

NORTH AMERICAN STANDARD

DIE BUTTONS (MATRIXES):

Straight Relief

Press Fit

Metric

NAPMA - 9917-00



North American Punch Manufacturers Association

PUBLISHED BY

NORTH AMERICAN PUNCH MANUFACTURERS ASSOCIATION
7402 Chestnut Ridge Rd. Lockport, NY 14094

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FOREWORD

This Standard is one of a series of interchangeable punches and accessories for precision stamping dies. It comprises a group die buttons (matrixes) used in various stamping dies, as built by die makers, for long-run production of specific and individual metal parts in many different kinds of punch presses.

Reference publications and guidelines for drafting standards:

- (1) Metric Limits and Fits- ANSI B4.2 1978(R1994)
- (2) Letter and Geometric Symbol References-ANSI Y 10, Y32 Series
- (3) Drafting Practices-ANSI Y 14 Series
- (4) Metric Dimensioning and Tolerances-ANSI Y 14.5 1994
- (5) Preferred Numbers - ISO 497 1973 R'10 Series
- (6) Drawings to use Third Angle Projection

The North American Punch Manufacturers Association (NAPMA), originally known as the National Association of Punch Manufacturers (NAPM), was incorporated on October 17, 1963. The purpose of this association is: To establish and promote standardization of precision punches, dies and accessories for the benefit of the stamping and forming industry.

Members of NAPMA, comprised of the majority of North American Punch Manufacturers, have been major contributors to the development of these standards.

See page 13 of this Standard for additional related standards. For more information contact:

**NORTH AMERICAN PUNCH MANUFACTURERS ASSOCIATION
7402 Chestnut Ridge Rd. Lockport, NY 14094**

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STRAIGHT RELIEF DIE BUTTONS

TABLES	CODE
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2. Die Buttons, Straight Relief Press Fit, Headless, Rectangle/Oblong/Square.....	504102/03/04 8 & 9
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NORTH AMERICAN PUNCH MANUFACTURERS ASSOCIATION

DIE BUTTONS (MATRIXES) STRAIGHT RELIEF, PRESS FIT METRIC

1.0 SCOPE

This is the North American Punch Manufacturers Association Standard for metric straight relief die buttons (matrixes) including dimensions, tolerances, nomenclature, sizes and shapes.

Headless straight relief press fit die buttons (matrixes) are available in body diameter sizes ranging from 8.0mm to 100.0mm. Standard hole shapes include round, rectangle, oblong and square with a variety of special shapes that have been catalogued for identification by description thereby negating the need for a drawing.

Headed straight relief press fit die buttons (matrixes) are available in body diameter sizes ranging from 8.0mm to 40.0mm. Standard hole shapes include round, rectangle, oblong and square with a variety of special shapes, that have been catalogued for identification by description thereby negating the need for a drawing.

2.0 NOMENCLATURE

2.1 Die Button (Matrix)

The female force element of a stamping die to be inserted in a die block or retainer. It generally consists of a working end (a hole, sized and shaped to fit the punch point), a retaining portion and a relief hole for slug passage through the button (matrix).

2.1.1 Working End (Cutting End). The working end has a precisely sized hole which has the proper fit to the related punch that is constant for a length to provide for sharpening.

2.1.2 Retaining Portion (Body). The body is cylindrical to fit a round hole in the die or retainer. The fit of the body to the retainer hole provides location of the die button (matrix) (relative to the punches, etc.) in the stamping die. The forces applied to the die button (matrix) are transmitted through the body to the die block, retainer, or die holder portion of the die set.

2.1.3 Head. A cylindrical section larger than the body serving two purposes. One, it provides greater area for load distribution and two, it provides retention for the die button (matrix) in the die block or retainer when light press fit (or slip fit) is used.

2.1.4 Relief Hole. The relief hole in the die button allows the die cut slug to pass through and out of the die assembly. The type of relief hole used in this Standard is termed straight relief. The relief hole is larger than the working hole for easy passage of the slugs through the die button (matrix). In the case of shaped hole die buttons (matrixes), the relief hole is round and sufficiently large to clear the extremities of the shaped slug.

2.2 Types of Die Buttons (Matrixes) included in this Standard

2.2.1 Straight relief Die Buttons (Matrixes) with a slight relief slug hole in both headed and headless styles.

2.3 Die Button (Matrix) Feature Nomenclature

2.3.1 Hole Diameter (P). The diameter of the cutting end of a round die button (matrix).

2.3.2 Hole Dimension. The dimensions required to define the end shape of a die hole other than round.

W - The smaller dimension of a hole shape.

P - The larger dimension of a hole shape.

2.3.3 Diagonal (G). The diagonal of a rectangle or square.

2.3.4 Limiting Diameter (Gmax). The maximum circumscribed diameter of a rectangle, square or other shape.

2.3.5 Land Length (B). The length of the precisely sized hole in the working end (cutting end) of a die button (matrix) that includes allowances for penetration into the die hole and grind or wear length (life)-length to be reduced by sharpening grinds.

2.3.6 Body Diameter (D). The cylindrical portion of the die button (matrix) that fits to a hole in the die block or retainer.

