                                                       |
| 10.0                              | 13.0         | 5.0 | 0.063                  | 13 / 19 / 25 | 4.0 - 9.99                                | 3.5 9.99                 |                                                                       |
| 13.0                              | 16.0         | 5.0 | 0.063                  | 13 / 19 / 25 | 5.0 - 12.99                               | 4.5 12.99                |                                                                       |
| 16.0                              | 19.0         | 5.0 | 0.063                  | 13 / 19 / 25 | 8.0 - 15.99                               | 6.0 15.99                |                                                                       |
| 20.0                              | 23.0         | 5.0 | 0.094                  | 13 / 19 / 25 | 12.0 - 19.99                              | 8.0 19.99                |                                                                       |
| 25.0                              | 28.0         | 5.0 | 0.094                  | 13 / 19 / 25 | 16.5 - 24.99                              | 10.0 24.99               |                                                                       |
| 32.0                              | 35.0         | 5.0 | 0.094                  | 13 / 19 / 25 | 20.0 - 31.99                              | 10.0 31.99               | <b>Standard Lengths</b><br><b>(page 51)</b>                           |

Qualified Shapes (Page 41).

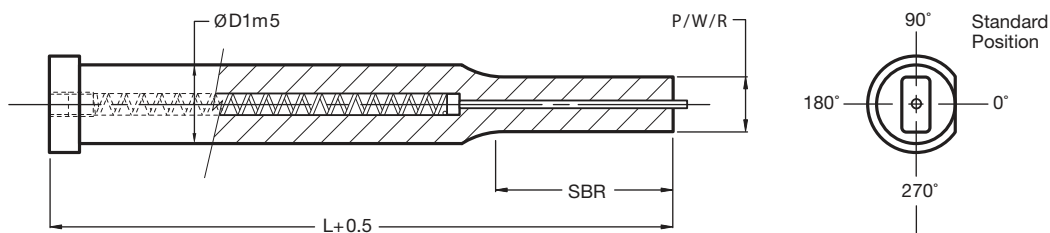
Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

\* The Ejector (A) dimension is in imperial (inches).

#### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | ME   | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

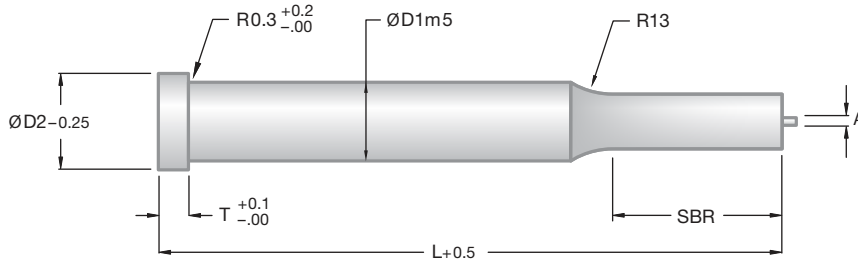
## ME series

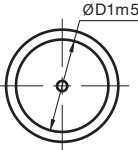
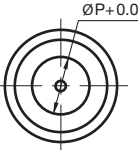
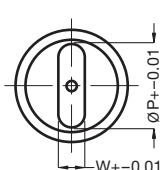
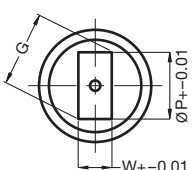
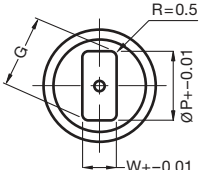
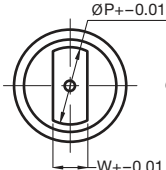
### Head Type Ejector Punch

3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |



| MEB                                                                               | MEC                                                                               | MEO                                                                               | MER                                                                               | MEL                                                                                | MEF                                                                                 | MEH                                                                                 |                                                                       |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
|  |  |  |  |  |  |  |                                                                       |
| For qualified shapes see page 41.                                                 |                                                                                   |                                                                                   | $G = \sqrt{W^2 + P^2}$                                                            | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$                                          | $G = W \times 1.1547$                                                               |                                                                                     |                                                                       |
| BODY Ø<br>D1                                                                      | HEAD Ø<br>D2                                                                      | T                                                                                 | A*                                                                                | SBR                                                                                | ROUND RANGE<br>P                                                                    | SHAPE<br>MIN W   G/P MAX                                                            | LENGTHS<br>(L)                                                        |
| 40.0                                                                              | 43.0                                                                              | 5.0                                                                               | 0.125                                                                             | 25 / 30                                                                            | 20.0 - 39.99                                                                        | 8.0 39.99                                                                           | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b> |
| 45.0                                                                              | 48.0                                                                              | 5.0                                                                               | 0.125                                                                             | 25 / 30                                                                            | 25.0 - 44.99                                                                        | 9.0 44.99                                                                           |                                                                       |
| 50.0                                                                              | 53.0                                                                              | 5.0                                                                               | 0.125                                                                             | 25 / 30                                                                            | 30.0 - 49.99                                                                        | 10.0 49.99                                                                          |                                                                       |
| 56.0                                                                              | 59.0                                                                              | 5.0                                                                               | 0.125                                                                             | 25 / 30                                                                            | 35.0 - 55.99                                                                        | 11.0 55.99                                                                          |                                                                       |
| 63.0                                                                              | 66.0                                                                              | 5.0                                                                               | 0.125                                                                             | 25 / 30                                                                            | 40.0 - 62.99                                                                        | 12.0 62.99                                                                          |                                                                       |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | <b>Standard Lengths</b><br><b>(page 51)</b>                           |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                       |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                       |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                       |

Qualified Shapes (Page 41).

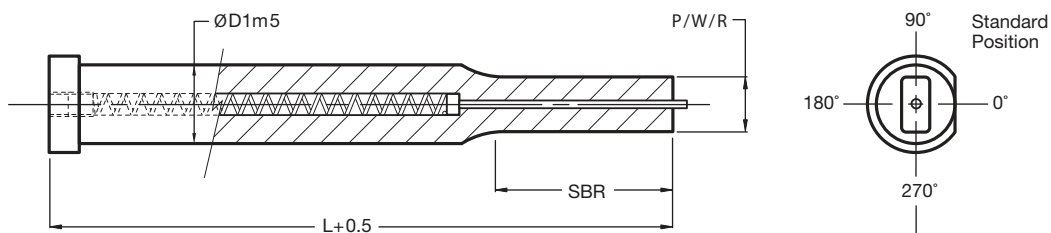
Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

\* The Ejector (A) dimension is in imperial (inches).

#### ORDER EXAMPLE



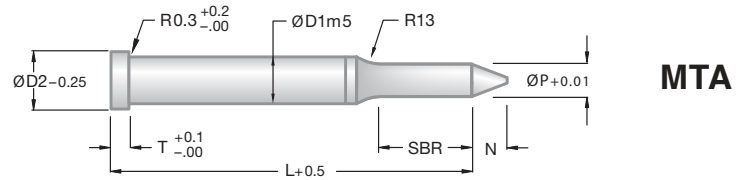
| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | ME   | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

## MTA/MTP series Head Type Pilot Punches

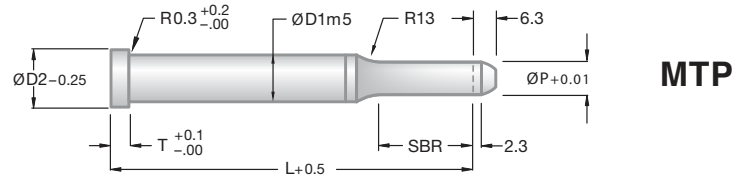
### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |



**MTA**



**MTP**

| MTA  |      |     |              |      |              | LENGTHS L                                                                                                                |
|------|------|-----|--------------|------|--------------|--------------------------------------------------------------------------------------------------------------------------|
| D1   | D2   | T   | SBR          | N    | RANGE P      |                                                                                                                          |
| 10.0 | 13.0 | 5.0 | 13 / 19 / 25 | 10.0 | 4.9 - 9.99   | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |
| 13.0 | 16.0 | 5.0 | 13 / 19 / 25 | 12.0 | 5.9 - 12.99  |                                                                                                                          |
| 16.0 | 19.0 | 5.0 | 13 / 19 / 25 | 17.0 | 9.9 - 15.99  |                                                                                                                          |
| 20.0 | 23.0 | 5.0 | 13 / 19 / 25 | 22.0 | 12.9 - 19.99 |                                                                                                                          |
| 25.0 | 28.0 | 5.0 | 13 / 19 / 25 | 25.0 | 16.9 - 24.99 |                                                                                                                          |
| 32.0 | 35.0 | 5.0 | 13 / 19 / 25 | 25.0 | 19.9 - 31.99 |                                                                                                                          |
|      |      |     |              |      |              |                                                                                                                          |

| MTP  |      |     |              |              | LENGTHS L                                                                                                                |
|------|------|-----|--------------|--------------|--------------------------------------------------------------------------------------------------------------------------|
| D1   | D2   | T   | SBR          | RANGE P      |                                                                                                                          |
| 5.0  | 8.0  | 5.0 | 13           | 1.0 - 4.99   | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |
| 6.0  | 9.0  | 5.0 | 13 / 19      | 1.9 - 5.99   |                                                                                                                          |
| 8.0  | 11.0 | 5.0 | 13 / 19 / 25 | 2.4 - 7.99   |                                                                                                                          |
| 10.0 | 13.0 | 5.0 | 13 / 19 / 25 | 3.9 - 9.99   |                                                                                                                          |
| 13.0 | 16.0 | 5.0 | 13 / 19 / 25 | 4.9 - 12.99  |                                                                                                                          |
| 16.0 | 19.0 | 5.0 | 13 / 19 / 25 | 7.9 - 15.99  |                                                                                                                          |
| 20.0 | 23.0 | 5.0 | 13 / 19 / 25 | 11.9 - 19.99 |                                                                                                                          |
| 25.0 | 28.0 | 5.0 | 13 / 19 / 25 | 14.9 - 24.99 |                                                                                                                          |
| 32.0 | 35.0 | 5.0 | 13 / 19 / 25 | 19.9 - 31.99 |                                                                                                                          |
|      |      |     |              |              |                                                                                                                          |

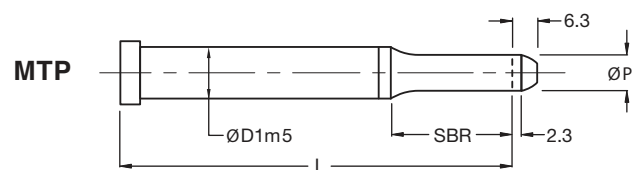
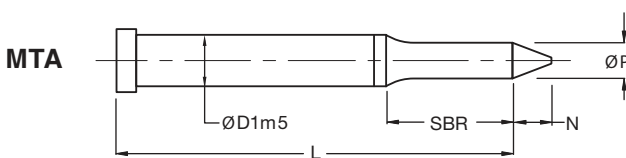
Qualified Shapes (Page 41).

Standard Alterations (Page 42).

Extended Range Shank Diameters (Page 9).

Locating Devices (Page 43).

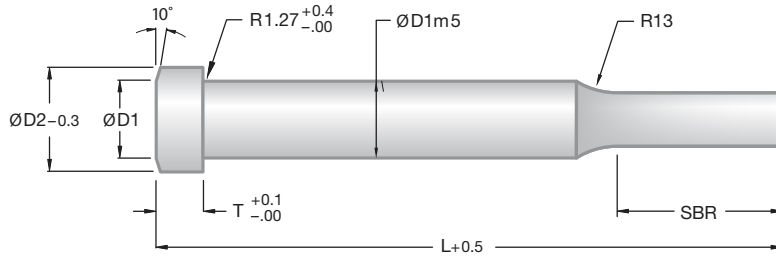
### ORDER EXAMPLE



|     | QTY | Material | Type | D1 | x | L  | P   | SBR | Alterations    | Coating |
|-----|-----|----------|------|----|---|----|-----|-----|----------------|---------|
| MTA | 10  | M2       | MTA  | 13 | x | 90 | 7.0 | 10  | Roof Top Shear | TIN     |
| MTP | 10  | M2       | MTP  | 13 | x | 90 | 7.0 | 10  | Roof Top Shear | TIN     |

## MTU series

### Ultimate Head Type Punch



#### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M4       | 60-62    |

| MTUB                              |              | MTUC |              | MTUO             |                          | MTUR                   |                                                     | MTUL                                      |  | MTUF |  | MTUH                  |  |
|-----------------------------------|--------------|------|--------------|------------------|--------------------------|------------------------|-----------------------------------------------------|-------------------------------------------|--|------|--|-----------------------|--|
|                                   |              |      |              |                  |                          |                        |                                                     |                                           |  |      |  |                       |  |
| For qualified shapes see page 41. |              |      |              |                  |                          | $G = \sqrt{W^2 + P^2}$ |                                                     | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$ |  |      |  | $G = W \times 1.1547$ |  |
| BODY Ø<br>D1                      | HEAD Ø<br>D2 | T    | SBR          | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX |                        | LENGTHS<br>(L)                                      |                                           |  |      |  |                       |  |
| 8.0                               | 13.0         | 8.0  | 13 / 19 / 25 | 3.0 - 7.99       | 3.0                      | 7.99                   | <b>Available Lengths:<br/>50mm<br/>to<br/>200mm</b> |                                           |  |      |  |                       |  |
| 10.0                              | 15.0         | 8.0  | 13 / 19 / 25 | 3.0 - 9.99       | 3.0                      | 9.99                   |                                                     |                                           |  |      |  |                       |  |
| 13.0                              | 18.0         | 8.0  | 13 / 19 / 25 | 6.0 - 12.99      | 3.0                      | 12.99                  |                                                     |                                           |  |      |  |                       |  |
| 16.0                              | 21.0         | 8.0  | 13 / 19 / 25 | 8.0 - 15.99      | 4.0                      | 15.99                  |                                                     |                                           |  |      |  |                       |  |
| 20.0                              | 25.0         | 8.0  | 13 / 19 / 25 | 12.0 - 19.99     | 5.0                      | 19.99                  |                                                     |                                           |  |      |  |                       |  |
| 25.0                              | 30.0         | 8.0  | 13 / 19 / 25 | 16.0 - 24.99     | 6.0                      | 24.99                  | <b>Standard Lengths<br/>(page 51)</b>               |                                           |  |      |  |                       |  |
|                                   |              |      |              |                  |                          |                        |                                                     |                                           |  |      |  |                       |  |
|                                   |              |      |              |                  |                          |                        |                                                     |                                           |  |      |  |                       |  |

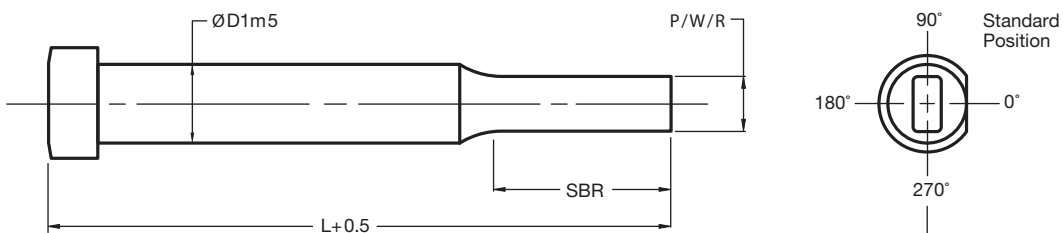
Qualified Shapes (Page 41).

Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

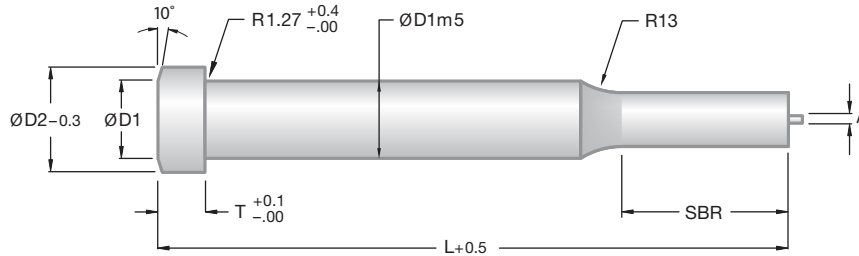
#### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M4       | MTU  | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

## MUE series

### Ultimate Head Type Ejector Punch



#### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M4       | 60-62    |

| MUEB                              | MUEC         | MUEO | MUER                   | MUEL         | MUEF                                      | MUEH                     |                                                                       |
|-----------------------------------|--------------|------|------------------------|--------------|-------------------------------------------|--------------------------|-----------------------------------------------------------------------|
|                                   |              |      |                        |              |                                           |                          |                                                                       |
| For qualified shapes see page 41. |              |      | $G = \sqrt{W^2 + P^2}$ |              | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$ |                          |                                                                       |
|                                   |              |      |                        |              | $G = W \times 1.1547$                     |                          |                                                                       |
| BODY Ø<br>D1                      | HEAD Ø<br>D2 | T    | A*                     | SBR          | ROUND RANGE<br>P                          | SHAPE<br>MIN W   G/P MAX | LENGTHS<br>(L)                                                        |
| 8.0                               | 13.0         | 8.0  | 0.025                  | 13 / 19 / 25 | 3.0 - 7.99                                | 3.0 7.99                 | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b> |
| 10.0                              | 15.0         | 8.0  | 0.025                  | 13 / 19 / 25 | 3.0 - 9.99                                | 3.0 9.99                 |                                                                       |
| 13.0                              | 18.0         | 8.0  | 0.025                  | 13 / 19 / 25 | 6.0 - 12.99                               | 3.0 12.99                |                                                                       |
| 16.0                              | 21.0         | 8.0  | 0.032                  | 13 / 19 / 25 | 8.0 - 15.99                               | 4.0 15.99                |                                                                       |
| 20.0                              | 25.0         | 8.0  | 0.032                  | 13 / 19 / 25 | 12.0 - 19.99                              | 5.0 19.99                |                                                                       |
| 25.0                              | 30.0         | 8.0  | 0.032                  | 13 / 19 / 25 | 16.0 - 24.99                              | 6.0 24.99                |                                                                       |
|                                   |              |      |                        |              |                                           |                          | <b>Standard Lengths</b><br><b>(page 51)</b>                           |
|                                   |              |      |                        |              |                                           |                          |                                                                       |
|                                   |              |      |                        |              |                                           |                          |                                                                       |

Qualified Shapes (Page 41).

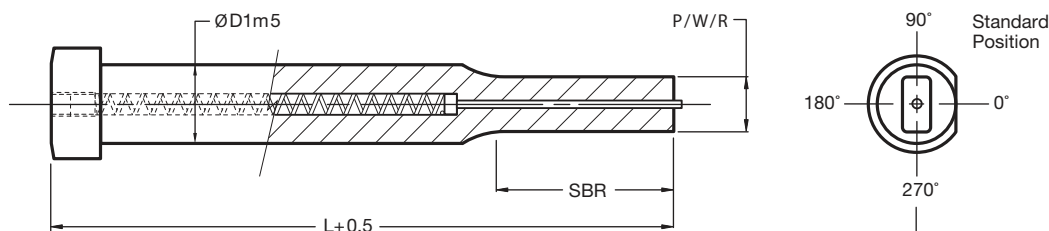
Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

\* The Ejector (A) dimension is in imperial (inches).

