

**Quality
Punches,
Pilots,
Die Buttons,
& Retainers**

BAILLOCK



Global leader in
providing fabrication
and stamping solutions

a MISUMI Group Company

www.daytonlamina.com

**Improved
performance,
less downtime,
longer tool life**



Ball Lock Quality Products

Product Applications

Dayton Ball Lock Punches, Retainers, Die Buttons, and Accessories are mainstays in industries with high-demand applications, including automotive and major appliance manufacturing. Because there is no need to pull a die from the press, removal and replacement of worn punches can reduce downtime and improve profitability.

Dayton Ball Lock Punches add longer tool life and improve finished part quality. For example, *Dayton Jektol® Punches* (slug ejection punches) provide increased punch to die button clearance; can triple the number of cycles between punch regrinds; and extend tool life.

Dayton Ball Lock Die Buttons include *Ball Lock, Press Fit, and EDM Die Button Blanks*.

Dayton Ball Lock Retainers provide many features, functions, and benefits. For example, *Dayton True Position® Retainers* (the recognized industry standard) eliminate hand fitting; reduce mounting time, and are ideally suited for both round and complex-shaped products. Other Dayton Retainers include *Multi-Position™, End and Square, Single Punch*, and our unique line of *EZ Fit™ Retainers*—a simpler, better way to reconfigure and/or replace existing retainers.

Dayton Ball Lock Accessories (e.g., backing plugs, ball release tools, and urethane strippers) complete the full line of Dayton Ball Lock products, and can help speed up and improve production. For example, *Dayton Punch Pullers* (left photo) are simple and easy to use. Just slide the punch puller over the punch shank, rotate the built-in wrench until it is tight, re-lease the ball, and pull down.

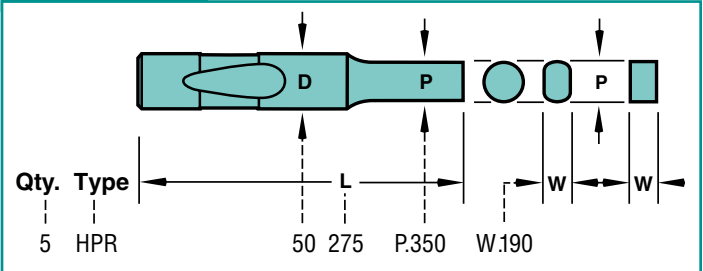


Ordering Information

Each page contains detailed instructions on how to order specific Dayton Ball Lock products. Individual product drawings completely define the product—including shape, dimensions, tolerances, and concentricity. When ordering, you are asked to specify quantity, product type, shank and length codes, and point or hole size (for example).

In the example below, the type specified is “HPR.” “H” stands for heavy duty, “P” stands for punch, and “R” stands for rectangle. 50 is the shank diameter, which is coded by the first two digits of the decimal equivalent (.500”). 275 is the overall length, which is coded by inches and quarter-inches (2.75”). Finally, P.350 and W.190 represent the point or hole size dimension.

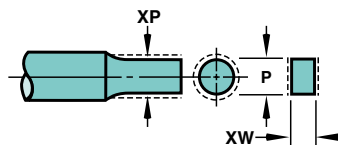
HOW TO ORDER



Standard Alterations

Punches, die buttons, and retainers are available in sizes other than those listed in the catalog.

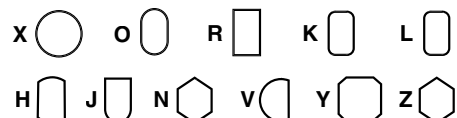
When ordering, you are asked to specify different designations for various non-standard dimensions. For example, if the P and W dimensions are outside the standard range, an “X” is placed in front of the P or W dimension, e.g., “XP” and/or “XW.” If the point length is longer or shorter than standard, designate “XB” for the point length. See the foldout tabs in the individual product sections for these and other special order designations.



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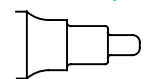
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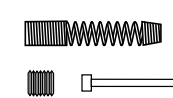
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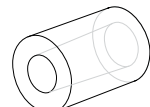
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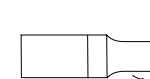
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Product Designation

Each page contains detailed instructions on how to order specific Dayton Ball Lock products. In addition, use the following chart to define the product as a part number.

Example:

Line	Product Shape	Shank Dia. D (shank diameter) Coded by the first 2 digits of dec. equiv. (.500).	Overall Length L Coded by whole number and first two digits of dec. equiv. (2.750).
HPR	50	275	
Product Type	Series Catalog Number	Length	Point or Hole Size Dimensions, As Specified
HPR	50	275	P.350, W.190

Diameter (D) is shown on the order as a two- or three-digit code. To convert the shank diameter to the appropriate code, use the following chart.

Code	D	Code	D	Code	D
12	.1250	50	.5000	150	1.5000
18	.1875	62	.6250	175	1.7500
25	.2500	75	.7500	200	2.0000
31	.3125	87	.8750	225	2.2500
37	.3750	100	1.0000	250	2.5000
43	.4375	125	1.2500	275	2.7500

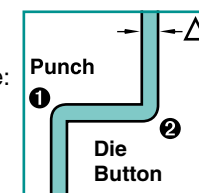
Classified Shapes

Classified shapes (83 common shapes, no detailing required) are available on all punches, die buttons, and guide bushings, as indicated in this catalog. See pp. 32, 33 for more information and special instructions. Also, see individual product pages and p. 40 for additional information on orientation and views.

Clearance

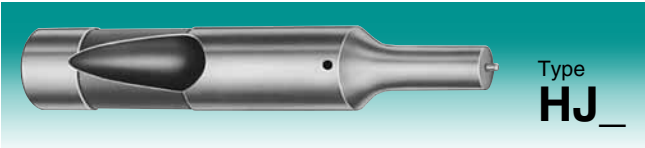
Normal grinding methods produce:

- .007 max. fillet on the punch — matching corner shape on the die button.
- .007 max. fillet on the die button — matching corner shape on the punch.



Jektol[®] Punches

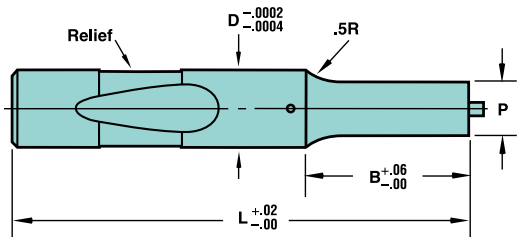
Heavy Duty



Material
Steel: A2, M2, PS4, RC 60-63

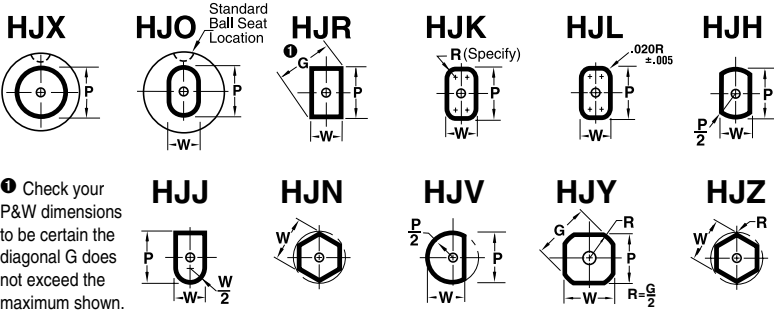
Round P $\begin{matrix} +.0005 \\ -.0000 \end{matrix}$ $\begin{matrix} \text{P to D} \\ \text{P to D} \end{matrix}$

Shape P, W $\pm .0005$ $\begin{matrix} \text{P to D} \\ \text{P to D} \end{matrix}$



Jektol[®] Punches

Heavy Duty



Features/Benefits

Jektol[®] punches permit doubling punch to die button clearance; produce up to three times the number of hits between sharpenings; and reduce burr heights.

HOW TO ORDER

Specify:	Qty.	Type	D Code	L	P (or P&W)	Steel
Example:	25	HJX	37	C300	P.175	A2
	12	HJO	75	450	P.692, W.312	M2

Standard Ball Seat Locations

Standard Ball Seat Location is at 90°. Alternate locations of 0°, 180°, or 270° can be specified at no additional cost.

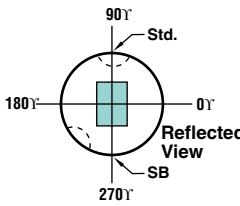
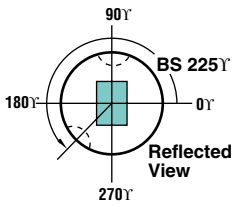
Custom Ball Seat Locations

Custom Ball Seat Locations can be specified as "BS" and degrees counter-clockwise from 0°. For additional information, see "Locking Devices" on p. 40.

Double Ball Seat

A second ball seat may be specified. Normally located 180° from the primary ball seat, these are used to minimize sharpening of notching punches by rotating the punch 180°. Specify "SB" and degree desired. A second ball can also be located 90° from the primary ball seat.

Not recommended for diameters under .750.



Surface Coatings

Some catalog products can be coated to increase hardness, reduce galling, and improve wear and/or corrosion resistance.

DayTride[®] (XN)—a low-cost surface application that treats all exposed surfaces. Ideal for punches and die buttons. Provides high dimensional stability. Approx. hardness: RC65-73.

DayTiN[®] (XNT)—applied via PVD (physical vapor deposition). Provides extreme hardness (hard as carbide) and excellent lubricity when used with a lubricant. Not recommended for stainless steel, copper, or nickel. Approx. hardness: *Vickers 2300.

DayTAN[™] (XAN)—ultra-hard, high-aluminum PVD coating. Absorbs shear stress and provides high temperature resistance. Ideal for HSLA, dual phase, and TRIP steels. Approx. hardness: *Vickers 3400.

TiCN (XCN)—very hard PVD, thin film. Provides ultra hardness (harder than carbide) and superior abrasive wear resistance. Approx. hardness: *Vickers 3000.

XNM—PVD, solid film. Produces lower coefficient of friction than other coatings. Provides excellent lubricity. Approx. hardness: *Vickers 2000.

XNP—the ultimate coating for extrusion and forming applications. Also works well in shaving operations. Tolerance is $\pm .0002$. Approx. hardness: *Vickers 3100.

DayKool[™] (XCR)—cryogenic steel conditioning process, used primarily with hard, thick materials. Improves strength, toughness, and dimensional stability.

CrN (CRN)—excellent adhesion, high toughness, and good corrosion resistance. Primary applications are metal forming (copper, brass, bronze), metal die casting, and plastic injection molding. Approx. hardness: *Vickers 1800-2100.

ZertonPlus[™] (XNA)—excellent wear resistance, thermal shock stability and hot hardness. Approx. hardness *Vickers 3200.

XNAPprogress (XNAP)—ultra-hard PVD coating that absorbs shear stress; provides excellent high-temperature resistance. Ideal for stamping where tools are exposed to extreme stress profiles. A good alternative to TD coating without the dimensional changes associated with that process. Approx hardness: *Vickers 3200.

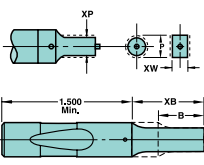
Diamond Like Carbon Coating (XCD)—combines high hardness with an extremely low coefficient of friction. Good protection against abrasive & adhesive wear. Approx. hardness *Vickers 5000.

