



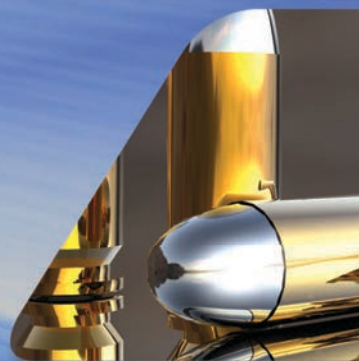
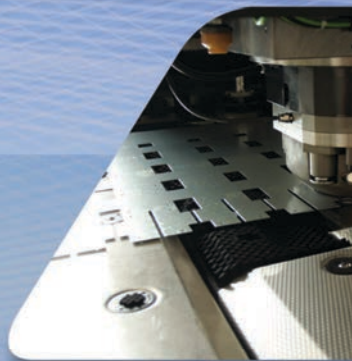
PRECISION PUNCH & TOOLING

— *Where Innovation Meets Precision* —



*Uncompromising Quality,
Outstanding Service... Every Time.*

Stamping
Molding
Pharmaceutical
Medical Components
Ammunition
Fin Die Tooling
Metal Forming
Fabricating
Aerospace
Electronics
Automotive
Battery
Can & End





mission statement

We will place our customers in a position to succeed by proactively understanding their evolving needs by continually expanding upon the products we offer, the core technologies we invest in, and the training of our people. We will relentlessly improve upon our value - creating processes to achieve unparalleled customer commitment, service, quality, and value so that we mutually benefit from predictable, sustainable, and profitable growth • •

vision statement

We are a manufacturer of high precision steel tooling and components, serving market segments involved in: Stamping, Injection Molding, Metal Forming, Fabricating, Ammunition, Electronics, Automotive, Aerospace, Can & End Tooling, Fin Die Tooling, Medical, Dental, Pharmaceutical, and Biotech.

We will continue to invest in our processes, core competencies, company knowledge/skills, and capital equipment to meet the evolving needs of our customers, offering a continually expanding portfolio of products and services. In doing so, we will develop customer-supplier integration and relationships which anticipate their product needs and simplify their decision to make us their one stop supplier of choice • •

GROUND PERFORATORS

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Serving Our Customers' Vision for Special and Custom Tooling Requirements.

Precision Punch & Tooling has a long-established reputation as a quality manufacturer and a leader for standard, custom, and special tooling for the many market segments and industries we serve. The markets and the needs of our customers continue to evolve at an ever-increasing rate. This demands that our capabilities continue to expand and our passion for innovation lead to new products, higher quality, and an even higher level of service and support to the customers we serve.

Precision Punch & Tooling has become the manufacturer of choice when product development and innovation of special or custom tooling for unique manufacturing applications is critical. Our Mission and Vision Statements guide our commitment to serving the evolving needs of our customers. • •

Engineering Solutions & Services

- Steel selection for your specific application
- Heat treatment methods to optimize tool life
- Engineered surface treatments
- Computer Aided Engineering
- Computer Aided Design and Manufacturing
- FEA analysis, process simulation, and tooling optimization
- Product development of specialty tooling
- Design for manufacture and performance



PUNCHES, PINS & DIES



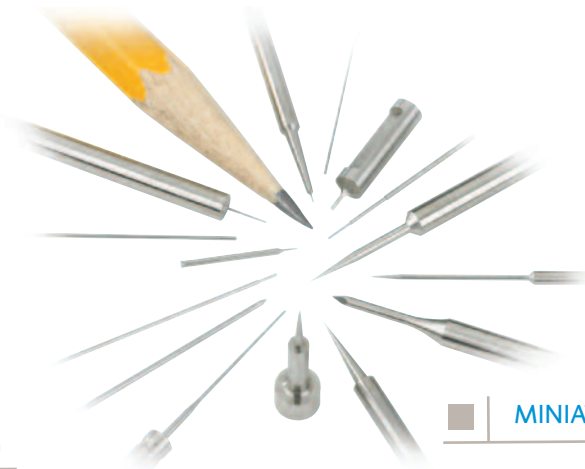
MEDICAL & PHARMACEUTICAL COMPONENTS



BLANKS



CAN & END TOOLING



MINIATURES



AMMUNITION



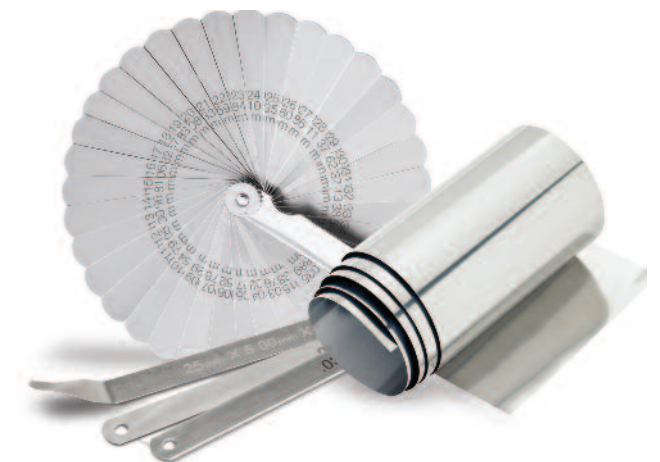
INJECTION MOLDING



FIN DIE TOOLING



CUSTOM, AUTOMOTIVE & AEROSPACE



FEELER GAGES & SHIM STOCK



PRECISION TOOLING MADE IN THE USA SINCE 1965

precision.

Living up to our commitment.

Our catalog lists our extensive line of ground perforators, close space punches, punch blanks, stepped punches, die buttons, core pins, nitrided ejector pins, forged pins, feeler gages, wire springs and nitrogen gas springs. Our huge stock of standard products is available for immediate delivery and usually ships within 24 hours. For your convenience, we also offer online tracking of your shipment.

Our custom capabilities are unmatched. Our team of process engineers will work with you from start to finish. They will evaluate your specifications and design a process using state of the art production equipment operated by highly skilled, experienced operators to consistently meet your requirements. You can count on us to meet your specifications and exceed your expectations.

From the tiniest one-off component to the most demanding high-volume requirements, **precision** and perfection can be found in each piece we manufacture. From the raw steel to the finished product, we never settle for anything less than best. That's why our customers rely on us for consistency and quality... *time and time again.*

www.ppunch.com

uncompromised quality | outstanding service

M-2 High Speed Steel Perforators

Form Ground • Rc 60/63

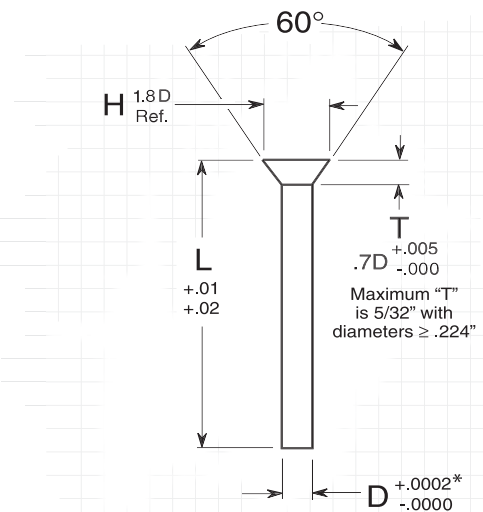


Style A



D Diameter ".001" increments	L = Overall Length					
	2"	2½"	3"	4"	6"	8"
.010 - .014	•					
.015 - .019	•					
.020 - .029	•	•	•	•		
.030 - .055		•	•	•		
.056 - .087		•	•	•	•	•
.088 - .131		•	•	•	•	•
.132 - .179		•	•	•	•	•
.180 - .225		•	•	•	•	•
.226 - .250		•	•	•	•	•

Unshaded areas delivery from stock.
Shaded areas delivery upon request.
Altered lengths available upon request.
Larger diameters or optional material on request.
All dimensions are inches.



*D = +.0003
-.0000 If greater than .250
and/or L (length) greater than 2.500

Minimum Cut-off Charge \$5.00			
Diameter	.010-.029	.030-.125	.126-.250
Price (each)	On Request	.30	.40

Quantity Discounts			
1-24	25-49	50-249	250+
NET	5%	10%	Call

How to order: Example				
Style	Dia.	Length	Mat.	Qty.
A	.126	2 1/2	M-2	50

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

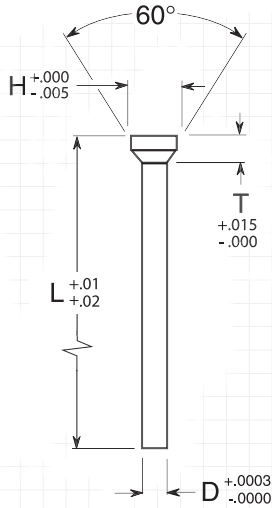
FAX 860.224.4238

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M-2 High Speed Steel Perforators

Form Ground • Rc 60/63

Style AB



D Diameter ".001" increments	H	T	L = Overall Length					
			2"	2½"	3½"	4"	6"	8"
.010 - .014	1/32	1/16	•	•	•	•		
.015 - .019	1/32	1/16	•	•	•	•		
.020 - .029	3/64	1/16	•	•	•	•		
.030 - .036	1/16	1/16			•	•		
.037 - .046	5/64	1/16		•	•	•	•	•
.047 - .055	3/32	5/64			•	•	•	•
.056 - .064	7/64	5/64			•	•	•	•
.065 - .078	1/8	5/64		•	•	•	•	•
.079 - .087	9/64	3/32						
.088 - .099	5/32	3/32		•	•	•	•	•
.100 - .120	11/64	3/32						
.121 - .131	3/16	3/32						
.132 - .147	13/64	3/32		•	•	•	•	•
.148 - .163	7/32	3/32						
.164 - .179	15/64	3/32						
.180 - .194	1/4	3/32		•	•	•	•	•
.195 - .210	17/64	3/32						
.211 - .225	9/32	3/32						
.226 - .241	19/64	3/32		•	•	•	•	•
.242 - .257	5/16	3/32						
.258 - .272	21/64	3/16		•	•	•	•	•
.273 - .288	11/32	3/16						
.289 - .304	23/64	3/16		•	•	•	•	•
.305 - .320	3/8	3/16						
.321 - .336	25/64	3/16		•	•	•	•	•
.337 - .352	13/32	3/16						
.353 - .368	27/64	3/16		•	•	•	•	•
.369 - .375	7/16	3/16						
.376 - .436	D +0.06 +0.09	3/16		•	•	•	•	•
.437 - .484		3/16		•	•	•	•	•
.485 - .562		3/16		•	•	•	•	•
.563 - .625		3/16		•	•	•	•	•
.626 - 1.000		3/16	On Request					

Unshaded areas delivery from stock.
 Shaded areas delivery upon request.
 Altered lengths available upon request.
 Larger diameters or optional material on request.
 All dimensions are inches.