#### ORDER EXAMPLE



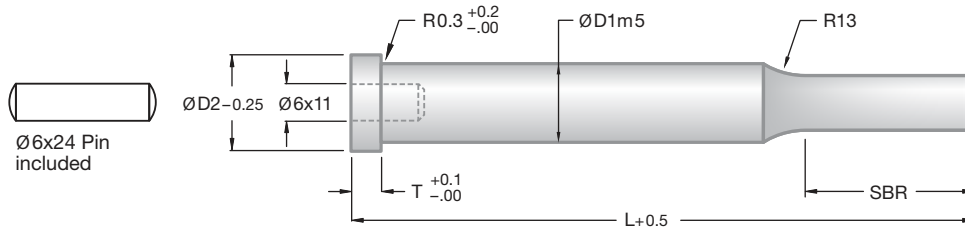
| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M4       | MUE  | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

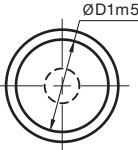
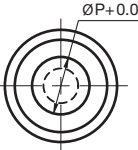
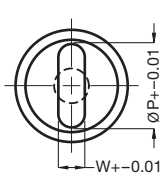
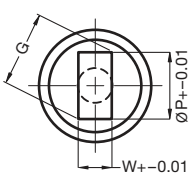
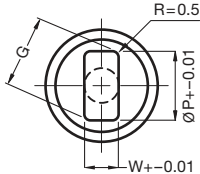
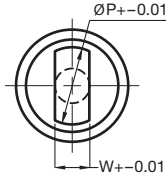
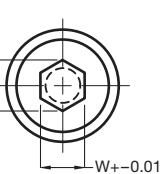
## MC series Center Dowel Punch

### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |



| MCB                                                                               | MCC                                                                               | MCO                                                                               | MCR                                                                               | MCL                                                                                | MCF                                                                                 | MCH                                                                                 |                                                                       |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
|  |  |  |  |  |  |  |                                                                       |
| For qualified shapes see page 41.                                                 |                                                                                   |                                                                                   | $G = \sqrt{W^2 + P^2}$                                                            |                                                                                    | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$                                           |                                                                                     |                                                                       |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | $G = W \times 1.1547$                                                               |                                                                                     |                                                                       |
| BODY Ø<br>D1                                                                      | HEAD Ø<br>D2                                                                      | T                                                                                 | SBR                                                                               | ROUND RANGE<br>P                                                                   | SHAPE<br>MIN W   G/P MAX                                                            |                                                                                     | LENGTHS<br>(L)                                                        |
| 10.0                                                                              | 13.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 4.0 - 9.99                                                                         | 3.5                                                                                 | 9.99                                                                                | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b> |
| 13.0                                                                              | 16.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 5.0 - 12.99                                                                        | 4.5                                                                                 | 12.99                                                                               |                                                                       |
| 16.0                                                                              | 19.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 8.0 - 15.99                                                                        | 6.0                                                                                 | 15.99                                                                               |                                                                       |
| 20.0                                                                              | 23.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 12.0 - 19.99                                                                       | 8.0                                                                                 | 19.99                                                                               |                                                                       |
| 25.0                                                                              | 28.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 16.5 - 24.99                                                                       | 10.0                                                                                | 24.99                                                                               |                                                                       |
| 32.0                                                                              | 35.0                                                                              | 5.0                                                                               | 13 / 19 / 25                                                                      | 20.0 - 31.99                                                                       | 10.0                                                                                | 31.99                                                                               |                                                                       |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | <b>Standard Lengths</b><br><b>(page 51)</b>                           |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                       |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                       |

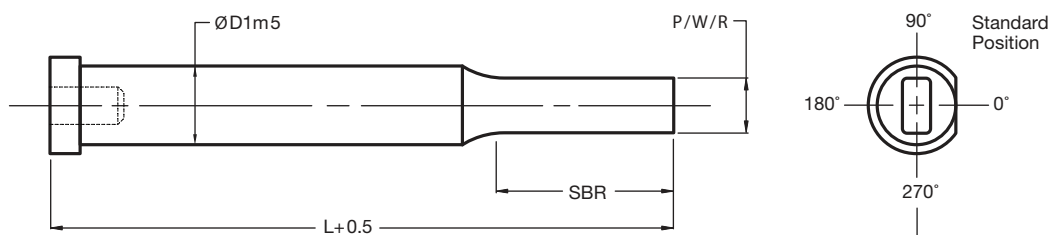
Qualified Shapes (Page 41).

Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MC   | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |



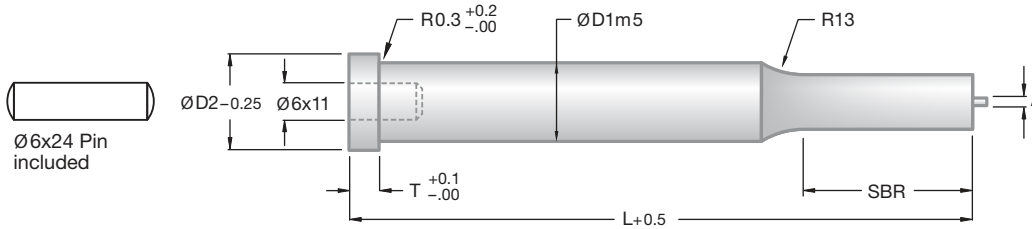
## MCE series

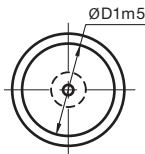
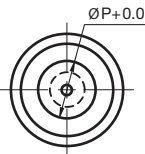
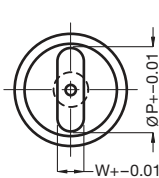
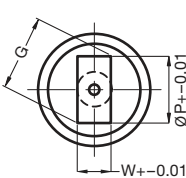
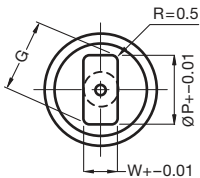
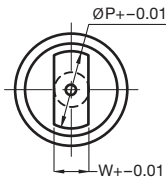
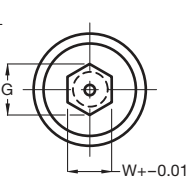
### Center Dowel Ejector Punch

3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |



| MCEB                                                                              | MCEC                                                                              | MCEO                                                                              | MCER                                                                              | MCEL                                                                               | MCEF                                                                                | MCEH                                                                                |                                                                       |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------|
|  |  |  |  |  |  |  |                                                                       |
| For qualified shapes see page 41.                                                 |                                                                                   |                                                                                   | $G = \sqrt{W^2 + P^2}$                                                            |                                                                                    | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$                                           |                                                                                     |                                                                       |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | $G = W \times 1.1547$                                                               |                                                                                     |                                                                       |
| BODY Ø<br>D1                                                                      | HEAD Ø<br>D2                                                                      | T                                                                                 | A*                                                                                | SBR                                                                                | ROUND RANGE<br>P                                                                    | SHAPE<br>MIN W   G/P MAX                                                            | LENGTHS<br>(L)                                                        |
| 10.0                                                                              | 13.0                                                                              | 5.0                                                                               | 0.025                                                                             | 13 / 19 / 25                                                                       | 4.0 - 9.99                                                                          | 3.5 9.99                                                                            | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b> |
| 13.0                                                                              | 16.0                                                                              | 5.0                                                                               | 0.025                                                                             | 13 / 19 / 25                                                                       | 5.0 - 12.99                                                                         | 4.5 12.99                                                                           |                                                                       |
| 16.0                                                                              | 19.0                                                                              | 5.0                                                                               | 0.032                                                                             | 13 / 19 / 25                                                                       | 8.0 - 15.99                                                                         | 6.0 15.99                                                                           |                                                                       |
| 20.0                                                                              | 23.0                                                                              | 5.0                                                                               | 0.032                                                                             | 13 / 19 / 25                                                                       | 12.0 - 19.99                                                                        | 8.0 19.99                                                                           |                                                                       |
| 25.0                                                                              | 28.0                                                                              | 5.0                                                                               | 0.032                                                                             | 13 / 19 / 25                                                                       | 16.5 - 24.99                                                                        | 10.0 24.99                                                                          |                                                                       |
| 32.0                                                                              | 35.0                                                                              | 5.0                                                                               | 0.032                                                                             | 13 / 19 / 25                                                                       | 20.0 - 31.99                                                                        | 10.0 31.99                                                                          |                                                                       |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     | <b>Standard Lengths</b><br><b>(page 51)</b>                           |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                       |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                       |

Qualified Shapes (Page 41).

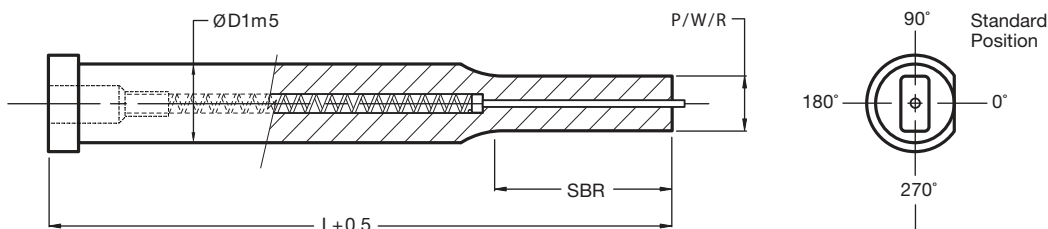
Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

\* The Ejector (A) dimension is in imperial (inches).

#### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MCE  | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

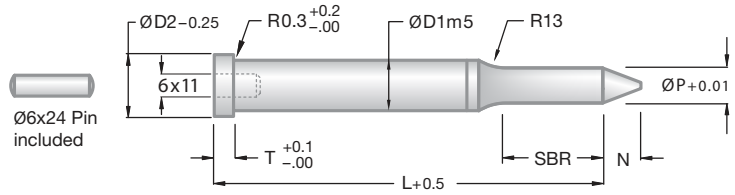
## MCA/MCP series

### Center Dowel Pilot Punches

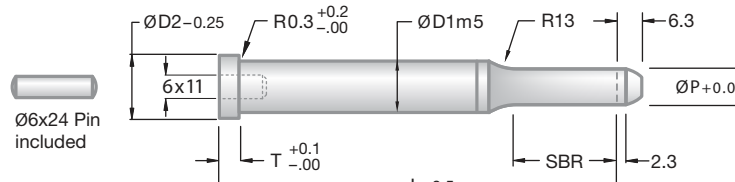
#### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |



**MCA**



**MCP**

| MCA  |      |   |              |      |              | LENGTHS L                                                                                                                |
|------|------|---|--------------|------|--------------|--------------------------------------------------------------------------------------------------------------------------|
| D1   | D2   | T | SBR          | N    | RANGE P      |                                                                                                                          |
| 10.0 | 13.0 | 5 | 13 / 19 / 25 | 10.0 | 4.9 - 9.99   | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |
| 13.0 | 16.0 | 5 | 13 / 19 / 25 | 12.0 | 5.9 - 12.99  |                                                                                                                          |
| 16.0 | 19.0 | 5 | 13 / 19 / 25 | 17.0 | 9.9 - 15.99  |                                                                                                                          |
| 20.0 | 23.0 | 5 | 13 / 19 / 25 | 22.0 | 12.9 - 19.99 |                                                                                                                          |
| 25.0 | 28.0 | 5 | 13 / 19 / 25 | 25.0 | 16.9 - 24.99 |                                                                                                                          |
| 32.0 | 35.0 | 5 | 13 / 19 / 25 | 25.0 | 19.9 - 31.99 |                                                                                                                          |
|      |      |   |              |      |              |                                                                                                                          |

| MCP  |      |   |              |              |                                                                                                                          | LENGTHS L |
|------|------|---|--------------|--------------|--------------------------------------------------------------------------------------------------------------------------|-----------|
| D1   | D2   | T | SBR          | RANGE P      |                                                                                                                          |           |
| 10.0 | 13.0 | 5 | 13 / 19 / 25 | 3.9 - 9.99   | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |           |
| 13.0 | 16.0 | 5 | 13 / 19 / 25 | 4.9 - 12.99  |                                                                                                                          |           |
| 16.0 | 19.0 | 5 | 13 / 19 / 25 | 7.9 - 15.99  |                                                                                                                          |           |
| 20.0 | 23.0 | 5 | 13 / 19 / 25 | 11.9 - 19.99 |                                                                                                                          |           |
| 25.0 | 28.0 | 5 | 13 / 19 / 25 | 14.9 - 24.99 |                                                                                                                          |           |
| 32.0 | 35.0 | 5 | 13 / 19 / 25 | 19.9 - 31.99 |                                                                                                                          |           |
|      |      |   |              |              |                                                                                                                          |           |

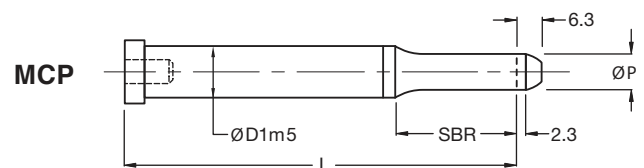
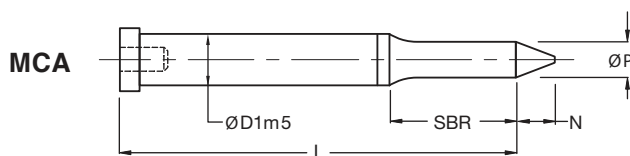
Qualified Shapes (Page 41).

Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

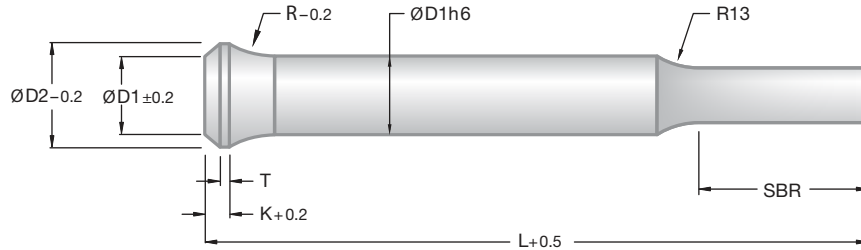
Locating Devices (Page 43).

#### ORDER EXAMPLE



|     | QTY | Material | Type | D1 | x | L  | P   | SBR | Alterations    | Coating |
|-----|-----|----------|------|----|---|----|-----|-----|----------------|---------|
| MCA | 10  | M2       | MCA  | 13 | x | 90 | 7.0 | 10  | Roof Top Shear | TIN     |
| MCP | 10  | M2       | MCP  | 13 | x | 90 | 7.0 | 10  | Roof Top Shear | TIN     |

## MBN series Bottle Neck Punch



### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MBNB                              | MBNC         | MBNO | MBNR                   | MBNL | MBNF                                      | MBNH |                  |                          |                                                     |
|-----------------------------------|--------------|------|------------------------|------|-------------------------------------------|------|------------------|--------------------------|-----------------------------------------------------|
|                                   |              |      |                        |      |                                           |      |                  |                          |                                                     |
| For qualified shapes see page 41. |              |      | $G = \sqrt{W^2 + P^2}$ |      | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$ |      |                  |                          |                                                     |
|                                   |              |      |                        |      | $G = W \times 1.1547$                     |      |                  |                          |                                                     |
| BODY Ø<br>D1                      | HEAD Ø<br>D2 | T    | SBR                    | k    | r                                         | z    | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX | LENGTHS<br>(L)                                      |
| 5.0                               | 7.0          | 1.5  | 13 / 19                | 4.0  | 10.0                                      | 15.0 | 1.5 - 4.99       | 1.5 4.99                 | <b>Available Lengths:<br/>50mm<br/>to<br/>200mm</b> |
| 6.0                               | 9.0          | 1.5  | 13 / 19                | 4.0  | 10.0                                      | 15.0 | 1.5 - 5.99       | 1.5 5.99                 |                                                     |
| 8.0                               | 11.0         | 1.5  | 13 / 19                | 4.0  | 12.0                                      | 15.0 | 2.5 - 7.99       | 2.5 7.99                 |                                                     |
| 10.0                              | 14.0         | 1.5  | 13 / 19 / 25           | 4.0  | 15.0                                      | 15.0 | 4.0 - 9.99       | 3.5 9.99                 |                                                     |
| 13.0                              | 17.0         | 1.5  | 13 / 19 / 25           | 4.0  | 15.0                                      | 15.0 | 5.0 - 12.99      | 4.5 12.99                |                                                     |
| 16.0                              | 20.0         | 1.5  | 13 / 19 / 25           | 4.0  | 15.0                                      | 15.0 | 8.0 - 15.99      | 6.0 15.99                |                                                     |
| 20.0                              | 25.0         | 1.5  | 13 / 19 / 25           | 4.0  | 15.0                                      | 15.0 | 12.0 - 19.99     | 8.0 19.99                |                                                     |
| 25.0                              | 30.0         | 1.5  | 13 / 19 / 25           | 4.0  | 15.0                                      | 15.0 | 16.0 - 24.99     | 10.0 24.99               |                                                     |
|                                   |              |      |                        |      |                                           |      |                  |                          | <b>Standard Lengths<br/>(page 51)</b>               |

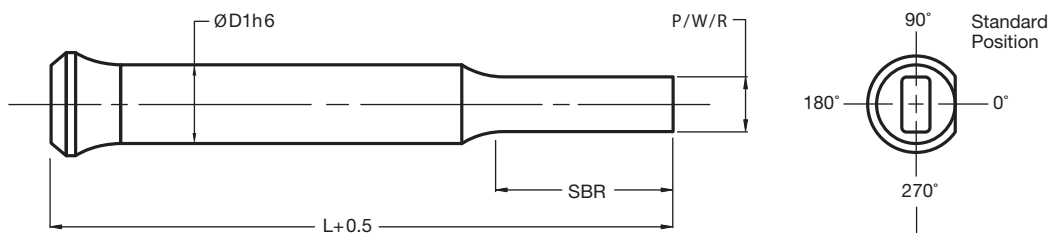
Qualified Shapes (Page 41).

Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

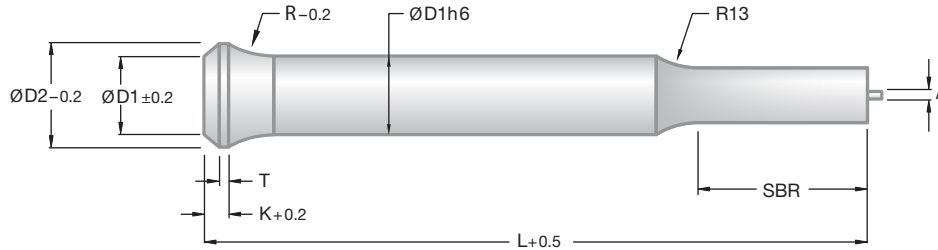
### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MBN  | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

## MBNE series

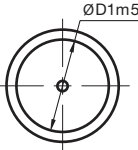
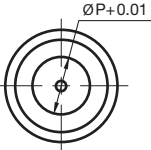
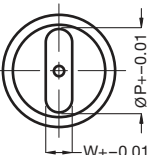
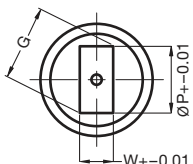
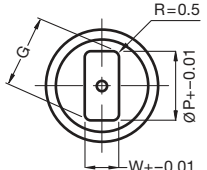
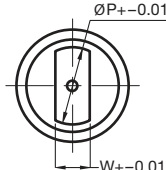
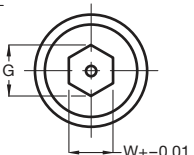
### Bottle Neck Ejector Punches



#### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MBNEB                                                                             | MBNEC                                                                             | MBNEO                                                                             | MBNER                                                                             | MBNEL                                                                              | MBNEF                                                                               | MBNEH                                                                               |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|  |  |  |  |  |  |  |
| For qualified shapes see page 41.                                                 |                                                                                   |                                                                                   | $G = \sqrt{W^2 + P^2}$                                                            |                                                                                    | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$                                           |                                                                                     |
|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                    | $G = W \times 1.1547$                                                               |                                                                                     |

| BODY Ø<br>D1 | HEAD Ø<br>D2 | T   | A*    | SBR          | k   | r    | z    | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX | Available Lengths:<br>50mm<br>to<br>200mm<br><br>Standard Lengths<br>(page 51) |
|--------------|--------------|-----|-------|--------------|-----|------|------|------------------|--------------------------|--------------------------------------------------------------------------------|
| 6.0          | 9.0          | 1.5 | 0.025 | 13 / 19      | 4.0 | 10.0 | 15.0 | 1.5 - 5.99       | 1.5 5.99                 |                                                                                |
| 8.0          | 11.0         | 1.5 | 0.025 | 13 / 19      | 4.0 | 10.0 | 15.0 | 2.5 - 7.99       | 2.5 7.99                 |                                                                                |
| 10.0         | 14.0         | 1.5 | 0.025 | 13 / 19 / 25 | 4.0 | 12.0 | 15.0 | 4.0 - 9.99       | 3.5 9.99                 |                                                                                |
| 13.0         | 17.0         | 1.5 | 0.025 | 13 / 19 / 25 | 4.0 | 15.0 | 15.0 | 5.0 - 12.99      | 4.5 12.99                |                                                                                |
| 16.0         | 20.0         | 1.5 | 0.032 | 13 / 19 / 25 | 4.0 | 15.0 | 15.0 | 8.0 - 15.99      | 6.0 15.99                |                                                                                |
| 20.0         | 25.0         | 1.5 | 0.032 | 13 / 19 / 25 | 4.0 | 15.0 | 15.0 | 12.0 - 19.99     | 8.0 19.99                |                                                                                |
| 25.0         | 30.0         | 1.5 | 0.032 | 13 / 19 / 25 | 4.0 | 15.0 | 15.0 | 16.0 - 24.99     | 10.0 24.99               |                                                                                |
|              |              |     |       |              |     |      |      |                  |                          |                                                                                |
|              |              |     |       |              |     |      |      |                  |                          |                                                                                |

Qualified Shapes (Page 41).