Code	Material
XN —DayTride [®]	M2 & PS4
XNT —DayTiN [®]	M2 & PS4
XAN —DayTAN [™]	M2 & PS4
XCN —TiCN	M2 & PS4
XNM	M2 & PS4
XNP	M2 & PS4
XCR —DayKool [™]	M2 & PS4
CRN	M2 & PS4
XNA —ZertonPlus [™]	M2 & PS4
XNAP—XNAPprogress	M2 & PS4
XCD	M2 & PS4

* Vickers used when RC exceeds 80.
® DayTride and DayTiN are registered trademarks of Dayton Progress.
™ DayTAN, DayKool, and ZertonPlus are trademarks of Dayton Progress.

Standard Alterations

Jektol[®] Punches—Heavy Duty



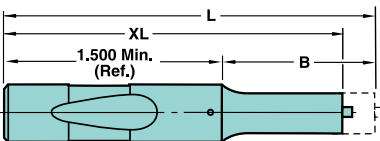
XP, XW P and W Dimensions
Smaller than Standard

XB Point Length
Other than Standard

For XBB, add three days to delivery.

	XB										XBB
Point Length	.5001-.6251	.6251-.7501	.7501-.8751	.8751-1.0001	1.0001-1.1251	1.1251-1.2501	1.2501-1.3751	1.3751-1.5001	1.5001-1.6251	1.6251-1.7501	1.7501-2.0001
Code Type	Min. P (Rounds)										
37 HJX	.062	.062	.080	.080	.115	.115	.115	.115	.115		
50 HJX	.158	.158	.158	.158	.158	.158	.158	.158	.158	.187	
62 HJX	.158	.158	.158	.158	.158	.158	.158	.158	.158	.187	
75 HJX	.235	.235	.235	.235	.235	.235	.235	.235	.235	.281	
87 HJX	.300	.300	.300	.300	.300	.300	.300	.300	.300	.350	
100 HJX	.350	.350	.350	.350	.350	.350	.350	.350	.350	.350	
125 HJX	.450	.450	.450	.450	.450	.450	.450	.450	.450	.450	
	Min. W (Shapes)										
37 HJ	.062	.062	.080	.080	.115	.115	.115	.115	.115		
50 HJ	.158	.158	.158	.158	.158	.158	.158	.158	.158	.187	
62 HJ	.158	.158	.158	.158	.158	.158	.158	.158	.158	.187	
75 HJ	.235	.235	.235	.235	.235	.235	.235	.235	.235	.281	
87 HJ	.235	.235	.235	.235	.235	.235	.235	.235	.235	.281	
100 HJ	.235	.235	.235	.235	.235	.235	.235	.235	.235	.281	
125 HJ		.281	.281	.281	.281	.281	.281	.281	.281	.281	

XL Overall Length Shortened
Stock removal from point end which shortens B length. To maintain "B", specify "XLB".



XLB Overall Length Shortened
B length maintained

XJ Smaller Jektol[®] Components
See p. 39

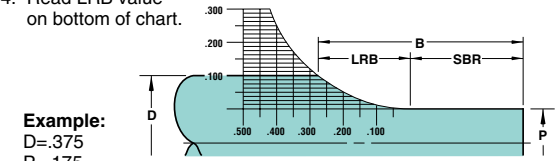
XK No sidehole
For air injection. No cost.

LL Precision Overall Length
Same as XL except overall length is held to $\pm .001$.

SBR Straight Before Radius

To determine Length of Radius Blend (LRB)

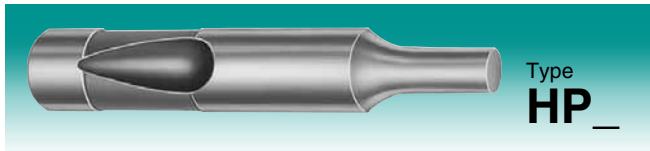
1. Calculate (D-P)/2.
2. Find (D-P)/2 value on left side of chart.
3. Follow line over to intersection point on radius blend line.
4. Read LRB value on bottom of chart.



Example:
D=.375
P=.175
(D-P)/2=(.375-.175)/2=.100
Following the .100 line on chart over the radius blend line shows the LRB to be approximately .300.

Regular Punches

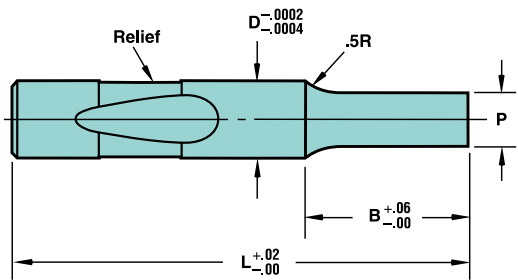
Heavy Duty



Material
Steel: A2, M2, PS4, RC 60-63

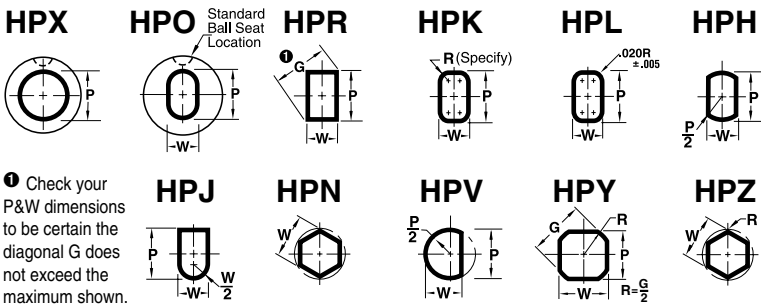
Round P $\pm .0005$
Shape P, W $\pm .0005$

© .0005 | P to D
© .001 | P to D



Regular Punches

Heavy Duty



Features/Benefits

Regular punches provide three times better alignment than other major brands; offer longer tool life; and can significantly improve finished part quality.

HOW TO ORDER

Specify:	Qty.	Type	D Code	L	P (or P&W)	Steel
Example: 16		HPX	62	B375	P.370	M2
7		HPR	50	300	P.327, W.254	A2

Standard Ball Seat Locations

Standard Ball Seat Location is at 90°. Alternate locations of 0°, 180°, or 270° can be specified at no additional cost.

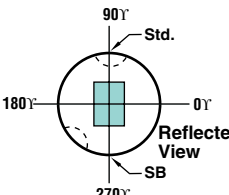
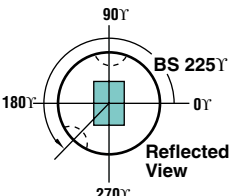
Custom Ball Seat Locations

Custom Ball Seat Locations can be specified as “BS” and degrees counter-clockwise from 0°. For additional information, see “Locking Devices” on p. 40.

Double Ball Seat

A second ball seat may be specified. Normally located 180° from the primary ball seat, these are used to minimize sharpening of notching punches by rotating the punch 180°. Specify “SB” and degree desired. A second ball can also be located 90° from the primary ball seat.

Not recommended for diameters under .500.



Surface Coatings

Some catalog products can be coated to increase hardness, reduce galling, and improve wear and/or corrosion resistance.

DayTride® (XN)—a low-cost surface application that treats all exposed surfaces. Ideal for punches and die buttons. Provides high dimensional stability. Approx. hardness: RC65-73.

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DayTAN™ (XAN)—ultra-hard, high-aluminum PVD coating. Absorbs shear stress and provides high temperature resistance. Ideal for HSLA, dual phase, and TRIP steels. Approx. hardness: *Vickers 3400.

TiCN (XCN)—very hard PVD, thin film. Provides ultra hardness (harder than carbide) and superior abrasive wear resistance. Approx. hardness: *Vickers 3000.

XNM—PVD, solid film. Produces lower coefficient of friction than other coatings. Provides excellent lubricity. Approx. hardness: *Vickers 2000.

XNP—the ultimate coating for extrusion and forming applications. Also works well in shaving operations. Tolerance is $\pm .0002$. Approx. hardness: *Vickers 3100.

DayKool™ (XCR)—cryogenic steel conditioning process, used primarily with hard, thick materials. Improves strength, toughness, and dimensional stability.

CrN (CRN)—excellent adhesion, high toughness, and good corrosion resistance. Primary applications are metal forming (copper, brass, bronze), metal die casting, and plastic injection molding. Approx. hardness: *Vickers 1800-2100.

ZertonPlus™ (XNA)—excellent wear resistance, thermal shock stability and hot hardness. Approx. hardness *Vickers 3200.

XNAProgress (XNAP)—ultra-hard PVD coating that absorbs shear stress; provides excellent high-temperature resistance. Ideal for stamping where tools are exposed to extreme stress profiles. A good alternative to TD coating without the dimensional changes associated with that process. Approx hardness: *Vickers 3200.

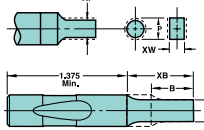
Diamond Like Carbon Coating (XCD)—combines high hardness with an extremely low coefficient of friction. Good protection against abrasive & adhesive wear. Approx. hardness *Vickers 5000.

Code	Material
XN —DayTride®	M2 & PS4
XNT —DayTiN®	M2 & PS4
XAN —DayTAN™	M2 & PS4
XCN —TiCN	M2 & PS4
XNM	M2 & PS4
XNP	M2 & PS4
XCR —DayKool™	M2 & PS4
CRN	M2 & PS4
XNA —ZertonPlus™	M2 & PS4
XNAP—XNAProgress	M2 & PS4
XCD	M2 & PS4

* Vickers used when RC exceeds 80.
© DayTride and DayTiN are registered trademarks of Dayton Progress.
™ DayTAN, DayKool, and ZertonPlus are trademarks of Dayton Progress.

Standard Alterations

Regular Punches—Heavy Duty



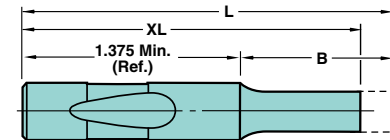
XP, XW P and W Dimensions Smaller than Standard

XB Point Length Other than Standard

For XBB and X3B, add three days to delivery.

	XB										XBB	X3B
Point Length	.5001-.6250	.6251-.7500	.7501-.8750	.8751-1.0000	1.0001-1.1250	1.1251-1.2500	1.2501-1.3750	1.3751-1.5000	1.5000-1.6250	1.6251-2.0000	2.0001-2.5000	2.5001-3.0000
Code Type	Min. P (Rounds)											
37 HPX	.050	.050	.080	.080	.106	.115	.115	.115	.115	.187	.250	.312
50 HPX	—	.093	.093	.093	.125	.125	.125	.125	.125	.187	.250	.312
62 HPX	—	.125	.125	.125	.158	.158	.158	.158	.158	.187	.250	.312
75 HPX	—	.235	.235	.235	.235	.235	.235	.235	.235	.281	.375	.375
87 HPX	—	.300	.300	.300	.300	.300	.300	.300	.300	.350	.375	.437
100 HPX	—	.350	.350	.350	.350	.350	.350	.350	.350	.350	.375	.437
125 HPX	—	.450	.450	.450	.450	.450	.450	.450	.450	.450	.450	.450
	Min. W (Shapes)											
37 HP	.050	.050	.080	.080	.106	.115	.115	.115	.115	.156		
50 HP	—	.093	.093	.093	.125	.125	.125	.125	.125	.156		
62 HP	—	.125	.125	.125	.158	.158	.158	.158	.158	.187		
75 HP	—	.235	.235	.235	.235	.235	.235	.235	.235	.250		
87 HP	—	.235	.235	.235	.235	.235	.235	.235	.235	.250		
100 HP	—	.235	.235	.235	.235	.235	.235	.235	.235	.250		
125 HP	—	—	.235	.235	.235	.235	.235	.235	.235	.265		

XL Overall Length Shortened
Stock removal from point end which shortens B length. To maintain “B”, specify “XLB”.