2.3.7 Head Diameter (H). The diameter of the head portion of the die button (matrix).

2.3.8 Head Thickness (T). The thickness (length) of the head.

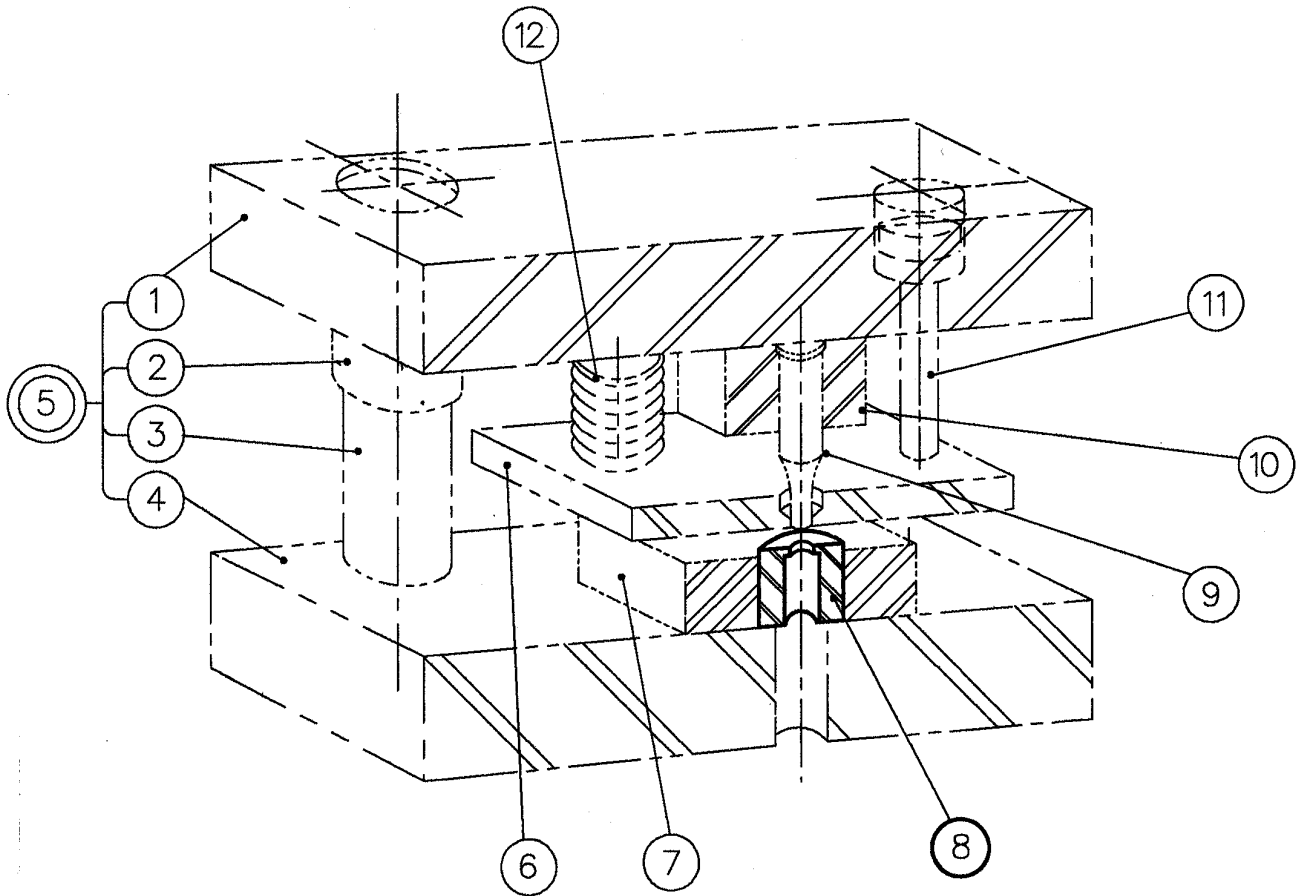
2.3.9 Overall Length (L). The total length of the die button (matrix).

2.3.10 Tapered Lead. The tapered lead of the body diameter at the relief hole end of a headless die button (matrix), to allow primary entry and piloting during assembly. The taper lead allows for the step between drill and ream operations in blind retainer holes.

2.3.11 Press Lead-in. The straight press-in lead of the body diameter at the relief hole end of a headless die button (matrix) to allow primary entry and piloting during assembly.

2.3.12 Fillet. The blend of body diameter to head diameter of a head-type die button to avoid stress concentration at a sharp corner.

2.3.13 Relief Hole Diameter (R). The diameter of the relief hole in the straight relief die button.



COMMON DIE LANGUAGE

- | | |
|------------------------------|--|
| 1. Punch Holder | 7. Die Button (Matrix) Retainer |
| 2. Guide Post Bushing | 8. Die Button (Matrix) |
| 3. Guide Post | 9. Punch |
| 4. Die Holder | 10. Punch Retainer |
| 5. Die Set | 11. Stripper Bolt |
| 6. Stripper Pad | 12. Stripper Spring |

Note: This Standard covers item 8 Die Button only.