Minimum Cut-off Charge \$5.00					
Diameter	.010-.029	.030-.125	.126-.375	.376-.499	.500-.625
Price (each)	On request	.30	.40	.60	On request

Quantity Discounts			
1-24	25-49	50-249	250+
NET	5%	10%	Call

How to order: Example				
Style	Dia.	Length	Mat.	Qty.
AB	.126	2 1/2	M-2	50

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

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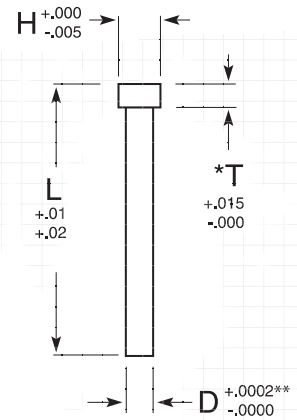
M-2 High Speed Steel Perforators

Form Ground • Rc 60/63



Style B

D Diameter ".001" increments	H	T	L = Overall Length							
			2"	2½"	3½"	4"	6"	8"	10"	12"
.010 - .014	1/32	1/16	•	•	•	•				
.015 - .019	1/32	1/16	•	•	•	•				
.020 - .029	3/64	1/16	•	•	•	•				
.030 - .036	1/16	1/16			•	•				
.037 - .046	5/64	1/16		•	•	•	•			
.047 - .055	3/32	3/32			•	•	•			
.056 - .064	7/64	3/32								
.065 - .078	1/8	3/32		•	•	•	•			
.079 - .087	9/64	3/32								
.088 - .099	5/32	3/32								
.100 - .120	11/64	3/32		•	•	•	•		•	•
.121 - .131	3/16	1/8								
.132 - .147	13/64	1/8		•	•	•	•	•	•	•
.148 - .163	7/32	1/8								
.164 - .179	15/64	1/8								
.180 - .194	1/4	1/8								
.195 - .210	17/64	1/8		•	•	•	•	•	•	•
.211 - .225	9/32	1/8								
.226 - .241	19/64	1/8								
.242 - .257	5/16	3/16		•	•	•	•	•	•	•
.258 - .272	21/64	3/16								
.273 - .288	11/32	3/16								
.289 - .304	23/64	3/16								
.305 - .320	3/8	3/16		•	•	•	•	•	•	•
.321 - .336	25/64	3/16								
.337 - .352	13/32	3/16								
.353 - .368	27/64	3/16		•	•	•	•	•	•	•
.369 - .375	7/16	3/16								
.376 - .436	D +.06 +.09	3/16		•	•	•	•	•	•	•
.437 - .484		3/16		•	•	•	•	•	•	•
.485 - .562		3/16		•	•	•	•	•	•	•
.563 - .625		3/16		•	•	•	•	•	•	•
.626 - 1.000		3/16	On Request							



* Optional "T" of 3/16"
All Sizes

**D = +.0003 If greater than .375
-.0000
and/or L (length) greater than 2.500
or style BT.

Unshaded areas delivery from stock.
Shaded areas delivery upon request.
Altered lengths available upon request.
Larger diameters or optional material on request.
All dimensions are inches.

Minimum Cut-off Charge \$5.00					
Diameter	.010-.029	.030-.125	.126-.375	.376-.499	.500-.625
Price (each)	On request	.30	.40	.60	On request

Quantity Discounts			
1-24	25-49	50-249	250+
NET	5%	10%	Call

How to order: Example				
Style	Dia.	Length	Mat.	Qty.
B	.126	2 1/2	M-2	50

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

FAX 860.224.4238

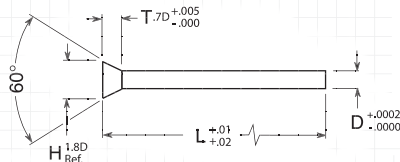
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Close Space Punch Blanks

M-2: Rc 60/63 • A-2: Rc 60/62 • PM-10V: Rc 61/63



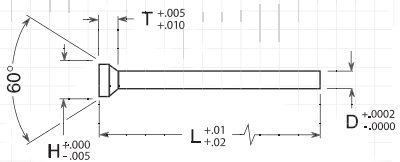
Style CS-A



Style CS-A	D Dia.	L Length	2½"	
			A-2 M-2	PM-10V
CS-A - 06	.0625	2 1/2 Only	•	•
CS-A - 09	.0938		•	•
CS-A - 12	.1250		•	•
CS-A - 15	.1562		•	•
CS-A - 18	.1875		•	•
CS-A - 21	.2188		•	•
CS-A - 25	.2500*		•	•

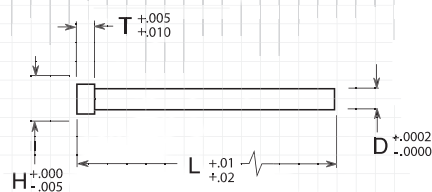
*.250 diameter T= 5/32

Style CS-AB



Style CS-AB	D Dia.	H	T	L Length	2½"		3½"	
					A-2 M-2	PM-10V	A-2 M-2	PM-10V
CS-AB-06	.0625	7/64	5/64	Standard 2 1/2 - 3 1/2 Cut to length (See cut-off charge below)	•	•	•	On Request
CS-AB-09	.0938	5/32	3/32		•	•	•	
CS-AB-12	.1250	3/16	3/32		•	•	•	
CS-AB-15	.1562	7/32	3/32		•	•	•	
CS-AB-18	.1875	1/4	3/32		•	•	•	
CS-AB-21	.2188	9/32	3/32		•	•	•	
CS-AB-25	.250	5/16	3/32		•	•	•	
CS-AB-31	.3125	3/8	3/16		•	•	•	
CS-AB-37	.375	7/16	3/16		•	•	•	

Style CS-B



Style CS-B	D Dia.	H	T	L Length	2½"		3½"	
					A-2 M-2	PM-10V	A-2 M-2	PM-10V
CS-B - 06	.0625	1/8	1/8	Standard 2 1/2 - 3 1/2 Cut to length (See cut-off charge below)	•	•	•	•
CS-B - 09	.0938	5/32	1/8		•	•	•	•
CS-B - 12	.1250	3/16	1/8		•	•	•	•
CS-B - 15	.1562	7/32	1/8		•	•	•	•
CS-B - 18	.1875	1/4	1/8		•	•	•	•
CS-B - 21	.2188	9/32	1/8		•	•	•	•
CS-B - 25	.250	5/16	1/8		•	•	•	•
CS-B - 31	.3125	3/8	3/16		•	•	•	•
CS-B - 37	.375	7/16	3/16		•	•	•	•

• Delivery from stock.
All dimensions are inches.

Minimum Cut-off Charge \$5.00		
Diameter	.0625-.125	.1562-.375
Price (each)	.30	.40

Quantity Discounts			
1-24	25-49	50-249	250+
NET	5%	10%	Call

How to order: Example				
Style	Dia.	Length	Mat.	Qty.
CS-B-12	.0625-.375	2 1/2	M-2	50

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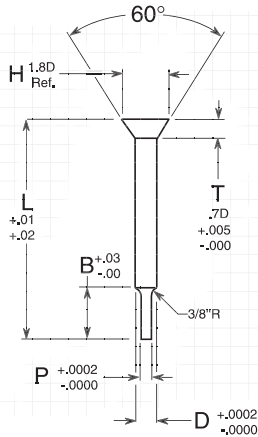
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Stepped Close Space Punches

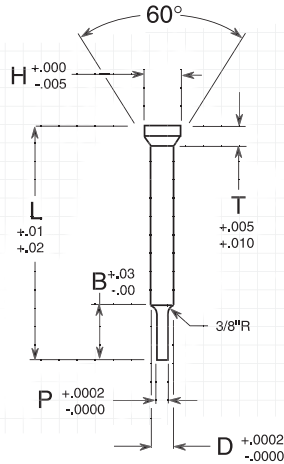
M-2: Rc 60/63 • A-2: Rc 60/62 • PM-10V: Rc 61/63



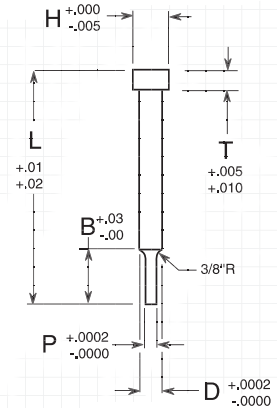
Style CS-AP



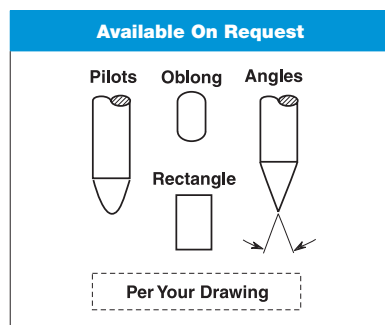
Style CS-ABP



Style CS-BP



All Styles	D Dia.	L Length	P = Point Diam. any .0001" incr.	B = Std. Point Length	2 1/2"		3 1/2"	
					A-2 M-2	PM-10V	A-2 M-2	PM-10V*
-06	.0625	Standard 2 1/2 - 3 1/2 Cut to length (See cut-off charge below)	Min.	.031	3/16	•	•	•
-09	.0938		Min.	.062	1/4	•	•	•
-12	.125		Min.	.093	5/16	•	•	•
-15	.1562		Min.	.125	3/8	•	•	•
-18	.1875		Min.	.156	7/16	•	•	•
-21	.2188		Min.	.182	1/2	•	•	•
-25	.250		Min.	.218	9/16	•	•	•
-31	.3125		Min.	.281	5/8	•	•	•
-37	.375		Min.	.343	5/8	•	•	•



- Delivery 1-3 days.
- (*) CS-BP only.
- See page 4 for BLANK sizes available.
- All dimensions are inches.

Minimum Cut-off Charge \$5.00		
Diameter	.0625-.125	.1562-.375
Price (each)	.30	.40

Quantity Discounts					
1-5	6-24	25-49	50-249	250+	
\$10 Set	NET	5%	10%	Call	

How to order: Example				
Style	Length	Mat.	Pt. Dia.	Qty.
CS-BP-06	2	A-2	.031	15

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

FAX 860.224.4238

sales@ppunch.com

Punch Blanks

M-2: Rc 60/63 • A-2: Rc 60/62 • D-2, PM-M4, PM-10V: Rc 61/63

Style PPB



Standard Lengths

Style PPB	D Dia.	D Dia.	T*	L = Length 1/4" increm.	A-2	M-2	D-2	PM-M4	PM-10V
PPB - 12	1/8	1/4	1/8 (3/16)	1 1/4 - 3	•	•	•	•	•
PPB - 18	3/16	5/16	1/8 (3/16)	1 1/4 - 3 1/2	•	•	•	•	•
PPB - 25	1/4	3/8	3/16 (1/8)	1 1/4 - 3 1/2	•	•	•	•	•
PPB - 31	5/16	7/16	3/16 (1/8)	1 1/4 - 4	•	•	•	•	•
PPB - 37	3/8	1/2	3/16 (1/8)	1 1/4 - 4	•	•	•	•	•
PPB - 43	7/16	9/16	3/16	1 1/2 - 4	•	•	•	•	•
PPB - 50	1/2	5/8	3/16	1 1/2 - 4	•	•	•	•	•
PPB - 62	5/8	3/4	3/16 (1/4)	1 1/2 - 4	•	•	•	•	•
PPB - 75	3/4	7/8	3/16 (1/4)	1 1/2 - 4	•	•	•	•	•
PPB - 100	1	1 1/8	3/16 (1/4)	1 1/2 - 4	•	•	•	•	•

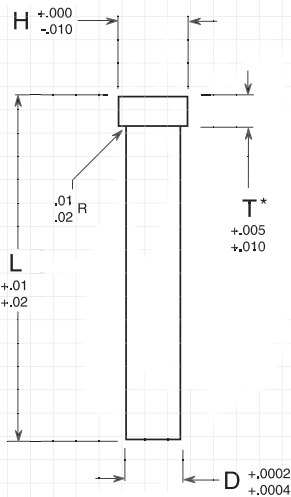
* PPBT: Optional T (PPBT) A-2 and M-2 only.

Extra Length 6" and 8"

Style PPB	D Dia.	H Dia.	T = Head Thickness	6"		8"	
				A-2	M-2	A-2	M-2
PPB - 12	1/8	1/4	1/8	•	•	•	•
PPB - 18	3/16	5/16	1/8	•	•	•	•
PPB - 25	1/4	3/8	3/16	•	•	•	•
PPB - 31	5/16	7/16	3/16	•	•	•	•
PPB - 37	3/8	1/2	3/16	•	•	•	•
PPB - 43	7/16	9/16	3/16	•	•	•	•
PPB - 50	1/2	5/8	3/16	•	•	•	•
PPB - 62	5/8	3/4	3/16	•	•	•	•
PPB - 75	3/4	7/8	3/16	•	•	•	•
PPB - 100	1	1 1/8	3/16	•	•	•	•

Extra Length 10" and 12" (available on request)

• Delivery from stock.
All dimensions are inches.