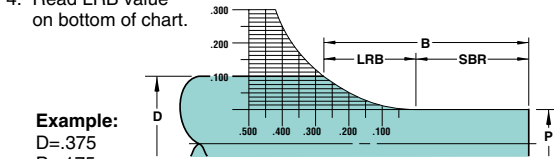
XLB Overall Length Shortened
B length maintained

LL Precision Overall Length
Same as XL except overall length is held to $\pm .001$.

SBR Straight Before Radius

To determine Length of Radius Blend (LRB)

1. Calculate (D-P)/2.
2. Find (D-P)/2 value on left side of chart.
3. Follow line over to intersection point on radius blend line.
4. Read LRB value on bottom of chart.



Example:
D=.375
P=.175
(D-P)/2=(.375-.175)/2=.100
Following the .100 line on chart over the radius blend line shows the LRB to be approximately .300.

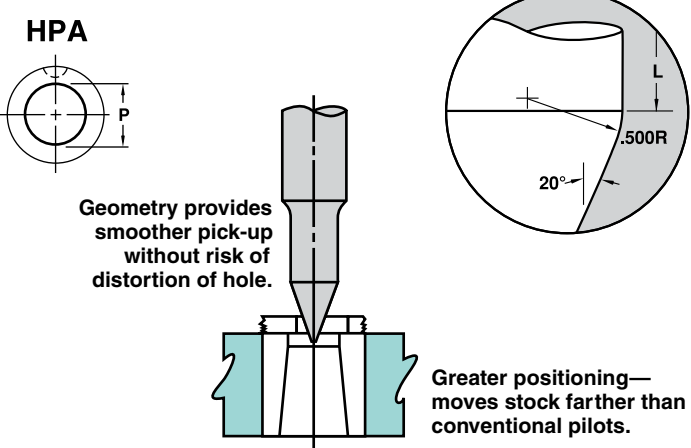
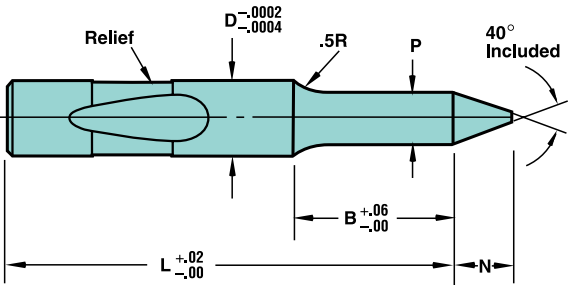
Positive Pick-Up Pilots

Heavy Duty



Type
HPA

Material
Steel: M2, PS4, RC 60-63
All heads are drawn to RC 40-55.
Round P $+ .0005$
 $- .0000$ © .0005 P to D
When P=D, shank tolerance applies.



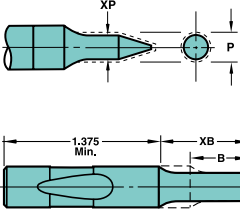
Order any length shown. If you require a length between those shown, designate “XL.”
Example: You require a length of 3.600. Order 375, then show XL 3.600. See “How to Order” example on the next page. XL is available down to 1.375. Note shank length limitation of .75. (B length may be shorter than shown when XL is under the shortest length shown.)
There is no additional charge for XL.

Shank		Point Lgth. B	Round				L															L						
D	Code		Min. XP	Range P	*N	Pn	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25		Code	5.50	5.75	6.00	6.25	6.50	6.75	7.00	
.375	37	.625	.083	.186 - .375	.37	.2342	250	275	300	325	350	375	400	425	450	475	500	525		37	550	575	600	625	650	675	700	
.500	50	.812	.092	.249 - .500	.50	.3252														50								
.625	62	.937	.124	.311 - .625	.62	.4162														62								
.750	75	1.062	.234	.436 - .750	.75	.5072														75								
.875	87	1.187	.299	.624 - .875	.87	.5982														87								
1.000	100	1.250	.349	.749-1.000	1.00	.6892														100								
1.250	125	1.437	.449	.999-1.250	1.25	.8712														125								
.375	37	.75	.083	.186 - .375	.37	.2342	B250	B275	B300	B325	B350	B375	B400	B425	B450	B475	B500	B525		37	B550	B575	B600	B625	B650	B675	B700	
.500	50		.092	.249 - .500	.50	.3252														50								
.625	62		.124	.311 - .625	.62	.4162														62								
.750	75		.234	.436 - .750	.75	.5072														75								
.875	87		.299	.624 - .875	.87	.5982														87								
1.000	100	.349	.749-1.000	1.00	.6892															100								
1.250	125	.449	.999-1.250	1.25	.8712															125								
.375	37	1.00	.083	.186 - .375	.37	.2342	C250	C275	C300	C325	C350	C375	C400	C425	C450	C475	C500	C525		37	C550	C575	C600	C625	C650	C675	C700	
.500	50		.092	.249 - .500	.50	.3252														50								
.625	62		.124	.311 - .625	.62	.4162														62								
.750	75		.234	.436 - .750	.75	.5072														75								
.875	87		.299	.624 - .875	.87	.5982														87								
1.000	100	.349	.749-1.000	1.00	.6892															100								
1.250	125	.449	.999-1.250	1.25	.8712															125								
.500	50	1.25	.124	.249 - .500	.50	.3252		D275	D300	D325	D350	D375	D400	D425	D450	D475	D500	D525		50	D550	D575	D600	D625	D650	D675	D700	
.625	62		.157	.311 - .625	.62	.4162														62								
.750	75		.234	.436 - .750	.75	.5072														75								
.875	87		.299	.624 - .875	.87	.5982														87								
1.000	100		.349	.749-1.000	1.00	.6892														100								
1.250	125	.449	.999-1.250	1.25	.8712															125								

*N =[(P-.057)/.728]+.132 when “P” dimension is less than “Pn” shown in chart.

Standard Alterations

Positive Pick-Up Pilots—Heavy Duty



XP P Dimensions
Smaller than Standard

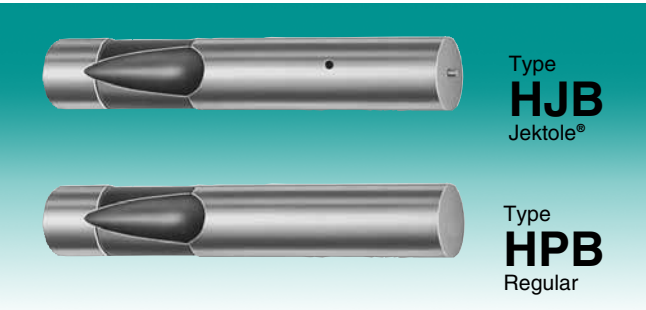
XB Point Length
Other than Standard

Specify XB, XBB, or X3B and length (see chart below).

For XBB and X3B, add three days to delivery.

Point Length	XB												XBB	X3B
	.5001-.6250	.6251-.7501	.7501-.8750	.8751-1.0001	1.0001-1.1250	1.1251-1.2501	1.2501-1.3750	1.3751-1.5001	1.5001-1.6250	1.6251-2.0000	2.0001-2.5001	2.5001-3.0000		
Code Type	Min. P (Rounds)													
37 HPA	.083	.083	.083	.083	.105	.114	.114	.114	.114	.186	.249	.311		
50 HPA	.092	.092	.092	.092	.124	.124	.124	.124	.124	.186	.249	.311		
62 HPA	.124	.124	.124	.124	.155	.155	.155	.155	.155	.186	.249	.311		
75 HPA	.234	.234	.234	.234	.234	.234	.234	.234	.234	.280	.311	.374		
87 HPA	.299	.299	.299	.299	.299	.299	.299	.299	.299	.349	.374	.436		
100 HPA	.349	.349	.349	.349	.349	.349	.349	.349	.349	.349	.374	.436		
125 HPA	.449	.449	.449	.449	.449	.449	.449	.449	.449	.449	.449	.449		

Punch Blanks Jektol® & Regular Heavy Duty



Material
Steel: A2, M2, PS4, RC 60-63

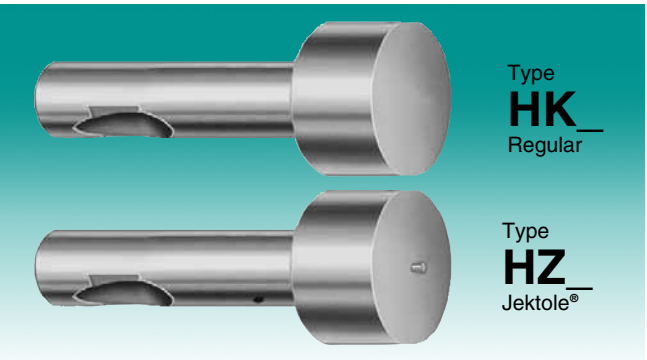
Type	Shank		L															* Jektote® Group
	D	Code	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	
HJB	.375	37	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	J4
	.500	50																J6
	.625	62																J6
	.750	75															J9	
	.875	87															J9	
	1.000	100															J9	
	1.250	125															J12	

Type	Shank		L																		
	D	Code	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00
HPB	.375	37	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700
	.500	50																			
	.625	62																			
	.750	75			300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700
	.875	87																			
	1.000	100																			
	1.250	125																			

* See p. 39 for additional information.

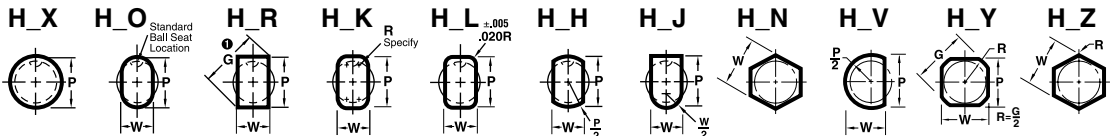
HOW TO ORDER					
Specify:	Qty.	Type	D Code	L	Steel
Example:	12	HJB	50	300	M2
	5	HPB	75	400	A2

Point Larger than Shank Jektol® & Regular Heavy Duty



Material
Steel: A2, M2, RC 60-63.
Round P $\pm \begin{smallmatrix} .0005 \\ -.0000 \end{smallmatrix}$
Shape P, W $\pm .0005$

Check your P&W dimensions to be certain the diagonal G does not exceed the maximum shown.



Type	Shank		Point Lgth. B	Round Range P	Shape			L									* Jektol® Group
	D	Code			Min XW	Min. W	Max. P/G	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	
HK_ Regular HZ_ Jektol®	.375	37	.62	.376 - .875	.062	.125	.875	250	275	300	325	350	375	400	425	450	J4
	.500	50	.75	.501-1.250	.158	.188	1.250										J6
	.625	62	.88	.626-1.500	.158	.250	1.500										J6
	.750	75	.94	.751-1.500	.235	.312	1.500										J9
	.875	87	.94	.876-1.750	.235	.375	1.750										J9
	1.000	100	.94	1.001-1.750	.235	.437	1.750										J9
	1.250	125	1.25	1.251-2.000	.281	.500	2.000										J12

* See p. 39 for additional information.

Standard Ball Seat Locations

Standard Ball Seat Location is at 90°. Alternate locations of 0°, 180°, or 270° can be specified at no additional cost.