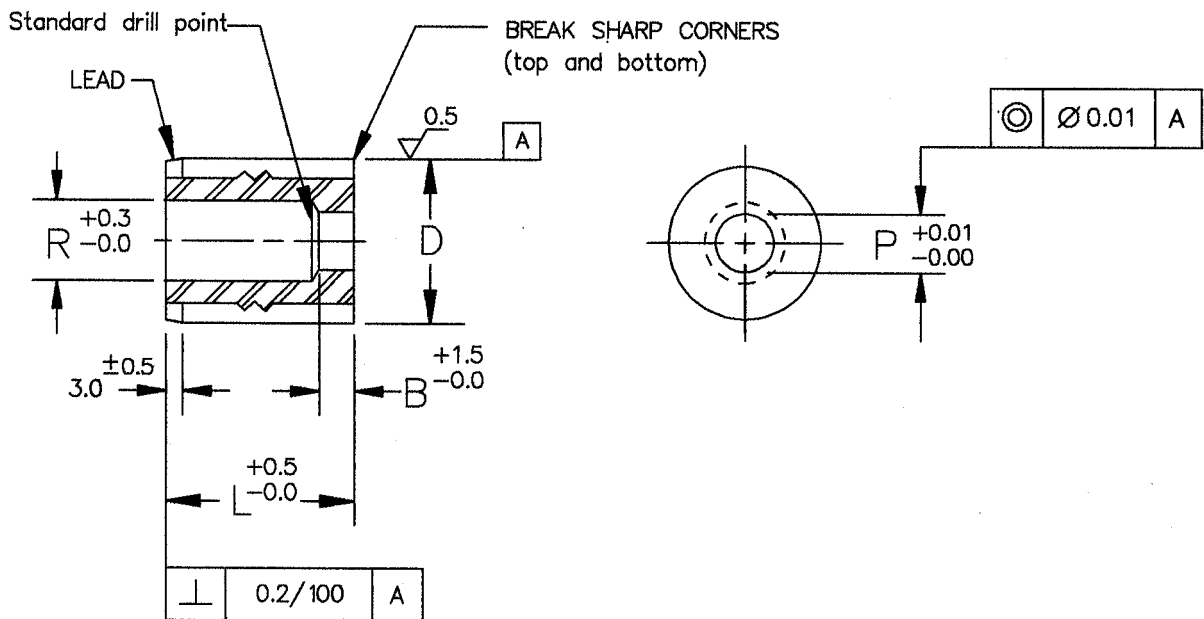


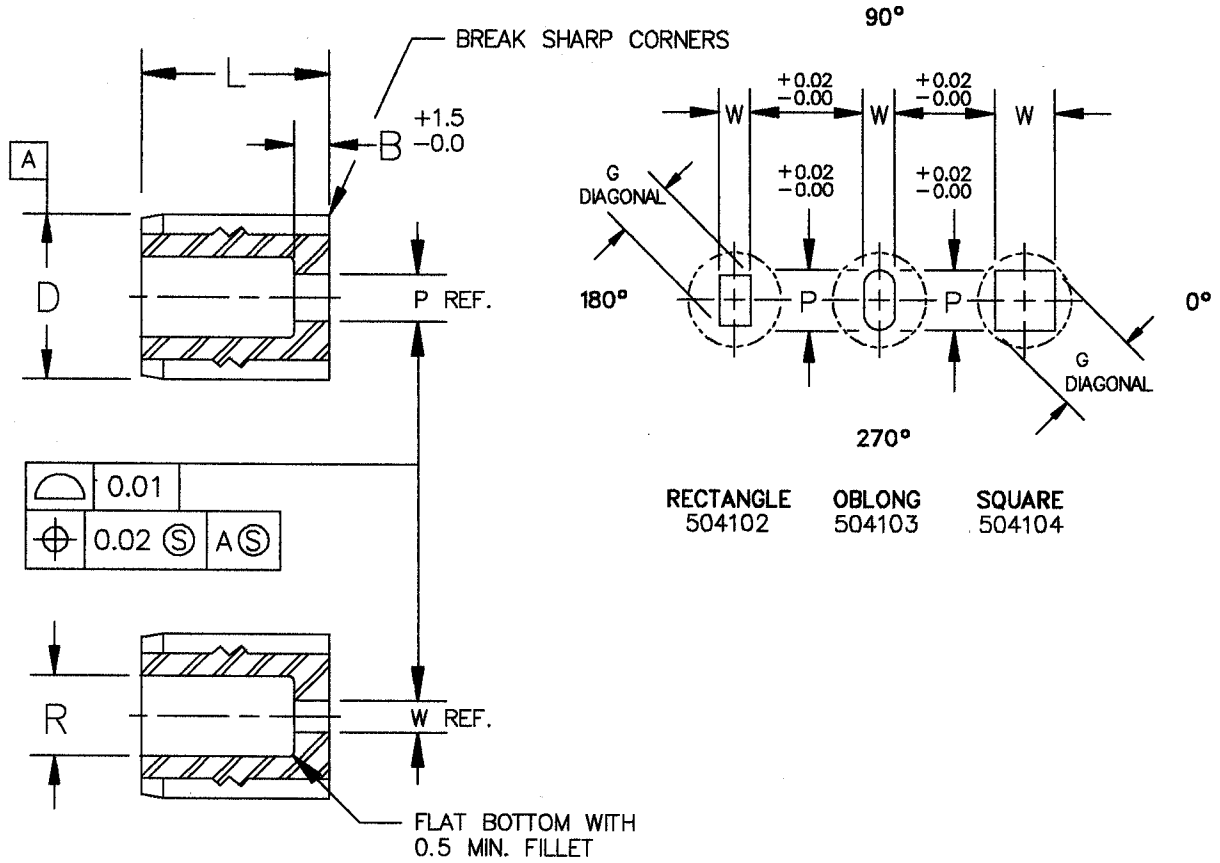
Table 1 Die Button – Straight Relief, Press Fit, Headless, Round.
(Code No. 504101)