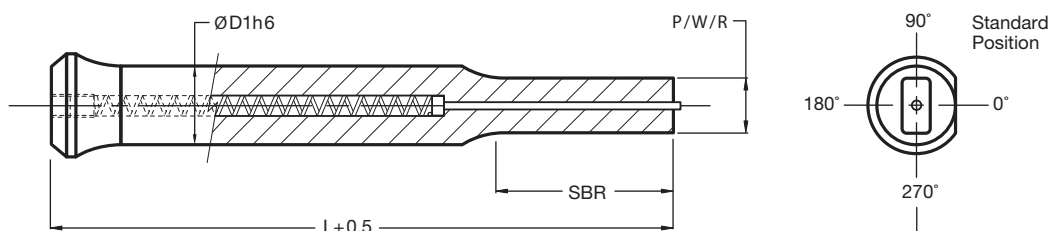
Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

\* The Ejector (A) dimension is in imperial (inches).

#### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MBNE | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

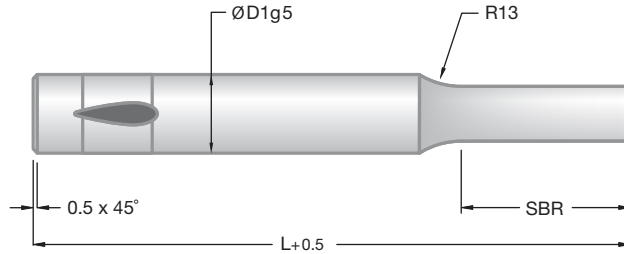
## MBL series

### Light Duty Ball Lock Punch

3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |



| MBLB                              | MBLC    | MBLO             | MBLR                     | MBLL  | MBLF                                                                                                    | MBLH |
|-----------------------------------|---------|------------------|--------------------------|-------|---------------------------------------------------------------------------------------------------------|------|
|                                   |         |                  |                          |       |                                                                                                         |      |
| For qualified shapes see page 41. |         |                  | $G = \sqrt{W^2 + P^2}$   |       | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$                                                               |      |
|                                   |         |                  |                          |       | $G = W \times 1.1547$                                                                                   |      |
| BODY Ø<br>D1                      | SBR     | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX |       | <p><b>Available Lengths:</b><br/>50mm<br/>to<br/>200mm</p> <p><b>Standard Lengths</b><br/>(page 51)</p> |      |
| 6.0                               | 13 / 19 | 2.5 - 5.98       | 2.0                      | 5.98  |                                                                                                         |      |
| 10.0                              | 13 / 19 | 3.5 - 9.98       | 3.2                      | 9.98  |                                                                                                         |      |
| 13.0                              | 13 / 19 | 5.0 - 12.98      | 4.5                      | 12.98 |                                                                                                         |      |
| 16.0                              | 19 / 25 | 8.5 - 15.98      | 6.0                      | 15.98 |                                                                                                         |      |
| 20.0                              | 19 / 25 | 12.5 - 19.98     | 8.0                      | 19.98 |                                                                                                         |      |
| 25.0                              | 19 / 25 | 16.0 - 24.98     | 10.0                     | 24.98 |                                                                                                         |      |
| 32.0                              | 19 / 25 | 20.0 - 31.98     | 16.0                     | 31.98 |                                                                                                         |      |
| 38.0                              | 19 / 25 | 25.0 - 37.98     | 18.0                     | 37.98 |                                                                                                         |      |

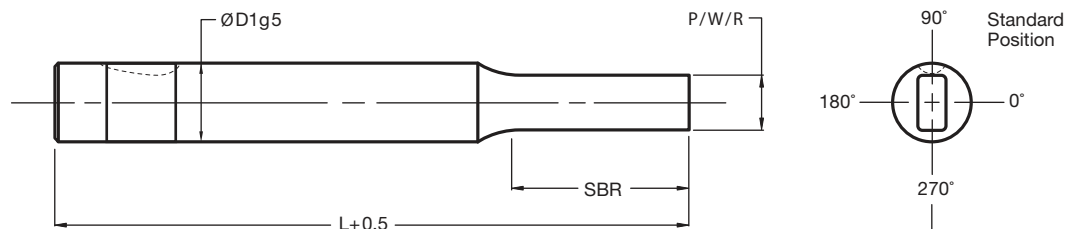
Qualified Shapes (Page 41).

Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

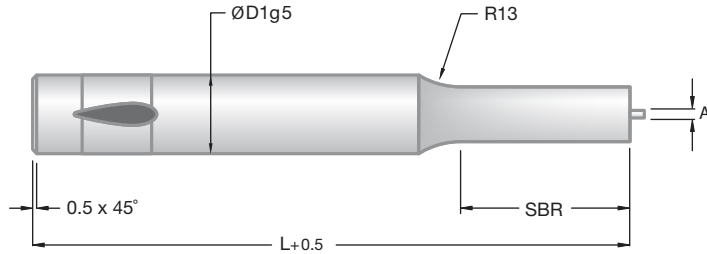
#### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MBL  | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

## MBLE series

### Light Duty Ball Lock Ejector Punch



#### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MBLEB                             | MBLEC | MBLEO   | MBLER                  | MBLEL                    | MBLEF                                     | MBLEH                                                                                                                    |
|-----------------------------------|-------|---------|------------------------|--------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
|                                   |       |         |                        |                          |                                           |                                                                                                                          |
| For qualified shapes see page 41. |       |         | $G = \sqrt{W^2 + P^2}$ |                          | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$ |                                                                                                                          |
|                                   |       |         |                        |                          | $G = W \times 1.1547$                     |                                                                                                                          |
| BODY Ø<br>D1                      | A*    | SBR     | ROUND RANGE<br>P       | SHAPE<br>MIN W   G/P MAX |                                           | LENGTHS<br>(L)                                                                                                           |
| 6.0                               | 0.031 | 13 / 19 | 2.5 - 5.98             | 2.0                      | 5.98                                      | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |
| 10.0                              | 0.047 | 13 / 19 | 3.5 - 9.98             | 3.2                      | 9.98                                      |                                                                                                                          |
| 13.0                              | 0.063 | 13 / 19 | 5.0 - 12.98            | 4.5                      | 12.98                                     |                                                                                                                          |
| 16.0                              | 0.063 | 19 / 25 | 8.5 - 15.98            | 6.0                      | 15.98                                     |                                                                                                                          |
| 20.0                              | 0.094 | 19 / 25 | 12.5 - 19.98           | 8.0                      | 19.98                                     |                                                                                                                          |
| 25.0                              | 0.094 | 19 / 25 | 16.0 - 24.98           | 10.0                     | 24.98                                     |                                                                                                                          |
| 32.0                              | 0.094 | 19 / 25 | 20.0 - 31.98           | 16.0                     | 31.98                                     |                                                                                                                          |
| 38.0                              | 0.125 | 19 / 25 | 25.0 - 37.98           | 18.0                     | 37.98                                     |                                                                                                                          |

Qualified Shapes (Page 41).

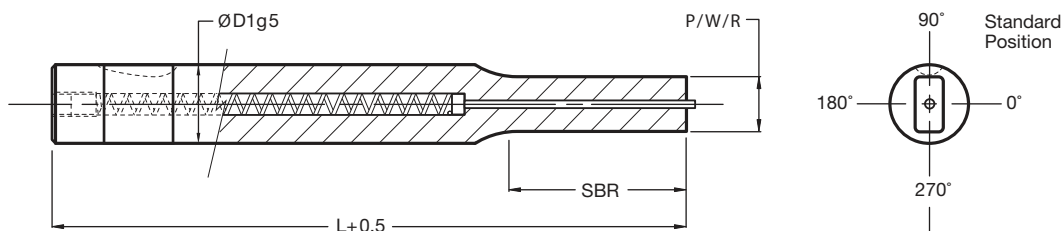
Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

\* The Ejector (A) dimension is in imperial (inches).

#### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MBLE | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

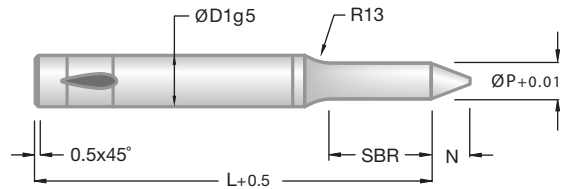
## MBLA/MBLP series

### Light Duty Ball Lock Pilot Punches

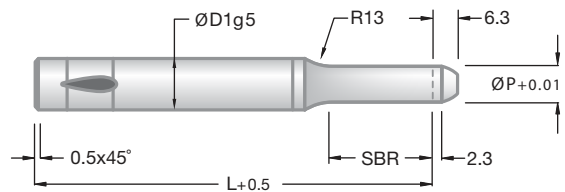
#### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |



**MBLA**



**MBLP**

| MTBLA |              |      |              |                                                                                                                          |
|-------|--------------|------|--------------|--------------------------------------------------------------------------------------------------------------------------|
| D1    | SBR          | N    | RANGE P      | LENGTHS L                                                                                                                |
| 10.0  | 13 / 19 / 25 | 10.0 | 4.9 - 9.99   | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |
| 13.0  | 13 / 19 / 25 | 12.0 | 5.9 - 12.99  |                                                                                                                          |
| 16.0  | 13 / 19 / 25 | 17.0 | 9.9 - 15.99  |                                                                                                                          |
| 20.0  | 13 / 19 / 25 | 22.0 | 12.9 - 19.99 |                                                                                                                          |
| 25.0  | 13 / 19 / 25 | 25.0 | 16.9 - 24.99 |                                                                                                                          |
| 32.0  | 13 / 19 / 25 | 25.0 | 19.9 - 31.99 |                                                                                                                          |
| 38.0  | 13 / 19 / 25 | 30.0 | 24.9 - 37.99 |                                                                                                                          |

| MTBLP |              |              |                                                                                                                          |  |
|-------|--------------|--------------|--------------------------------------------------------------------------------------------------------------------------|--|
| D1    | SBR          | RANGE P      | LENGTHS L                                                                                                                |  |
| 6.0   | 13 / 19      | 1.9 - 5.99   | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |  |
| 10.0  | 13 / 19 / 25 | 3.9 - 9.99   |                                                                                                                          |  |
| 13.0  | 13 / 19 / 25 | 4.9 - 12.99  |                                                                                                                          |  |
| 16.0  | 13 / 19 / 25 | 7.9 - 15.99  |                                                                                                                          |  |
| 20.0  | 13 / 19 / 25 | 11.9 - 19.99 |                                                                                                                          |  |
| 25.0  | 13 / 19 / 25 | 14.9 - 24.99 |                                                                                                                          |  |
| 32.0  | 13 / 19 / 25 | 19.9 - 31.99 |                                                                                                                          |  |
| 38.0  | 13 / 19 / 25 | 24.9 - 37.99 |                                                                                                                          |  |

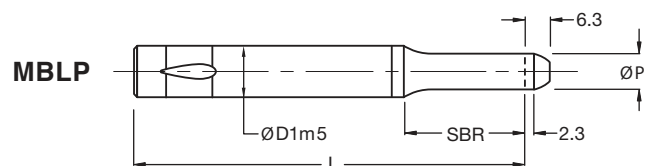
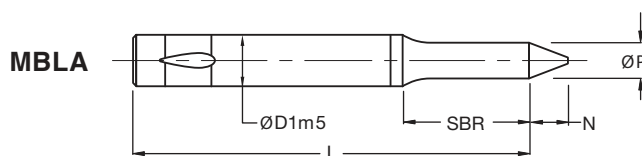
Qualified Shapes (Page 41).

Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

#### ORDER EXAMPLE



|      | QTY | Material | Type | D1 | x | L  | P   | SBR | Alterations    | Coating |
|------|-----|----------|------|----|---|----|-----|-----|----------------|---------|
| MBLA | 10  | M2       | MBLA | 13 | x | 90 | 7.0 | 10  | Roof Top Shear | TIN     |
| MBLP | 10  | M2       | MBLP | 13 | x | 90 | 7.0 | 10  | Roof Top Shear | TIN     |

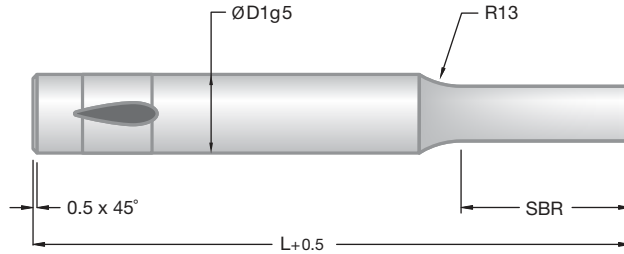
## MBH series

### Heavy Duty Ball Lock Punch

#### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |



| MBHB                              | MBHC    | MBHO             | MBHR                     | MBHL  | MBHF                                                                                                                                               | MBHH |
|-----------------------------------|---------|------------------|--------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------------------|------|
|                                   |         |                  |                          |       |                                                                                                                                                    |      |
| For qualified shapes see page 41. |         |                  | $G = \sqrt{W^2 + P^2}$   |       | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$                                                                                                          |      |
|                                   |         |                  |                          |       | $G = W \times 1.1547$                                                                                                                              |      |
| BODY Ø<br>D1                      | SBR     | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX |       | <p><b>Available Lengths:</b></p> <p><b>50mm</b></p> <p><b>to</b></p> <p><b>200mm</b></p><br><p><b>Standard Lengths</b></p> <p><b>(page 51)</b></p> |      |
| 10.0                              | 13 / 19 | 2.5 - 9.98       | 2.5                      | 9.98  |                                                                                                                                                    |      |
| 13.0                              | 13 / 19 | 5.0 - 12.98      | 4.5                      | 12.98 |                                                                                                                                                    |      |
| 16.0                              | 19 / 25 | 8.0 - 15.98      | 6.0                      | 15.98 |                                                                                                                                                    |      |
| 20.0                              | 19 / 25 | 12.0 - 19.98     | 8.0                      | 19.98 |                                                                                                                                                    |      |
| 25.0                              | 19 / 25 | 16.0 - 24.98     | 10.0                     | 24.98 |                                                                                                                                                    |      |
| 32.0                              | 19 / 25 | 24.0 - 31.98     | 12.0                     | 31.98 |                                                                                                                                                    |      |
| 40.0                              | 19 / 25 | 30.0 - 39.98     | 18.0                     | 37.98 |                                                                                                                                                    |      |

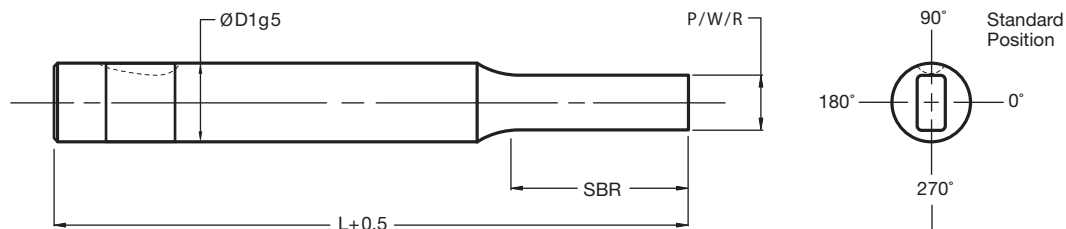
Qualified Shapes (Page 41).

Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

#### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MBH  | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |



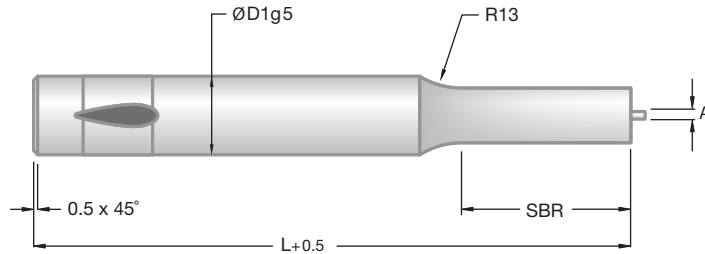
## MBHE series

### Heavy Duty Ball Lock Ejector Punch

3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |



| MBHEB                             | MBHEC | MBHEO   | MBHER                  | MBHEL                    | MBHEF                                     | MBHEH                                                                                                                    |
|-----------------------------------|-------|---------|------------------------|--------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|
|                                   |       |         |                        |                          |                                           |                                                                                                                          |
| For qualified shapes see page 41. |       |         | $G = \sqrt{W^2 + P^2}$ |                          | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$ |                                                                                                                          |
|                                   |       |         |                        |                          | $G = W \times 1.1547$                     |                                                                                                                          |
| BODY Ø<br>D1                      | A*    | SBR     | ROUND RANGE<br>P       | SHAPE<br>MIN W   G/P MAX |                                           | LENGTHS<br>(L)                                                                                                           |
| 10.0                              | 0.047 | 13 / 19 | 2.5 - 9.98             | 2.5                      | 9.98                                      | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |
| 13.0                              | 0.063 | 13 / 19 | 5.0 - 12.98            | 4.5                      | 12.98                                     |                                                                                                                          |
| 16.0                              | 0.063 | 19 / 25 | 8.0 - 15.98            | 6.0                      | 15.98                                     |                                                                                                                          |
| 20.0                              | 0.094 | 19 / 25 | 12.0 - 19.98           | 8.0                      | 19.98                                     |                                                                                                                          |
| 25.0                              | 0.094 | 19 / 25 | 16.0 - 24.98           | 10.0                     | 24.98                                     |                                                                                                                          |
| 32.0                              | 0.094 | 19 / 25 | 24.0 - 31.98           | 12.0                     | 31.98                                     |                                                                                                                          |
| 40.0                              | 0.125 | 19 / 25 | 30.0 - 39.98           | 18.0                     | 39.98                                     |                                                                                                                          |

Qualified Shapes (Page 41).

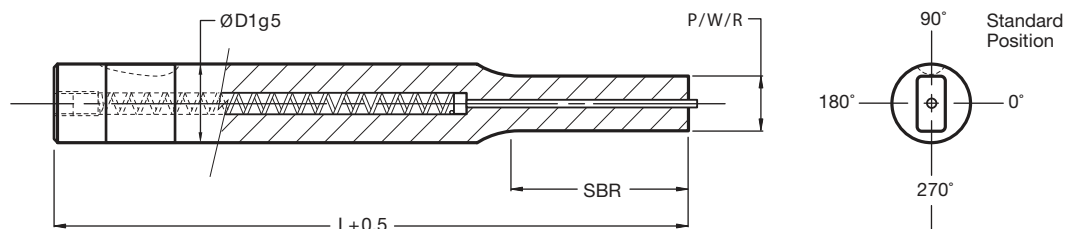
Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

\* The Ejector (A) dimension is in imperial (inches).

#### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MBHE | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

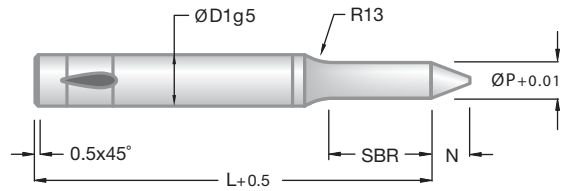
## MBHA/MBHP series

### Heavy Duty Ball Lock Pilot Punches

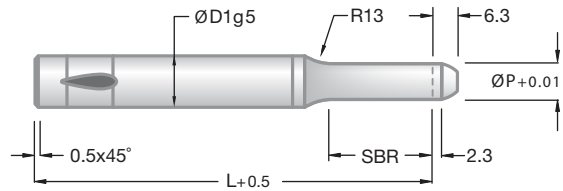
#### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |



**MBHA**



**MBHP**

| MBHA |          |      |              |                                                                                                                          |
|------|----------|------|--------------|--------------------------------------------------------------------------------------------------------------------------|
| D1   | SBR      | N    | RANGE P      | LENGTHS L                                                                                                                |
| 10.0 | 13/19/25 | 10.0 | 4.9 - 9.99   | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |
| 13.0 | 13/19/25 | 12.0 | 5.9 - 12.99  |                                                                                                                          |
| 16.0 | 13/19/25 | 17.0 | 9.9 - 15.99  |                                                                                                                          |
| 20.0 | 13/19/25 | 22.0 | 12.9 - 19.99 |                                                                                                                          |
| 25.0 | 13/19/25 | 25.0 | 16.9 - 24.99 |                                                                                                                          |
| 32.0 | 13/19/25 | 25.0 | 19.9 - 31.99 |                                                                                                                          |
| 40.0 | 13/19/25 | 30.0 | 24.9 - 39.99 |                                                                                                                          |

| MBHP |          |              |                                                                                                                          |  |
|------|----------|--------------|--------------------------------------------------------------------------------------------------------------------------|--|
| D1   | SBR      | RANGE P      | LENGTHS L                                                                                                                |  |
| 10.0 | 13/19/25 | 3.9 - 9.99   | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |  |
| 13.0 | 13/19/25 | 4.9 - 12.99  |                                                                                                                          |  |
| 16.0 | 13/19/25 | 7.9 - 15.99  |                                                                                                                          |  |
| 20.0 | 13/19/25 | 11.9 - 19.99 |                                                                                                                          |  |
| 25.0 | 13/19/25 | 14.9 - 24.99 |                                                                                                                          |  |
| 32.0 | 13/19/25 | 19.9 - 31.99 |                                                                                                                          |  |
| 40.0 | 13/19/25 | 24.9 - 39.99 |                                                                                                                          |  |

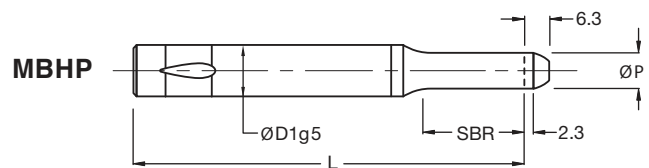
Qualified Shapes (Page 41).

Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

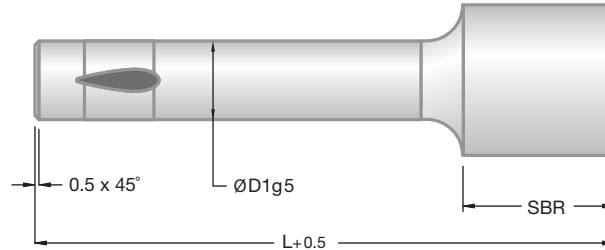
#### ORDER EXAMPLE



|      | QTY | Material | Type | D1 | x | L  | P   | SBR | Alterations    | Coating |
|------|-----|----------|------|----|---|----|-----|-----|----------------|---------|
| MBHA | 10  | M2       | MBHA | 13 | x | 90 | 7.0 | 10  | Roof Top Shear | TIN     |
| MBHP | 10  | M2       | MBHP | 13 | x | 90 | 7.0 | 10  | Roof Top Shear | TIN     |

## MBLK series

### Light Duty Knob Style Punch



#### 3D CONFIGURATOR

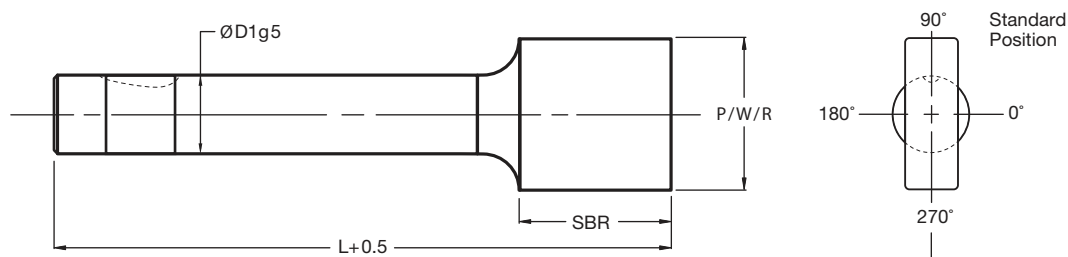


| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MBLKC                                                                                                                                                               | MBLKO        | MBLKR            | MBLKL                    | MBLKF                                                                                                                               | MBLKH |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------|
|                                                                                                                                                                     |              |                  |                          |                                                                                                                                     |       |
| <p>For qualified shapes see page 41.</p> <p><math>G = W^2 + P^2</math>      <math>G = (W - 2R)^2 + (P - 2R)^2 + 2R</math>      <math>G = W \times 1.1547</math></p> |              |                  |                          |                                                                                                                                     |       |
| BODY Ø<br>D1                                                                                                                                                        | SBR          | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX | LENGTHS<br>(L)                                                                                                                      |       |
| 10.0                                                                                                                                                                | 13 / 19 / 25 | 10.01 - 30.0     | 4.0   30.0               | <p><b>Available Lengths:</b><br/><b>50mm</b><br/><b>to</b><br/><b>200mm</b></p> <p><b>Standard Lengths</b><br/><b>(page 51)</b></p> |       |
| 13.0                                                                                                                                                                | 13 / 19 / 25 | 13.01 - 32.0     | 5.0   32.0               |                                                                                                                                     |       |
| 16.0                                                                                                                                                                | 13 / 19 / 25 | 16.01 - 38.0     | 6.5   38.0               |                                                                                                                                     |       |
| 20.0                                                                                                                                                                | 13 / 19 / 25 | 20.01 - 40.0     | 8.0   40.0               |                                                                                                                                     |       |
| 25.0                                                                                                                                                                | 13 / 19 / 25 | 25.01 - 44.0     | 10.0   44.0              |                                                                                                                                     |       |
| 32.0                                                                                                                                                                | 13 / 19 / 25 | 32.01 - 50.0     | 11.5   50.0              |                                                                                                                                     |       |
| 38.0                                                                                                                                                                | 13 / 19 / 25 | 38.01 - 56.0     | 14.0   56.0              |                                                                                                                                     |       |

Qualified Shapes (Page 41).  
Extended Range Shank Diameters (Page 9).  
Standard Alterations (Page 42).  
Locating Devices (Page 43).

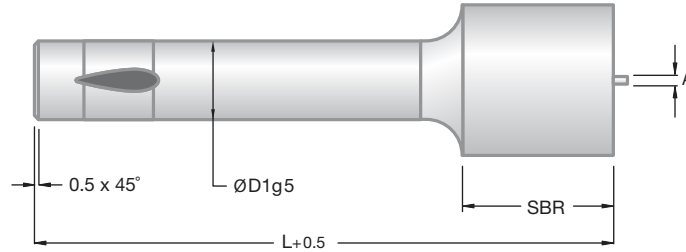
#### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MBLK | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

## MBLEK series

### Light Duty Knob Style Ejector Punch



#### 3D CONFIGURATOR



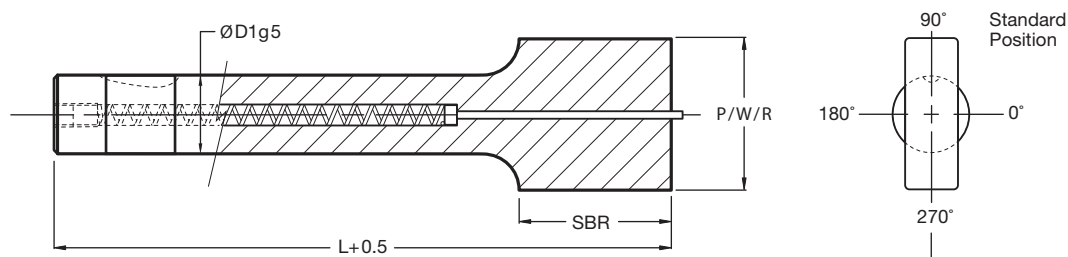
| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MBLEKC                                                                                                                                                              | MBLEKO | MBLEKR       | MBLEKL        | MBELKF                   | MBLEKH                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------------|---------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                     |        |              |               |                          |                                                                                                                                                 |
| <p>For qualified shapes see page 41.</p> <p><math>G = W^2 + P^2</math>      <math>G = (W - 2R)^2 + (P - 2R)^2 + 2R</math>      <math>G = W \times 1.1547</math></p> |        |              |               |                          |                                                                                                                                                 |
| BODY Ø D1                                                                                                                                                           | A*     | SBR          | ROUND RANGE P | SHAPE<br>MIN W   G/P MAX | LENGTHS (L)                                                                                                                                     |
| 10.0                                                                                                                                                                | 0.025  | 13 / 19 / 25 | 10.01 - 30.0  | 4.0   30.0               | <p><b>Available Lengths:</b></p> <p><b>50mm</b></p> <p><b>to</b></p> <p><b>200mm</b></p> <p><b>Standard Lengths</b></p> <p><b>(page 51)</b></p> |
| 13.0                                                                                                                                                                | 0.025  | 13 / 19 / 25 | 13.01 - 32.0  | 5.0   32.0               |                                                                                                                                                 |
| 16.0                                                                                                                                                                | 0.032  | 13 / 19 / 25 | 16.01 - 38.0  | 6.5   38.0               |                                                                                                                                                 |
| 20.0                                                                                                                                                                | 0.032  | 13 / 19 / 25 | 20.01 - 40.0  | 8.0   40.0               |                                                                                                                                                 |
| 25.0                                                                                                                                                                | 0.032  | 13 / 19 / 25 | 25.01 - 44.0  | 10.0   44.0              |                                                                                                                                                 |
| 32.0                                                                                                                                                                | 0.047  | 13 / 19 / 25 | 32.01 - 50.0  | 11.5   50.0              |                                                                                                                                                 |
| 38.0                                                                                                                                                                | 0.047  | 13 / 19 / 25 | 38.01 - 56.0  | 14.0   56.0              |                                                                                                                                                 |

Qualified Shapes (Page 41).  
 Extended Range Shank Diameters (Page 9).  
 Standard Alterations (Page 42).  
 Locating Devices (Page 43).

\* The Ejector (A) dimension is in imperial (inches).

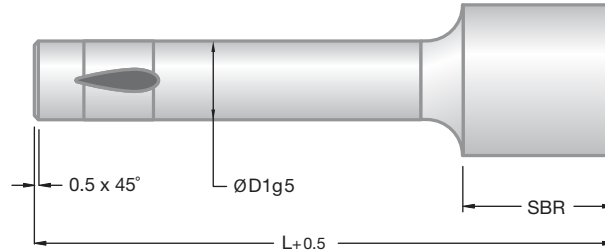
#### ORDER EXAMPLE



| QTY | Material | Type  | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|-------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MBLEK | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

## MBHK series

### Heavy Duty Knob Style Punch



#### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MBHKC                             | MBHKO        | MBHKR            | MBHKL                              | MBHKF                                                                                                                                           | MBHKH                 |
|-----------------------------------|--------------|------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
|                                   |              |                  |                                    |                                                                                                                                                 |                       |
| For qualified shapes see page 41. |              | $G = W^2 + P^2$  | $G = (W - 2R)^2 + (P - 2R)^2 + 2R$ |                                                                                                                                                 | $G = W \times 1.1547$ |
| BODY Ø<br>D1                      | SBR          | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX           | <p><b>Available Lengths:</b></p> <p><b>50mm</b></p> <p><b>to</b></p> <p><b>200mm</b></p> <p><b>Standard Lengths</b></p> <p><b>(page 51)</b></p> |                       |
| 10.0                              | 13 / 19 / 25 | 10.01 - 30.0     | 4.0   30.0                         |                                                                                                                                                 |                       |
| 13.0                              | 13 / 19 / 25 | 13.01 - 32.0     | 5.0   32.0                         |                                                                                                                                                 |                       |
| 16.0                              | 13 / 19 / 25 | 16.01 - 38.0     | 6.5   38.0                         |                                                                                                                                                 |                       |
| 20.0                              | 19 / 25 / 30 | 20.01 - 40.0     | 8.0   40.0                         |                                                                                                                                                 |                       |
| 25.0                              | 19 / 25 / 30 | 25.01 - 44.0     | 10.0   44.0                        |                                                                                                                                                 |                       |
| 32.0                              | 19 / 25 / 30 | 32.01 - 50.0     | 11.5   50.0                        |                                                                                                                                                 |                       |
| 40.0                              | 19 / 25 / 30 | 40.01 - 56.0     | 14.0   56.0                        |                                                                                                                                                 |                       |

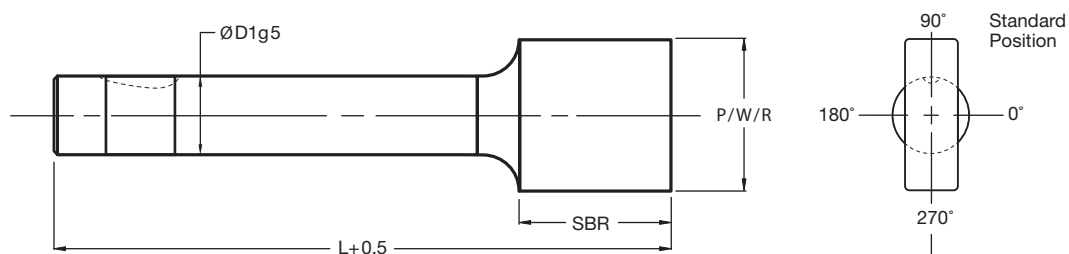
Qualified Shapes (Page 41).

Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

Locating Devices (Page 43).

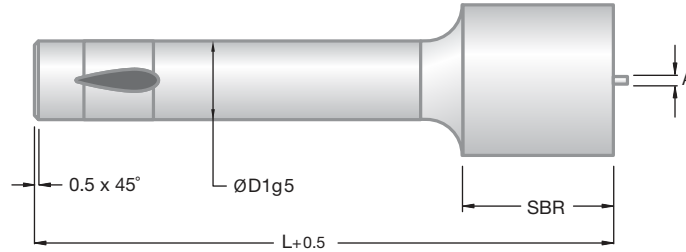
#### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MBHK | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

## MBHEK series

### Heavy Duty Knob Style Ejector Punch



#### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MBHEKC                            | MBHEKO | MBHEKR          | MBHEKL                             | MBHEKF                   | MBHEKH                                                                                                                   |
|-----------------------------------|--------|-----------------|------------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------|
|                                   |        |                 |                                    |                          |                                                                                                                          |
| For qualified shapes see page 41. |        | $G = W^2 + P^2$ | $G = (W - 2R)^2 + (P - 2R)^2 + 2R$ |                          | $G = W \times 1.1547$                                                                                                    |
| BODY Ø<br>D1                      | A*     | SBR             | ROUND RANGE<br>P                   | SHAPE<br>MIN W   G/P MAX | LENGTHS<br>(L)                                                                                                           |
| 10.0                              | 0.025  | 13 / 19 / 25    | 10.01 - 30.0                       | 4.0   30.0               | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |
| 13.0                              | 0.025  | 13 / 19 / 25    | 13.01 - 32.0                       | 5.0   32.0               |                                                                                                                          |
| 16.0                              | 0.032  | 13 / 19 / 25    | 16.01 - 38.0                       | 6.5   38.0               |                                                                                                                          |
| 20.0                              | 0.032  | 19 / 25 / 30    | 20.01 - 40.0                       | 8.0   40.0               |                                                                                                                          |
| 25.0                              | 0.032  | 19 / 25 / 30    | 25.01 - 44.0                       | 10.0   44.0              |                                                                                                                          |
| 32.0                              | 0.032  | 19 / 25 / 30    | 32.01 - 50.0                       | 11.5   50.0              |                                                                                                                          |
| 40.0                              | 0.032  | 19 / 25 / 30    | 40.01 - 56.0                       | 14.0   56.0              |                                                                                                                          |

Qualified Shapes (Page 41).

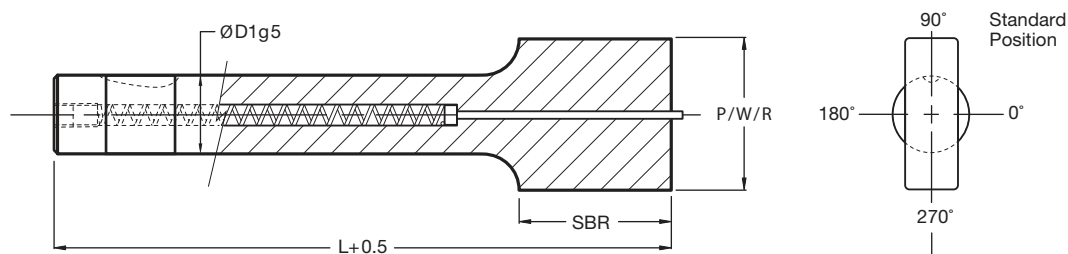
Extended Range Shank Diameters (Page 9).

Standard Alterations (Page 42).

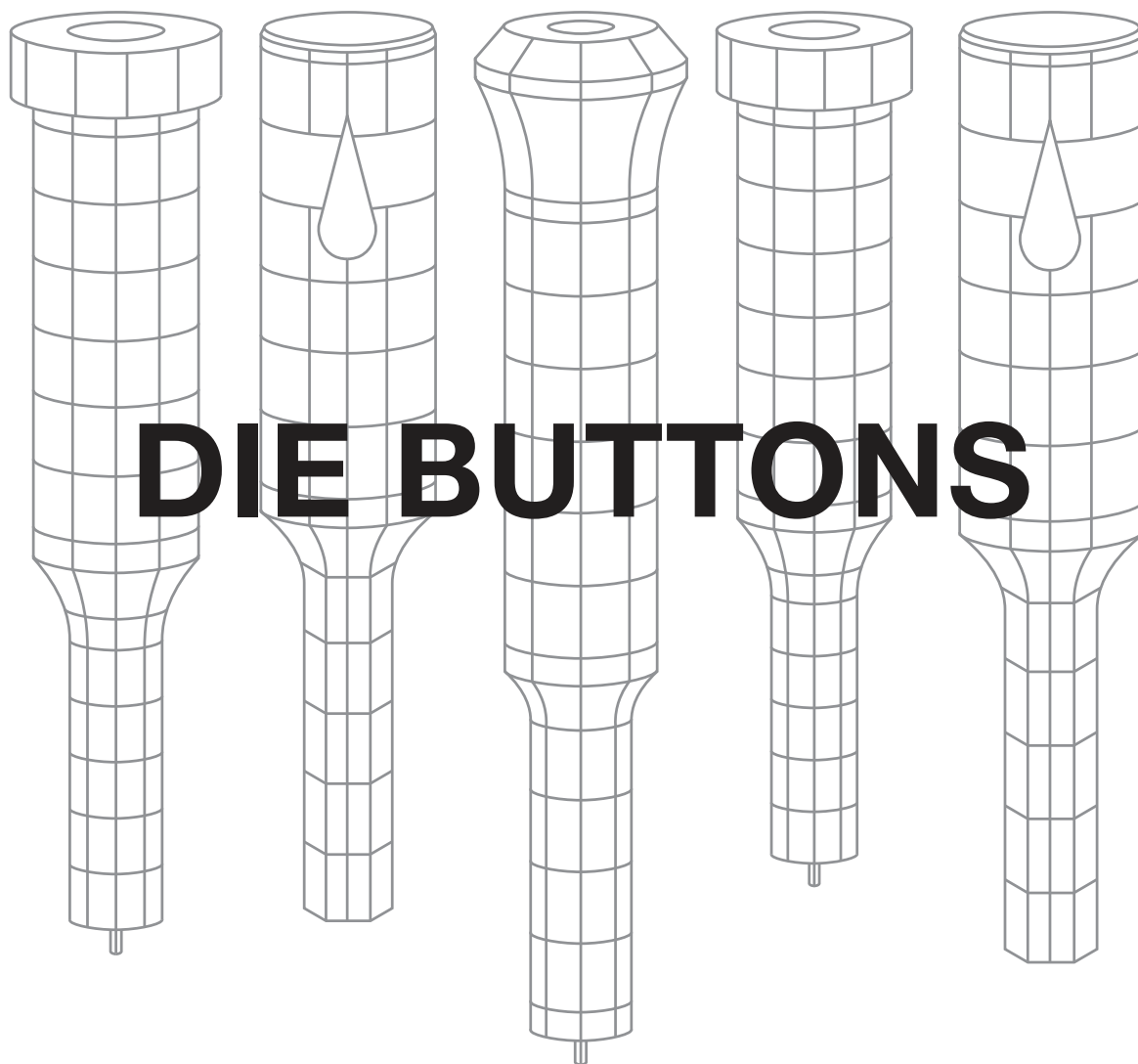
Locating Devices (Page 43).

\* The Ejector (A) dimension is in imperial (inches).