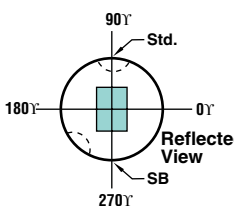
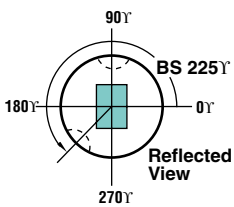
Custom Ball Seat Locations

Custom Ball Seat Locations can be specified as “BS” and degrees counter-clockwise from 0°. For additional information, see “Locking Devices” on p. 40.

Double Ball Seat

A second ball seat may be specified. Normally located 180° from the primary ball seat, these are used to minimize sharpening of notching punches by rotating the punch 180°. Specify “SB” and degree desired. A second ball can also be located 90° from the primary ball seat.

Not recommended for diameters under .750 for HZ_ and .500 for HK_.



HOW TO ORDER

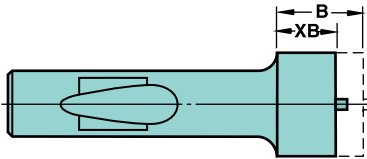
Specify:	Qty.	Type	D Code	L	P (or P&W)	Steel
Example:	2	HKR	100	350	P1.350, W.500	M2

Standard Alterations

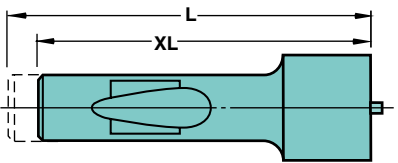
Point Larger than Shank Ball Lock punches are available in sizes other than those shown in the chart above.

When ordering, you are asked to specify different designations for various non-standard dimensions. For example, if the P and W dimensions are outside the standard range, an “X” is placed in front of the P or W dimension, e.g., “XP” and/or “XW.” If the point length is other than standard, designate “XB” as the point length. Also see “Standard Alterations” on the front of the pullout tab in this section for other special order designators.

Standard Alterations Point Larger than Shank—Heavy Duty



XB Point Length Shorter than Standard (Shortens punch from the point end.)



XL Overall Length Shortened Stock removal from **shank end**. Minimum shank length is 1 1/16". Does not alter ball seat location.

LL Precision Overall Length Same as XL except overall length is held to $\pm .001$.

Dayton Slug Control

Dayton Slug Control is a guaranteed method for reducing the risk of pulling slugs to the die surface during withdrawal of the punch. A series of grooves is designed inside the die button. There, the slugs are trapped until they fall freely through the relief. The use of Dayton Slug Control has no effect on hole size, and will not require any changes in current regrind practices.



Our guarantee: *Use Dayton Slug Control in a stamping die now pulling slugs. If, for any reason, you are not completely satisfied, we will refund the full cost of the Slug Control alteration.* (We cannot guarantee the retention of slugs when clearance exceeds 10% per side.)

Ordering

Dayton Slug Control is easy to specify and order. Simply add the information that is unique to your application to the die button catalog number. Please specify XSC for alteration and show material thickness (inches) and clearance per side (percentage).

HOW TO ORDER

Catalog Number				Your Specs		
Inch	KDX	62	100	P.250	XSC	MT.0625
Type	D	L	P	Alt. Code	Mat'l Thickness (inches)	Clear Per Side (%)

For additional information, contact your Dayton distributor.

Surface Coatings

Some catalog products can be coated to increase hardness, reduce galling, and improve wear and/or corrosion resistance.

DayTride® (XN)—a low-cost surface application that treats all exposed surfaces. Ideal for punches and die buttons. Provides high dimensional stability. Approx. hardness: RC65-73.

DayTiN® (XNT)—applied via PVD (physical vapor deposition). Provides extreme hardness (hard as carbide) and excellent lubricity when used with a lubricant. Not recommended for stainless steel, copper, or nickel. Approx. hardness: *Vickers 2300.

DayTAN™ (XAN)—ultra-hard, high-aluminum PVD coating. Absorbs shear stress and provides high temperature resistance. Ideal for HSLA, dual phase, and TRIP steels. Approx. hardness: *Vickers 3400.

TiCN (XCN)—very hard PVD, thin film. Provides ultra hardness (harder than carbide) and superior abrasive wear resistance. Approx. hardness: *Vickers 3000.

XNM—PVD, solid film. Produces lower coefficient of friction than other coatings. Provides excellent lubricity. Approx. hardness: *Vickers 2000.

XNP—the ultimate coating for extrusion and forming applications. Also works well in shaving operations. Tolerance is $\pm .0002$. Approx. hardness: *Vickers 3100.

DayKool™ (XCR)—cryogenic steel conditioning process, used primarily with hard, thick materials. Improves strength, toughness, and dimensional stability.

CrN (CRN)—excellent adhesion, high toughness, and good corrosion resistance. Primary applications are metal forming (copper, brass, bronze), metal die casting, and plastic injection molding. Approx. hardness: *Vickers 1800-2100.

ZertonPlus™ (XNA)—excellent wear resistance, thermal shock stability and hot hardness. Approx. hardness *Vickers 3200.

XNAProgress (XNAP)—ultra-hard PVD coating that absorbs shear stress; provides excellent high-temperature resistance. Ideal for stamping where tools are exposed to extreme stress profiles. A good alternative to TD coating without the dimensional changes associated with that process. Approx hardness: *Vickers 3200.

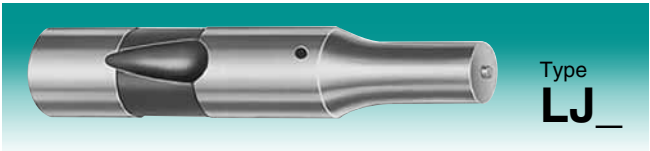
Diamond Like Carbon Coating (XCD)—combines high hardness with an extremely low coefficient of friction. Good protection against abrasive & adhesive wear. Approx. hardness *Vickers 5000.

Code	Material
XN —DayTride®	M2 & PS4
XNT —DayTiN®	M2 & PS4
XAN —DayTAN™	M2 & PS4
XCN —TiCN	M2 & PS4
XNM	M2 & PS4
XNP	M2 & PS4
XCR —DayKool™	M2 & PS4
CRN	M2 & PS4
XNA —ZertonPlus™	M2 & PS4
XNAP —XNAProgress	M2 & PS4
XCD	M2 & PS4

* Vickers used when RC exceeds 80.
© DayTride and DayTiN are registered trademarks of Dayton Progress.
™ DayTAN, DayKool, and ZertonPlus are trademarks of Dayton Progress.

Jektol[®] Punches

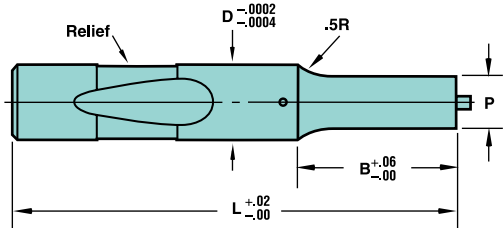
Light Duty



Material
Steel: A2, M2, PS4, RC 60-63

Round P $\pm .0005$
Shape P, W $\pm .0005$

P to D
 P to D

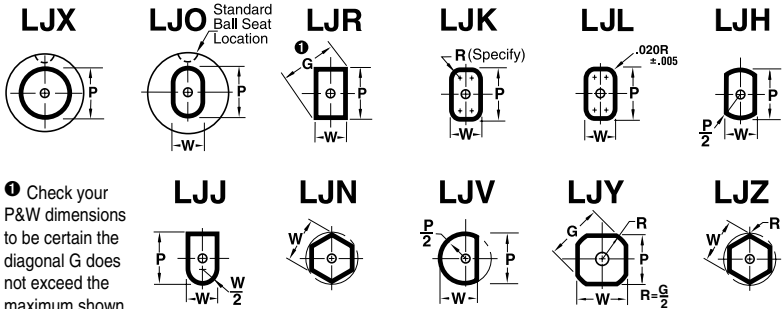


Shank		Point	Round		Shape		L											L						**		
D	Code	Lgth. B	Min. XP	Range P	Min. XW	Min. Max. W	P/G	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	Code	4.75	5.00	5.25	5.50	5.75	6.00	Jektol® Group
.250	25	.500	.050	.062-.249	.050	.062-.249		200											25							J2, J3*
.375	37	.625	.115	.125-.374	.115	.125-.374													37							J4
.500	50	.750	.158	.187-.499	.158	.187-.499													50							J6
.625	62	.875	.158	.312-.624	.158	.250-.624			225	250	275	300	325	350	375	400	425	450	62	475	500	525	550	575	600	J6
.750	75	.937	.235	.437-.749	.235	.312-.749													75							J9
.875	87	.937	.300	.625-.874	.235	.375-.874												87							J9	
1.000	100	.937	.350	.750-.999	.235	.437-.999												100							J9	
.250	25	.75	.050	.093-.249	.050	.093-.249													25							J2, J3*
.375	37		.115	.125-.374	.115	.125-.374													37							J4
.500	50		.158	.187-.499	.158	.187-.499													50							J6
.625	62		.158	.312-.624	.158	.250-.624		B225	B250	B275	B300	B325	B350	B375	B400	B425	B450	62	B475	B500	B525	B550	B575	B600	J6	
.750	75		.235	.437-.749	.235	.312-.749												75							J9	
.875	87	1.00	.300	.625-.874	.235	.375-.874												87							J9	
1.000	100		.350	.750-.999	.235	.437-.999												100							J9	
.375	37		.115	.125-.374	.115	.125-.374													37							J4
.500	50		.158	.187-.499	.158	.187-.499													50							J6
.625	62		.158	.312-.624	.158	.250-.624		C225	C250	C275	C300	C325	C350	C375	C400	C425	C450	62	C475	C500	C525	C550	C575	C600	J6	
.750	75	1.25	.235	.437-.749	.235	.312-.749												75							J9	
.875	87		.300	.625-.874	.235	.375-.874												87							J9	
1.000	100		.350	.750-.999	.235	.437-.999												100							J9	
.500	50		.158	.187-.499	.158	.187-.499													50							J6
.625	62		.158	.312-.624	.158	.250-.624													62							J6
.750	75	1.25	.235	.437-.749	.235	.312-.749				D250	D275	D300	D325	D350	D375	D400	D425	D450	75	D475	D500	D525	D550	D575	D600	J9
.875	87		.300	.625-.874	.235	.375-.874													87							J9
1.000	100		.350	.750-.999	.235	.437-.999													100							J9

*J2 (P=.050-.0639) J3 (P≥.064)
**See p.39 for additional information.

Jektol[®] Punches

Light Duty



Features/Benefits

Jektol[®] punches permit doubling punch to die button clearance; produce up to three times the number of hits between sharpenings; and reduce burr heights.

HOW TO ORDER

Specify:	Qty.	Type	D Code	L	P (or P&W)	Steel
Example:	21	LJX	37	325	P.175	A2
	15	LJR	50	400	P.327, W.254	M2

Standard Ball Seat Locations

Standard Ball Seat Location is at 90°. Alternate locations of 0°, 180°, or 270° can be specified at no additional cost.

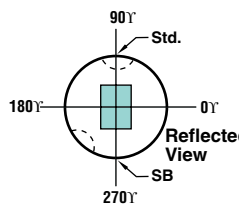
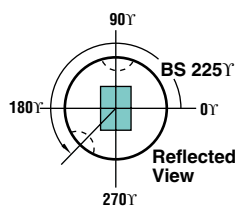
Custom Ball Seat Locations

Custom Ball Seat Locations can be specified as “BS” and degrees counter-clockwise from 0°. For additional information, see “Locking Devices” on p. 40.