Nominal Body		Standard Range PØ	Land Length B		Relief Hole Ø R	Overall Length L							
Ø D	Tolerance n5		Std.	Alternate		20	22	25	28	30	32	35	
				A									B
8.0	+0.016 +0.010	1.50 – 2.40	4			3.5							
		2.41 – 3.00	4			4.0							
		3.01 – 3.20	4	8		4.0							
10.0	+0.016 +0.010	1.50 – 2.40	4			3.5							
		2.41 – 3.00	4			4.0							
		3.01 – 3.20	4	8		4.0	20	22	25	28	30	32	35
		3.21 – 5.00	4	8		6.0							
13.0	+0.020 +0.012	1.50 – 2.40	5			3.5							
		2.41 – 3.00	5			4.0							
		3.01 – 3.20	5	8		4.0	20	22	25	28	30	32	35
		3.21 – 5.00	5	8		6.0							
16.0	+0.020 +0.012	5.01 – 7.20	5	8		8.0							
		7.21 – 8.80	5	8		9.5	20	22	25	28	30	32	35
20.0	+0.024 +0.015	7.00 – 8.80	5	12	20	9.5	20	22	25	28	30	32	35
8.81 – 11.00		5	12	20	12.0	20	22	25	28	30	32	35	
9.00 – 14.00		6	12	20	15.0	20	22	25	28	30	32	35	
25.0	+0.024 +0.015	11.00 – 14.00	6	12	20	15.0	20	22	25	28	30	32	35
		14.01 – 16.50	6	12	20	17.5	20	22	25	28	30	32	35

Table 1 Die Button – Straight Relief, Press Fit, Headless, Round.
(Code No. 504101)

Nominal Body		Standard Range P Ø	Land Length B			Relief Hole Ø R	Overall Length L							
Ø D	Tolerance j6		Std.	Alternate			20	22	25	28	30	32	35	
				A	B									
32.0	+0.011 -0.005	13.00 – 16.50	6	12	20	17.5	20	22	25	28	30	32	35	
		16.51 – 20.00	6	12	20	21.0								
38.0/40.0		16.00 – 20.00	8	12	20	21.0	20	22	25	28	30	32	35	
		20.01 – 26.00	8	12	20	27.0								
45.0		19.00 – 26.00	8	12	20	27.0		22	25	28	30	32	35	40
		26.01 – 35.00	8	12	20	36.0								
50.0		22.00 – 26.00	8	12	20	27.0		22	25	28	30	32	35	40
		26.01 – 35.00	8	12	20	36.0								
		35.01 – 40.00	8	12	20	41.0								
56.0		+0.012 -0.007	25.00 – 35.00	8	12	20	36.0		22	25	28	30	32	35
	35.01 – 40.00		8	12	20	41.0								
	40.01 – 45.00		8	12	20	46.0								
63.0	28.00 – 35.00		8	12	20	36.0		22	25	28	30	32	35	40
	35.01 – 40.00		8	12	20	41.0								
	40.01 – 45.00		8	12	20	46.0								
	45.01 – 50.00		8	12	20	51.0								
71.0	31.00 – 40.00		8	12	20	41.0		22	25	28	30	32	35	40
	40.01 – 45.00		8	12	20	46.0								
	45.01 – 50.00		8	12	20	51.0								
	50.01 – 56.00	8	12	20	57.0									
76.0	39.00 – 45.00	8	12	20	46.0			25	28	30	32	35	40	
	45.01 – 50.00	8	12	20	51.0									
	50.01 – 56.00	8	12	20	57.0									
	56.01 – 60.00	8	12	20	61.0									
85.0	+0.013 -0.009	43.00 – 50.00	8	12	20	51.0			25	28	30	32	35	40
		50.01 – 56.00	8	12	20	57.0								
		56.01 – 60.00	8	12	20	61.0								
		60.01 – 66.00	8	12	20	67.0								
90.0		45.00 – 50.00	8	12	20	51.0			25	28	30	32	35	40
		50.01 – 56.00	8	12	20	57.0								
		56.01 – 60.00	8	12	20	61.0								
		60.01 – 66.00	8	12	20	67.0								
		66.01 – 70.00	8	12	20	71.0								
100.0		50.00 – 56.00	8	12	20	57.0			25	28	30	32	35	40
	56.01 – 60.00	8	12	20	61.0									
	60.01 – 66.00	8	12	20	67.0									
	66.01 – 70.00	8	12	20	71.0									
	70.01 – 78.00	8	12	20	79.0									

Material: Tool steel
 Hardness range: Rockwell C 58–62
 Taper: Hole P, 0.1/100 mm max. back taper (cutting end small).
 Body: Diameter D straight to tapered within diameter tolerances (cutting end large).



NOTE: SPECIFICATIONS ARE THE SAME AS PAGE 6 AND 7 UNLESS OTHERWISE SHOWN.
KEY FLATS AND DOWEL SLOTS ARE STANDARD AT 0°. LOCATIONS OTHER THAN STANDARD
ARE SPECIFIED IN DEGREES COUNTERCLOCKWISE FROM 0°.

Table 2 Die Button—Straight Relief, Press Fit, Headless, Rectangle/Oblong/Square.
(Code No. 504102 / 504103 / 504104)

Nominal Body		Standard Range Min. Max. W - G/P	Land Length B			Relief Hole Ø R	Overall Length L						
Ø D	Tolerance n5		Std.	Alternate			20	22	25	28	30	32	35
				A	B								
10.0	+0.016 +0.010	1.20 - 3.20	4	8		4.0	20	22	25	28	30	32	35
		1.20 - 5.00	4	8									
13.0	+0.020	2.00 - 5.00	5	8		6.0	20	22	25	28	30	32	35
		2.00 - 7.20	5	8									
16.0	+0.012	2.40 - 7.20	5	8		8.0	20	22	25	28	30	32	35
		2.40 - 8.80	5	8									
20.0	+0.024	3.20 - 8.80	5	12	20	9.5	20	22	25	28	30	32	35
		3.20 - 11.00	5	12	20								
22.0	+0.015	4.00 - 14.00	6	12	20	15.0	20	22	25	28	30	32	35
25.0		+0.015	4.80 - 14.00	6	12	20	15.0	20	22	25	28	30	32
	4.80 - 16.50		6	12	20	17.5							