Quantity Discounts			
1-24	25-49	50-249	250+
NET	5%	10%	Call

How to order: Example			
Style	Length	Mat.	Qty.
PPB 25	3	M-2	50
PPBT 12	3	M-2	50

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

FAX 860.224.4238

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Ejector Punch Blanks

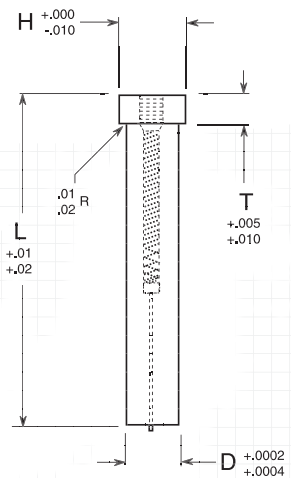
M-2: Rc 60/63 • D-2, PM-M4, PM-10V: Rc 61/63



Style PEB

Style PEB	D Dia.	H	T	L = Length 1/4 " increm.	Component (PEC)	M-2	D-2	PM-M4	PM-10V
12 *	1/8	1/4	1/8	1 1/4 - 2 1/2	10	•			
18	3/16	5/16	1/8	1 1/4 - 3	20	•	•	•	•
25	1/4	3/8	3/16	1 1/4 - 3	29	•	•	•	•
31	5/16	7/16	3/16	1 1/4 - 4	42	•	•	•	•
37	3/8	1/2	3/16	1 1/4 - 4	60	•	•	•	•
43	7/16	9/16	3/16	1 1/2 - 4	60	•	•	•	•
50	1/2	5/8	3/16	1 1/2 - 4	60	•	•	•	•
62	5/8	3/4	3/16	1 1/2 - 4	90	•	•	•	•
75	3/4	7/8	3/16	1 1/2 - 4	90	•	•	•	•
100	1	1 1/8	3/16	1 1/2 - 4	90	•	•	•	•

* PEB-12 stocked in M-2 only.



Component Specifications

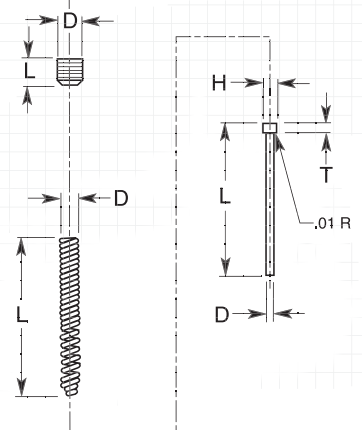
Component	Set Screw		Spring		Pin			
	D	L	D	L	D	L	H	T
PEC-05	3-48	0.19	.080	2.40	.017	1.10	.048	.031
PEC-10	2-56	0.12	.065	2.40	.022	2.0	.062	.031
PEC-20	3-48	0.19	.080	2.40	.027	2.0	.062	.047
PEC-29	5-40	0.19	.104	2.40	.027	2.0	.073	.047
PEC-42	8-32	0.19	.135	3.20	.041	2.0	.094	.062
PEC-60	10-32	0.19	.162	3.00	.058	2.0	.120	.062
PEC-90	1/4-28	0.25	.216	3.05	.089	2.25	.156	.094
PEC-120	5/16-24	0.25	.270	2.56	.120	2.25	.188	.094

Shaded areas delivery upon request.
Components may be purchased separately.
• Delivery from stock.
All dimensions are inches.

Quantity Discounts			
1-24	25-49	50-249	250+
NET	5%	10%	Call

How to order: Example			
Style	Length	Mat.	Qty.
PEB-31	3 1/4	PM-M4	50

Style PEC



For pricing and delivery call 860.229.9902 or visit www.ppunch.com

FAX 860.224.4238

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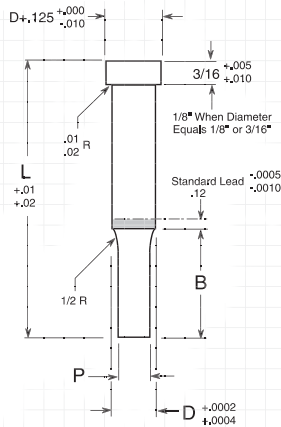
Stepped Punches

M-2: Rc 60/63 • A-2: Rc 60/62 • D-2, PM-M4, PM-10V: Rc 61/63

Style PS*



Point	Tolerance	Concentricity	
		P to D	T.I.R.
Round	#1 $+0.0002$ -0	.0003	
	#2 $+0.0005$ -0	.0005	
Shaped	#1 $+0.0002$ -0	.0003	
	#2 $+0.0005$ -0.0005	.001	
How to check "G"... $G = \sqrt{P^2 + W^2}$			



Standard Keying			
Parallel to the major axis (Ref. 0°) Custom location on request.			
Single Flat 1F	Double Flat 2F	Dowel 2D	
			$\frac{D}{2} +.0625$ for 1/8" Dia. Dowel

Style PSP	Style PSO	Style PSD
Round 	Oblong 	Dee
Style PSR	Style PSK	Style PSF
Rectangle 	Radius Rectangle (also includes square) 	Flatted Round

* When ordering please specify style PSP, PSO, PSD, PSR, PSK or PSF.
For additional shapes see page 25.
All dimensions are inches.

How to order: Example							
Style	Length	Mat.	Pt. Dim. (P x W)	Pt. Length	Tol.	Keying	Qty.
PSP-31	2	M-2	.138	1	#2		24
PSO-25	2 1/4	10-V	.1614 x .0986	1 1/4	#1	1F	6
PSK-37	2 1/4	10-V	.1614x.1267 R .010	1 1/4	#1	1F	6

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

FAX 860.224.4238

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Stepped Punches

M-2: Rc 60/63 • D-2, PM-M4, PM-10V: Rc 61/63



Style PS*	D Dia.	L = Standard Length											Point Length B	Round Min. P	Shapes		
															Min. W	Max. P or G	
PS* 12	1/8	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3				1/2	.031	.062	.1245	
			1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3				3/4	.062	.062		
				1 3/4	2	2 1/4	2 1/2	2 3/4	3				1	.062	.062		
					2	2 1/4	2 1/2	2 3/4	3				1 1/4	.093	.093		
PS* 18	3/16	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2		1/2	.046	.062	.1870	
			1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2		3/4	.062	.062		
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2		1	.062	.062		
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2		1 1/4	.093	.093		
						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2		1 1/2	.125	.125		
PS* 25	1/4	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2		1/2	.062	.062	.2495	
			1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2		3/4	.062	.062		
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2		1	.062	.062		
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2		1 1/4	.093	.093		
						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2		1 1/2	.125	.125		
PS* 31	5/16	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1/2	.093	.093	.3120
			1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.093	.093	
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.093	.093	
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.093	.093	
						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.125	.125	
PS* 37	3/8	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1/2	.125	.125	.3745
			1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.125	.125	
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.125	.125	
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.125	.125	
						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.125	.125	
PS* 43	7/16		1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.187	.187	.4370
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.187	.187	
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.187	.187	
						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.187	.187	
PS* 50	1/2		1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.225	.187	.4995
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.225	.187	
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.225	.187	
						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.225	.187	
PS* 62	5/8		1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.310	.250	.6245
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.310	.250	
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.310	.250	
						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.310	.250	
PS* 75	3/4		1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.390	.312	.7495
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.390	.312	
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.390	.312	
						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.390	.312	
PS* 100	1		1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.485	.375	.9995
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.485	.375	
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.485	.375	
						2 1/4		2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.485	.375	

* When ordering please specify style PSP, PSO, PSD, PSR, PSK or PSF.

Delivery: Round = 1 to 2 days; Shapes = 3 days.

Coatings available.

All dimensions are inches.

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

FAX **860.224.4238**

sales@ppunch.com

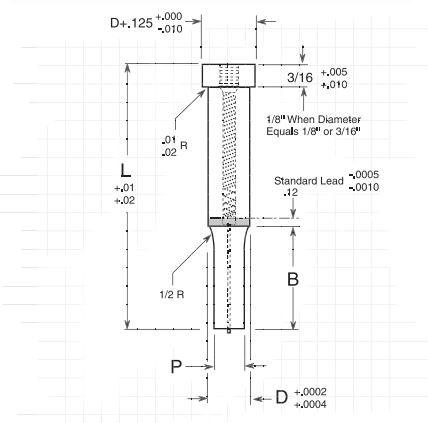
Ejector Punches

M-2: Rc 60/63 • D-2, PM-M4, PM-10V: Rc 61/63

Style PE*



Point	Tolerance	Concentricity	
		P to D	T.I.R.
Round	#1 $\begin{smallmatrix} +.0002 \\ -.0 \end{smallmatrix}$	.0003	
	#2 $\begin{smallmatrix} +.0005 \\ -.0 \end{smallmatrix}$	.0005	
Shaped	#1 $\begin{smallmatrix} +.0002 \\ -.0 \end{smallmatrix}$	.0003	
	#2 $\begin{smallmatrix} +.0005 \\ -.0005 \end{smallmatrix}$	.001	
How to check "G"... $G = \sqrt{P^2 + W^2}$			



Standard Keying		
Parallel to the major axis (Ref. 0°) Custom location on request.		
Single Flat 1F 	Double Flat 2F 	Dowel 2D

See page 7 for PEC Component Specifications.

Style PEP	Style PEO	Style PED
Round 	Oblong 	Dee
Style PER	Style PEK	Style PEF
Rectangle 	Radius Rectangle (also includes square) 	Flatted Round

How to order: Example							
Style	Length	Mat.	Pt. Dim. (P x W)	Pt. Length	Tol.	Keying	Qty.
PEP-31	2	M-2	.138	1	#2		24
PEO-25	2 1/4	10-V	.1614 x .0986	1 1/4	#1	1F	6
PEK-37	2 1/4	10-V	.1614 x .1267 R .010	1 1/4	#1	1F	6

* When ordering please specify style PEP, PEO, PED, PER, PEK or PEF.
For additional shapes see page 25.
All dimensions are inches.

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

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Ejector Punches

M-2: Rc 60/63 • D-2, PM-M4, PM-10V: Rc 61/63



Style PE*	D Dia.	L = Standard Length												Point Length B	Round Min. P	Shapes		Ejector Comp. PEC
																Min. W	Max. P or G	
PE* 12	1/8	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2							1/4	.050	.062	.1245	PEC-10
		1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2							1/2	.050	.062		
PE* 18	3/16	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3					1/2	.062	.062	.1870	PEC-20
			1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3					3/4	.062	.062		
				1 3/4	2	2 1/4	2 1/2	2 3/4	3					1	.062	.093		
PE* 25	1/4	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3					1/2	.093	.093	.2495	PEC-29
			1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3					3/4	.093	.093		
				1 3/4	2	2 1/4	2 1/2	2 3/4	3					1	.093	.093		
PE* L					2	2 1/4	2 1/2	2 3/4	3					1 1/4	.093	.093		
PE* 31	5/16	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1/2	.125	.125	.3120	PEC-42
			1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.125	.125		
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.125	.125		
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.125	.125		
PE* L						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.125	.125		
PE* 37	3/8	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1/2	.187	.187	.3745	PEC-60
			1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.187	.187		
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.187	.187		
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.187	.187		
PE* L						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.187	.187		
PE* 43	7/16		1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.187	.187	.4370	PEC-60
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.187	.187		
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.187	.187		
PE* L						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.187	.187		
PE* 50	1/2		1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.225	.250	.4995	PEC-60
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.225	.250		
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.225	.250		
PE* L						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.225	.250		
PE* 62	5/8		1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.310	.282	.6245	PEC-90
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.310	.282		
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.310	.282		
PE* L						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.310	.282		
PE* 75	3/4		1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.390	.312	.7495	PEC-90
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.390	.312		
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.390	.312		
PE* L						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.390	.312		
PE* 100	1		1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	3/4	.485	.375	.9995	PEC-90
				1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1	.485	.375		
					2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/4	.485	.375		
PE* L						2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	1 1/2	.485	.375		

* When ordering please specify style PEP, PEO, PED, PER, PEK or PEF.

Note: PE* L denotes longest Point Length — Please specify when ordering.

Delivery: Round = 1 to 2 days; Shapes = 3 days.

Coatings available.

All dimensions are inches.