Double Ball Seat

A second ball seat may be specified. Normally located 180° from the primary ball seat, these are used to minimize sharpening of notching punches by rotating the punch 180°. Specify “SB” and degree desired. A second ball can also be located 90° from the primary ball seat.

Not recommended for diameters under .625.



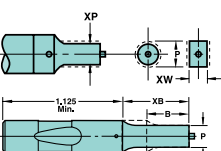
Standard Alterations

Jektol[®] punches are available in sizes other than those shown in the chart to the left.

When ordering, you are asked to specify different designations for various non-standard dimensions. For example, if the P and W dimensions are outside the standard range, an “X” is placed in front of the P or W dimension, e.g., “XP” and/or “XW.” If the point length is other than standard, designate “XB” as the point length. Also see “Standard Alterations” on the front of the pullout tab in this section for other special order designators.

Standard Alterations

Jektol[®] Punches—Light Duty



XP, XW P and W Dimensions Smaller than Standard

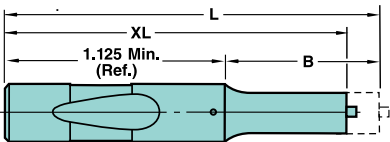
XB Point Length Other than Standard

For XBB, add three days to delivery.

	XB										XBB
Point Length	.5001-.6250	.6251-.7500	.7501-.8750	.8751-1.0000	1.0001-1.1250	1.1251-1.2500	1.2501-1.3750	1.3751-1.5000	1.5001-1.6250	1.6251-2.0000	
Code Type	Min. P (Rounds)										
25 LJX	.050	.050	.080	.080							
37 LJX	.115	.115	.115	.115	.115	.115	.115	.115			
50 LJX	.158	.158	.158	.158	.158	.158	.158	.158	.158	.187	
62 LJX	.158	.158	.158	.158	.158	.158	.158	.158	.158	.188	
75 LJX	.235	.235	.235	.235	.235	.235	.235	.235	.235	.281	
87 LJX	.300	.300	.300	.300	.300	.300	.300	.300	.300	.312	
100 LJX	.350	.350	.350	.350	.350	.350	.350	.350	.350	.350	
	Min. W (Shapes)										
25 LJL	.050	.050	.080	.080							
37 LJL	.115	.115	.115	.115	.115	.115	.115	.115			
50 LJL	.158	.158	.158	.158	.158	.158	.158	.158	.158	.187	
62 LJL			.158	.158	.158	.158	.158	.158	.158	.188	
75 LJL			.235	.235	.235	.235	.235	.235	.235	.250	
87 LJL		.235	.235	.235	.235	.235	.235	.235	.235	.250	
100 LJL		.235	.235	.235	.235	.235	.235	.235	.235	.250	

XL Overall Length Shortened

Stock removal from point end which shortens B length.



XLB Overall Length Shortened

B length maintained

LL Precision Overall Length

Same as XL except overall length is held to ±.001.

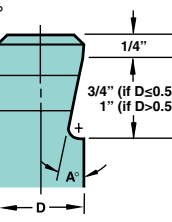
WS Whistle Stop

See table for standard angles. The Whistle Stop alteration is ground through the ball seat, subject to the same limitations as other standard and custom ball seat locations.

Example: LJX50 400, P.327, M2, WS, XA 7.5°

D	A°
25,37	5°
50	7.5°
62-100	10°

Angles of 5° and 7.5° also available on .625 and larger diameters. (Specify **XA** and angle after **WS**.)



XJ Smaller Jektol[®] Components

See p.39.

XK No Side Hole

For air ejection. No cost.

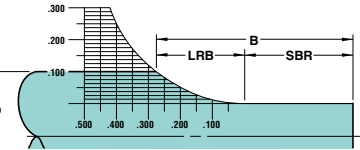
SBR Straight Before Radius

To determine Length of Radius Blend (LRB)

- Calculate (D-P)/2.
- Find (D-P)/2 value on left side of chart.
- Follow line over to intersection point on radius blend line.
- Read LRB value on bottom of chart.

Example:
D=.375
P=.175
(D-P)/2=(.375-.175)/2=.100

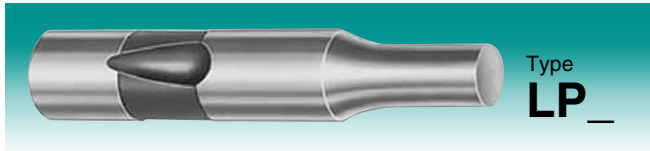
Following the .100 line on chart over the radius blend line shows the LRB to be approximately .300.



* Vickers used when RC exceeds 80.
® DayTride and DayTiN are registered trademarks of Dayton Progress.
™ DayTAN, DayKool, and ZertonPlus are trademarks of Dayton Progress.

Regular Punches

Light Duty



Material
Steel: A2, M2, PS4, RC 60-63

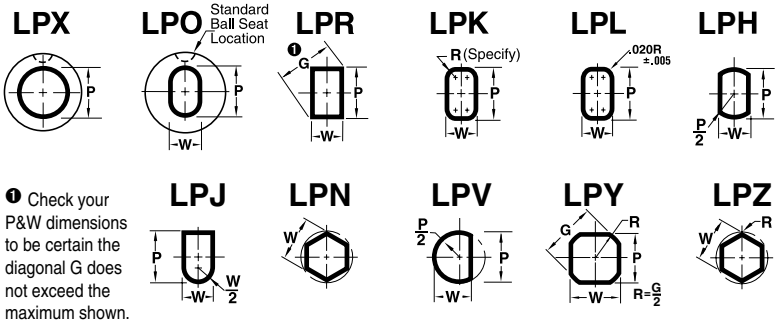
Round P $\pm .0005$
Shape P, W $\pm .0005$

© .0005 P to D
© .001 P to D

Shank		Point Lgth. B	Round		Shape			L														L									
D	Code		Min. XP	Range P	Min. XW	Min. W	Max. P/G	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00		Code	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	
.250	25	.500	.040	.062-.249	.040	.062-.249		200														25									
.375	37	.625	.050	.125-.374	.050	.125-.374																	37								
.500	50	.750	.093	.187-.499	.093	.187-.499																	50								
.625	62	.875	.125	.312-.624	.125	.250-.624			225	250	275	300	325	350	375	400	425	450	475	500			62	525	550	575	600	625	650	675	700
.750	75	.937	.235	.437-.749	.235	.312-.749																	75								
.875	87	.937	.300	.625-.874	.235	.375-.874																87									
1.000	100	.937	.350	.750-.999	.235	.437-.999																100									
.250	25		.040	.093-.249	.040	.093-.249																25									
.375	37		.050	.125-.374	.050	.125-.374																37									
.500	50		.093	.187-.499	.093	.187-.499																50									
.625	62	.75	.125	.312-.624	.125	.250-.624		B225	B250	B275	B300	B325	B350	B375	B400	B425	B450	B475	B500			62	B525	B550	B575	B600	B625	B650	B675	B700	
.750	75		.235	.437-.749	.235	.312-.749																75									
.875	87		.300	.625-.874	.235	.375-.874																87									
1.000	100		.350	.750-.999	.235	.437-.999																100									
.375	37		.080	.125-.374	.080	.125-.374																37									
.500	50		.093	.187-.499	.093	.187-.499																50									
.625	62		.125	.312-.624	.125	.250-.624																62									
.750	75	1.00	.235	.437-.749	.235	.312-.749		C225	C250	C275	C300	C325	C350	C375	C400	C425	C450	C475	C500			75	C525	C550	C575	C600	C625	C650	C675	C700	
.875	87		.300	.625-.874	.235	.375-.874																87									
1.000	100		.350	.750-.999	.235	.437-.999																100									
.500	50		.125	.187-.499	.125	.187-.499																50									
.625	62		.158	.312-.624	.158	.250-.624																62									
.750	75	1.25	.235	.437-.749	.235	.312-.749				D250	D275	D300	D325	D350	D375	D400	D425	D450	D475	D500		75	D525	D550	D575	D600	D625	D650	D675	D700	
.875	87		.300	.625-.874	.235	.375-.874																87									
1.000	100		.350	.750-.999	.235	.437-.999																100									

Regular Punches

Light Duty



Features/Benefits

Regular punches provide three times better alignment than other major brands; offer longer tool life; and can significantly improve finished part quality.

HOW TO ORDER

Specify:	Qty.	Type	D Code	L	P (or P&W)	Steel
Example:	25	LPX	87	B275	P.740	M2
	12	LPO	100	B350	P.937, W.475	A2

Standard Ball Seat Locations

Standard Ball Seat Location is at 90°. Alternate locations of 0°, 180°, or 270° can be specified at no additional cost.

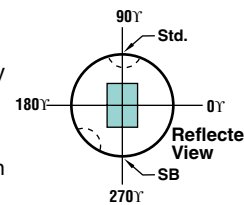
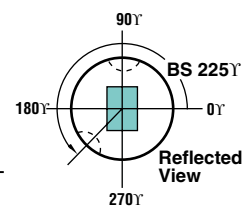
Custom Ball Seat Locations

Custom Ball Seat Locations can be specified as “BS” and degrees counter-clockwise from 0°. For additional information, see “Locking Devices” on p. 40.

Double Ball Seat

A second ball seat may be specified. Normally located 180° from the primary ball seat, these are used to minimize sharpening of notching punches by rotating the punch 180°. Specify “SB” and degree desired. A second ball can also be located 90° from the primary ball seat.

Not recommended for diameters under .375.



Standard Alterations

Regular punches are available in sizes other than those shown in the chart to the left.

When ordering, you are asked to specify different designations for various non-standard dimensions. For example, if the P and W dimensions are outside the standard range, an “X” is placed in front of the P or W dimension, e.g., “XP” and/or “XW.” If the point length is other than standard, designate “XB” as the point length. Also see “Standard Alterations” on the front of the pullout tab in this section for other special order designators.

Surface Coatings

Some catalog products can be coated to increase hardness, reduce galling, and improve wear and/or corrosion resistance.

DayTride® (XN)—a low-cost surface application that treats all exposed surfaces. Ideal for punches and die buttons. Provides high dimensional stability. Approx. hardness: RC65-73.

DayTiN® (XNT)—applied via PVD (physical vapor deposition). Provides extreme hardness (hard as carbide) and excellent lubricity when used with a lubricant. Not recommended for stainless steel, copper, or nickel. Approx. hardness: *Vickers 2300.

DayTAN™ (XAN)—ultra-hard, high-aluminum PVD coating. Absorbs shear stress and provides high temperature resistance. Ideal for HSLA, dual phase, and TRIP steels. Approx. hardness: *Vickers 3400.

TiCN (XCN)—very hard PVD, thin film. Provides ultra hardness (harder than carbide) and superior abrasive wear resistance. Approx. hardness: *Vickers 3000.

XNM—PVD, solid film. Produces lower coefficient of friction than other coatings. Provides excellent lubricity. Approx. hardness: *Vickers 2000.

XNP—the ultimate coating for extrusion and forming applications. Also works well in shaving operations. Tolerance is $\pm .0002$. Approx. hardness: *Vickers 3100.

DayKool™ (XCR)—cryogenic steel conditioning process, used primarily with hard, thick materials. Improves strength, toughness, and dimensional stability.

CrN (CRN)—excellent adhesion, high toughness, and good corrosion resistance. Primary applications are metal forming (copper, brass, bronze), metal die casting, and plastic injection molding. Approx. hardness: *Vickers 1800-2100.

ZertonPlus™ (XNA)—excellent wear resistance, thermal shock stability and hot hardness. Approx. hardness *Vickers 3200.