Table 2 Die Button— Straight Relief, Press Fit, Headless, Rectangle/Oblong/Square.
(Code No. 504102/ 504103/ 504104)

Nominal Body		Standard Range		Land Length B		Relief Hole Ø R	Overall Length L								
Ø D	Tolerance j6	Min. W	Max. G/P	Std.	Alternate		20	22	25	28	30	32	35		
					A									B	
32.0	+0.011 -0.005	5.50 - 16.50		6	12	20	17.5	20	22	25	28	30	32	35	
		5.50 - 20.00		6	12	20	21.0								
38.0/40.0		6.40 - 20.00		8	12	20	21.0	20	22	25	28	30	32	35	
		6.40 - 26.00		8	12	20	27.0								
45.0		8.00 - 26.00		8	12	20	27.0		22	25	28	30	32	35	40
		8.00 - 35.00		8	12	20	36.0								
50.0		9.00 - 35.00		8	12	20	36.0		22	25	28	30	32	35	40
		9.00 - 40.00		8	12	20	41.0								
56.0		10.00 - 35.00		8	12	20	36.0		22	25	28	30	32	35	40
		10.00 - 40.00		8	12	20	41.0								
	10.00 - 45.00		8	12	20	46.0									
63.0	11.00 - 40.00		8	12	20	41.0		22	25	28	30	32	35	40	
	11.00 - 45.00		8	12	20	46.0									
	11.00 - 50.00		8	12	20	51.0									
71.0	12.00 - 40.00		8	12	20	41.0		22	25	28	30	32	35	40	
	12.00 - 45.00		8	12	20	46.0									
	12.00 - 50.00		8	12	20	51.0									
	12.00 - 56.00		8	12	20	57.0									
76.0	15.00 - 45.00		8	12	20	46.0			25	28	30	32	35	40	
	15.00 - 50.00		8	12	20	51.0									
	15.00 - 56.00		8	12	20	57.0									
	15.00 - 60.00		8	12	20	61.0									
85.0	21.00 - 50.00		8	12	20	51.0			25	28	30	32	35	40	
	21.00 - 56.00		8	12	20	57.0									
	21.00 - 60.00		8	12	20	61.0									
	21.00 - 66.00		8	12	20	67.0									
90.0	25.00 - 50.00		8	12	20	51.0			25	28	30	32	35	40	
	25.00 - 56.00		8	12	20	57.0									
	25.00 - 60.00		8	12	20	61.0									
	25.00 - 66.00		8	12	20	67.0									
	25.00 - 70.00		8	12	20	71.0									
100.0	33.00 - 56.00		8	12	20	57.0			25	28	30	32	35	40	
	33.00 - 60.00		8	12	20	61.0									
	33.00 - 66.00		8	12	20	67.0									
	33.00 - 70.00		8	12	20	71.0									
	33.00 - 78.00		8	12	20	79.0									

Any flat on a shaped die button (matrix) will not exceed 0.1/100 mm within the maximum P dimension in relationship to a key flat or dowel slot.
Taper: Hole P or W, 0.1/100 mm max. back taper only (cutting end small).