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

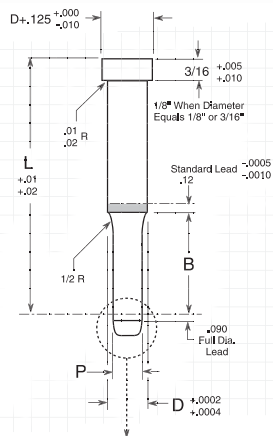
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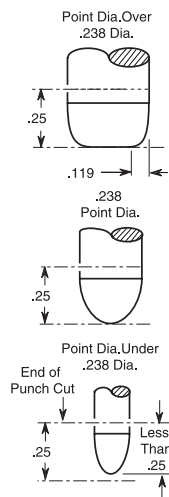
Pilot Punches

M-2: Rc 60/63 • A-2: Rc 60/62 • D-2, PM-M4, PM-10V: Rc 61/63

Style PPP



Parabolic Points at Various Diameters



Style PPP	D Dia.	L = Standard Length										Point Length B	Point Diam. F		
													Min	Max	
12	1/8	11/4	11/2	13/4	2	2 1/4	2 1/2	23/4	3			1/2	.061	.125	
			11/2	13/4	2	2 1/4	2 1/2	23/4	3			3/4	.061	.125	
				13/4	2	2 1/4	2 1/2	23/4	3			1	.061	.125	
					2	2 1/4	2 1/2	23/4	3			1 1/4	.092	.125	
18	3/16	11/4	11/2	13/4	2	2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	1/2	.061	.1875	
			11/2	13/4	2	2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3/4	.061	.1875	
				13/4	2	2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	1	.061	.1875	
					2	2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	1 1/4	.092	.1875	
25	1/4				2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	1 1/2	.124	.1875		
		11/4	11/2	13/4	2	2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	1/2	.061	.250	
			11/2	13/4	2	2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3/4	.061	.250	
				13/4	2	2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	1	.061	.250	
31	5/16				2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	1 1/4	.092	.250		
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	1 1/2	.124	.250		
		11/4	11/2	13/4	2	2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1/2	.092	.3125
			11/2	13/4	2	2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	3/4	.092	.3125
37	3/8				2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1	.092	.3125	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/4	.092	.3125	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.3125	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.3125	
43	7/16				2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	3/4	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/4	.124	.375	
50	1/2				2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
62	5/8				2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
75	3/4				2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
100	1				2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	
					2 1/4	2 1/2	23/4	3	3 1/4	3 1/2	3 3/4	1 1/2	.124	.375	

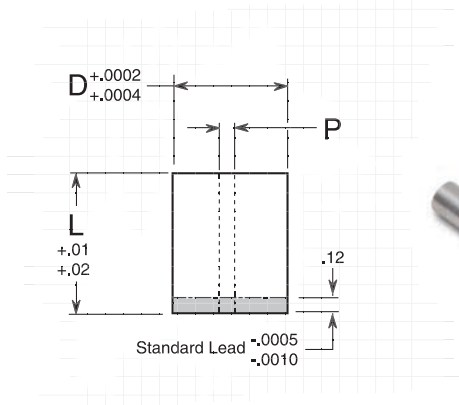
Delivery: 3 days. Coatings available. All dimensions are inches.

Tolerance	Concentricity	
	P to D	T.I.R
#1 $\begin{smallmatrix} +.0002 \\ -.0 \end{smallmatrix}$	.0003	
#2 $\begin{smallmatrix} +.0005 \\ -.0 \end{smallmatrix}$	.0005	

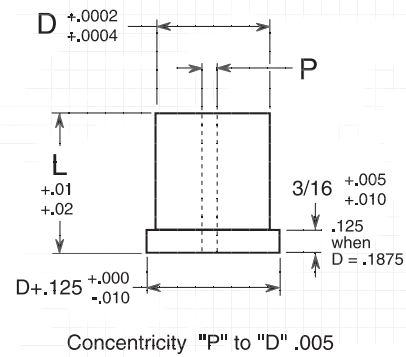
How to order: Example						
Style	Length	Mat.	Pt. Dia.	Pt. Length	Tol.	Qty
PPP-50	33 ³ / ₄	M-2	.2718	1 1 ¹ / ₂	#2	19

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

Style DB



Style HB



Style DB or HB	D Dia.	P* Dia.	L = Standard Length								
18	.1875	.030	1/2	5/8	3/4	7/8	1	1 1/8			
25	.2500	.046	1/2	5/8	3/4	7/8	1	1 1/8			
31	.3125	.046	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4		
37	.3750	.062	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
43	.4375	.062	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
50	.5000	.093	1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
62	.6250	.093			3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
75	.7500	.093			3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
87	.8750	.093			3/4	7/8	1	1 1/8	1 1/4	1 3/8	1 1/2
100	1.000	.125			3/4	7/8	1	1 1/8	2 3/4	1 3/8	1 1/2
125	1.250	.125			3/4	7/8	1	1 1/8	2 3/4	1 3/8	1 1/2

*Smaller P Diameter available on request.

Delivery from stock.

SPECIALS: Complete to B/P; available in A-2, PM-M4, D-2; custom hole location.

All dimensions are inches.

Quantity Discounts			
1-9	10-24	25-49	50+
NET	5%	10%	Call

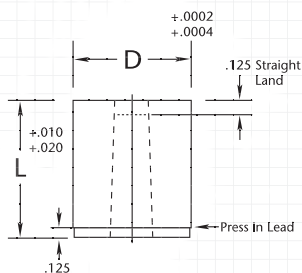
How to order: Example			
Style	Length	Mat.	Qty.
HB-25	1	M-2	10

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

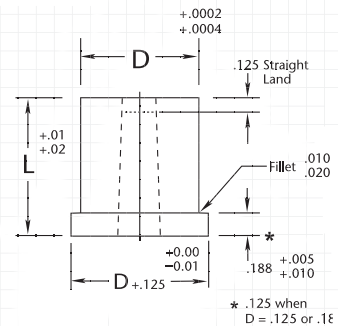
Precision Die Buttons

M-2: Rc 60/63 • PM-10V: Rc 61/63 • (A-2, D-2 and M-4 on request)

Style D*

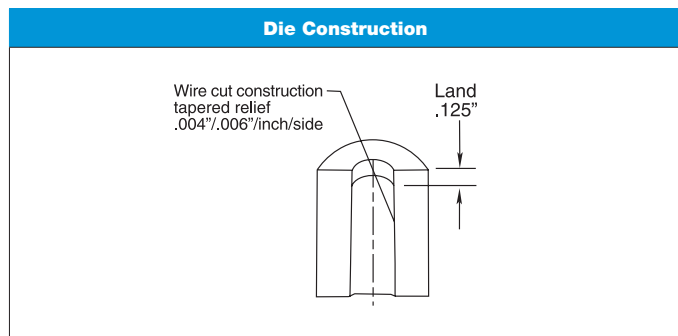


Style H*



Style P	Style O	Style D
Round 	Oblong 	Dee
Style R	Style K	Style F
Rectangle 	Radius Rectangle 	Flatted Round

Point	Tolerance	Concentricity	
		P to D	T.I.R.
Round	#1 $+.0002$ -0	.0003	
	#2 $+.0005$ -0	.0005	
Shaped	#1 $+.0002$ -0	.0003	
	#2 $+.0005$ $-.0005$	.001	
How to check "G"... $G = \sqrt{P^2 + W^2}$			



* When ordering please specify style Headless DP, DO, DD, DR, DK or DF; Headed HP, HO, HD, HR, HK or HF.
For additional shapes see page 25.
All dimensions are inches.

How to order: Example							
Style	Body Code	Length	Mat.	Pt. Dim. (P x W)	Tol.	Keying	Qty.
DK	37	7/8	M-2	.109 x .225 R .010	#1	1F	4
HO	50	1	M-2	.250 x .375	#2		6

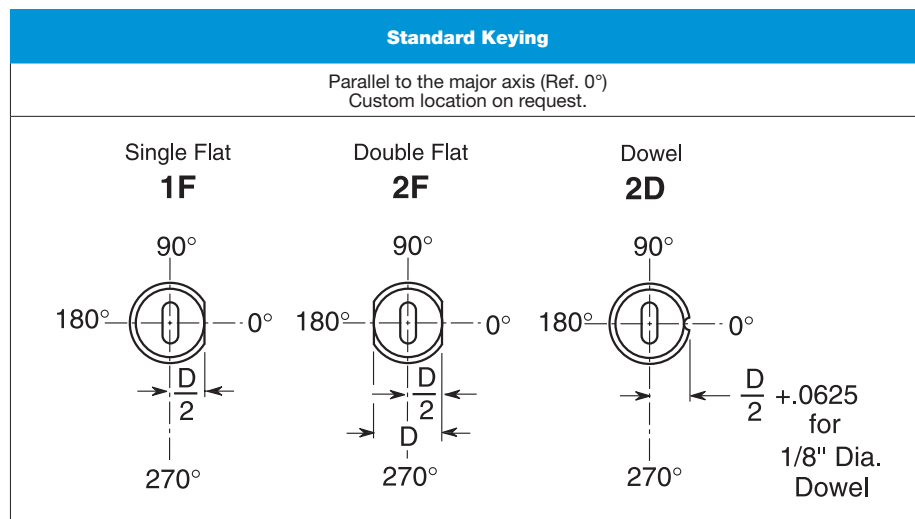
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Style D* or H*	Body Code	Body Dia.	Round*		Shapes*		L = Standard Length							
			Min.	Max.	Min. W	Max. P or G								
D* H*	18	3/16	.050 - .128		.050 - .130		1/2	5/8	3/4	7/8	1	1 1/8		
D* H*	25	1/4	.062 - .170		.062 - .170		1/2	5/8	3/4	7/8	1	1 1/8		
D* H*	31	5/16	.062 - .212		.062 - .212		1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	
D* H*	37	3/8	.075 - .255		.075 - .255		1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8
D* H*	43	7/16	.075 - .297		.075 - .297		1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8
D* H*	50	1/2	.108 - .344		.108 - .344		1/2	5/8	3/4	7/8	1	1 1/8	1 1/4	1 3/8
D* H*	62	5/8	.108 - .425		.108 - .425				3/4	7/8	1	1 1/8	1 1/4	1 3/8
D* H*	75	3/4	.108 - .510		.108 - .510				3/4	7/8	1	1 1/8	1 1/4	1 3/8
D* H*	87	7/8	.108 - .680		.108 - .595				3/4	7/8	1	1 1/8	1 1/4	1 3/8
D* H*	100	1	.140 - .680		.140 - .680				3/4	7/8	1	1 1/8	1 1/4	1 3/8
D* H*	125	1 1/4	.140 - .850		.140 - .850				3/4	7/8	1	1 1/8	1 1/4	1 3/8

* Smaller P or W available on request.
All dimensions are inches.



For pricing and delivery call 860.229.9902 or visit www.ppunch.com

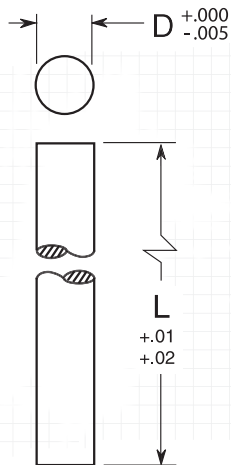
Ground Fractional Tool Blanks

M-2 High Speed Steel: Rc 60/63

Style FTB



These are standard M-2 blanks from which we grind our punches. All are in stock and available at very low prices.



D Diameter	L = Length				
	2½"	3½"	4"	6"	8"
1/32	•				
3/64	•				
1/16	•	•			
5/64	•	•			
3/32	•	•			
7/64	•	•			
1/8	•	•	•	•	•
9/64	•	•	•	•	•
5/32	•	•	•	•	•
11/64	•	•	•	•	•
3/16	•	•	•	•	•
13/64	•	•	•	•	•
7/32	•	•	•	•	•
15/64	•	•	•	•	•
1/4	•	•	•	•	•
17/64	•	•	•	•	•
9/32	•	•	•	•	•
19/64	•	•	•	•	•
5/16	•	•	•	•	•
21/64	•	•	•	•	•
11/32	•	•	•	•	•
23/64	•	•	•	•	•
3/8	•	•	•	•	•
25/64	•	•	•	•	•
13/32	•	•	•	•	•
27/64	•	•	•	•	•
7/16	•	•	•	•	•
1/2	•	•	•	•	•
9/16	•	•	•	•	•
5/8	•	•	•	•	•
3/4	•	•	•	•	•
7/8	•	•	•	•	•
1	•	•	•	•	•
1 1/8	•	•	•	•	•

• Delivery from stock.
All dimensions are inches.