XNAPprogress (XNAP)—ultra-hard PVD coating that absorbs shear stress; provides excellent high-temperature resistance. Ideal for stamping where tools are exposed to extreme stress profiles. A good alternative to TD coating without the dimensional changes associated with that process. Approx hardness: *Vickers 3200.

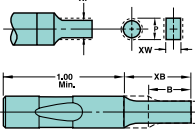
Diamond Like Carbon Coating (XCD)—combines high hardness with an extremely low coefficient of friction. Good protection against abrasive & adhesive wear. Approx. hardness *Vickers 5000.

Code	Material
XN —DayTride®	M2 & PS4
XNT —DayTiN®	M2 & PS4
XAN —DayTAN™	M2 & PS4
XCN —TiCN	M2 & PS4
XNP	M2 & PS4
XCR —DayKool™	M2 & PS4
CRN	M2 & PS4
XNA —ZertonPlus™	M2 & PS4
XNAP—XNAPprogress	M2 & PS4
XCD	M2 & PS4

* Vickers used when RC exceeds 80.
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™ DayTAN, DayKool, and ZertonPlus are trademarks of Dayton Progress.

Standard Alterations

Regular Punches—Light Duty



XP, XW P and W Dimensions Smaller than Standard

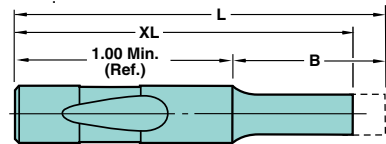
XB Point Length Other than Standard

For XBB and X3B, add three days to delivery.

	XB										XBB	X3B
Point Length	.5001-.6251	.7501-.8751	1.0001-1.1251	1.2501-1.3751	1.5001-1.6251	1.7501-1.8751	2.0001-2.1251	2.2501-2.3751	2.5001-2.6251	2.7501-2.8751	3.0001-3.1251	3.2501-3.3751
Code Type	Min. P (Rounds)											
25 LPX	.040	.040	.080	.080	.106	.115						
37 LPX	.050	.050	.080	.080	.106	.115	.115	.115	.115	.187	.250	.312
50 LPX	.093	.093	.093	.125	.125	.125	.125	.125	.125	.187	.250	.312
62 LPX	.125	.125	.125	.156	.156	.156	.156	.156	.156	.187	.250	.312
75 LPX	.235	.235	.235	.235	.235	.235	.235	.235	.235	.281	.312	.375
87 LPX	.300	.300	.300	.300	.300	.300	.300	.300	.300	.350	.375	.437
100 LPX	.350	.350	.350	.350	.350	.350	.350	.350	.350	.350	.375	.437
	Min. W (Shapes)											
25 LP	.040	.040	.080	.080	.106	.115						
37 LP	.050	.050	.080	.080	.106	.115	.115	.115	.115	.156		
50 LP	.093	.093	.093	.125	.125	.125	.125	.125	.125	.187		
62 LP	.125	.125	.125	.156	.156	.156	.156	.156	.156	.187		
75 LP	.235	.235	.235	.235	.235	.235	.235	.235	.235	.250		
87 LP	.300	.300	.300	.300	.300	.300	.300	.300	.300	.250		
100 LP	.350	.350	.350	.350	.350	.350	.350	.350	.350	.250		

XL Overall Length Shortened

Stock removal from point end which shortens B length.



XLB Overall Length Shortened

B length maintained

LL Precision Overall Length

Same as XL except overall length is held to $\pm .001$.

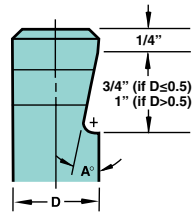
WS Whistle Stop

See table for standard angles. The Whistle Stop alteration is ground through the ball seat, subject to the same limitations as other standard and custom ball seat locations.

Example: LPX37 400, P.327, M2, WS, XA 5°

D	A°
25-37	5°
50	7.5°
62-100	10°

Angles of 5° and 7.5° also available on .625 and larger diameters. (Specify **XA** and angle after **WS**.)



SBR Straight Before Radius

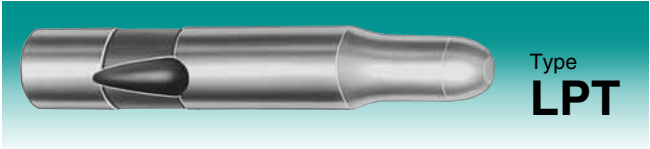
To determine Length of Radius Blend (LRB)

- Calculate (D-P)/2.
- Find (D-P)/2 value on left side of chart.
- Follow line over to intersection point on radius blend line.
- Read LRB value on bottom of chart.

Example:
D=.375
P=.175
(D-P)/2=(.375-.175)/2=.100
Following the .100 line on chart over the radius blend line shows the LRB to be approximately .300.

Regular Pilots

Light Duty

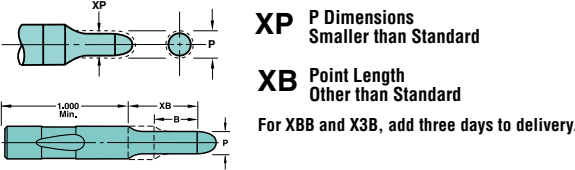


Material
Steel: A2, M2, PS4, RC 60-63
Round P $\begin{smallmatrix} +.0005 \\ -.0000 \end{smallmatrix}$ © .0005 P to D
When P=D, shank tolerance applies.

Shank		Point Lgth. B	Round		L															L							
D	Code		Min. XP	Range P	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	Code	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	
.250	25	.500	.050	.061 - .250	200		225	250	275	300	325	350	375	400	425	450	475	500	25	525	550	575	600	625	650	675	700
.375	37	.625	.061	.124 - .375															37								
.500	50	.750	.092	.186 - .599															50								
.625	62	.875	.124	.311 - .625															62								
.750	75	.937	.234	.436 - .750															75								
.875	87	.937	.299	.624 - .875		B225	B250	B275	B300	B325	B350	B375	B400	B425	B450	B475	B500	87	B525	B550	B575	B600	B625	B650	B675	B700	
1.000	100	.937	.349	.749-1.000														100									
.250	25	.75	.050	.092 - .250														25									
.375	37		.061	.124 - .375														37									
.500	50		.092	.186 - .500														50									
.625	62		.124	.311 - .625	62																						
.750	75		.234	.436 - .750	75																						
.875	87		.299	.624 - .875	87																						
1.000	100		.349	.749-1.000	100																						
.375	37	1.00	.079	.124 - .375		C225	C250	C275	C300	C325	C350	C375	C400	C425	C450	C475	C500	37	C525	C550	C575	C600	C625	C650	C675	C700	
.500	50		.092	.186 - .500														50									
.625	62		.124	.311 - .625														62									
.750	75		.234	.436 - .750														75									
.875	87		.299	.624 - .875														87									
1.000	100	.349	.749-1.000	100																							
.500	50	1.25	.124	.186 - .500			D250	D275	D300	D325	D350	D375	D400	D425	D450	D475	D500	50	D525	D550	D575	D600	D625	D650	D675	D700	
.625	62		.157	.311 - .625														62									
.750	75		.234	.436 - .750														75									
.875	87		.299	.624 - .875														87									
1.000	100		.349	.749-1.000														100									

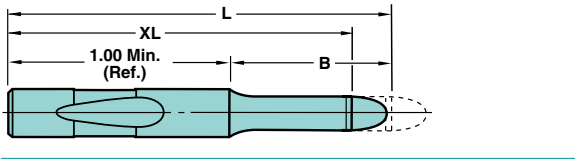
Standard Alterations

Regular Pilots—Light Duty



Point Length	XB										XBB	X3B
	.5001-.6250	.6251-.7501	.7501-.8751	.8751-1.0001	1.0001-1.1251	1.1251-1.2501	1.2501-1.3751	1.3751-1.5001	1.5001-1.6251	1.6251-1.7501	1.7501-2.0001	2.0001-2.5001
Code Type	Min. P (Rounds)											
25 LPT	.050	.050	.079	.079	.105	.114						
37 LPT	.061	.061	.079	.079	.105	.114	.114	.114	.114	.186	.249	.311
50 LPT	.092	.092	.092	.124	.124	.124	.124	.124	.124	.186	.249	.311
62 LPT	.124	.124	.124	.155	.155	.155	.155	.155	.155	.186	.249	.311
75 LPT	.234	.234	.234	.234	.234	.234	.234	.234	.234	.280	.311	.374
87 LPT	.299	.299	.299	.299	.299	.299	.299	.299	.299	.349	.374	.436
100 LPT	.349	.349	.349	.349	.349	.349	.349	.349	.349	.349	.374	.436

XL Overall Length Shortened
Stock removal from point end which shortens B length.

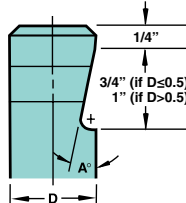


XLB Overall Length Shortened
B length maintained

WS Whistle Stop See table for standard angles. The Whistle Stop alteration is ground through the ball seat, subject to the same limitations as other standard and custom ball seat locations.

Example: LPT62 400, P327, M2, WS, XA 10°

D	A°
25,37	5°
50	7.5°
62-100	10°



Angles of 5° and 7.5° also available on .625 and larger diameters. (Specify **XA** and angle after **WS**.)

SBR Straight Before Radius
To determine Length of Radius Blend (LRB)
1. Calculate (D-P)/2.
2. Find (D-P)/2 value on left side of chart.
3. Follow line over to intersection point on radius blend line.
4. Read LRB value on bottom of chart.

Example:
D=.375
P=.175
(D-P)/2=(.375-.175)/2=.100
Following the .100 line on chart over the radius blend line shows the LRB to be approximately .300.

Surface Coatings

Some catalog products can be coated to increase hardness, reduce galling, and improve wear and/or corrosion resistance.

DayTride® (XN)—a low-cost surface application that treats all exposed surfaces. Ideal for punches and die buttons. Provides high dimensional stability. Approx. hardness: RC65-73.

DayTiN® (XNT)—applied via PVD (physical vapor deposition). Provides extreme hardness (hard as carbide) and excellent lubricity when used with a lubricant. Not recommended for stainless steel, copper, or nickel. Approx. hardness: *Vickers 2300.

DayTAN™ (XAN)—ultra-hard, high-aluminum PVD coating. Absorbs shear stress and provides high temperature resistance. Ideal for HSLA, dual phase, and TRIP steels. Approx. hardness: *Vickers 3400.

TiCN (XCN)—very hard PVD, thin film. Provides ultra hardness (harder than carbide) and superior abrasive wear resistance. Approx. hardness: *Vickers 3000.

XNM—PVD, solid film. Produces lower coefficient of friction than other coatings. Provides excellent lubricity. Approx. hardness: *Vickers 2000.

XNP—the ultimate coating for extrusion and forming applications. Also works well in shaving operations. Tolerance is ± .0002. Approx. hardness: *Vickers 3100.

DayKool™ (XCR)—cryogenic steel conditioning process, used primarily with hard, thick materials. Improves strength, toughness, and dimensional stability.

CrN (CRN)—excellent adhesion, high toughness, and good corrosion resistance. Primary applications are metal forming (copper, brass, bronze), metal die casting, and plastic injection molding. Approx. hardness: *Vickers 1800-2100.

ZertonPlus™ (XNA)—excellent wear resistance, thermal shock stability and hot hardness. Approx. hardness *Vickers 3200.