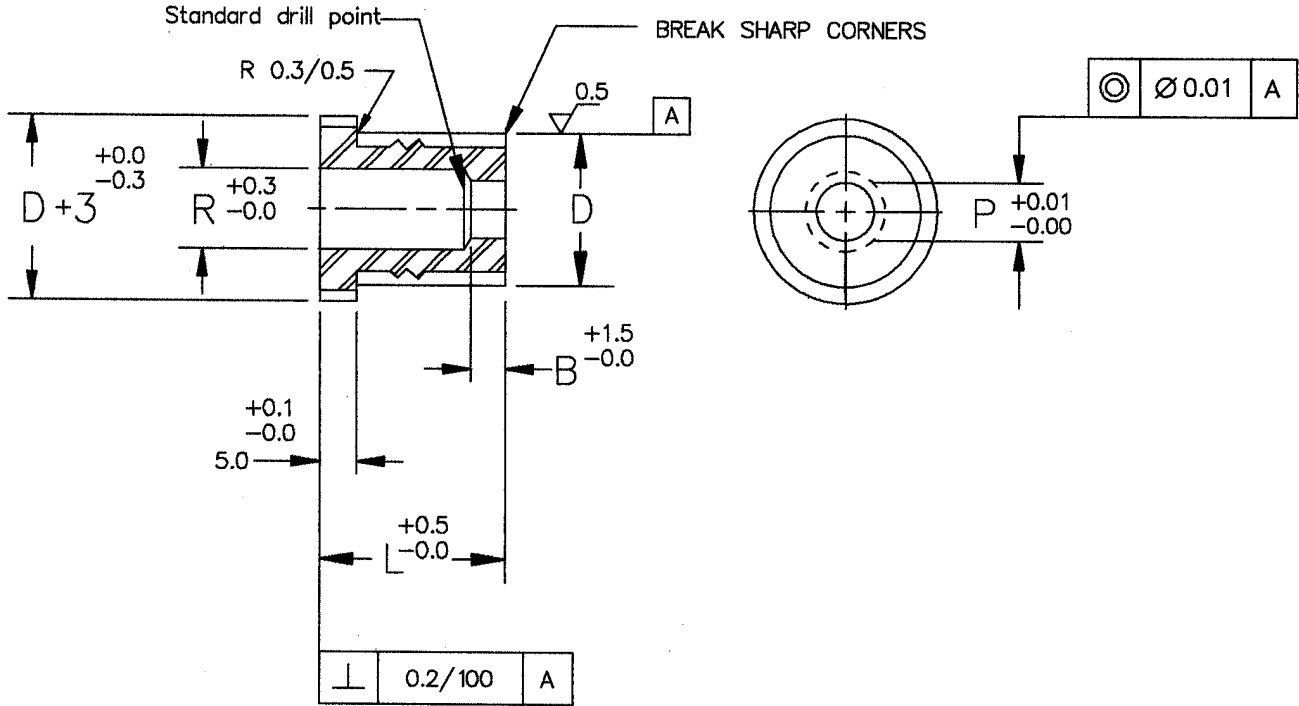


Table 3 Die Button—Straight Relief, Press Fit, Headed, Round.
(Code No. 504201)

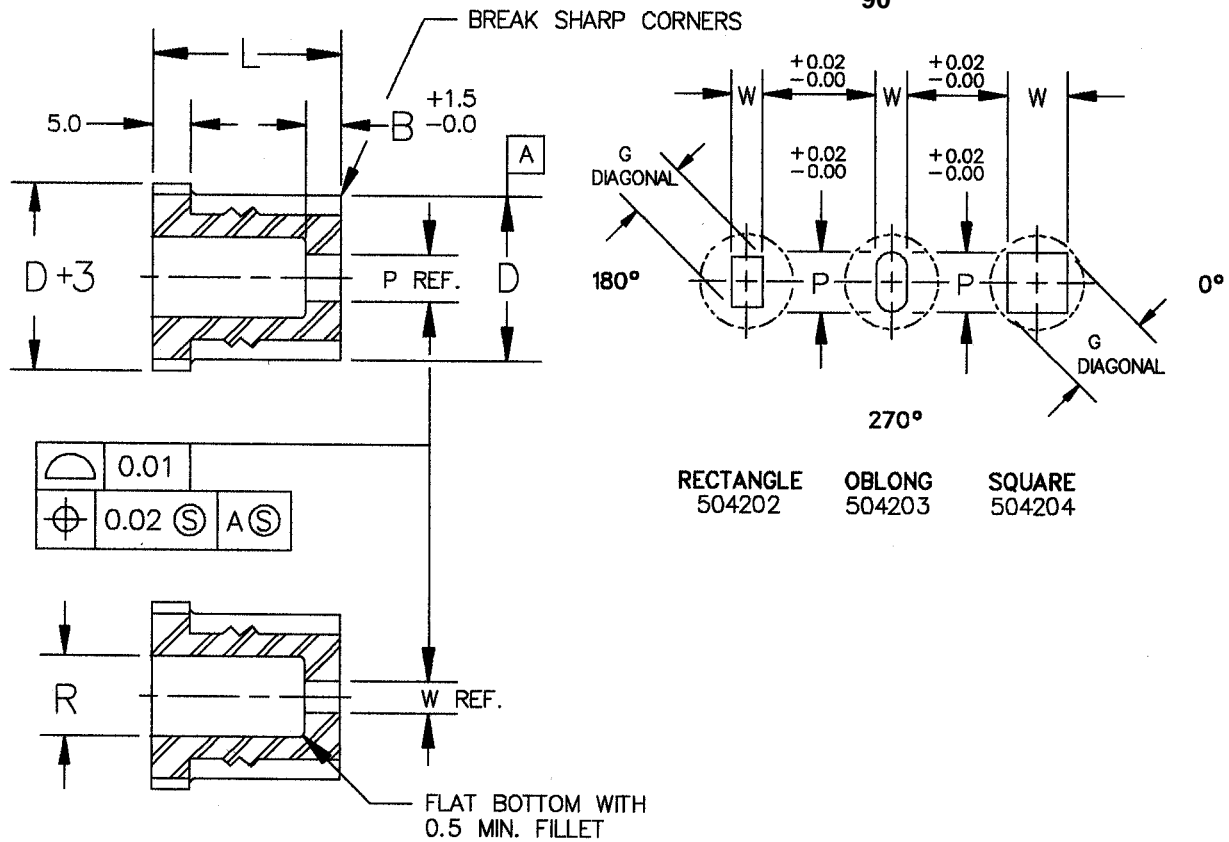
Nominal Body		Standard Range P \varnothing	Land Length B			Relief Hole \varnothing R	Overall Length L						
\varnothing D	Tolerance m5		Std.	Alternate			20	22	25	28	30	32	35
				A	B								
8.0	+0.012 +0.006	1.50 - 2.40	4			3.5	20	22	25	28	30	32	35
		2.41 - 3.00	4			4.0							
		3.01 - 3.20	4	8		4.0							
10.0	+0.012 +0.006	1.50 - 2.40	4			3.5	20	22	25	28	30	32	35
		2.41 - 3.00	4			4.0							
		3.01 - 3.20	4	8		4.0							
		3.21 - 5.00	4	8		6.0							
13.0	+0.015 +0.007	1.50 - 2.40	5			3.5	20	22	25	28	30	32	35
		2.41 - 3.00	5			4.0							
		3.01 - 3.20	5	8		4.0							
		3.21 - 5.00	5	8		6.0							
		5.01 - 7.20	5	8		8.0							
16.0	+0.015 +0.007	5.00 - 7.20	5	8		8.0	20	22	25	28	30	32	35
		7.21 - 8.80	5	8		9.5							
20.0	+0.017 +0.008	7.00 - 8.80	5	12	20	9.5	20	22	25	28	30	32	35
8.81 - 11.00		5	12	20	12.0								
22.0		9.00 - 14.00	6	12	20	15.0							
25.0	+0.017 +0.008	11.00 - 14.00	6	12	20	15.0	20	22	25	28	30	32	35
		14.01 - 16.50	6	12	20	17.5							
32.0	+0.020 +0.009	13.00 - 16.50	6	12	20	17.5	20	22	25	28	30	32	35
		16.51 - 20.00	6	12	20	21.0							
38.0/40.0	+0.020 +0.009	16.00 - 20.00	8	12	20	21.0	20	22	25	28	30	32	35
		20.01 - 26.00	8	12	20	27.0							