Quantity Discounts			
1-24	25-49	50-249	250+
NET	5%	10%	Call

How to order: Example				
Style	Dia.	Length	Mat.	Qty.
FTB	1/2	2 1/2	M-2	2

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Decimal Tool/Gage Blanks

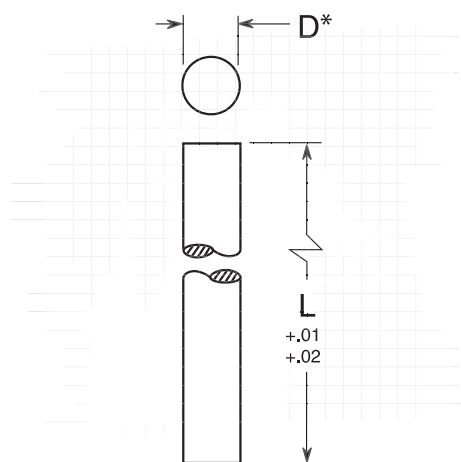
M-2: High Speed Steel • Rc 60/63



Style DTB



D Diameter	L = Length						
	2½"	3½"	4"	6"	8"	10"	12"
.006 - .029							
.030 - .061	•	•					
.062 - .100	•	•	•	•	•		
.101 - .140	•	•	•	•	•		
.141 - .250	•	•	•	•	•		
.251 - .312	•	•	•	•	•		
.313 - .375	•	•	•	•	•		
.376 - .437	•	•	•	•	•		
.438 - .500	•	•	•	•	•		
.501 - .562	•	•	•	•	•		
.563 - .625	•	•	•	•	•		
.626 - .750	•	•	•	•	•		
.751 - .875	•	•	•	•	•		
.876 - 1.000	•	•	•	•	•		
1.001 - 1.125	•	•	•	•	•		



*Specify Choice Of "D" Tolerances

P	N	M
+.0002	+.0001	+.0000
-.0000	-.0001	-.0002

Shaded areas delivery upon request.

All items are subject to the set-up charge per diameter.

Delivery: 3 days.

Tool blanks also available in A-2, PM-M4, PM-10V, Stainless Steel.

All dimensions are inches.

Minimum Cut-off Charge \$5.00						Quantity Discounts				How to order: Example					
Diameter	.010-.029	.030-.125	.126-.375	.376-.499	.500-.625	1-24	25-49	50-249	250+	Style	Dia.	Tol.	Length	Mat.	Qty.
Price (each)	On request	.30	.40	.60	On request	NET	5%	10%	Call	DTB	.1365	P	2½"	M-2	25

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

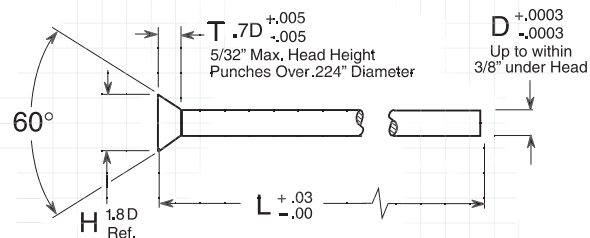
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Bevel Head Perforators

Tool Steel: RC 58/60 • M-2 High Speed Steel: Rc 60/63

Style AF*



D Diameter .001" increments	L Length	AF 01	AF M-2
.020 - .029	2	•	
	2 1/2	•	•
.030 - .039	2	•	
	2 1/2	•	•
.040 - .0625 (1/16)	2	•	
	2 1/2	•	•
.063 - .0781 (5/64)	2	•	
	2 1/2	•	•
.079 - .0937 (3/32)	2	•	
	2 1/2	•	•
.094 - .1094 (7/64)	2	•	
	2 1/2	•	•
.110 - .125 (1/8)	2	•	
	2 1/2	•	•
.126 - .135	2	•	
	2 1/2	•	•
.136 - .157	2	•	
	2 1/2	•	•
.158 - .187	2	•	
	2 1/2	•	•
.188 - .250	2	•	
	2 1/2	•	•

* Specify AF 01 or AF M-2.
Shaded areas delivery upon request.
Larger sizes available on request.
10 piece minimum.
All dimensions are inches.

Minimum Cut-off Charge \$5.00			
Diameter	.020-.029	.030-.125	.126-.250
Price (each)	On request	.30	.40

Quantity Discounts			
10-24	25-49	50-249	250+
NET	5%	10%	Call

How to order: Example			
Style	Dia.	Length	Qty.
AF 01	.125	2 1/2	50
AF M-2	.125	2 1/2	50

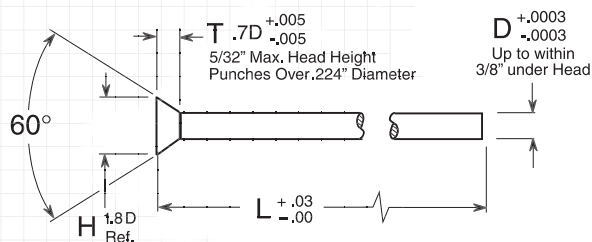
For pricing and delivery call 860.229.9902 or visit www.ppunch.com

Long Length Bevel Head Perforators

Tool Steel: RC 58/60 • Style AF-01: 4" and 6" lengths



Style AF 01



DIAMETER: FRACTIONAL INCREMENTS

D Diameter FRACTIONAL	L Length
1/16 5/64 3/32 7/64	4
	6
1/8	4
	6
9/64 5/32	4
	6
11/64 3/16	4
	6
13/64 7/32	4
	6
15/64 1/4	4
	6
17/64 9/32	4
	6
19/64 5/16	4
	6
21/64 11/32	4
	6
23/64 3/8	4
	6

DIAMETER: DECIMAL .001" INCREMENTS

D Diameter DECIMAL .001 increments	L Length
.047 - .109	4
	6
.110 - .124	4
	6
.126 - .156	4
	6
.157 - .187	4
	6
.188 - .218	4
	6
.219 - .249	4
	6
.251 - .281	4
	6
.282 - .312	4
	6
.313 - .343	4
	6
.344 - .374	4
	6

Shaded areas delivery upon request.
Delivery from stock (Fractional only).
10 piece minimum.
Special pricing on large quantities.
All dimensions are inches.

Minimum Cut-off Charge \$5.00				How to order: Example			
Diameter	.010-.029	.030-.125	.126-.375	Style	Dia.	Length	Qty.
Price (each)	On request	.30	.40	AF-01	5/32	6	200

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

Long Length Bevel Head Perforators

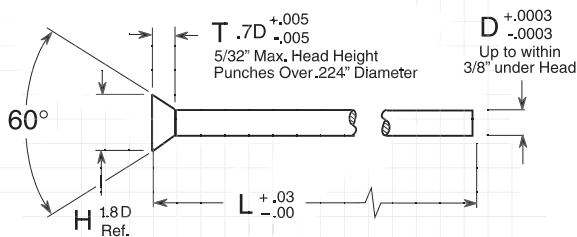
M-2 High Speed Steel: RC 60/63 • Style AF-M2: 4" and 6" lengths

Style AF-M2



D Diameter FRACTIONAL	L = Length	
	4"	6"
1/16 5/64 3/32 7/64	•	•
1/8	•	•
9/64 5/32	•	•
11/64 3/16	•	•
13/64 7/32	•	•
15/64 1/4	•	•
17/64 9/32	•	•
19/64 5/16	•	•
21/64 11/32	•	•
23/64 3/8	•	•

• Delivery: 3-5 days.
For decimal size diameters, refer to Style A.
All dimensions are inches.



Minimum Cut-off Charge \$5.00			
Diameter	.010-.029	.030-.125	.126-.375
Price (each)	On request	.30	.40

How to order: Example			
Style	Dia.	Length	Qty.
AF M-2	1/8	4	50

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

Style EC

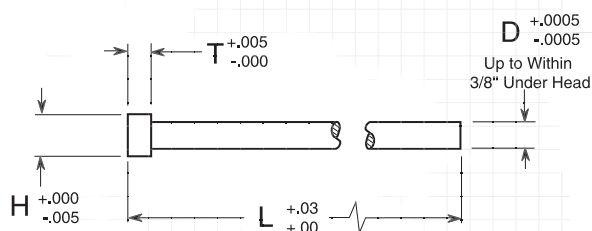
Style	D Dia.	H	T	L = Length		
				4"	6"	10"
EC-06	1/16	7/64	3/64	•	•	
EC-07	5/64	9/64	3/64	•	•	
EC-09	3/32	5/32	5/64	•	•	
EC-10	7/64	3/16	5/64	•	•	
EC-12	1/8	7/32	3/32	•	•	•
EC-14	9/64	1/4	7/64	•	•	•
EC-15	5/32	17/64	1/8	•	•	•
EC-17	11/64	5/16	1/8	•	•	•
EC-18	3/16	5/16	9/64	•	•	•
EC-20	13/64	11/32	5/32	•	•	•
EC-21	7/32	3/8	5/32	•	•	•
EC-23	15/64	13/32	11/64	•	•	•
EC-25	1/4	7/16	3/16	•	•	•
EC-26	17/64	7/16	1/4	•	•	•
EC-28	9/32	7/16	1/4	•	•	•
EC-29	19/64	1/2	1/4	•	•	•
EC-31	5/16	1/2	1/4	•	•	•
EC-32	21/64	9/16	1/4	•	•	•
EC-34	11/32	9/16	1/4	•	•	•
EC-35	23/64	5/8	1/4	•	•	•
EC-37	3/8	5/8	1/4	•	•	•



• **Delivery from stock.**

Specifications: Oil hardening tool steel; hardness Rc58/60; heads annealed Rc 42/45.

All dimensions are inches.



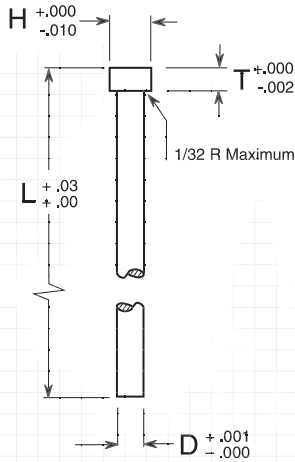
How to order: Example

Style	Dia.	Length	Qty.
EC-12	1/8	4	200

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Core Pins

Style SH and HH



Style SH: Standard Hardness, Rc 30/35

Style	D Dia.	H	T	L Length		
				3"	6"	10"
SH-09	3/32	1/4	1/8	•	•	•
SH-10	7/64	1/4	1/8	•	•	•
SH-12	1/8	1/4	1/8	•	•	•
SH-14	9/64	1/4	1/8	•	•	•
SH-15	5/32	9/32	5/32	•	•	•
SH-17	11/64	11/32	3/16	•	•	•
SH-18	3/16	3/8	3/16	•	•	•
SH-20	13/64	3/8	3/16	•	•	•
SH-21	7/32	13/32	3/16	•	•	•
SH-25	1/4	7/16	3/16	•	•	•
SH-28	9/32	7/16	1/4	•	•	•
SH-31	5/16	1/2	1/4	•	•	•
SH-34	11/32	9/16	1/4	•	•	•
SH-37	3/8	5/8	1/4	•	•	•
SH-40	13/32	11/16	1/4	•	•	•
SH-43	7/16	11/16	1/4	•	•	•
SH-46	15/32	3/4	1/4	•	•	•
SH-50	1/2	3/4	1/4	•	•	•
SH-56	9/16	13/16	1/4		•	•
SH-62	5/8	7/8	1/4		•	•
SH-75	3/4	1	1/4		•	•

Style HH: High Hardness, Rc 50/54

Style	D Dia.	H	T	L Length		
				3"	6"	10"
HH-09	3/32	1/4	1/8	•	•	•
HH-10	7/64	1/4	1/8	•	•	•
HH-12	1/8	1/4	1/8	•	•	•
HH-14	9/64	1/4	1/8	•	•	•
HH-15	5/32	9/32	5/32	•	•	•
HH-17	11/64	11/32	3/16	•	•	•
HH-18	3/16	3/8	3/16	•	•	•
HH-20	13/64	3/8	3/16	•	•	•
HH-21	7/32	13/32	3/16	•	•	•
HH-25	1/4	7/16	3/16	•	•	•
HH-28	9/32	7/16	1/4	•	•	•
HH-31	5/16	1/2	1/4	•	•	•
HH-34	11/32	9/16	1/4	•	•	•
HH-37	3/8	5/8	1/4	•	•	•
HH-40	13/32	11/16	1/4	•	•	•
HH-43	7/16	11/16	1/4	•	•	•
HH-46	15/32	3/4	1/4	•	•	•
HH-50	1/2	3/4	1/4	•	•	•
HH-56	9/16	13/16	1/4		•	•
HH-62	5/8	7/8	1/4		•	•
HH-75	3/4	1	1/4		•	•

Delivery from stock.