XNAPprogress (XNAP)—ultra-hard PVD coating that absorbs shear stress; provides excellent high-temperature resistance. Ideal for stamping where tools are exposed to extreme stress profiles. A good alternative to TD coating without the dimensional changes associated with that process. Approx hardness: *Vickers 3200.

Diamond Like Carbon Coating (XCD)—combines high hardness with an extremely low coefficient of friction. Good protection against abrasive & adhesive wear. Approx. hardness *Vickers 5000.

Code	Material
XN —DayTride®	M2 & PS4
XNT —DayTiN®	M2 & PS4
XAN —DayTAN™	M2 & PS4
XCN —TiCN	M2 & PS4
XNM	M2 & PS4
XNP	M2 & PS4
XCR —DayKool™	M2 & PS4
CRN	M2 & PS4
XNA —ZertonPlus™	M2 & PS4
XNAP—XNAPprogress	M2 & PS4
XCD	M2 & PS4

* Vickers used when RC exceeds 80.
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™ DayTAN, DayKool, and ZertonPlus are trademarks of Dayton Progress.

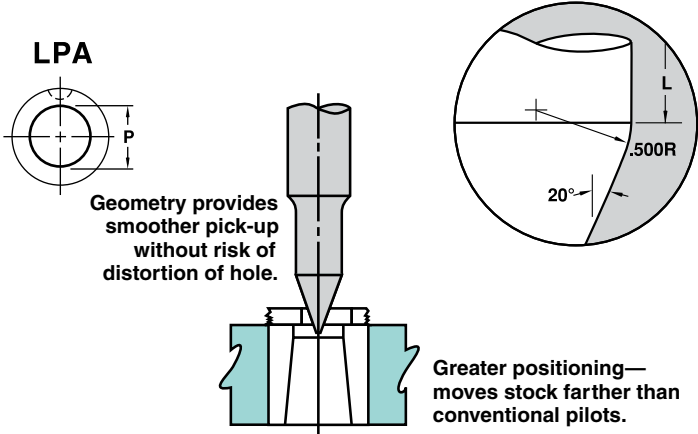
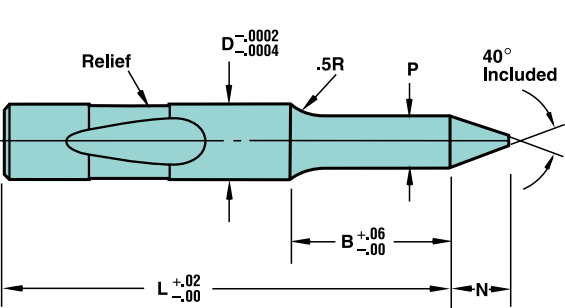
Positive Pick-Up Pilots

Light Duty



Type
LPA

Material
Steel: M2, PS4, RC 60-63
Round P $\begin{smallmatrix} +.0005 \\ -.0000 \end{smallmatrix}$  .0005 | P to D
When P=D, shank tolerance applies.



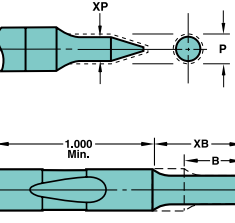
Order any length shown. If you require a length between those shown, designate “XL.”
Example: You require a length of 3.600. Order 375, then show XL 3.600. See “How to Order” example on the next page. XL is available down to 1.375. Note shank length limitation of .75. (B length may be shorter than shown when XL is under the shortest length shown.)
There is no additional charge for XL.

Shank		Point Lgth. B	Round				L												L								
D	Code		Min. XP	Range P	*N		2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25		Code	5.50	5.75	6.00	6.25	6.50	6.75	7.00
.375	37	.625	.083	.186 - .375	.37	.2342	250	275	300	325	350	375	400	425	450	475	500	525		37	550	575	600	625	650	675	700
.500	50	.750	.092	.249 - .500	.50	.3252														50							
.625	62	.875	.124	.311 - .625	.62	.4162														62							
.750	75	.937	.234	.436 - .750	.75	.5072														75							
.875	87	.937	.299	.624 - .875	.87	.5982														87							
1.000	100	.937	.349	.749-1.000	1.00	.6892													100								
.375	37	.75	.083	.186 - .375	.37	.2342	B250	B275	B300	B325	B350	B375	B400	B425	B450	B475	B500	B525		37	B550	B575	B600	B625	B650	B675	B700
.500	50		.092	.249 - .500	.50	.3252														50							
.625	62		.124	.311 - .625	.62	.4162														62							
.750	75		.234	.436 - .750	.75	.5072														75							
.875	87		.299	.624 - .875	.87	.5982														87							
1.000	100	.349	.749-1.000	1.00	.6892														100								
.375	37	1.00	.083	.186 - .375	.37	.2342	C250	C275	C300	C325	C350	C375	C400	C425	C450	C475	C500	C525		37	C550	C575	C600	C625	C650	C675	C700
.500	50		.092	.249 - .500	.50	.3252														50							
.625	62		.124	.311 - .625	.62	.4162														62							
.750	75		.234	.436 - .750	.75	.5072														75							
.875	87		.299	.624 - .875	.87	.5982														87							
1.000	100	.349	.749-1.000	1.00	.6892														100								
.500	50	1.25	.124	.249 - .500	.50	.3252		D275	D300	D325	D350	D375	D400	D425	D450	D475	D500	D525		50	D550	D575	D600	D625	D650	D675	D700
.625	62		.157	.311 - .625	.62	.4162														62							
.750	75		.234	.436 - .750	.75	.5072														75							
.875	87		.299	.624 - .875	.87	.5982														87							
1.000	100		.349	.749-1.000	1.00	.6892														100							

*N =[(P-.057)/.728]+.132 when “P” dimension is less than “Pn” shown in chart.

Standard Alterations

Positive Pick-Up Pilots—Light Duty



XP P Dimensions
Smaller than Standard

XB Point Length
Other than Standard

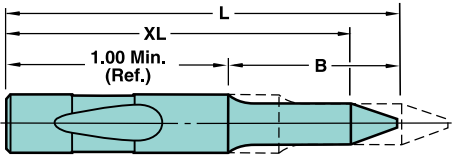
Specify XB, XBB, or X3B and length
(see chart below).

For XBB and X3B, add three days
to delivery.

Point Length	XB										XBB	X3B	
	5001-6250	6251-7500	7501-8750	8751-10000	10001-11250	11251-12500	12501-13750	13751-15000	15001-16250	1.6251-2.0000	2.0001-2.5000	2.5001-3.0000	
Code Type	Min. P (Rounds)												
37 LPA	.083	.083	.083	.083	.105	.114	.114	.114	.114	.186	.249	.311	
50 LPA	.092	.092	.092	.092	.124	.124	.124	.124	.124	.186	.249	.311	
62 LPA	.124	.124	.124	.124	.155	.155	.155	.155	.155	.186	.249	.311	
75 LPA	.234	.234	.234	.234	.234	.234	.234	.234	.234	.280	.311	.374	
87 LPA	.299	.299	.299	.299	.299	.299	.299	.299	.299	.349	.374	.436	
100 LPA	.349	.349	.349	.349	.349	.349	.349	.349	.349	.349	.374	.436	

XL Overall Length Shortened

Stock removal from point end. B length is maintained.
Available at no charge within catalog range.

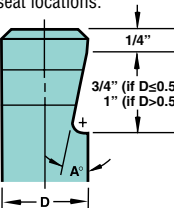


WS Whistle Stop

See table for standard angles. The Whistle Stop alteration is ground through the ball seat, subject to the same limitations as other standard and custom ball seat locations.

Example: LPA50 400, P.327, M2, WS, XA 7.5°

D	A°
25,37	5°
50	7.5°
62-100	10°

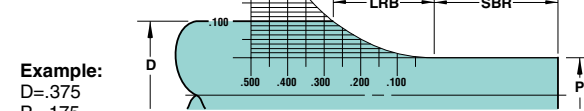


Angles of 5° and 7.5° also available
on .625 and larger diameters. (Specify **XA** and angle after **WS**.)

SBR Straight Before Radius

To determine Length of Radius Blend (LRB)

- Calculate (D-P)/2.
- Find (D-P)/2 value on left side of chart.
- Follow line over to intersection point on radius blend line.
- Read LRB value on bottom of chart.



Example:
D=.375
P=.175
(D-P)/2= (.375-.175)/2=.100
Following the .100 line on chart over the radius blend line shows the LRB to be approximately .300.

Features/Benefits

Positive pick-up pilots provide smoother pick-up without the risk of distorting the hole; in addition, the unique design moves the stock farther than conventional pilots.

HOW TO ORDER

Specify:	Qty.	Type	D Code	L	P	Steel
Example:	5	LPA	50	300	P.375	M2

Standard Alterations

Ball Lock positive pick-up pilots are available in sizes other than those shown in the chart to the left.

When ordering, you are asked to specify different designations for various non-standard dimensions. For example, if the P dimension is outside the standard range, an “X” is placed in front of the P dimension, e.g., “XP.” If the point length is other than standard, designate “XB” as the point length. Also see “Standard Alterations” on the front of the pullout tab in this section for other special order designators.

Surface Coatings

Some catalog products can be coated to increase hardness, reduce galling, and improve wear and/or corrosion resistance.

DayTride® (XN)—a low-cost surface application that treats all exposed surfaces. Ideal for punches and die buttons. Provides high dimensional stability. Approx. hardness: RC65-73.

DayTiN® (XNT)—applied via PVD (physical vapor deposition). Provides extreme hardness (hard as carbide) and excellent lubricity when used with a lubricant. Not recommended for stainless steel, copper, or nickel. Approx. hardness: *Vickers 2300.

DayTAN™ (XAN)—ultra-hard, high-aluminum PVD coating. Absorbs shear stress and provides high temperature resistance. Ideal for HSLA, dual phase, and TRIP steels. Approx. hardness: *Vickers 3400.

TiCN (XCN)—very hard PVD, thin film. Provides ultra hardness (harder than carbide) and superior abrasive wear resistance. Approx. hardness: *Vickers 3000.

XNM—PVD, solid film. Produces lower coefficient of friction than other coatings. Provides excellent lubricity. Approx. hardness: *Vickers 2000.

XNP—the ultimate coating for extrusion and forming applications. Also works well in shaving operations. Tolerance is ± .0002. Approx. hardness: *Vickers 3100.

DayKool™ (XCR)—cryogenic steel conditioning process, used primarily with hard, thick materials. Improves strength, toughness, and dimensional stability.

CrN (CRN)—excellent adhesion, high toughness, and good corrosion resistance. Primary applications are metal forming (copper, brass, bronze), metal die casting, and plastic injection molding. Approx. hardness: *Vickers 1800-2100.

ZertonPlus™ (XNA)—excellent wear resistance, thermal shock stability and hot hardness. Approx. hardness *Vickers 3200.

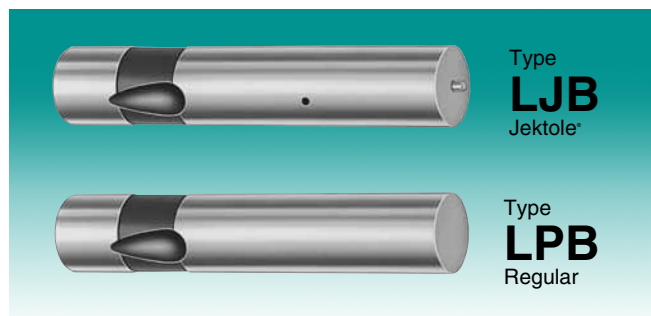
XNAProgress (XNAP)—ultra-hard PVD coating that absorbs shear stress; provides excellent high-temperature resistance. Ideal for stamping where tools are exposed to extreme stress profiles. A good alternative to TD coating without the dimensional changes associated with that process. Approx hardness: *Vickers 3200.