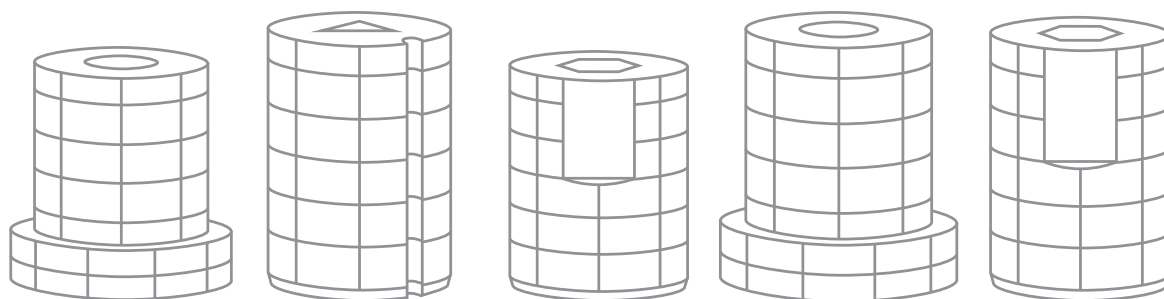
#### ORDER EXAMPLE



| QTY | Material | Type  | D1 x L  | P / W / R       | SBR | Locating Method | Alterations    | Coating |
|-----|----------|-------|---------|-----------------|-----|-----------------|----------------|---------|
| 10  | M2       | MBHEK | 13 x 90 | 7.0 / 5.0 / 1.0 | 19  | SF 0°           | Roof Top Shear | TIN     |

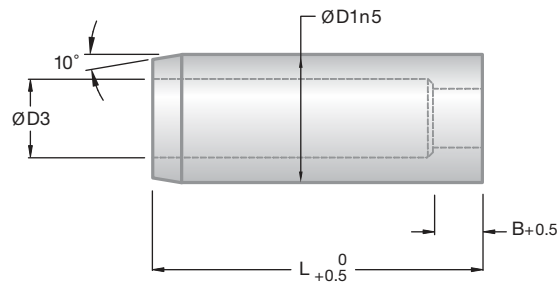


# DIE BUTTONS



## MTD series

### Die Button with Round Stepped Relief



#### 3D CONFIGURATOR



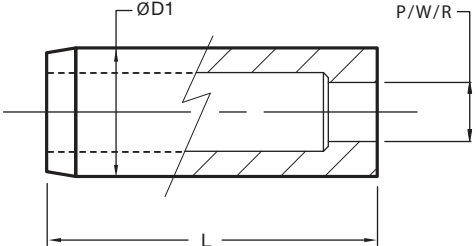
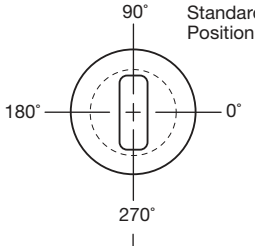
| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MTDC                              | MTDO | MTDR                   | MTDL             | MTDF                                      | MTDH                                                                                                                         |
|-----------------------------------|------|------------------------|------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
|                                   |      |                        |                  |                                           |                                                                                                                              |
| For qualified shapes see page 41. |      | $G = \sqrt{W^2 + P^2}$ |                  | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$ |                                                                                                                              |
|                                   |      |                        |                  | $G = W \times 1.1547$                     |                                                                                                                              |
| D1                                | B    | MAX D3                 | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX                  | LENGTHS<br>L                                                                                                                 |
| 8.0                               | 4    | 4.0                    | 2.0 - 3.5        | 1.5   3.5                                 | <b>Available Lengths:</b><br><b>20mm</b><br><b>to</b><br><b>35mm</b><br><br><b>See Standard Lengths</b><br><b>on page 51</b> |
| 10.0                              | 4    | 5.8                    | 3.0 - 5.0        | 2.0   5.0                                 |                                                                                                                              |
| 13.0                              | 5    | 8.0                    | 4.0 - 7.2        | 3.0   7.2                                 |                                                                                                                              |
| 16.0                              | 5    | 9.5                    | 6.0 - 8.8        | 4.0   8.8                                 |                                                                                                                              |
| 20.0                              | 8    | 12.0                   | 7.5 - 11.3       | 6.0   11.3                                |                                                                                                                              |
| 22.0                              | 8    | 15.0                   | 9.0 - 14.3       | 8.0   14.3                                |                                                                                                                              |
| 25.0                              | 8    | 17.3                   | 11.0 - 16.6      | 8.0   16.6                                |                                                                                                                              |
| 32.0                              | 8    | 20.7                   | 15.0 - 20.0      | 8.0   20.0                                |                                                                                                                              |
| 38.0                              | 8    | 27.7                   | 18.0 - 27.0      | 10.0   27.0                               |                                                                                                                              |
| 40.0                              | 8    | 27.7                   | 18.0 - 27.0      | 10.0   27.0                               |                                                                                                                              |
| 45.0                              | 8    | 36.0                   | 19.05 - 35.6     | 5.0   35.6                                |                                                                                                                              |
| 50.0                              | 8    | 41.0                   | 22.2 - 40.6      | 7.0   40.6                                |                                                                                                                              |

Standard Alterations page 42.

Locating Devices page 44.

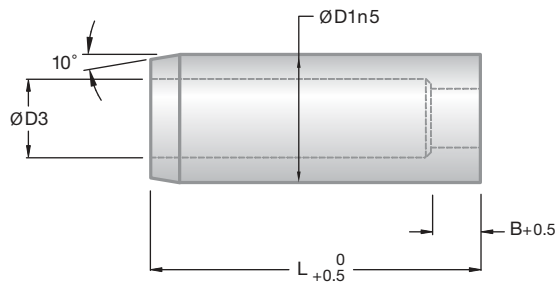
#### ORDER EXAMPLE

|                                                                                     |          |      |         |                                                                                      |                 |
|-------------------------------------------------------------------------------------|----------|------|---------|--------------------------------------------------------------------------------------|-----------------|
|  |          |      |         |  |                 |
| QTY                                                                                 | Material | Type | D1 x L  | P / W / R                                                                            | Locating Method |
| 10                                                                                  | M2       | MTD  | 25 x 32 | 7.0 / 5.0 / 1.0                                                                      | SF 0°           |



# MFD series

## Die Button with Tapered Relief



### 3D CONFIGURATOR



### Material Hardness

M2 60-62

| MFDC                              | MFDO | MFDR                   | MFDL | MFDF                                      | MDH |
|-----------------------------------|------|------------------------|------|-------------------------------------------|-----|
|                                   |      |                        |      |                                           |     |
| For qualified shapes see page 41. |      | $G = \sqrt{W^2 + P^2}$ |      | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$ |     |
|                                   |      |                        |      | $G = W \times 1.1547$                     |     |

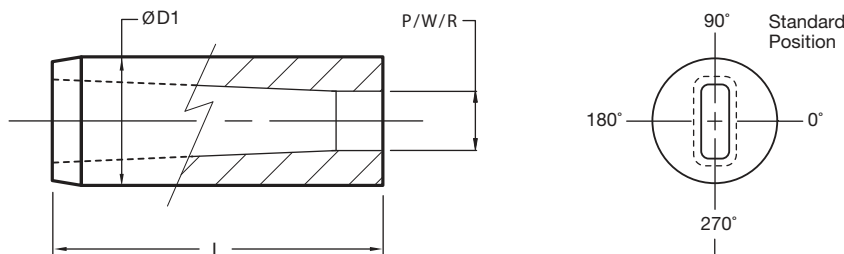
| D1   | MAX D3 | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX | LENGTHS<br>L                                                                                                                 |
|------|--------|------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------|
| 5.0  | 2.8    | 1.0 - 2.4        | 1.2   2.4                | <b>Available Lengths:</b><br><b>20mm</b><br><b>to</b><br><b>35mm</b><br><br><b>See Standard Lengths</b><br><b>on page 51</b> |
| 6.0  | 3.5    | 1.6 - 3.0        | 1.5   3.0                |                                                                                                                              |
| 8.0  | 4.0    | 2.0 - 3.5        | 1.5   3.5                |                                                                                                                              |
| 10.0 | 5.8    | 3.0 - 5.0        | 2.0   5.0                |                                                                                                                              |
| 13.0 | 8.0    | 4.0 - 7.2        | 3.0   7.2                |                                                                                                                              |
| 16.0 | 9.5    | 6.0 - 8.8        | 4.0   8.8                |                                                                                                                              |
| 20.0 | 12.0   | 7.5 - 11.3       | 6.0   11.3               |                                                                                                                              |
| 22.0 | 15.0   | 9.0 - 14.3       | 8.0   14.3               |                                                                                                                              |
| 25.0 | 17.3   | 11.0 - 16.6      | 8.0   16.6               |                                                                                                                              |
| 32.0 | 20.7   | 15.0 - 20.0      | 8.0   20.0               |                                                                                                                              |
| 38.0 | 27.7   | 18.0 - 27.0      | 10.0   27.0              |                                                                                                                              |
| 40.0 | 27.7   | 18.0 - 27.0      | 10.0   27.0              |                                                                                                                              |

For extended range shank diameters page 33.

Standard Alterations page 42.

Locating Devices page 44.

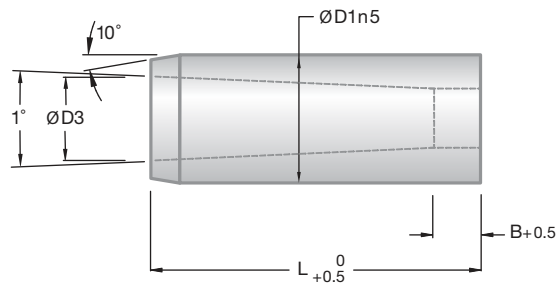
### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | Locating Method |
|-----|----------|------|---------|-----------------|-----------------|
| 10  | M2       | MFD  | 25 x 32 | 7.0 / 5.0 / 1.0 | SF 0°           |

# MFD series

## Die Button with Tapered Relief



### 3D CONFIGURATOR



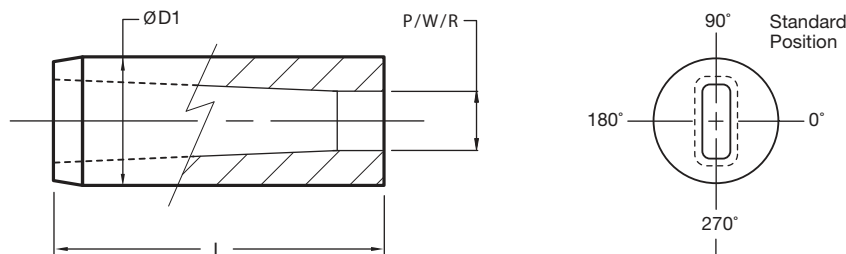
| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MFDC                              | MFDO   | MFDR                   | MFDL                     | MDFD                                      | MFDH                                                                                                                         |
|-----------------------------------|--------|------------------------|--------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
|                                   |        |                        |                          |                                           |                                                                                                                              |
| For qualified shapes see page 41. |        |                        |                          |                                           |                                                                                                                              |
|                                   |        | $G = \sqrt{W^2 + P^2}$ |                          | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$ |                                                                                                                              |
|                                   |        |                        |                          | $G = W \times 1.1547$                     |                                                                                                                              |
| D1                                | MAX D3 | ROUND RANGE<br>P       | SHAPE<br>MIN W   G/P MAX |                                           | LENGTHS<br>L                                                                                                                 |
| 45.0                              | 36.0   | 19.05 - 35.6           | 5.0                      | 35.6                                      | <b>Available Lengths:</b><br><b>20mm</b><br><b>to</b><br><b>35mm</b><br><br><b>See Standard Lengths</b><br><b>on page 51</b> |
| 50.0                              | 41.0   | 22.2 - 40.6            | 7.0                      | 40.6                                      |                                                                                                                              |
| 56.0                              | 46.0   | 25.4 - 45.6            | 8.0                      | 45.6                                      |                                                                                                                              |
| 63.0                              | 51.0   | 28.55 - 50.5           | 9.0                      | 50.5                                      |                                                                                                                              |
| 71.0                              | 57.0   | 31.75 - 56.5           | 11.0                     | 56.5                                      |                                                                                                                              |
| 76.0                              | 61.0   | 34.90 - 60.5           | 13.0                     | 60.5                                      |                                                                                                                              |
| 85.0                              | 67.0   | 42.50 - 66.5           | 15.0                     | 66.5                                      |                                                                                                                              |
| 90.0                              | 71.0   | 44.5 - 70.5            | 20.0                     | 70.5                                      |                                                                                                                              |
| 100.0                             | 79.0   | 49.5 - 78.5            | 25.0                     | 78.5                                      |                                                                                                                              |

Standard Alterations page 42.

Locating Devices page 44.

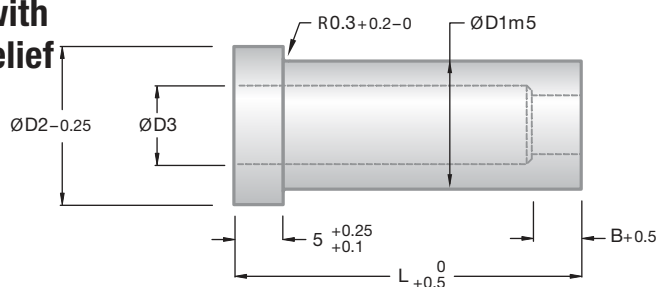
### ORDER EXAMPLE



| QTY | Material | Type | D1 x L  | P / W / R       | Locating Method |
|-----|----------|------|---------|-----------------|-----------------|
| 10  | M2       | MFD  | 25 x 32 | 7.0 / 5.0 / 1.0 | SF 0°           |

## MH series

### Head Die Button with Round Stepped Relief



#### 3D CONFIGURATOR



#### Material Hardness

M2 60-62

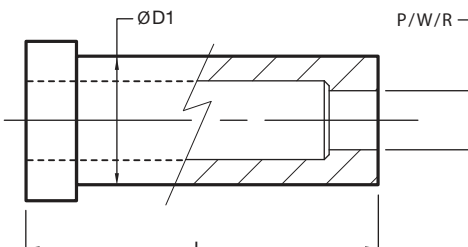
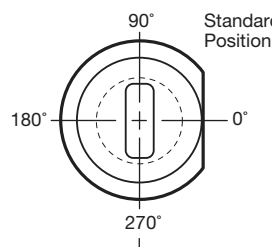
| MHC                               | MHO                  | MHR                    | MHL                                       | MHF                  | MHH                   |
|-----------------------------------|----------------------|------------------------|-------------------------------------------|----------------------|-----------------------|
|                                   |                      |                        |                                           |                      |                       |
| $\varnothing P+0.01$              | $\varnothing P+0.01$ | $\varnothing P+0.01$   | $\varnothing P+0.01$                      | $\varnothing P+0.01$ | $\varnothing P+0.01$  |
|                                   | $W+0.01$             | $W+0.01$               | $W+0.01$                                  | $W+0.01$             | $W+0.01$              |
| For qualified shapes see page 41. |                      | $G = \sqrt{W^2 + P^2}$ | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$ |                      | $G = W \times 1.1547$ |

| D1   | B | D2   | MAX D3 | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX | LENGTHS<br>L                                                                                                                 |
|------|---|------|--------|------------------|--------------------------|------------------------------------------------------------------------------------------------------------------------------|
| 8.0  | 4 | 11.0 | 4.0    | 2.0 - 3.5        | 1.5   3.5                | <b>Available Lengths:</b><br><b>16mm</b><br><b>to</b><br><b>35mm</b><br><br><b>See Standard Lengths</b><br><b>on page 51</b> |
| 10.0 | 4 | 13.0 | 5.8    | 3.0 - 5.0        | 2.0   5.0                |                                                                                                                              |
| 13.0 | 5 | 16.0 | 8.0    | 4.0 - 7.2        | 3.0   7.2                |                                                                                                                              |
| 16.0 | 5 | 19.0 | 9.5    | 6.0 - 8.8        | 4.0   8.8                |                                                                                                                              |
| 20.0 | 8 | 23.0 | 12.0   | 7.5 - 11.3       | 6.0   11.3               |                                                                                                                              |
| 22.0 | 8 | 25.0 | 15.0   | 9.0 - 14.3       | 8.0   14.3               |                                                                                                                              |
| 25.0 | 8 | 28.0 | 17.3   | 11.0 - 16.6      | 8.0   16.6               |                                                                                                                              |
| 32.0 | 8 | 35.0 | 20.7   | 15.0 - 20.0      | 8.0   20.0               |                                                                                                                              |
| 38.0 | 8 | 41.0 | 27.7   | 18.0 - 27.0      | 10.0   27.0              |                                                                                                                              |
| 40.0 | 8 | 43.0 | 27.7   | 18.0 - 27.0      | 10.0   27.0              |                                                                                                                              |
| 45.0 |   | 48.0 | 36.0   | 19.05 - 35.6     | 5.0   35.6               |                                                                                                                              |
| 50.0 |   | 53.0 | 41.0   | 22.2 - 40.6      | 7.0   40.6               |                                                                                                                              |

Standard Alterations page 42.

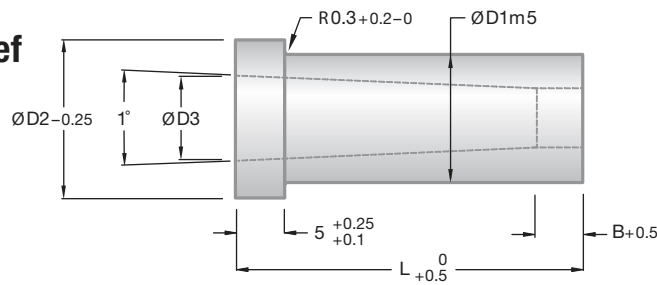
Locating Devices page 44.

#### ORDER EXAMPLE

|  |          |      |         |                 |  |    |
|-------------------------------------------------------------------------------------|----------|------|---------|-----------------|--------------------------------------------------------------------------------------|----|
| QTY                                                                                 | Material | Type | D1 x L  | P / W / R       | Locating Method                                                                      |    |
| 10                                                                                  | M2       | MH   | 25 x 32 | 7.0 / 5.0 / 1.0 | SF                                                                                   | 0° |

# MFH series

## Head Die Button with Tapered Relief



### 3D CONFIGURATOR



### Material Hardness

M2 60-62

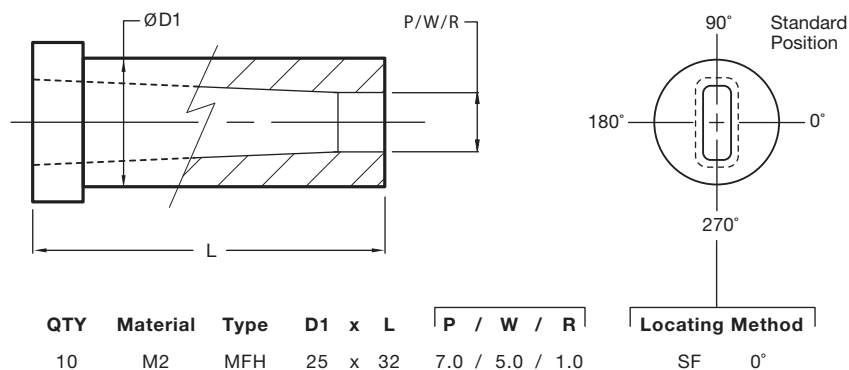
| MFHC                              | MFHO | MFHR                   | MFHL             | MFHF                                      | MFHH                                                                                                                         |
|-----------------------------------|------|------------------------|------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
|                                   |      |                        |                  |                                           |                                                                                                                              |
| For qualified shapes see page 41. |      | $G = \sqrt{W^2 + P^2}$ |                  | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$ |                                                                                                                              |
|                                   |      |                        |                  | $G = W \times 1.1547$                     |                                                                                                                              |
| D1                                | D2   | MAX D3                 | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX                  | LENGTHS<br>L                                                                                                                 |
| 5.0                               | 8.0  | 2.8                    | 1.0 - 2.4        | 1.2   2.4                                 | <b>Available Lengths:</b><br><b>20mm</b><br><b>to</b><br><b>35mm</b><br><br><b>See Standard Lengths</b><br><b>on page 51</b> |
| 6.0                               | 9.0  | 3.5                    | 1.6 - 3.0        | 1.5   3.0                                 |                                                                                                                              |
| 8.0                               | 11.0 | 4.0                    | 2.0 - 3.5        | 1.5   3.5                                 |                                                                                                                              |
| 10.0                              | 13.0 | 5.8                    | 3.0 - 5.0        | 2.0   5.0                                 |                                                                                                                              |
| 13.0                              | 16.0 | 8.0                    | 4.0 - 7.2        | 3.0   7.2                                 |                                                                                                                              |
| 16.0                              | 19.0 | 9.5                    | 6.0 - 8.8        | 4.0   8.8                                 |                                                                                                                              |
| 20.0                              | 23.0 | 12.0                   | 7.5 - 11.3       | 6.0   11.3                                |                                                                                                                              |
| 22.0                              | 25.0 | 15.0                   | 9.0 - 14.3       | 8.0   14.3                                |                                                                                                                              |
| 25.0                              | 28.0 | 17.3                   | 11.0 - 16.6      | 8.0   16.6                                |                                                                                                                              |
| 32.0                              | 35.0 | 20.7                   | 15.0 - 20.0      | 8.0   20.0                                |                                                                                                                              |
| 38.0                              | 41.0 | 27.7                   | 18.0 - 27.0      | 10.0   27.0                               |                                                                                                                              |
| 40.0                              | 43.0 | 27.7                   | 18.0 - 27.0      | 10.0   27.0                               |                                                                                                                              |

For extended range shank diameters page 36.