Specifications: Air hardened hot work die steel; precision ground after heat treating; heads forged and annealed.

All dimensions are inches.

How to order: Example			
Style	Dia.	Length	Qty.
SH-09	3/32	6	50

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

FAX 860.224.4238

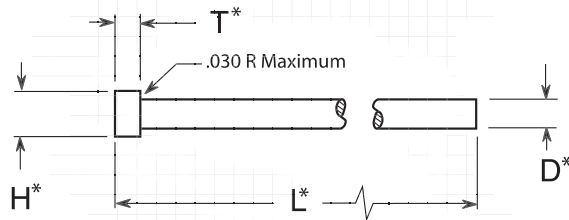
sales@ppunch.com

Nitrided Ejector Pins

Surface Hardness: Rc 64/74 • Core Hardness: Rc 41/45



Style EP and EPO



Style EP: Standard Ejector Pins

Style	D Dia.	H	T	L = Length			
				6"	10"	14"	18"
EP-04	3/64	1/4	1/8	•	•		
EP-06	1/16	1/4	1/8	•	•		
EP-07	5/64	1/4	1/8	•	•		
EP-09	3/32	1/4	1/8	•	•		
EP-10	7/64	1/4	1/8	•	•	•	•
EP-12	1/8	1/4	1/8	•	•	•	•
EP-14	9/64	1/4	1/8	•	•	•	•
EP-15	5/32	9/32	5/32	•	•	•	•
EP-17	11/64	11/32	3/16	•	•	•	•
EP-18	3/16	3/8	3/16	•	•	•	•
EP-20	13/64	3/8	3/16		•	•	•
EP-21	7/32	13/32	3/16	•	•	•	•
EP-23	15/64	13/32	3/16		•	•	•
EP-25	1/4	7/16	3/16	•	•	•	•
EP-26	17/64	7/16	1/4		•	•	•
EP-28	9/32	7/16	1/4	•	•	•	•
EP-29	19/64	1/2	1/4		•	•	•
EP-31	5/16	1/2	1/4	•	•	•	•
EP-32	21/64	9/16	1/4		•	•	•
EP-34	11/32	9/16	1/4	•	•	•	•
EP-35	23/64	5/8	1/4		•	•	•
EP-37	3/8	5/8	1/4	•	•	•	•
EP-40	13/32	11/16	1/4	•	•	•	•
EP-43	7/16	11/16	1/4	•	•	•	•
EP-46	15/32	3/4	1/4	•	•	•	•
EP-50	1/2	3/4	1/4	•	•	•	•
EP-56	9/16	13/16	1/4	•	•	•	•
EP-62	5/8	7/8	1/4	•	•	•	•
EP-68	11/16	15/16	1/4	•	•	•	•
EP-75	3/4	1	1/4	•	•	•	•
EP-87	7/8	1 1/8	1/4	•	•	•	•
EP-100	1	1 1/4	1/4	•	•	•	•

Style EPO: .005 Oversize Ejector Pins

Style	D Dia.	H	T	L = Length	
				10"	14"
EPO-06	1/16	1/4	1/8	•	
EPO-07	5/64	1/4	1/8	•	
EPO-09	3/32	1/4	1/8	•	
EPO-10	7/64	1/4	1/8	•	
EPO-12	1/8	1/4	1/8	•	•
EPO-14	9/64	1/4	1/8	•	
EPO-15	5/32	9/32	5/32	•	•
EPO-17	11/64	11/32	3/16	•	
EPO-18	3/16	3/8	3/16	•	•
EPO-21	7/32	13/32	3/16	•	
EPO-25	1/4	7/16	3/16	•	•
EPO-28	9/32	7/16	1/4	•	
EPO-31	5/16	1/2	1/4	•	•
EPO-34	11/32	9/16	1/4	•	
EPO-37	3/8	5/8	1/4	•	•
EPO-40	13/32	11/16	1/4	•	
EPO-43	7/16	11/16	1/4	•	•
EPO-46	15/32	3/4	1/4	•	
EPO-50	1/2	3/4	1/4	•	•

When ordering specify EP or EPO.

Specifications: H-13 hot work die steel; heads forged and annealed; body nitrided; honed finish.

All dimensions are inches.

* Tolerances				
	D	H	T	L
Up to 1/2" Dia. & 14" Long	-.0005" -.0008"	+.000" -.010"	+.000" -.002"	+.375" -.000"
Over 1/2" Dia. & 14" Long	-.0003" -.0008"	+.000" -.010"	+.000" -.002"	+.375" -.000"

How to order: Example			
Style	Dia.	Length	Qty.
EPO-06	1/16	14	50

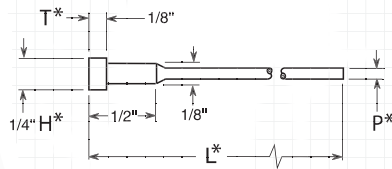
For pricing and delivery call 860.229.9902 or visit www.ppunch.com

Nitrided Ejector Pins

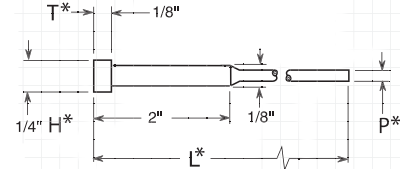
Surface Hardness: Rc 64/74 • Core Hardness: Rc 41/45 • Shoulder Type



Style EPS-5



Style EPS-2



Style	D Diameter	L Length		
		6"	10"	14"
EPS-5-046	3/64	•	•	•
EPS-5-051	.005 3/64 O.S.		•	
EPS-5-062	1/16	•	•	•
EPS-5-067	.005 1/16 O.S.		•	
EPS-5-078	5/64	•	•	•
EPS-5-083	.005 5/64 O.S.		•	
EPS-5-093	3/32	•	•	•
EPS-5-098	.005 3/32 O.S.		•	
EPS-5-109	7/64	•	•	•
EPS-5-114	.005 7/64 O.S.		•	

Style	D Diameter	L Length		
		6"	10"	14"
EPS-2-046	3/64	•	•	•
EPS-2-051	.005 3/64 O.S.		•	
EPS-2-062	1/16	•	•	•
EPS-2-067	.005 1/16 O.S.		•	
EPS-2-078	5/64	•	•	•
EPS-2-083	.005 5/64 O.S.		•	
EPS-2-093	3/32	•	•	•
EPS-2-098	.005 3/32 O.S.		•	
EPS-2-109	7/64	•	•	•
EPS-2-114	.005 7/64 O.S.		•	

When ordering please specify EPS-5 or EPS-2.

Specifications: H-13 hot work die steel; heads forged and annealed; body nitrided; honed finish.
All dimensions are inches.

How to order: Example			
Style	Dia.	Length	Qty.
EPS-5-046	3/64	10	50

* Tolerances			
P	H	T	L
-.0005" -.0008"	+.000" -.010"	+.000" -.002"	+.375" -.000"

For pricing and delivery call 860.229.9902 or visit www.ppunch.com

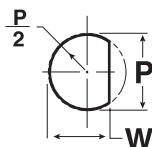
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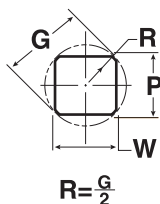
Custom Shapes

Available on: PS and PE Punches and on D and H Dies
Please specify Shape Style when ordering. See below.

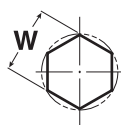
S1



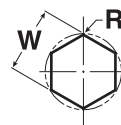
S2



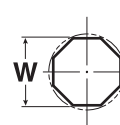
S3



S4

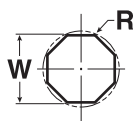


S5



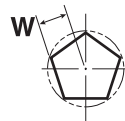
A = Even No. of Sides

S6



A = Even No. of Sides

S7



A = Odd No. of Sides

S8

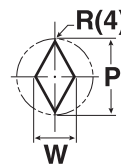


A = Odd No. of Sides

S9



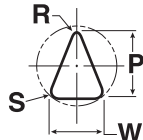
S10



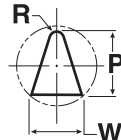
S11



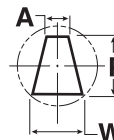
S12



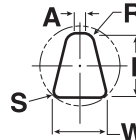
S13



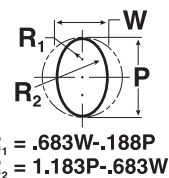
S14



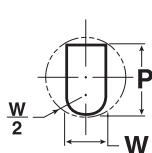
S15



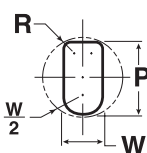
S16



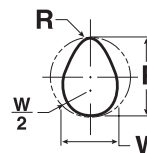
S17



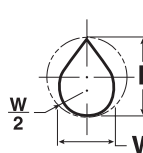
S18



S19



S20



NOTES TO ABOVE DRAWINGS:

1. Corner Radius

- Inside: Punches & Dies - .003 to .008 (both)
- Outside: Punches & Dies - Sharp (unless specified)

2. Center line on drawings indicates center line of body diameter.

Pricing on request.

All dimensions are inches.

How to order: Example

Style	Length	Mat.	Pt. Dim. (P x W) R	Pt. Lng.	Tol.	Keying	Qty.
PSS18-50	2 1/4	10-V	.418 x .324 R .007	1	#2	2D	4
DS18-62	1	10-V	.420 x .326 R .008	-	#2	2D	4

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Our success has been achieved by servicing a broad range of customers. Whether world renowned aerospace industries, consumer goods manufacturers, industrial suppliers, service companies, or local job shops, our products help them save time and increase their profits.

We've been manufacturing precision feeler gages since 1965. Through our continuous investments in people, equipment and raw materials, we are able to offer custom feeler gages in an expanding gamut that is on time and at competitive prices.

You know that you increase your production by using the right tool. Don't struggle with **"almost"** the right gages. Using the best gages will help you produce more products... **faster, easier, and with less variation.**

Gage Sets

Carbon Steel Products | Inch Sizes

Stainless Steel Products | Inch Sizes

Metric Carbon Steel Products

Feeler Coils

Assortment Packs

Taper Blades

Shim Stock

Custom Products

Include a gage when you ship your product; it will aid your customers in correct installation and adjustment, and help keep your after-sales support at expected levels.

Some of the industries we serve:

- Aerospace
- Automotive
- Transportation
- Power & Utilities
- Electronics
- Textile and Paper
- Maintenance & Service
- Machine Tools
- Defense
- Medical





Precision Punch & Tooling offers a complete line of versatile Wire Die Springs and Nitrogen Gas Springs made by Special Springs.

It's a natural fit: Precision Punch & Tooling's signature quality and precision, and Special Springs' high level of dimensional accuracy, durability and reliability. That's why many of our customers use these springs along with Precision Punch & Tooling products for injection molding, metal stamping and in tool & die shops.