Material: Tool steel

Hardness range: Rockwell C 58-62

Taper: Hole P, 0.1/100 mm max. back taper (cutting end small).

Body: Diameter D straight to tapered within diameter tolerances (cutting end small).



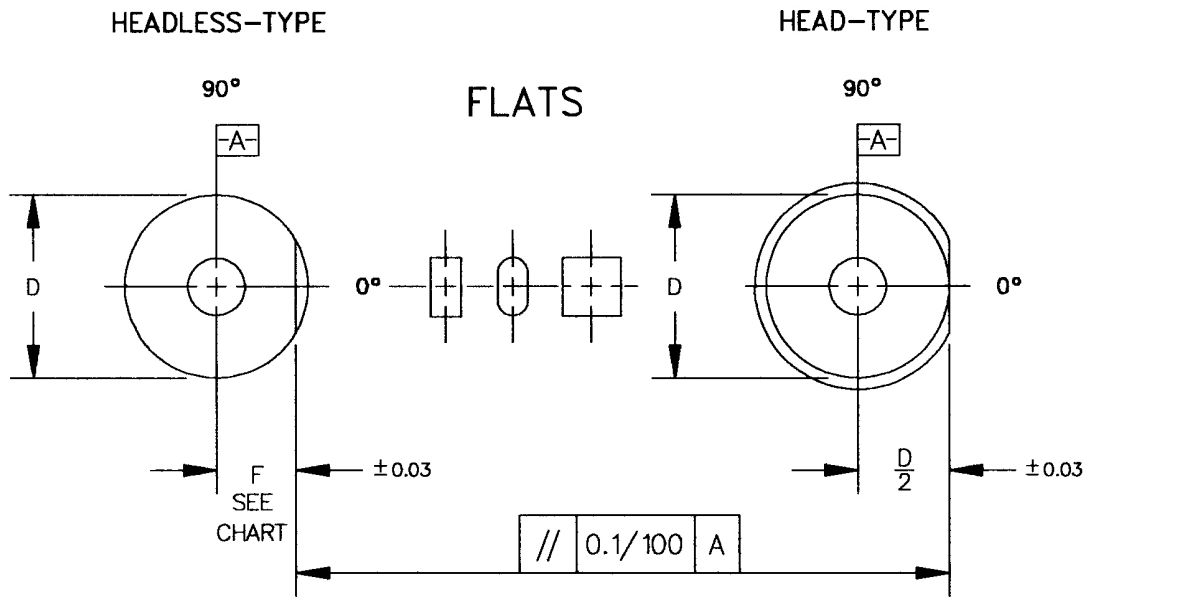
NOTE: SPECIFICATIONS ARE THE SAME AS PAGE 10 UNLESS OTHERWISE SHOWN.
KEY FLATS AND DOWEL SLOTS ARE STANDARD AT 0° . LOCATIONS OTHER THAN STANDARD
ARE SPECIFIED IN DEGREES COUNTERCLOCKWISE FROM 0° .

Table 4 Die Button—Straight Relief, Press Fit, Headed, Rectangle/Oblong/Square.
(Code No. 504202 / 504203 / 504204)