Standard Alterations page 42.

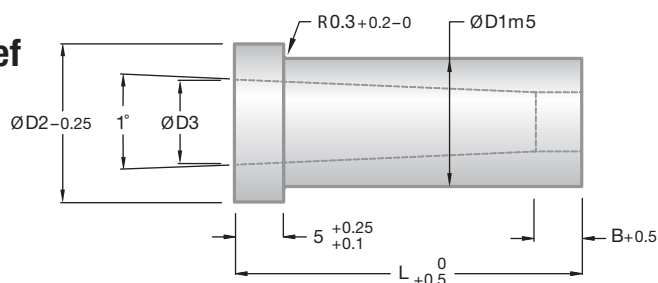
Locating Devices page 44.

### ORDER EXAMPLE



# MFH series

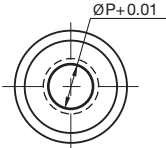
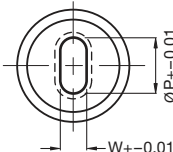
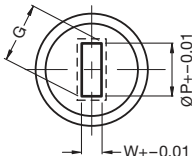
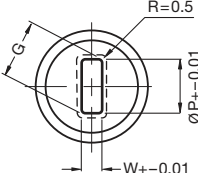
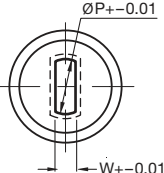
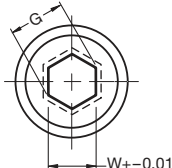
## Head Die Button with Tapered Relief



### 3D CONFIGURATOR



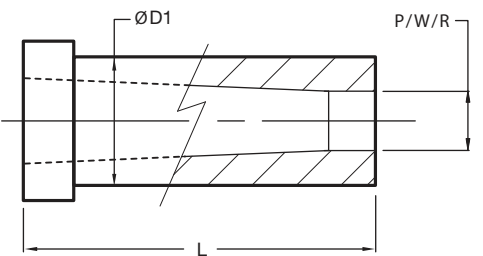
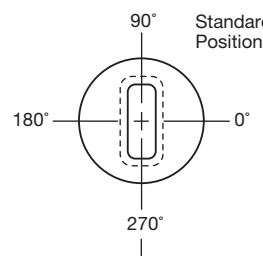
| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MFHC                                                                              | MFHO                                                                              | MFHR                                                                              | MFHL                                                                               | MFHF                                                                                | MFHH                                                                                |                                                                                                                                   |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
|  |  |  |  |  |  |                                                                                                                                   |
| For qualified shapes see page 41.                                                 |                                                                                   | $G = \sqrt{W^2 + P^2}$                                                            |                                                                                    | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$                                           |                                                                                     |                                                                                                                                   |
|                                                                                   |                                                                                   |                                                                                   |                                                                                    | $G = W \times 1.1547$                                                               |                                                                                     |                                                                                                                                   |
| D1                                                                                | D2                                                                                | MAX D3                                                                            | ROUND RANGE<br>P                                                                   | SHAPE<br>MIN W   G/P MAX                                                            |                                                                                     | LENGTHS<br>L                                                                                                                      |
| 45.0                                                                              | 48.0                                                                              | 36.0                                                                              | 19.05 - 35.6                                                                       | 5.0                                                                                 | 35.6                                                                                | <div>Available Lengths:</div> <div>20mm</div> <div>to</div> <div>35mm</div> <div>See Standard Lengths</div> <div>on page 51</div> |
| 50.0                                                                              | 53.0                                                                              | 41.0                                                                              | 22.2 - 40.6                                                                        | 7.0                                                                                 | 40.6                                                                                |                                                                                                                                   |
| 56.0                                                                              | 59.0                                                                              | 46.0                                                                              | 25.4 - 45.6                                                                        | 8.0                                                                                 | 45.6                                                                                |                                                                                                                                   |
| 63.0                                                                              | 66.0                                                                              | 51.0                                                                              | 28.55 - 50.5                                                                       | 9.0                                                                                 | 50.5                                                                                |                                                                                                                                   |
| 71.0                                                                              | 74.0                                                                              | 57.0                                                                              | 31.75 - 56.5                                                                       | 11.0                                                                                | 56.5                                                                                |                                                                                                                                   |
| 76.0                                                                              | 79.0                                                                              | 61.0                                                                              | 34.90 - 60.5                                                                       | 13.0                                                                                | 60.5                                                                                |                                                                                                                                   |
| 85.0                                                                              | 88.0                                                                              | 67.0                                                                              | 42.50 - 66.5                                                                       | 15.0                                                                                | 66.5                                                                                |                                                                                                                                   |
| 90.0                                                                              | 93.0                                                                              | 71.0                                                                              | 44.5 - 70.5                                                                        | 20.0                                                                                | 70.5                                                                                |                                                                                                                                   |
| 100.0                                                                             | 103.0                                                                             | 79.0                                                                              | 49.5 - 78.5                                                                        | 25.0                                                                                | 78.5                                                                                |                                                                                                                                   |
|                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                                                                   |
|                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                                                                   |
|                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |                                                                                                                                   |

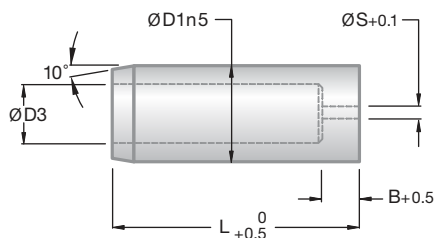
Standard Alterations page 42.

Locating Devices page 44.

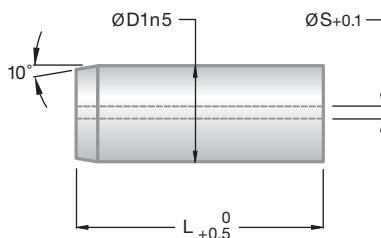
### ORDER EXAMPLE

|  |          |      |         |  |                 |
|-------------------------------------------------------------------------------------|----------|------|---------|--------------------------------------------------------------------------------------|-----------------|
| QTY                                                                                 | Material | Type | D1 x L  | P / W / R                                                                            | Locating Method |
| 10                                                                                  | M2       | MFH  | 25 x 32 | 7.0 / 5.0 / 1.0                                                                      | SF 0°           |

### MDW



### MFDW



### 3D CONFIGURATOR



| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

Standard Alterations page 42.

Locating Devices page 44.

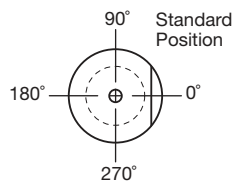
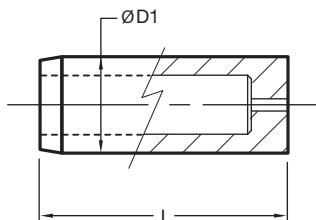
\* The Wire Start Hole (S) dimension is in imperial (inches).

| MDW     |   |      |        |                                                                                                                          |
|---------|---|------|--------|--------------------------------------------------------------------------------------------------------------------------|
| BODY D1 | B | D3   | S      | LENGTHS L                                                                                                                |
| 5.0     | 2 | 2.8  | 0.047" | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |
| 6.0     | 3 | 3.5  | 0.047" |                                                                                                                          |
| 8.0     | 4 | 4.0  | 0.047" |                                                                                                                          |
| 10.0    | 4 | 5.8  | 0.047" |                                                                                                                          |
| 13.0    | 5 | 8.0  | 0.047" |                                                                                                                          |
| 16.0    | 5 | 9.5  | 0.062" |                                                                                                                          |
| 20.0    | 8 | 12.0 | 0.062" |                                                                                                                          |
| 22.0    | 8 | 15.0 | 0.062" |                                                                                                                          |
| 25.0    | 8 | 17.3 | 0.062" |                                                                                                                          |
| 32.0    | 8 | 20.7 | 0.062" |                                                                                                                          |
| 38.0    | 8 | 27.7 | 0.062" |                                                                                                                          |
| 40.0    | 8 | 27.7 | 0.062" |                                                                                                                          |
| 45.0    | 8 | 36.0 | 0.062" |                                                                                                                          |
| 50.0    | 8 | 41.0 | 0.062" |                                                                                                                          |
| 56.0    | 8 | 46.0 | 0.062" |                                                                                                                          |
| 63.0    | 8 | 51.0 | 0.062" |                                                                                                                          |
| 71.0    | 8 | 57.0 | 0.062" |                                                                                                                          |
| 76.0    | 8 | 61.0 | 0.062" |                                                                                                                          |
| 85.0    | 8 | 67.0 | 0.062" |                                                                                                                          |
| 90.0    | 8 | 71.0 | 0.062" |                                                                                                                          |
| 100.0   | 8 | 79.0 | 0.062" |                                                                                                                          |

| MFDW    |        |                                                                                                                          |
|---------|--------|--------------------------------------------------------------------------------------------------------------------------|
| BODY D1 | S*     | LENGTHS L                                                                                                                |
| 5.0     | 0.047" | <b>Available Lengths:</b><br><b>50mm</b><br><b>to</b><br><b>200mm</b><br><br><b>Standard Lengths</b><br><b>(page 51)</b> |
| 6.0     | 0.047" |                                                                                                                          |
| 8.0     | 0.047" |                                                                                                                          |
| 10.0    | 0.047" |                                                                                                                          |
| 13.0    | 0.047" |                                                                                                                          |
| 16.0    | 0.094" |                                                                                                                          |
| 20.0    | 0.094" |                                                                                                                          |
| 22.0    | 0.094" |                                                                                                                          |
| 25.0    | 0.094" |                                                                                                                          |
| 32.0    | 0.094" |                                                                                                                          |
| 38.0    | 0.094" |                                                                                                                          |
| 40.0    | 0.125" |                                                                                                                          |
| 45.0    | 0.125" |                                                                                                                          |
| 50.0    | 0.125" |                                                                                                                          |
| 56.0    | 0.125" |                                                                                                                          |
| 63.0    | 0.125" |                                                                                                                          |
| 71.0    | 0.125" |                                                                                                                          |
| 76.0    | 0.125" |                                                                                                                          |
| 85.0    | 0.125" |                                                                                                                          |
| 90.0    | 0.125" |                                                                                                                          |
| 100.0   | 0.125" |                                                                                                                          |

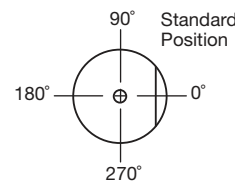
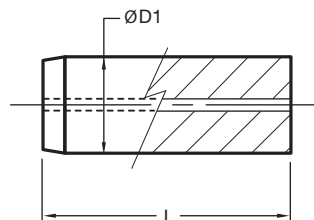
### ORDER EXAMPLE

#### MDW



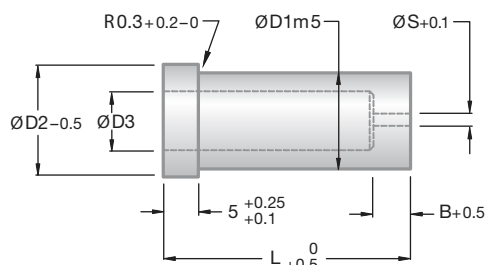
| QTY | Material | Type | D1 | x | L  | Locating Method |
|-----|----------|------|----|---|----|-----------------|
| 10  | M2       | MDW  | 25 | x | 32 | SF 0°           |

#### MFDW

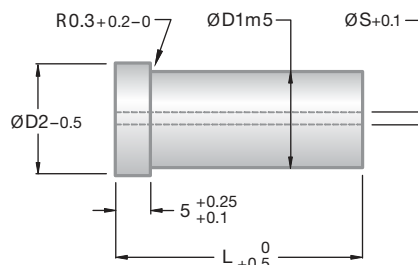


| QTY | Material | Type | D1 | x | L  | Locating Method |
|-----|----------|------|----|---|----|-----------------|
| 10  | M2       | MFDW | 25 | x | 32 | SF 0°           |

### MHW



### MFHW



### 3D CONFIGURATOR



### Material Hardness

M2 60-62

Standard Alterations page 42.

Locating Devices page 44.

\* The Wire Start Hole (S) dimension is in imperial (inches).

### MHW

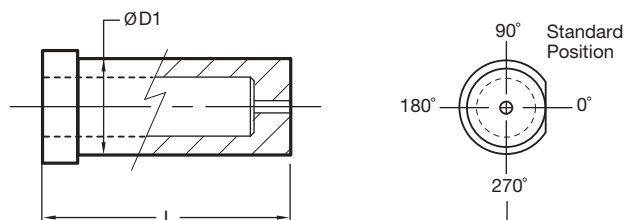
| BODY D1 | B | HEAD D2 | D3   | S*     | LENGTHS L                                 |
|---------|---|---------|------|--------|-------------------------------------------|
| 5.0     | 2 | 8.0     | 2.8  | 0.047" | Available Lengths:<br>50mm<br>to<br>200mm |
| 6.0     | 3 | 9.0     | 3.5  | 0.047" |                                           |
| 8.0     | 4 | 11.0    | 4.0  | 0.047" |                                           |
| 10.0    | 4 | 13.0    | 5.8  | 0.047" |                                           |
| 13.0    | 5 | 16.0    | 8.0  | 0.047" |                                           |
| 16.0    | 5 | 19.0    | 9.5  | 0.062" |                                           |
| 20.0    | 8 | 23.0    | 12.0 | 0.062" |                                           |
| 22.0    | 8 | 25.0    | 15.0 | 0.062" |                                           |
| 25.0    | 8 | 28.0    | 17.3 | 0.062" |                                           |
| 32.0    | 8 | 35.0    | 20.7 | 0.062" |                                           |
| 38.0    | 8 | 41.0    | 27.7 | 0.062" | Standard Lengths<br>(page 51)             |
| 40.0    | 8 | 43.0    | 27.7 | 0.062" |                                           |
| 45.0    | 8 | 48.0    | 36.0 | 0.062" |                                           |
| 50.0    | 8 | 53.0    | 41.0 | 0.062" |                                           |
| 56.0    | 8 | 59.0    | 46.0 | 0.062" |                                           |
| 63.0    | 8 | 66.0    | 51.0 | 0.062" |                                           |
| 71.0    | 8 | 74.0    | 57.0 | 0.062" |                                           |
| 76.0    | 8 | 79.0    | 61.0 | 0.062" |                                           |
| 85.0    | 8 | 88.0    | 67.0 | 0.062" |                                           |
| 90.0    | 8 | 93.0    | 71.0 | 0.062" |                                           |
| 100.0   | 8 | 103.0   | 79.0 | 0.062" |                                           |

### MFHW

| BODY D1 | HEAD D2 | S*     | LENGTHS L                                 |
|---------|---------|--------|-------------------------------------------|
| 5.0     | 8.0     | 0.047" | Available Lengths:<br>50mm<br>to<br>200mm |
| 6.0     | 9.0     | 0.047" |                                           |
| 8.0     | 11.0    | 0.047" |                                           |
| 10.0    | 13.0    | 0.047" |                                           |
| 13.0    | 16.0    | 0.047" |                                           |
| 16.0    | 19.0    | 0.062" |                                           |
| 20.0    | 23.0    | 0.062" |                                           |
| 22.0    | 25.0    | 0.062" |                                           |
| 25.0    | 28.0    | 0.062" |                                           |
| 32.0    | 35.0    | 0.062" |                                           |
| 38.0    | 41.0    | 0.062" | Standard Lengths<br>(page 51)             |
| 40.0    | 43.0    | 0.125" |                                           |
| 45.0    | 48.0    | 0.125" |                                           |
| 50.0    | 53.0    | 0.125" |                                           |
| 56.0    | 59.0    | 0.125" |                                           |
| 63.0    | 66.0    | 0.125" |                                           |
| 71.0    | 74.0    | 0.125" |                                           |
| 76.0    | 79.0    | 0.125" |                                           |
| 85.0    | 88.0    | 0.125" |                                           |
| 90.0    | 93.0    | 0.125" |                                           |
| 100.0   | 103.0   | 0.125" |                                           |

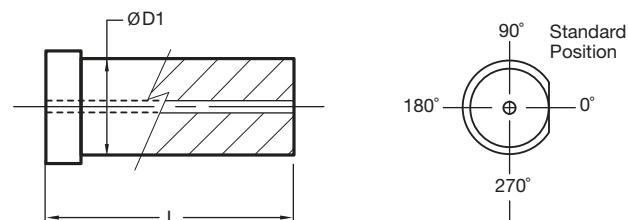
### ORDER EXAMPLE

### MHW



| QTY | Material | Type | D1 | x | L  | Locating Method |
|-----|----------|------|----|---|----|-----------------|
| 10  | M2       | MHW  | 25 | x | 32 | SF 0°           |

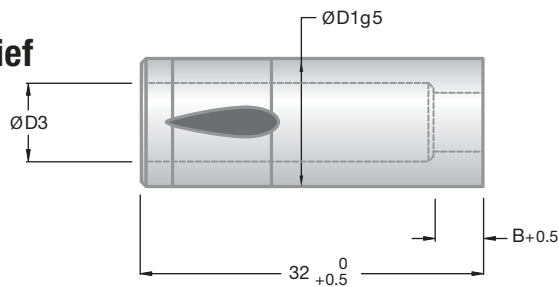
### MFHW



| QTY | Material | Type | D1 | x | L  | Locating Method |
|-----|----------|------|----|---|----|-----------------|
| 10  | M2       | MFHW | 25 | x | 32 | SF 0°           |

## MBLD series

### Ball Lock Die Button with Round Stepped Relief



#### 3D CONFIGURATOR



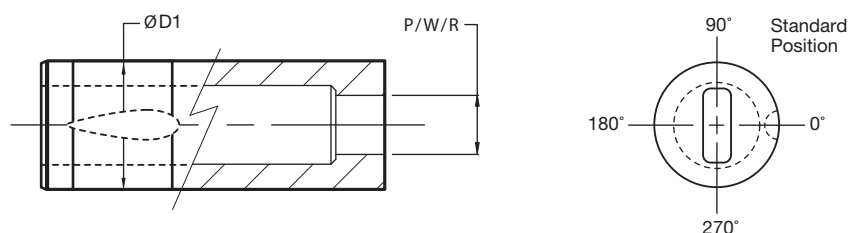
#### Material Hardness

M2 60-62

| MBLDC                             |   | MBLDO  |                  | MBLDR                    |      | MBLDL                                                                       |  | MBLDF                 |  | MBLDH |  |
|-----------------------------------|---|--------|------------------|--------------------------|------|-----------------------------------------------------------------------------|--|-----------------------|--|-------|--|
|                                   |   |        |                  |                          |      |                                                                             |  |                       |  |       |  |
| For qualified shapes see page 41. |   |        |                  | $G = \sqrt{W^2 + P^2}$   |      | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$                                   |  | $G = W \times 1.1547$ |  |       |  |
| D1                                | B | MAX D3 | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX |      | LENGTHS<br>L                                                                |  |                       |  |       |  |
| 13.0                              | 4 | 5.8    | 1.5 - 5.0        | 2.0                      | 5.0  | <div>Available Lengths:</div> <div>20mm</div> <div>to</div> <div>35mm</div> |  |                       |  |       |  |
| 16.0                              | 5 | 8.0    | 3.0 - 7.2        | 2.5                      | 7.2  |                                                                             |  |                       |  |       |  |
| 20.0                              | 5 | 12.0   | 4.5 - 11.0       | 4.5                      | 11.0 |                                                                             |  |                       |  |       |  |
| 25.0                              | 6 | 16.0   | 8.0 - 15.0       | 5.0                      | 15.0 |                                                                             |  |                       |  |       |  |
| 32.0                              | 6 | 20.0   | 11.0 - 19.0      | 6.0                      | 19.0 |                                                                             |  |                       |  |       |  |
| 38.0                              | 8 | 27.0   | 16.0 - 26.0      | 8.0                      | 6.0  | <div>See Standard Lengths</div> <div>on page 51</div>                       |  |                       |  |       |  |
|                                   |   |        |                  |                          |      |                                                                             |  |                       |  |       |  |
|                                   |   |        |                  |                          |      |                                                                             |  |                       |  |       |  |
|                                   |   |        |                  |                          |      |                                                                             |  |                       |  |       |  |
|                                   |   |        |                  |                          |      |                                                                             |  |                       |  |       |  |

Standard Alterations page 42.