Cross Reference Compatible - Competitors' parts can easily be cross referenced

ISO Standards - Our parts are interchangeable with competitors' parts

Large Range of Sizes - Hole diameters for wire die springs range from 10mm up to 63mm; body diameters of gas springs range from 12mm up to 195mm

Rectangular & Oval Styles - We offer both rectangular and oval styles of wire die springs

500,000 Items In Stock - We keep more items in stock to get you back on track faster

Same Day Shipping - Valid on any in-stock product ordered

Large Spring Loads Wire Die Springs - Spring rates ranging from Ultra Light Load up to Ultra Heavy

Satisfaction Guaranteed - We stand by our products and offer a 2-year warranty

Safety You Can Trust - Reduce the risk of tool damage or personal injury due to ejection of parts under pressure

Technical Section

Optimizing Tool Performance

- Tool Steel Selection
- Heat Treatment Options
- Surface Finishes
- Surface Treatments
- Stamping Performance
- Punch Design



$$= (D_d - d_p) / 2$$

17-4 PH

$D^{+.0002}_{+.0004}$

P

$D^{+.0002}_{+.0004}$

Choosing the Right Material

There are a wide range of tool steels and stainless steels that can meet the requirements of virtually every application; the challenge is determining the best steel that will optimize your process performance. Specific applications call for many different qualities in tool steels. These qualities are achieved by adding particular alloy(s) with an appropriate amount of carbon. The alloy(s) in combination with the carbon result in wear, toughness and compressive strength characteristics. Steels vary significantly in hardness, wear resistance and toughness.

Wear Resistance = Undesirable degradation of a tool by removal of material from its surface.

The wear resistance of tool steel is determined by the heat-treated hardness and the amount and type of hard alloy carbides present in the microstructure. The hardest and therefore most abrasion resistant carbides generally found in tool steels are the vanadium carbides. The primary alloying element that differentiates the wear resistance in traditional high-speed steels is the vanadium content.

Toughness = Less of a tendency to break

Toughness is the ability of a material to absorb energy up to the point of failure. Toughness requires strength as well as ductility, which allows a material to deform before fracturing.

Compressive Strength = Maximum load a tool can withstand before deforming or failure.

There are several alloying elements that affect the overall performance of tool steels. Most critical for compressive strength is the carbon content and the heat treat process. Additional alloys, in specific amounts and ratios, improve hardness, toughness and wear resistance. They are: Molybdenum (toughness), Tungsten (wear resistance), Vanadium (hardness), Chromium (wear and toughness), and Nickel (wear and toughness).

To determine the **Right Tool Steel** for your application, see below.

M-2

A conventional high-speed steel, hardened and triple tempered to RC: 60-63. It has poor toughness, good wear resistance and high compression strength.

A-2

An air-hardened tool steel containing 5% chromium. It replaces O1 when safer hardening, better dimensional stability, and increased wear-resistance are required. Good toughness and fair wear resistance.

D-2

A high carbon-high chromium steel. It has excellent wear resistance and deep hardening properties, and high compressive strength. Fair toughness and good wear resistance.

S7

A shock steel with exceptional impact properties and toughness. It is well suited for a wide range of tool and die work. Excellent toughness and poor wear resistance.

PM-M4

A powdered metal; a member of the molybdenum-tungsten family of high-speed steels. It utilizes higher carbon and vanadium content to develop excellent abrasion resistance. It is hardened and triple tempered to RC:61-63. Fair toughness and very good wear resistance.

PM-3V

Offers a high level of impact resistance with good wear resistance and compressive strength. The name is derived from its almost 3% vanadium content. Very good toughness and good wear resistance.

PM-9V

A powder metal tool steel that contains less carbon and vanadium than PM-10V, which results in a lower hardness, slightly lower wear resistance, but a significant increase in toughness. The lower carbon content also enables PM 9V to be used in warm and hot work applications where resistance to thermal fatigue cracking is important. Very good toughness and very good wear resistance.

PM-10V

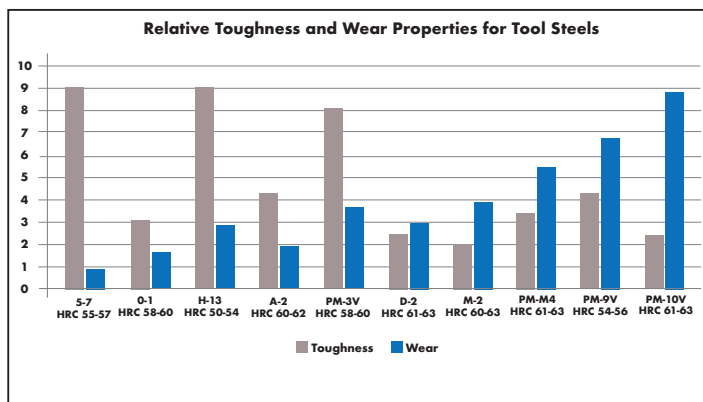
A powder metal tool steel and the most wear resistant material we offer. It is hardened and triple tempered to RC: 61-63 and provides longer tool life than M-2. The name is derived from its almost 10% vanadium content. The good impact toughness is the result of the fine grain size, small carbides, and superior cleanliness of the powder metallurgy microstructure. Good toughness and excellent wear resistance.

O-1

An oil hardened tool and die steel. It has good abrasion resistance, and sufficient toughness for normal tool and die applications. Fair toughness and good wear resistance.

H-13

A hot work steel designed to resist abrasion and washing action. It has enough red hardness to retain its properties at high operating temperatures (may reach 1200 degrees F), and where resistance to softening, heat checking and shock are important (has excellent shock resistance). Excellent toughness and fair wear resistance.



To determine the **Right Stainless Steel** for your application, see below.

Stainless steels are alloys of iron with a minimum 12% chromium to impart corrosion resistance. To obtain greater corrosion resistance, more chromium is added to the alloy. Stainless steels are uniform in composition. Along with iron and chromium, all stainless steels contain some carbon. The more carbon there is, the more chromium that must be used. Carbon is added for the purpose of making the alloy stronger. Other alloying elements are added for improved corrosion resistance, manufacturability and variations in strength.

302 Stainless Steel

In the annealed condition it is austenitic, nonmagnetic, extremely tough and ductile, and has excellent corrosion resistance.

316 Stainless Steel

Improved corrosion resistance over 302. It is also nonmagnetic, tough and ductile.

420 Stainless Steel

A hardened 12% chrome steel which will resist corrosion from mild atmospheres, fresh water, steam, blood, ammonia, many petroleum products and organic materials, and several mild acid environments. It has high strength at room and elevated temperatures and good toughness for long production runs.

440A Stainless Steel

This high-carbon, high-chromium martensitic stainless steel is designed to provide stainless steel properties with excellent hardness. It attains a hardness of Rockwell C 56 and maximum toughness when heat-treated. It has sufficient corrosion resistance as-annealed to permit its use in mild environments, fresh water, steam, ammonia, many petroleum products and organic materials, and several mild acid environments.

440 Stainless Steel

This is a high-carbon chromium steel designed to provide stainless steel properties with maximum hardness.

17-4 PH

This high carbon, high chromium alloy is produced by the electric furnace process and then vacuum degassed to meet the rigid standards of the aircraft industry for bearing applications. This steel develops high hardness and has exceptional resistance wear and abrasion.

• • • •

Choosing the Right Heat-Treat Process

Standard, Special and Custom Tooling manufactured by Precision Punch & Tooling Corporation are heat treated primarily using Salt Bath processes that are superior to heat treatment using Vacuum and Controlled Atmosphere Furnace processes. By superior, we mean increased wear resistance and toughness under the most severe applications. Precision Punch & Tooling also employs state-of-the-art Vacuum Furnace technology for appropriate applications or when specified by a customer.

Salt Bath Heat-Treatment of High-Speed Steel and Alloy Tool Steels

Molten salt baths are the oldest of the processes used today in the hardening of high-speed tools. Salt still produces the most desirable characteristics producing harder, tougher, finer grained cutting tools, with lower levels of retained austenite. A more uniform temperature distribution and more rapid quench rate are attained in a salt bath in comparison to vacuum quenching. Precision Punch & Tooling optimizes our heat treat process to obtain the optimum combination of hardness and toughness to suit each application. This also allows the removal of virtually all retained austenite by the quenching process and optimizing the tempering temperature and the number of tempering cycles. Retained austenite can result in dimensional changes and harmful residual stresses affecting the life of the tooling.

Vacuum Furnace Heat Treatment

Precision Punch & Tooling has available several Vacuum Furnaces appropriately suited for our customer's requirements up to and including a 0 bar pressure quench furnace that ensures dense heavy loads can be fully quenched. The convection heating improves cycle time, allows more uniform heating to control distortion and enables clean or bright processing at temperatures of 300F to 1400F. The isothermal quench capability can be used to control distortion and material properties of large pieces. Vacuum processing of tool steels has several advantages. The first is that there are no high temperature oxides formed. The low pressure and high temperature actually reduce the room temperature oxides on the surface so the parts are cleaner when they come out than when they go in. The second advantage is less obvious. Some "protective atmospheres" can cause intergranular attack. This is either in the form of intergranular oxides forming or chemical attack in grain boundaries.

• • • •

Choosing the Right Surface Finish

Improving the surface finish of a forming punch or tool will increase the life of the punch. This is true whether the punch has a coating added to the base tool steel or not. By improving the surface finish, the likelihood of adhesive wear or galling is greatly reduced.

The improved surface finish works on both minimally lubricated or fully flooded drawing or piercing operations by creating an elastohydrodynamic lubrication (EHL) film between contacting sliding surfaces.

The lower surface finish will better support a fluid film "h" which will keep contacting steel bodies separated by a very thin film of oil and/or coolant. This lower surface finish will improve the lambda ratio which defines the multiple of the film thickness being generated as a ratio of the composite surface finish of the contacting sliding surfaces. Ideally the lambda ratio would need to be greater than 1.0 to begin full fluid film separation and disallow metal to metal contact. The composite surface finish is defined as the vector sum of the contacting steel surface finishes.

$$\text{The composite surface finish} = \sqrt{(Ra1)^2 + (Ra2)^2}$$

$$\text{The lambda ratio} = \frac{h \text{ (fluid film)}}{\sqrt{(Ra1)^2 + (Ra2)^2}}$$

• • • •

Precision Punch & Tooling offers: Standard Finish

Every standard finish tool we produce will have a radial grind orientation to the surface and will meet a surface finish of 9 - 14 μ in Ra. This surface is deemed adequate for most piercing and forming operations.

Enhanced Finish

Our next best surface finish is an improved finish creating a surface finish which will meet a surface finish of 5 - 8 μ in Ra. It is a finish which will give increased durability by reducing the opportunity of adhesive wear or galling.

Premium Finish - Isotropic Finish

Our premium surface finish is a process which creates an isotropic finish which is the ideal combination of the topographical orientation of the punch surface relative to its axis. This surface condition has a random topographical lay and produces surface finishes of 2 - 4 μ in Ra. This surface preparation prior to a coating also improves the performance of the coating as the coating will take on the surface topography of the underlying tool surface finish. This finish greatly reduces the adhesive wear or galling and extends the life of the tooling.

Choosing the Right Surface Treatment

P-Tride™ | P-Wear™ | P-Wear Extreme™ | MoST™ | Alcrona™ | TiN | TiCN | TiAlN | Balinit C | Electroless Nickel | CrN | nACVic

Wear resistant surface treatments offer great benefit to stamping tools when applied appropriately. While there are many good surface treatments and processes to choose from, Physical Vapor Deposition (PVD) coatings are ideally suited and typically the best option to use on precision slip and press fit punch components.

Selecting the right surface treatment and substrate tool steel combination is critical for achieving optimum tool life. PVD coatings provide excellent abrasion and galling resistance while maintaining the integrity of many substrate tool steels. These coatings work best when applied to high speed tool steels such as M-2, PM-M4, and T-15. A few select cold work tool steel grades can also be PVD coated successfully as long as they maintain at least a 60 HRC when tempered at or above 1,000 degrees Fahrenheit.