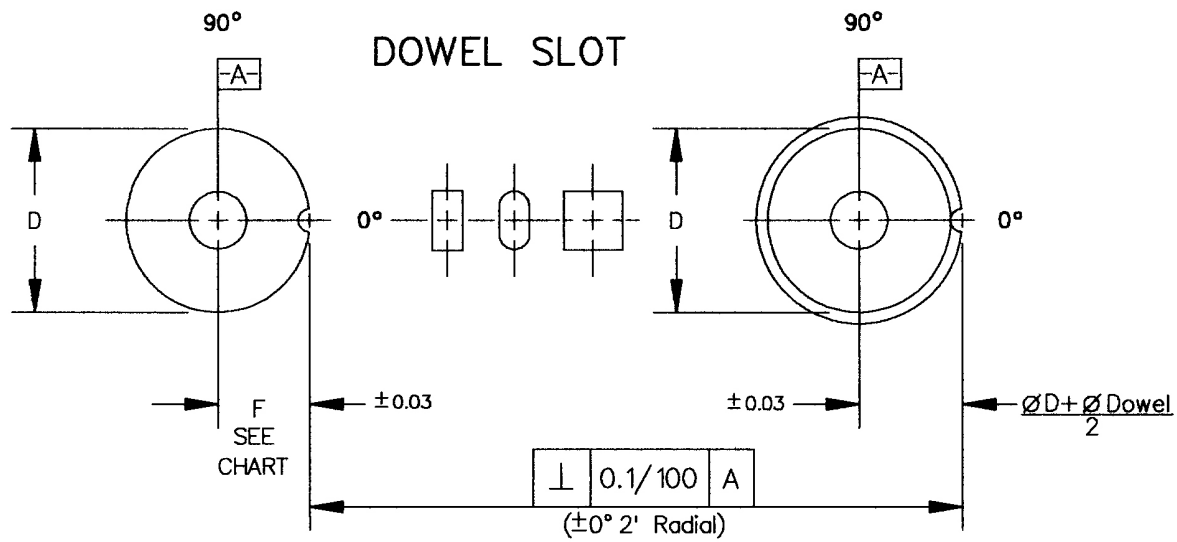
Nominal Body		Standard Range		Land Length B			Relief Hole \varnothing	Overall Length L						
\varnothing D	Tolerance m5	Min. W	Max. G/P	Std.	Alternate			R	20	22	25	28	30	32
					A	B								
10.0	$+0.012$ $+0.006$	1.20 - 3.20	1.20 - 5.00	4	8		4.0	20	22	25	28	30	32	35
				4	8		6.0							
13.0	$+0.015$ $+0.007$	2.00 - 5.00	2.00 - 7.20	5	8		6.0	20	22	25	28	30	32	35
16.0					5	8								
		2.40 - 7.20	2.40 - 8.80	5	8		9.5	20	22	25	28	30	32	35
20.0	$+0.017$ $+0.008$	3.20 - 8.80	3.20 - 11.00	5	12	20	9.5							
22.0					5	12	20	12.0						
25.0					6	12	20	15.0						
		4.80 - 14.00	4.80 - 16.50	6	12	20	15.0	20	22	25	28	30	32	35
32.0	$+0.020$ $+0.009$	5.50 - 16.50	5.50 - 20.00	6	12	20	17.5							
					6	12	20	21.0						
38.0/40.0			6.40 - 20.00	6.40 - 26.00	8	12	20	21.0						
				8	12	20	27.0	20	22	25	28	30	32	35

Any flat on a shaped die button (matrix) will not exceed 0.1/100 mm within the maximum P dimension in relationship to a key flat or dowel slot.
Taper: Hole P or W, 0.1/100 mm max. back taper only (cutting end small).

Orientation Devices



Body \varnothing ▶	08	10	13	16	20	22	25
F =	3.5	4.0	5.5	7.0	8.5	9.5	11.0
Body \varnothing ▶	32	38	40	45	50	56	63
F =	14.0	17.0	18.0	20.5	23.0	26.0	29.5
Body \varnothing ▶	71	76	85	90	100		
F =	33.5	35.5	40.0	42.5	47.5		



Dowel \varnothing		Body \varnothing D				
		08	10	13	16 to 25	32 to 71
3.0	F	4.7	5.5	6.7	.5D	.5D
4.0		5.2	6.0	7.2	.5D	.5D
6.0		6.2	7.0	8.2	.5D+1.0	.5D

NORTH AMERICAN PUNCH MANUFACTURERS ASSOCIATION
FOR INTERCHANGEABLE PUNCHES, DIES AND ACCESSORIES

- Punches - Ball-Lock, Light and Heavy Duty Metric NAPMA-9726-97
- Punches - Ball-Lock, Light and Heavy Duty Inch NAPMA-9912-99
- Die Buttons - (Matrixes) Straight Relief, Press-Fit Metric..... NAPMA-9917-00
- Die Buttons - (Matrixes) Straight Relief, Press-Fit Inch..... NAPMA-0002-00
- Punches - Head Type Metric NAPMA-0116-01
- Punches - Head Type Inch NAPMA-0101-01
- Die Buttons - (Matrixes) Taper Relief, Press-Fit Metric..... NAPMA-0118-02
- Retainers - Ball-Lock Punch and Die Button, Light and Heavy Duty
Metric..... NAPMA-0128-02
- Punches - Variable, Head Type Inch..... NAPMA-0204-02
- Die Buttons - (Matrixes) Variable, Press-Fit Inch NAPMA-0306-03
- Punch Guide Bushings - Variable, Press-Fit Inch ANSI/ASME B94.23-1969 (R1995)
- Die Buttons - (Matrixes) Ball-Lock Metric ANSI/ASME B94.29.1-1977 (R1995)
- Die Buttons - (Matrixes) Ball-Lock Inch ANSI/ASME B94.29-1970 (R1995)
- Gages - Functional, Ball-Lock Punches, Die Buttons and
Retainers Inch..... ANSI/ASME B94.17-1987 (R1995)
- Gages - Functional, Ball-Lock Punches, Die Buttons and
Retainers (Metric) ANSI/ASME B94.17.1-1977 (R1995)
- Punches - Variable, Head Type (Metric) ANSI/ASME B94.22.1-1977 (R1995)
- Die Buttons - Basic Taper Relief, Press-Fit..... ANSI/ASME B94.27-1970 (R1995)
- Punches - Variable, Angle Head Type and Related Quill Bushings ANSI/ASME B94.38-1972 (R1995)
- Punches - Basic Combination Angle Head Type and Related Quill
Bushings ANSI/ASME B94.39-1972 (R1995)
- Punches - Wire Type ANSI/ASME B94.40-1972 (R1995)
- Punches - Basic Angle Head Type and Related Quill Bushings ANSI/ASME B94.41-1972 (R1995)
- Punches - Basic Cylindrical Head Type and Related Quill Bushings ANSI/ASME B94.44-1972 (R1995)
- Gages - Functional, Ball-Lock Punches (Inch) ASME B94.56-1995
- Gages - Functional, Ball-Lock Punches (Metric) ASME B94.56.1M-1995