#### ORDER EXAMPLE

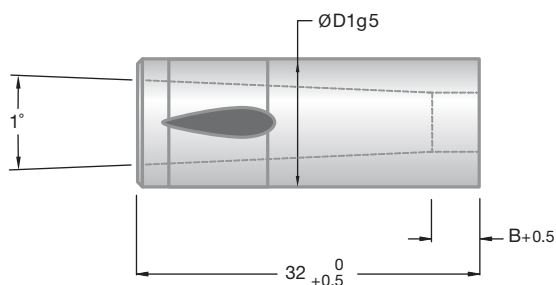


| QTY | Material | Type | D1 | P / W / R       | Locating Method |
|-----|----------|------|----|-----------------|-----------------|
| 10  | M2       | MBLD | 25 | 7.0 / 5.0 / 1.0 | BS 0°           |



## MFBLD series

### Ball Lock Die Button with Tapered Relief



#### 3D CONFIGURATOR

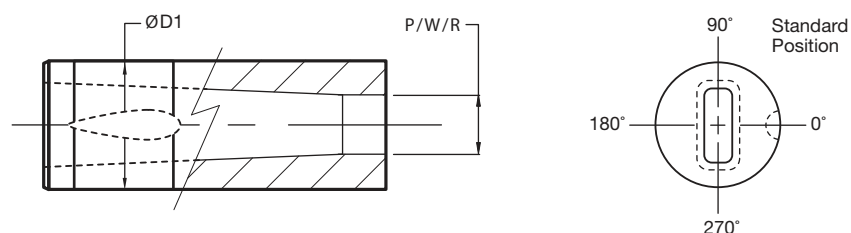


| Material | Hardness |
|----------|----------|
| M2       | 60-62    |

| MFBLDC                            | MFBLDO | MFBLDR                 | MFBLDL           | MFBLDF                                    | MFBLDH |                                                                      |
|-----------------------------------|--------|------------------------|------------------|-------------------------------------------|--------|----------------------------------------------------------------------|
|                                   |        |                        |                  |                                           |        |                                                                      |
| For qualified shapes see page 41. |        | $G = \sqrt{W^2 + P^2}$ |                  | $G = \sqrt{(W - 2R)^2 + (P - 2R)^2} + 2R$ |        |                                                                      |
|                                   |        |                        |                  | $G = W \times 1.1547$                     |        |                                                                      |
| D1                                | B      | MAX D3                 | ROUND RANGE<br>P | SHAPE<br>MIN W   G/P MAX                  |        | LENGTHS<br>L                                                         |
| 13.0                              | 4      | 5.8                    | 1.5 - 5.0        | 2.0                                       | 5.0    | <b>Available Lengths:</b><br><b>20mm</b><br><b>to</b><br><b>35mm</b> |
| 16.0                              | 5      | 8.0                    | 3.0 - 7.2        | 2.5                                       | 7.2    |                                                                      |
| 20.0                              | 5      | 12.0                   | 4.5 - 11.0       | 4.5                                       | 11.0   |                                                                      |
| 25.0                              | 6      | 16.0                   | 8.0 - 15.0       | 5.0                                       | 15.0   |                                                                      |
| 32.0                              | 6      | 20.0                   | 11.0 - 19.0      | 6.0                                       | 19.0   |                                                                      |
| 38.0                              | 8      | 27.0                   | 16.0 - 26.0      | 8.0                                       | 6.0    | <b>See Standard Lengths</b><br><b>on page 51</b>                     |
|                                   |        |                        |                  |                                           |        |                                                                      |
|                                   |        |                        |                  |                                           |        |                                                                      |
|                                   |        |                        |                  |                                           |        |                                                                      |
|                                   |        |                        |                  |                                           |        |                                                                      |

Standard Alterations page 42.

#### ORDER EXAMPLE

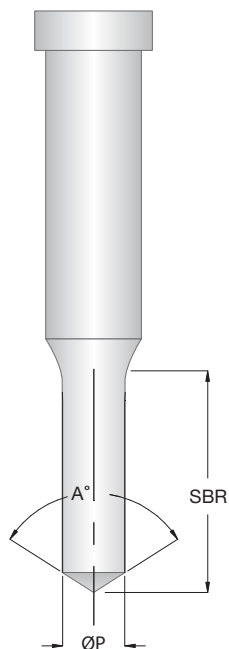


| QTY | Material | Type  | D1 | P / W / R       | Locating Method |
|-----|----------|-------|----|-----------------|-----------------|
| 10  | M2       | MFBLD | 25 | 7.0 / 5.0 / 1.0 | BS 0°           |

| 90°            |                |                |                |                |                |
|----------------|----------------|----------------|----------------|----------------|----------------|
| <b>Q1</b><br>  | <b>Q2</b><br>  | <b>Q3</b><br>  | <b>Q4</b><br>  | <b>Q5</b><br>  | <b>Q6</b><br>  |
| <b>Q7</b><br>  | <b>Q8</b><br>  | <b>Q9</b><br>  | <b>Q10</b><br> | <b>Q11</b><br> | <b>Q12</b><br> |
| <b>Q13</b><br> | <b>Q14</b><br> | <b>Q15</b><br> | <b>Q16</b><br> | <b>Q17</b><br> | <b>Q18</b><br> |
| <b>Q19</b><br> | <b>Q20</b><br> | <b>Q21</b><br> | <b>Q22</b><br> | <b>Q23</b><br> | <b>Q24</b><br> |
| <b>Q25</b><br> | <b>Q26</b><br> | <b>Q27</b><br> | <b>Q28</b><br> | <b>Q29</b><br> | <b>Q30</b><br> |
| <b>Q31</b><br> | <b>Q32</b><br> | <b>Q33</b><br> | <b>Q34</b><br> | <b>Q35</b><br> | <b>Q36</b><br> |
| <b>Q37</b><br> | <b>Q38</b><br> | <b>Q39</b><br> | <b>Q40</b><br> | <b>Q41</b><br> | <b>Q42</b><br> |
| 270°           |                |                |                |                |                |

Views are from above shank on punches and cutting edge of die button.

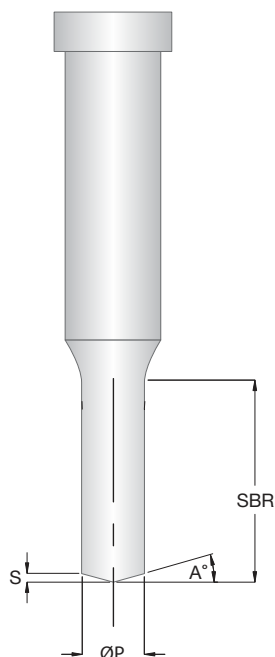
## CONICAL POINT



Add the following line to the order description:

Example: CP A = 3°

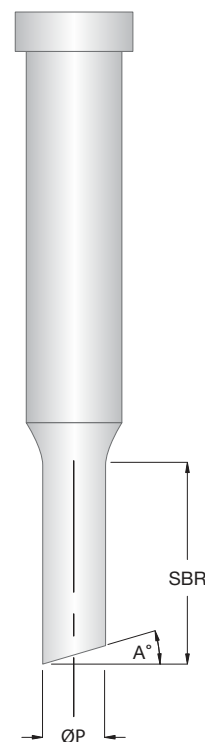
## ROOFTOP SHEAR



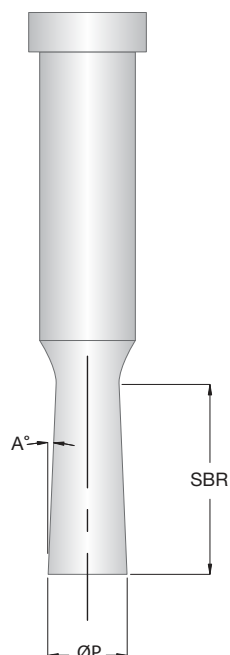
Add the following line to the order description:

Example: RS A = 3° or RS S = 3°

## ANGLE SHEAR



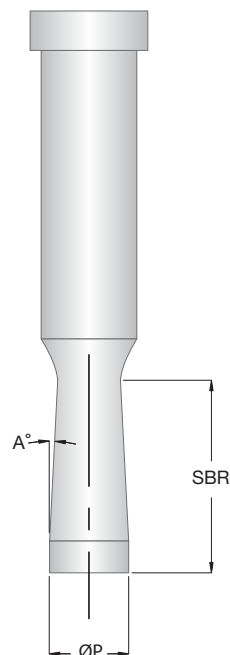
## BACK TAPERED



Add the following line to the order description:

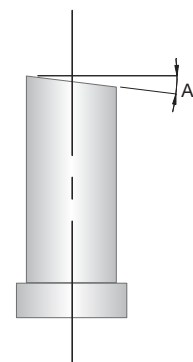
Example: BT A = 0.5°

## STRAIGHT + BACK TAPERED



Add the following line to the order description:

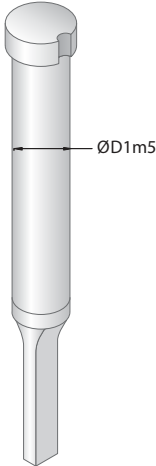
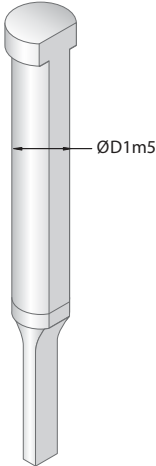
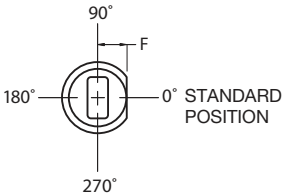
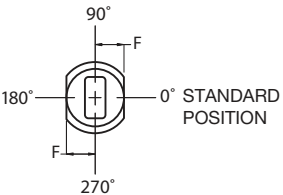
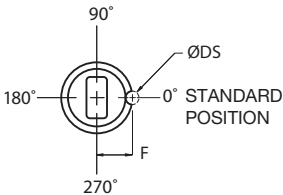
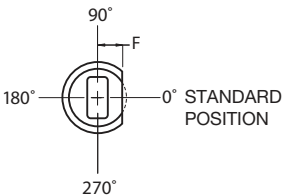
Example: SC S = 2 A = 0.5°



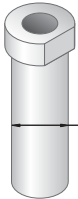
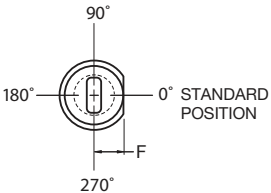
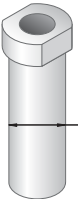
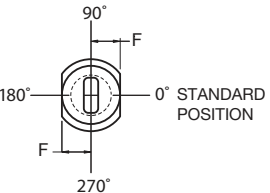
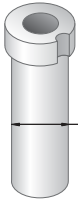
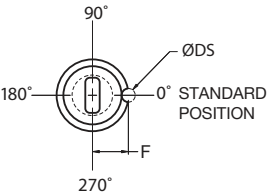
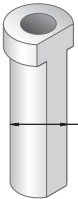
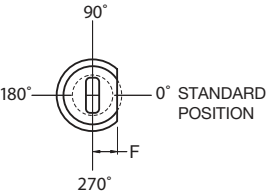
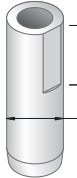
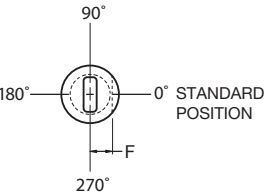
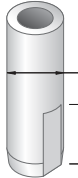
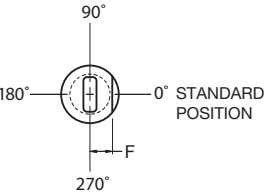
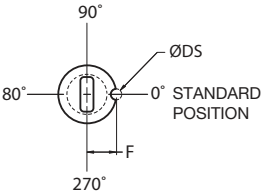
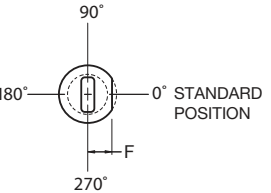
Add the following line to the order description:

Example: AS A = 3°

# PUNCHES

| SF                                                                                                                | DF                                                                                                                | DS                                                                                                                      | FL                                                                                              |
|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>SINGLE FLAT</b>                                                                                                | <b>DOUBLE FLAT</b>                                                                                                | <b>DOWEL SLOT</b>                                                                                                       | <b>FULL LENGTH FLAT</b>                                                                         |
|                                 |                                 |                                      |             |
|                                |                                |                                     |            |
| <p>F from punch center to flat.</p> <p>Add the following line to the description:</p> <p>Example:<br/>SF 145°</p> | <p>F from punch center to flat.</p> <p>Add the following line to the description:</p> <p>Example:<br/>DF 145°</p> | <p>F from punch center to pin center.</p> <p>Add the following line to the description:</p> <p>Example:<br/>DS 145°</p> | <p>F = depth</p> <p>Add the following line to the description:</p> <p>Example:<br/>FLS 145°</p> |

## DIE BUTTONS

| SF                                                                                                                                                                                                                                                                                                             | DF                                                                                                                                                                                                                                                                                                             | DS                                                                                                                                                                                                                                                                                  | FL                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   <p>F from punch center to flat.<br/>Add the following line to the description.<br/>Example: SF 145°</p>                                    |   <p>F from punch center to flat.<br/>Add the following line to the description.<br/>Example: DF 145°</p>                                    |   <p>F from die center to pin center.<br/>Add the following line to the description.<br/>Example: DS 145°</p>    |   <p>F from punch center to flat.<br/>Add the following line to the description.<br/>Example: SF1 F=1 145°</p> |
| SF4 (TOP)                                                                                                                                                                                                                                                                                                      | SF3 (BOTTOM)                                                                                                                                                                                                                                                                                                   | DS                                                                                                                                                                                                                                                                                  | FL                                                                                                                                                                                                                                                                                   |
|   <p>F from punch center to flat.<br/>F = Depth Z = Length<br/>Add the following line to the description.<br/>Example: SF3 1X14 145°</p> |   <p>F from punch center to flat.<br/>F = Depth Z = Length<br/>Add the following line to the description.<br/>Example: SF4 1X14 145°</p> |   <p>F from die center to pin center<br/>Add the following line to the description.<br/>Example: DS 145°</p> |   <p>F = depth<br/>Add the following line to the description.<br/>Example: SF1 F=1 145°</p>                |

## PERFORATING TECHNOLOGY

The perforating punch is an essential yet fragile part of the die assembly.

The success of a perforating punch is largely dependent on two key criteria:

- 1) Physical inter-changeability; and
- 2) Structural soundness.

## PERFORMANCE CRITERIA

Perforating punch performance is based on two key criteria:

- 1) Physical inter-changeability; and
- 2) Structural soundness.

With regard to punch performance, other key characteristics include the following: strength; load distribution; fatigue-resistance.

Structural soundness is impacted by material and construction details.

## FUNCTIONAL REQUIREMENTS

Perforating punch functionality is largely dictated by two factors:

- 1) The perforating process; and
- 2) The magnitude of developed loads.

## The Perforating Process

The perforating process requires two actions:

- 1) Perforating; and
- 2) Stripping.

Each action generates different loading conditions. The two actions must be successfully opposed for optimum component performance.

Under impact, a punch is forced through a work piece resulting in the separation of a slug; afterwards, the slug passes through the mating die cavity. The work piece hole conforms to the size and shape of the punch point. Similarly, the slug conforms to the die cavity.

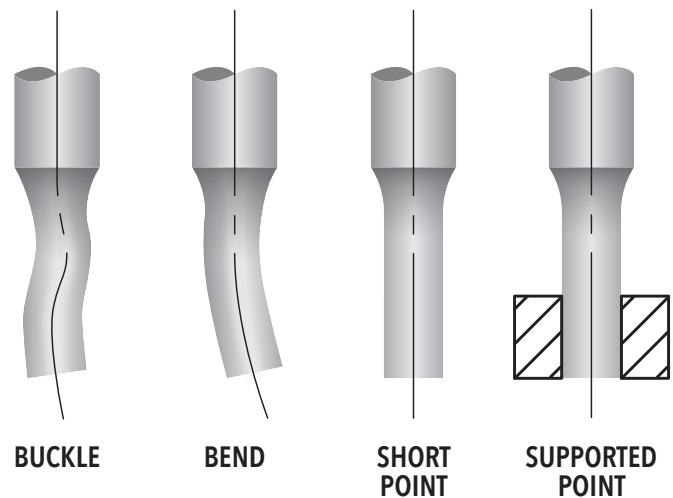
After the hole and slug have been produced, the direction of punch travel is reversed so that it withdraws from the work piece. A stripping mechanism is often used to restrain the work piece during punch withdrawal.

## Perforating Loads

Punch durability is largely dependent upon induced stress levels (relative to the ultimate strength of the component material).

Due to the nature of applied loads, breakage generally occurs during the perforating process; whereas, most cutting-edge wear develops during stripping.

For perforating punches, head breakage is a serious concern. Often times, this concern can be mitigated by increasing the shank diameter so that the load is distributed over a larger area, thereby reducing the stress value.



Improved punch durability can sometimes be achieved by a blend radius that reduces stress concentration in critical areas. For example, cutting edge chipping can be reduced or eliminated by stoning a .002" to .004" radius or chamfer on the component. This procedure effectively increases the contact area resulting in a lower stress level.

The perforating process subjects punch components to a variety of forces, including the following: compressive tensile forces; frictional forces; and, deflecting forces.

Frictional force is equal to the stripping load and directly related to the rate at which the component cutting edges erode. Factors impacting the magnitude of frictional force and, consequently, wear rate are expressed in the following formula:

$F = uN$  where  $F$  = Force of Friction (lbs.),

$u$  = Coefficient of Friction, and  $N$  = Normal Force (lbs.)

## Normal Force (N)

If a work piece hole becomes smaller than the perforating punch, it is likely that an interference fit developed during the perforating cycle. The resulting force is known as the “normal force” because its line of action is perpendicular to the direction of the punch travel.

Variables which effect the amount of interference and the magnitude of the normal force include the following:

- Punch-to-die clearance allowances;
- Ratio of hole size to work piece thickness;
- Proximity of the hole to an adjacent part edge;
- Spacing between adjacent holes;
- Type of stripping device utilized;
- Cutting edge condition of the perforating components.

For example, clearance allowances must be predicated on the functional requirements of a work piece hole. Small allowances result in minimum roll-over, long burnished lands, and slight angular breaks in the punched holes. In this instance, punch wear is accelerated and slug-jamming problems may develop. Whereas, large clearances produce more roll-over, shorter burnished lands, and an increase in the break or fracture angle. In this case, the punch wear rate is reduced, but there is a tendency for the slugs to be lifted out of the die cavity. When utilizing larger clearance allowances, slug-ejector punches should be used to prevent slug-pulling.

## Punch-to-Die Alignment

Punch-to-die alignment is an expression of the degree of clearance uniformity between corresponding points on the cutting periphery between a punch and die button. The equation is relatively straightforward: better alignment equals more uniform stamping; and, more uniform stamping equals greater production quantities (by a given die assembly). Non-uniform clearances subject a punch to unbalanced loads. Unbalanced loads result in deflection, which ultimately leads to premature component failure. To ensure punch-to-die alignment during the die construction assembly phase, special attention should be given to the following factors:

- Component of concentricity limits;
- Effect of shape deviations on clearance uniformity;
- Axial relationships in multi-hole retainer plates;
- Effect of the retention system on axial relationships;
- Total effect of the combined factors.

## Component of Concentricity Limits

The shank of the punch and the body of the die button establish the relative positions of the two components when assembled in their respective retainer plates. Any significant eccentricity of the punch point to its shank or the die hole to its body will contribute to a non-uniform clearance condition. The issue and concern is that misalignment increments may be accumulative (or self-canceling) depending upon the direction and amount of the individual offsets.

## Effect of Shape Deviations on Clearance Uniformity

Punch point or die hole shape deviations can cause the clearance per side to range from uniform to non-uniform values. As such, component loading can vary from a balanced condition to an unbalanced one (which produces deflection).

As permissible shape deviations are not usually specified, it is implied that they lie within the dimensional limits of the selected punch point or die hole. Point-to-point clearance variations are a result of the size tolerance and orientation of the mating components at assembly.

For a round punch point or die hole, the actual shape may range from a perfect circle to an ellipse and still lie within the dimensional limits. Relative to an ellipse, the minor axis cannot be smaller than the low limit dimension and the major axis cannot exceed the high limit. In effect, the maximum permissible difference between the two axes is equal to the total tolerance. The point-to-point clearance variation contributed by each component will not be greater than one half of its total size tolerance.