It is important to note that the PVD process is a line of sight process, which may limit the ability to coat interior contours and features. For these applications, nitriding, which case-hardens all exposed surfaces, is recommended.

Below is a list of standard surface treatments offered by Precision Punch & Tooling.

Additional coatings are available upon request.

Tooling Operations

	Pierce & Trim	Extrude & Draw	Form & Emboss	Shave & Lance	Coin & Hob	Molding
P-Tride™	•	•	•	•	•	•
P-Wear™	•	•	•	•		
P-Wear Extreme™	•	•	•	•	•	
MoST™		•		•		
Alcrona™	•	•	•			
TiN	•	•		•		
TiCN	•	•	•	•		
TiAlN				•		
Balinit C						•
Electroless Nickel						•
CrN		•	•			•
nACVic	•	•	•			



TiN – (Titanium Nitride) PVD Coating

Titanium nitride was the first general-purpose coating, and the PVD (physical vapor deposition) coating remains an extremely popular and inexpensive choice for wear resistant coatings on cutting tools, punching or forming applications. The TiN treatment provides excellent lubricity and wear resistance on cutting edges and wear surfaces.

- Works best when used with lubricants.
- Extreme micro hardness 2300 Vickers*.
- TiN is not recommended for stainless steel, nickel or copper applications.



P-Tride™ – Nitride

This case-hardening surface treatment coats and toughens all outer tool surfaces. Its popularity is derived from a large range of effective case applications available at a relatively small cost. Because P-Tride™ case-hardens all exposed surfaces without relying on line of sight (such as with the PVD process), it is extremely effective for coating items such as buttons and tools.

- Ideal for increasing surface hardness by approximately 10 points HRC.



TiCN – (Titanium CarboNitride) PVD Coating

Adding carbon to a TiN film creates a PVD coating that increases hardness by nearly 80%, resulting in extremely high wear resistance on cutting edges and wear surfaces. TiCN has the broadest range of applications among PVD coatings for enhanced performance and longer tool life.

- Improved lubricity.
- Extremely high micro hardness of 3000 Vickers*.
- TiCN is recommended for stainless steel, nickel or copper applications.



P-Wear™

This is a dual-process surface treatment/coating process. By providing an extremely hard coating on top of a less hard but tough surface treatment, load is distributed throughout the tool. This can prevent premature tool failure in applications, such as extracting or forming, where tools endure isolated stress or load on small areas.

- Provides excellent toughness with high micro hardness of 2300 Vickers*.
- P-Wear™ is not recommended for use in stainless steel, nickel and copper applications and is most effective when used with lubricants.



TiAlN – (Titanium Aluminum Nitride) PVD Coating

This is the coating of choice for high temperature applications where surface heat is generated. The aluminum in the film converts to aluminum oxide as the coating heats up, resulting in greater protection against shear stress and increased wear resistance on cutting edges. TiAlN coating is often used to protect dies and molds that are operated at high temperatures as in medium and hot forging and extrusion industries. High thermal stability.

- Extremely high micro hardness of 3400 Vickers*.
- Effectively used to machine titanium, aluminum and nickel alloys, stainless steels, alloy steels,
- Co-Cr-Mo and cast



P-Wear Extreme™

With the same superior qualities as P-Wear™, this dual-process surface treatment/coating process also offers a greater hardness and lower coefficient of friction, translating into higher wear resistance.

- Provides excellent micro hardness of 3000 Vickers*.
- P-Wear Extreme™ is recommended as a superior choice for stainless steel, nickel and copper applications as well as for shaving operations.

* Vickers used when RC exceeds 80.



MoST™ – (Titanium CarboNitrile with Molybdenum Disulfide)

PVD w/Moly Top Coating

MoST™ coating provides longer tool life through reduced operating friction and galling. The highly lubricious top layer coat is perfect for stamping of pre-painted material and plated material applications.

- Offers extremely high lubricity.
- Provides micro hardness of 2000 Vickers*.
- MoST™ is especially effective with stainless, HSLA grades, and high tensile strength stainless.
- MoST™ also offers an additional special heat treatment enhancement process to optimize toughness.
- MoST™ is a trademark of IonBond® Inc.



nACVic Coating

This coating is used for forming and punching applications for high alloyed materials. The coating offers a low coefficient of friction and therefore offers improved wear resistance. Approximate hardness is 4000 Vickers*.



Alcrona™ – (Aluminum Chromium Nitride) PVD Coating

This multifunctional aluminum and chromium coating is ideal for a very wide variety of high temperature and high strength cutting tools and for punching and forming applications. The treatment creates excellent wear resistance, thermal shock stability and high hot hardness properties. The enhanced performance is due to the advantages of thermal stability, low coefficient of friction, and ductility.

- Exceptionally low coefficient of friction.
- Extraordinary high thermal ability.
- Extremely high micro hardness of 3400 Vickers*.
- Alcrona™ is a trademark of Oerlikon Balzers.



Balinit C Coating

This coating is a WC/C-based coating, and thus a mixture of metal and diamond-like carbon. Results in reduced surface fatigue tribo-oxidation, thereby reducing adhesive wear and good sliding properties due to a low coefficient of friction.



CrN - Chrome Nitride Coating

This coating has excellent adhesion, high toughness, and good corrosion resistance. Typical applications are metal forming, metal die casting, and plastic injection molding. Approximate hardness is 1800-2100 Vickers*.



Electroless Nickel Coating

Depending on customer application combined with low, medium or high levels of Phosphorous, provides corrosion resistance and offers wear protection. Electroless Nickel PTFE (Teflon) plated in a medium level Phosphorous bath provides lubricity and mold release properties for low-temp injection mold operations. Electroless Nickel Boron provides maximum hardness and self-lubrication for anti-galling properties.

* Vickers used when RC exceeds 80.

Improve Stamping Performance

In addition to choosing the right steel, right surface treatment and right surface finish as described in previous sections, Punch and Die clearance need to be considered.

Punch and Die Clearances

The clearance between the punch and die is based on many factors such as: material, material hardness, material thickness, and desired finish of the stamped hole or OD of a blank. These factors also have an effect on the anticipated tool life. Tighter punch and die clearances will lead to a better-quality piercing in terms of: roll over (minimized), axial depth of the burnished area (maximized), the axial depth of the remaining breakout (minimized), and finally the exit side burr (minimized), but will create higher stresses in the tooling contact surfaces leading to impact spalling, adhesive galling, or abrasive wear. The roll over is caused by the initial entry of the part into the material being pierced and is a result of plastic deformation of the material prior to the commencement of the punch's cutting action.

As the punch enters the material being stamped and the cutting action begins, this creates a burnished annular ring whose depth increases with reduced punch and die clearance. As the burnished annular ring depth increases, the breakout depth decreases. Punch and die clearances are usually called out as a percentage of the material thickness being stamped as well as the material type and hardness. These clearances are traditionally called out per side as illustrated in **Figure 1 on page 37**.

The formula for blank and punch clearances is given by

$c = (Dd - dp)/2$ (see Table 1 for clearances) where:

c = punch and die clearance per side

Dd = diameter of the die opening

dp = diameter of the punch

Table1: Punch and Die Clearance “c” as a percentage of stock thickness

Material	<0.040"	0.040" - 0.080"	0.082" - 0.118	0.122" - 0.197"	0.200" - 0.275"
Low Carbon Steel	5%	6%	7%	8%	9%
Copper & Soft Brass	5%	6%	7%	8%	9%
Medium Carbon Steel 0.20% to 0.25% Carbon	6%	7%	8%	9%	10%
Hard Brass	6%	7%	8%	9%	10%
Hard Steel 0.40% to 0.60% Carbon	7%	8%	9%	10%	12%

Figure 2: Generally speaking for optimal die performance, the die profile opening is defined by the depth of the straight portion of the die h and the cone angle α . Typical cone angles are between 3 to 5 degrees. The h dimension is dependent on the material thickness and is generally 5 to 10% thicker than the material stock thickness being pierced. As a general rule the h dimension is no smaller than .140". Punch Force Calculations (either in SI or Imperial units of measure) $F = T \times L \times S$

Where:

F = Perforating Force

T = Thickness of the material

L = Length of shear (for a round hole $\pi \times$ diameter)

S = Shear strength of the material

Punch Design

These formulas are approximations. Punch and die designs can be evaluated using these calculations. It is common to use a factor of safety of 1.3 for the perforating force to account for misalignments, friction, etc. between the punch/die and work-piece. More sophisticated modelling of the actual perforating force can be performed with non-linear FEA (Finite Element Analysis) software packages. Punch designs which deviate from a constant cross-sectional area should be evaluated using FEA so grooves, fillets, and cross-sectional changes can be evaluated for stress concentration and column buckling (see Figure 3). The aforementioned punch designs can then be evaluated with cumulative damage techniques to predict cycles to failure based on the stress seen in the punch (this excludes any predictive life cycles related to Hertzian contact stress of the cutting edges of the punch).

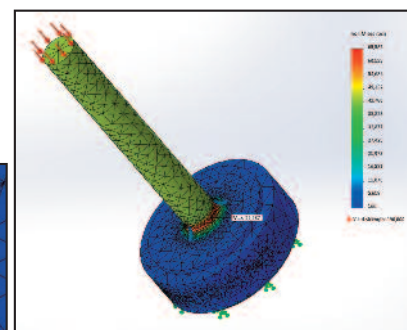
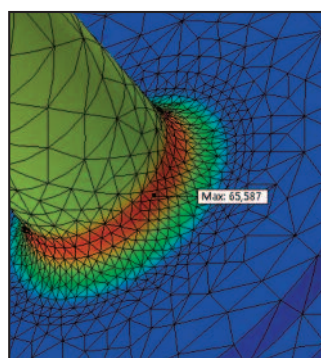
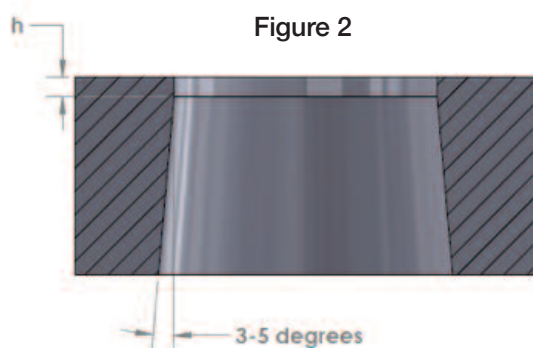
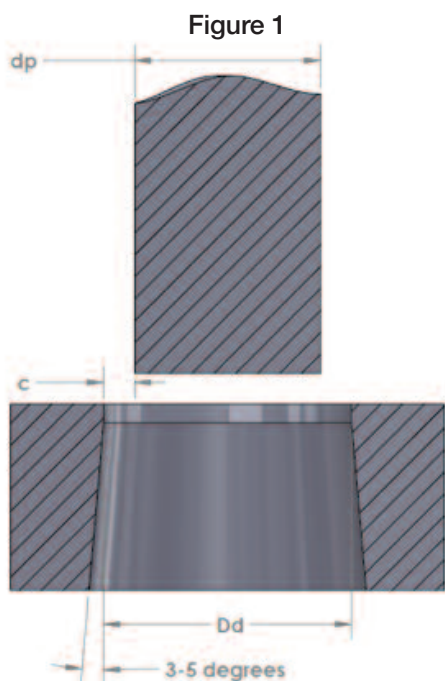
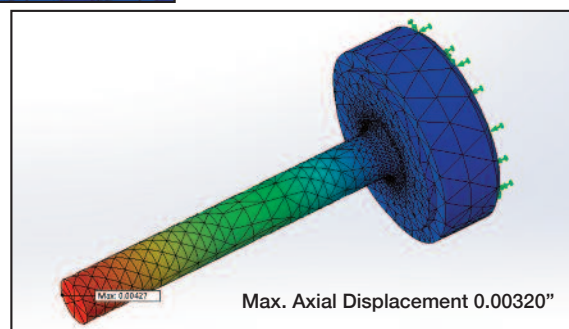


Figure 3





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