Size tolerances can range from  $+0.0002''/-0.0000''$  to  $+0.0010''/-0.0000''$ . However, these tolerances depend on the following characteristics: shape; component type; and precision level.

## **Axial Relationships in Multi-hole Retainer Plates**

Dimensional control of the spacing between adjacent retention holes is dependent upon the production method. For example, jig-boring or jig-grinding can maintain a specified dimension to  $\pm 0.0001''$  tolerance.

When multi-hole retainer plates are required, it is imperative that center distances be closely controlled to minimize axial displacements, especially as the outcome may have a substantial effect on the alignment of the mating components.

## **Effect of the Retention System on Axial Relationship**

The type of retention system effects the axial alignment of the punch or die button to its retainer hole. In a press-fit assembly, a light interference fit develops uniform pressure completely around the component and, as a result, the center lines coincide.

The ball-lock system of retention utilizes the slip-fit concept in conjunction with a spring-loaded ball. Spring pressure forces the component against the opposite side of the hole and maximum axial displacement occurs. The offset is predictable and can be compensated in retainer assemblies.

## **Total Effect of the Combined Factors**

As the mating components are assembled, the various factors combine to add to (or cancel out) one another to eliminate or exacerbate punch-to-die misalignment. Under the most adverse conditions of dimensional and axial relationships, the maximum eccentricity will be equal to the sum of the maximum misalignment increments per side. Conversely, the minimum accumulation of misalignment increments will total zero when conditions are ideal.

The clearance value must be established to satisfy work piece requirements. As such, it can be used to select the appropriate component standard relative to the desired retention system.

## **THE PERFORATING PUNCH**

Retained on the shank and usually unsupported at the point, the punch must possess the following characteristics: tough enough to withstand impact loads; strong enough to cause slug separation in the work piece; and, abrasion-resistant to oppose stripping forces. Finally, it must provide sufficient length to permit a reasonable number of re-sharpenings.

## **Point Length-to-Point Size Proportions**

The most critical relationship is "point length to point size". The punch point must be shaped and sized to satisfy the work piece hole requirement. The length of point required is equal to the sum of the following:

- a) Length of blend radius;
- b) Sharpening allowance;
- c) Length of stripper lip or straight portion in the support bushing;
- d) Work piece Thickness;
- e) Penetration into Die Cavity.

Excessive sharpening allowances increase the unsupported length which can lead to breakage issues.

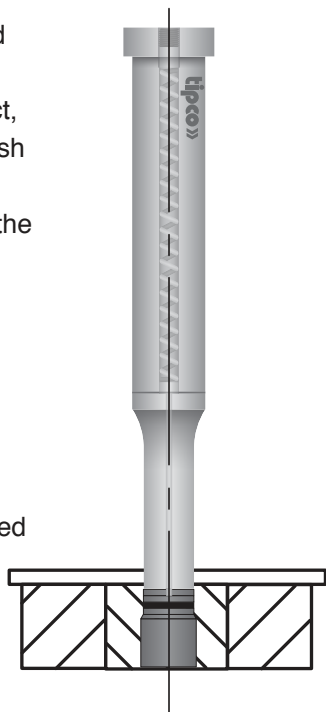


## Point-to-Shank Proportions

Various cross-sectional areas may be used throughout the punch length in order to reduce applied stress levels and improve component performance. Both rigidity and punching load distribution improve as shank diameter increases relative to the punch point size.

## The Ejector Punch and its Function

Ejector punch components incorporate a spring-loaded pin that extend beyond the face of the punch. At impact, the pin retracts until it is flush with the punch face. When the slug is separated from the workpiece, the pin exerts a force on the slug to drive it downward or to hold it in position depending upon the punch-to-die clearance allowance. As the punch is withdrawn, the ejector pin functions like a spring-loaded stripper and prevents the slug from rising with the punch. In many instances, a slug-ejector punch is inter-changeable with a solid punch.



## Die Button / Matrix Requirements

The die button provides a hardened cutting edge to facilitate slug separation. The cavity (or hole) accepts the slug and must be long enough to permit a satisfactory number of sharpenings. The die hole shape conforms to the punch point; however, the hole is larger to provide for the necessary clearance. Below the wear land, the die hole is enlarged to permit unrestricted slug travel.

Die button relief holes are divided into two groups:

- 1) Counter-bore; and,
- 2) Taper relief.

It is important to note that the selected relief hole type to be used is generally determined by individual preference.

The construction type is referred to as stepped when the hole is larger at the intersection with the bottom of the wear land. The balance of the relief hole may be tapered or straight and may not conform with the shape of the die cavity. No-step construction requires that there be no step at the intersection with the wear land and that the relief hole be tapered to conform with the die cavity shape.

Both construction types are available in headless or headed types. The headless die button must be press-fitted for retention. Headed die buttons may be slip-fitted to avoid distortion of the retainer plate when large numbers must be inserted. The larger bearing surface provided by the head also results in better load distribution.

## The Pilot Punch and its Function

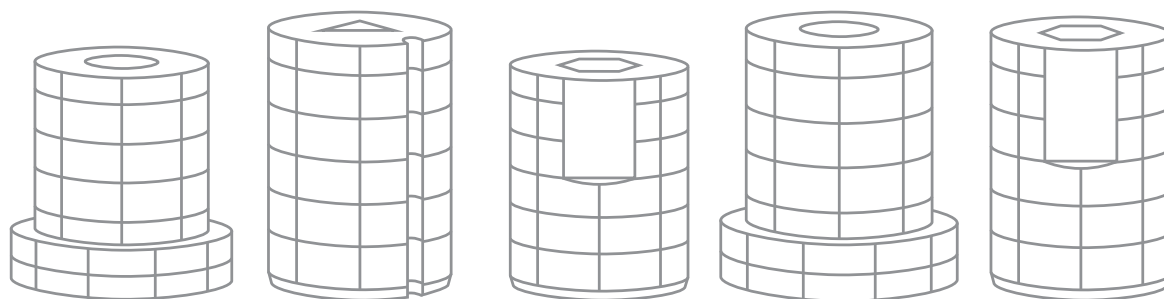
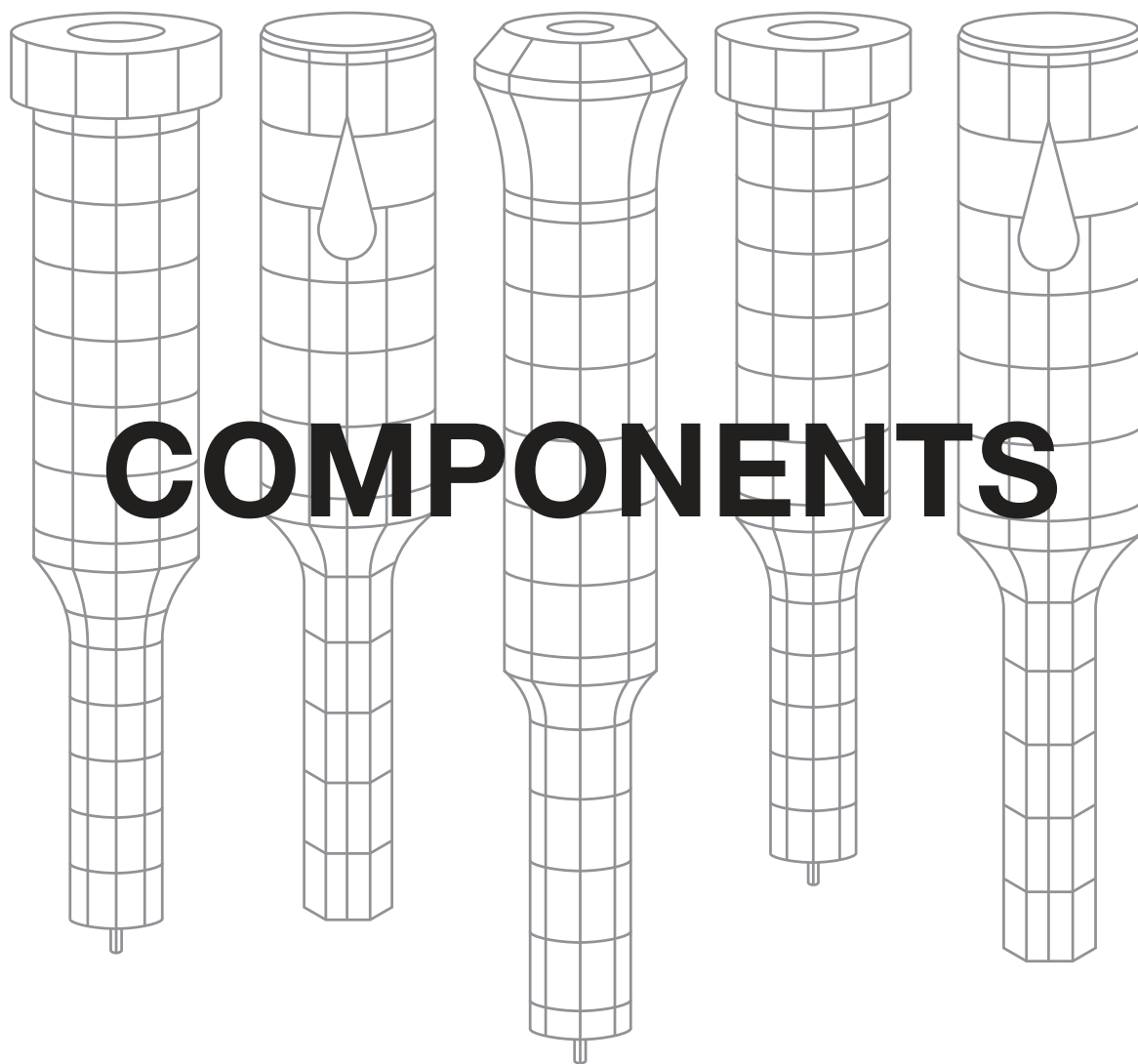
A pilot punch must enter a previously punched-hole, contact the hole edge, move the workpiece to its required position, and hold it in place before other components strike the workpiece. The pilot punch is usually .001" smaller on the diameter than its related perforator and has approximately .090" of full diameter lead beyond the face of the perforators. The end of a pilot punch may range from a bullet-nose to conical shape.

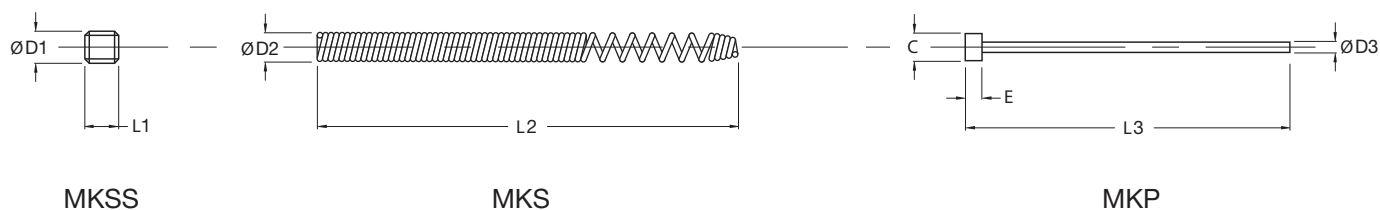


COUNTER  
BORED



TAPERED  
RELIEF





| D  | 5           | 6        | 8        | 10       | 13       | 16       | 20       | 25       | 32       | 40       |
|----|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| D1 | M2.5 x 0.45 | M3 x 0.5 | M4 x 0.7 | M5 x 0.8 | M5 x 0.8 | M5 x 0.8 | M6 x 1.0 | M6 x 1.0 | M6 x 1.0 | M8 x 1.5 |
| L1 | 5           | 5        | 5        | 5        | 5        | 5        | 6        | 6        | 6        | 8        |
| D2 | 2.01        | 2.39     | 3.30     | 4.19     | 4.19     | 4.19     | 5.03     | 5.03     | 5.03     | 6.80     |
| L2 | 50.80       | 60.45    | 66.80    | 76.20    | 76.20    | 76.20    | 76.20    | 76.20    | 76.20    | 64.80    |
| D3 | 0.51        | 0.69     | 1.04     | 1.47     | 1.47     | 1.47     | 2.26     | 2.26     | 2.26     | 3.05     |
| L3 | 28.19       | 50.8     | 50.8     | 50.8     | 50.8     | 50.8     | 57.15    | 57.15    | 57.15    | 57.15    |
| C  | 1.22        | 1.86     | 2.39     | 3.05     | 3.05     | 3.05     | 3.96     | 3.96     | 3.96     | 4.90     |
| E  | 0.76        | 1.19     | 1.58     | 1.58     | 1.58     | 1.58     | 2.39     | 2.39     | 2.39     | 2.50     |

### Order Examples

#### KIT:

MK D = 10\*

#### Single component:

MKS D = 10\*, MK D = 10\*

\*D = punch diameter

## Punches

|                                | MT  | ME  | MTU | MUE | MC  | MCE | MBN | MBNE |
|--------------------------------|-----|-----|-----|-----|-----|-----|-----|------|
| Standard<br>Lengths<br>(in mm) | 50  | 50  | 50  | 50  |     |     |     |      |
|                                | 56  | 56  | 56  | 56  |     |     |     |      |
|                                | 63  | 63  | 63  | 63  |     |     |     |      |
|                                | 71  | 71  | 71  | 71  | 71  | 71  |     |      |
|                                | 80  | 80  | 80  | 80  | 80  | 80  | 80  | 80   |
|                                | 90  | 90  | 90  | 90  | 90  | 90  | 90  | 90   |
|                                | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100  |
|                                | 120 | 120 |     |     |     |     |     |      |
|                                | 150 | 150 |     |     |     |     |     |      |
|                                | 175 | 175 |     |     |     |     |     |      |
|                                | 200 | 200 |     |     |     |     |     |      |

## Punches

|                                | MBL | MBLE | MBH | MBHE | MBLK | MBLEK | MBHK | MBHEK |
|--------------------------------|-----|------|-----|------|------|-------|------|-------|
| Standard<br>Lengths<br>(in mm) |     |      |     |      |      |       |      |       |
|                                | 63  | 63   | 63  | 63   |      |       |      |       |
|                                | 71  | 71   | 71  | 71   |      |       |      |       |
|                                | 80  | 80   | 80  | 80   | 80   | 80    | 80   | 80    |
|                                | 90  | 90   | 90  | 90   | 90   | 90    | 90   | 90    |
|                                | 100 | 100  | 100 | 100  | 100  | 100   | 100  | 100   |
|                                | 125 | 125  | 125 | 125  |      |       |      |       |
|                                |     |      | 150 |      |      |       |      |       |
|                                |     |      | 175 |      |      |       |      |       |
|                                |     |      | 200 |      |      |       |      |       |

## Die Buttons

|                                | MD | MFD | MH | MFH | MDW | MFDW | MHW | MFHW |
|--------------------------------|----|-----|----|-----|-----|------|-----|------|
| Standard<br>Lengths<br>(in mm) | 16 |     | 16 |     |     |      |     |      |
|                                | 20 | 20  | 20 | 20  | 20  | 20   | 20  | 20   |
|                                | 25 | 25  | 25 | 25  | 25  | 25   | 25  | 25   |
|                                | 30 | 30  | 30 | 30  | 30  | 30   | 30  | 30   |
|                                | 32 | 32  | 32 | 32  | 32  | 32   | 32  | 32   |
|                                | 35 | 35  | 35 | 35  | 35  | 35   | 35  | 35   |

## TiN

It is the least expensive and most commonly used.

- Good wear resistance on cutting edges and wear surfaces
- Good lubricity
- Suitable thermal stability for most cold work metalworking applications
- High micro hardness of 2300 Vickers

Note: TiN works best when used with lubricants and is not recommended for uses in stainless steel, nickel, or copper applications.

## TiCN

It has the broadest range of application use regarding PVD coatings including stainless steel, nickel and copper.

- Higher hardness and lower coefficient of friction than that of TiN coating resulting in extremely high wear resistance
- Improved lubricity
- Extremely high hardness of 3000 Vickers

Note: Suitable for uses in stainless steel, nickel, or copper applications.

## TiAlN

It is ideal for applications where surface heat is generated, which converts the aluminum constituent to aluminum oxide for added protection against shear stress and wear resistance on cutting edges.

- High thermal stability
- Extremely high micro hardness of 3400 Vickers

Note: Suitable for uses in stainless steel, nickel, copper or aluminum applications.

## ALCRONA

Performance is enhanced utilizing the thermal stability, low coefficient of friction and ductility advantages.

- Exceptionally low coefficient of friction
- Extraordinary high thermal stability
- Extremely high micro hardness of 3400 Vickers

Balanit® Alcrona is a trademark of Oerlikon Balzers.

## DLC

Being a carbon coating, it has extreme wear resistance and very low friction coefficients.

- Exceptionally low coefficient of friction
- Extraordinary high thermal stability

Note: Can be used without lubricants.

| FRACTIONS | DECIMAL | MM     |
|-----------|---------|--------|
| 1/64      | .0156   | 0.396  |
| 1/32      | .0312   | 0.793  |
| 3/64      | .0468   | 1.190  |
| 1/16      | .0625   | 1.587  |
| 5/64      | .0781   | 1.984  |
| 3/32      | .0937   | 2.381  |
| 7/64      | .1093   | 2.778  |
| 1/8       | .1250   | 3.175  |
| 9/64      | .1406   | 3.571  |
| 5/32      | .1562   | 3.968  |
| 11/64     | .1718   | 4.365  |
| 3/16      | .1875   | 4.762  |
| 13/64     | .2031   | 5.159  |
| 7/32      | .2187   | 5.556  |
| 15/64     | .2343   | 5.953  |
| 1/4       | .2500   | 6.350  |
| 17/64     | .2656   | 6.746  |
| 9/32      | .2812   | 7.143  |
| 19/64     | .2968   | 7.540  |
| 5/16      | .3125   | 7.937  |
| 21/64     | .3281   | 8.334  |
| 11/32     | .3437   | 8.731  |
| 23/64     | .3593   | 9.128  |
| 3/8       | .3750   | 9.525  |
| 25/64     | .3906   | 9.921  |
| 13/32     | .4062   | 10.318 |
| 27/64     | .4218   | 10.715 |
| 7/16      | .4375   | 11.112 |
| 29/64     | .4531   | 11.509 |
| 15/32     | .4687   | 11.906 |
| 31/64     | .4843   | 12.303 |
| 1/2       | .5000   | 12.700 |

| FRACTIONS | DECIMAL | MM     |
|-----------|---------|--------|
| 33/64     | .5156   | 13.096 |
| 17/32     | .5312   | 13.493 |
| 35/64     | .5468   | 13.890 |
| 9/16      | .5625   | 14.287 |
| 37/64     | .5781   | 14.684 |
| 19/32     | .5937   | 15.081 |
| 39/64     | .6093   | 15.478 |
| 5/8       | .6250   | 15.875 |
| 41/64     | .6406   | 16.271 |
| 21/32     | .6562   | 16.668 |
| 43/64     | .6718   | 17.065 |
| 11/16     | .6875   | 17.462 |
| 45/64     | .7031   | 17.859 |
| 23/32     | .7187   | 18.256 |
| 47/64     | .7343   | 18.653 |
| 3/4       | .7500   | 19.050 |
| 49/64     | .7656   | 19.446 |
| 25/32     | .7812   | 19.843 |
| 51/64     | .7968   | 20.240 |
| 13/16     | .8125   | 20.637 |
| 53/64     | .8281   | 21.034 |
| 27/32     | .8437   | 21.431 |
| 55/64     | .8593   | 21.828 |
| 7/8       | .8750   | 22.225 |
| 57/64     | .8906   | 22.621 |
| 29/32     | .9062   | 23.018 |
| 59/64     | .9218   | 23.415 |
| 15/16     | .9375   | 23.812 |
| 61/64     | .9531   | 24.209 |
| 31/32     | .9687   | 24.606 |
| 63/64     | .9843   | 25.003 |
| 1         | 1.000   | 25.400 |



**Canada Office:**

1 Coventry Road, Brampton, Ontario, L6T 4B1, Canada

Phone: 905-791-9811 | Toll Free: 800-268-0115 | [sales@tipcoinc.com](mailto:sales@tipcoinc.com)

**USA Office:**

6 Rowe Ct, Hamilton, Ohio 45015

Phone: 513-874-9140 | Toll Free: 800-544-8444 | [sales@tipcopunch.com](mailto:sales@tipcopunch.com)