Diamond Like Carbon Coating (XCD)—combines high hardness with an extremely low coefficient of friction. Good protection against abrasive & adhesive wear. Approx. hardness *Vickers 5000.

Code	Material
XN —DayTride®	M2 & PS4
XNT —DayTiN®	M2 & PS4
XAN —DayTAN™	M2 & PS4
XCN —TiCN	M2 & PS4
XNM	M2 & PS4
XNP	M2 & PS4
XCR —DayKool™	M2 & PS4
CRN	M2 & PS4
XNA —ZertonPlus™	M2 & PS4
XNAP —XNAProgress	M2 & PS4
XCD	M2 & PS4

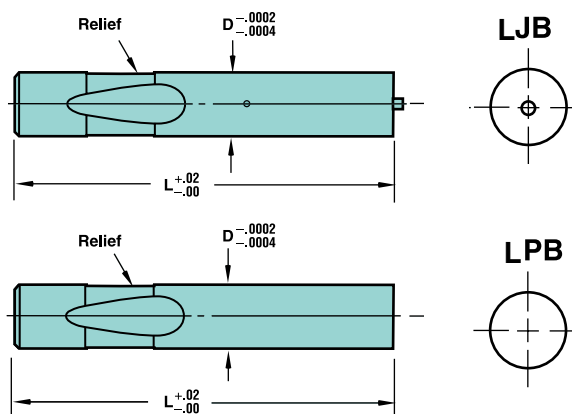
* Vickers used when RC exceeds 80.
® DayTride and DayTiN are registered trademarks of Dayton Progress.
™ DayTAN, DayKool, and ZertonPlus are trademarks of Dayton Progress.

Punch Blanks Jektole® & Regular Light Duty



Material

Steel: A2, M2, PS4, RC 60-63



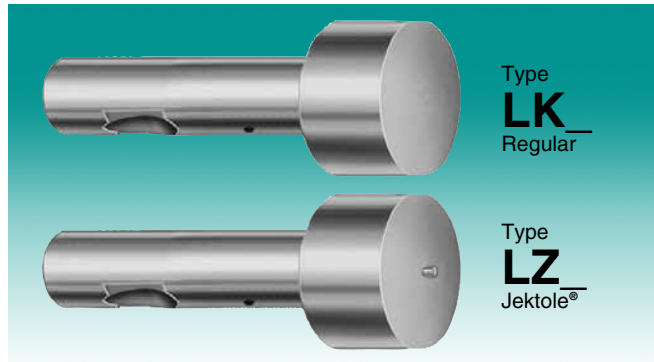
Type	Shank		L																	* Jektol® Group
	D	Code	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	
LJB	.250	25	200																	J3
	.375	37																		J4
	.500	50																		J6
	.625	62		225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	J6
	.750	75																		J9
	.875	87																		J9
	1.000	100																		J9

Type	Shank		L																					
	D	Code	2.00	2.25	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25	4.50	4.75	5.00	5.25	5.50	5.75	6.00	6.25	6.50	6.75	7.00	
LPB	.250	25	200																					
	.375	37																						
	.500	50																						
	.625	62		225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600					
	.750	75																						
	.875	87																						
	1.000	100																						

*See p. 39 for additional information.

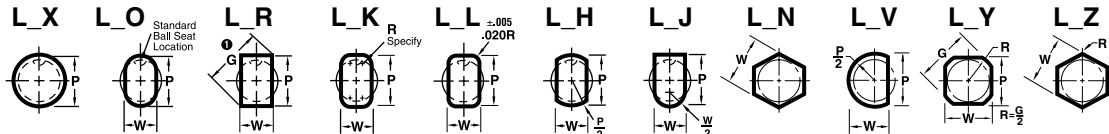
HOW TO ORDER

Specify:	Qty.	Type	D Code	L	Steel
Example:	12	LJB	50	300	M2



Material	
Steel: A2, M2, RC 60-63	
Round P	$\pm .0005$ $-.0000$
Shape P, W $\pm .0005$	$\pm .0005$ P to D $\pm .001$ P to D

❶ Check your P&W dimensions to be certain the diagonal G does not exceed the maximum shown.



Type	Shank		Point Lgth. B	Round	Shape			L								* Jektol® Group	
	D	Code		Range P	Min XW	Min. W	Max. P/G	2.50	2.75	3.00	3.25	3.50	3.75	4.00	4.25		4.50
LK_Regular LZ_Jektol®	.375	37	.62	.376 - .875	.062	.125 - .875											J4
	.500	50	.75	.501-1.250	.158	.188-1.250											J6
	.625	62	.88	.626-1.500	.158	.250-1.500											J6
	.750	75	.94	.751-1.500	.235	.312-1.500		250	275	300	325	350	375	400	425	450	J9
	.875	87	.94	.876-1.750	.235	.375-1.750											J9
	1.000	100	.94	1.001-1.750	.235	.437-1.750											J9

*See p. 39 for additional information.

Standard Ball Seat Locations

Standard Ball Seat Location is at 90°. Alternate locations of 0°, 180°, or 270° can be specified at no additional cost.

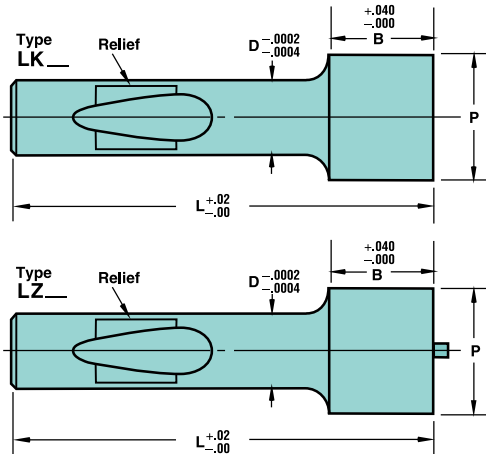
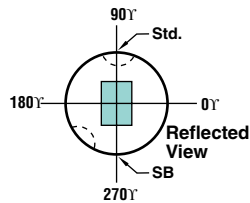
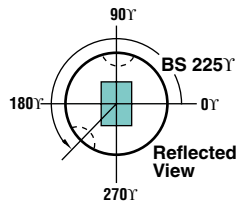
Custom Ball Seat Locations

Custom Ball Seat Locations can be specified as “BS” and degrees counter-clockwise from 0°. For additional information, see “Locking Devices” on p. 40.

Double Ball Seat

A second ball seat may be specified. Normally located 180° from the primary ball seat, these are used to minimize sharpening of notching punches by rotating the punch 180°. Specify “SB” and degree desired. A second ball can also be located 90° from the primary ball seat.

Not recommended for diameters under .625 for LZ__ and .500 for LK__.



HOW TO ORDER

Specify:	Qty.	Type	D Code	L	P (or P&W)	Steel
Example:	2	LKX	100	400	P1.300	M2

Standard Alterations

Point Larger than Shank Ball Lock punches are available in sizes other than those shown in the chart above.

When ordering, you are asked to specify different designations for various non-standard dimensions. For example, if the P and W dimensions are outside the standard range, an “X” is placed in front of the P or W dimension, e.g., “XP” and/or “XW.” If the point length is other than standard, designate “XB” as the point length. Also see “Standard Alterations” on the front of the pullout tab in this section for other special order designators.

Surface Coatings

Some catalog products can be coated to increase hardness, reduce galling, and improve wear and/or corrosion resistance.

DayTride® (XN)—a low-cost surface application that treats all exposed surfaces. Ideal for punches and die buttons. Provides high dimensional stability. Approx. hardness: RC65-73.

DayTiN® (XNT)—applied via PVD (physical vapor deposition). Provides extreme hardness (hard as carbide) and excellent lubricity when used with a lubricant. Not recommended for stainless steel, copper, or nickel. Approx. hardness: *Vickers 2300.

DayTAN™ (XAN)—ultra-hard, high-aluminum PVD coating. Absorbs shear stress and provides high temperature resistance. Ideal for HSLA, dual phase, and TRIP steels. Approx. hardness: *Vickers 3400.

TiCN (XCN)—very hard PVD, thin film. Provides ultra hardness (harder than carbide) and superior abrasive wear resistance. Approx. hardness: *Vickers 3000.

XNM—PVD, solid film. Produces lower coefficient of friction than other coatings. Provides excellent lubricity. Approx. hardness: *Vickers 2000.

XNP—the ultimate coating for extrusion and forming applications. Also works well in shaving operations. Tolerance is $\pm .0002$. Approx. hardness: *Vickers 3100.

DayKool™ (XCR)—cryogenic steel conditioning process, used primarily with hard, thick materials. Improves strength, toughness, and dimensional stability.

CrN (CRN)—excellent adhesion, high toughness, and good corrosion resistance. Primary applications are metal forming (copper, brass, bronze), metal die casting, and plastic injection molding. Approx. hardness: *Vickers 1800-2100.

ZertonPlus™ (XNA)—excellent wear resistance, thermal shock stability and hot hardness. Approx. hardness *Vickers 3200.

XNAProgress (XNAP)—ultra-hard PVD coating that absorbs shear stress; provides excellent high-temperature resistance. Ideal for stamping where tools are exposed to extreme stress profiles. A good alternative to TD coating without the dimensional changes associated with that process. Approx hardness: *Vickers 3200.

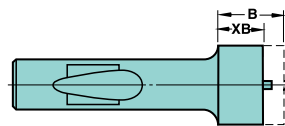
Diamond Like Carbon Coating (XCD)—combines high hardness with an extremely low coefficient of friction. Good protection against abrasive & adhesive wear. Approx. hardness *Vickers 5000.

Code	Material
XN —DayTride®	M2 & PS4
XNT —DayTiN®	M2 & PS4
XAN —DayTAN™	M2 & PS4
XCN —TiCN	M2 & PS4
XNM	M2 & PS4
XNP	M2 & PS4
XCR —DayKool™	M2 & PS4
CRN	M2 & PS4
XNA —ZertonPlus™	M2 & PS4
XNAP—XNAProgress	M2 & PS4
XCD	M2 & PS4

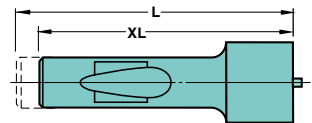
* Vickers used when RC exceeds 80.

© DayTride and DayTiN are registered trademarks of Dayton Progress.
™ DayTAN, DayKool, and ZertonPlus are trademarks of Dayton Progress.

Standard Alterations Point Larger than Shank—Light Duty



XB Point Length Shorter than Standard
(Shortens punch from the point end.)



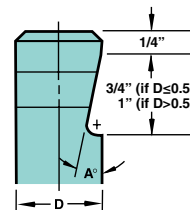
XL Overall Length Shortened
Stock removal from *shank end*. Minimum shank length is $1\frac{3}{16}$ ". Does not alter ball seat location.

LL Precision Overall Length
Same as XL except overall length is held to $\pm .001$.

WS Whistle Stop See table for standard angles. The Whistle Stop alteration is ground through the ball seat, subject to the same limitations as other standard and custom ball seat locations.

Example: LZ75 400, P1.250, M2, WS, XA 10°
LKR75 400, P1.250, W.350, M2, WS, XA 10°

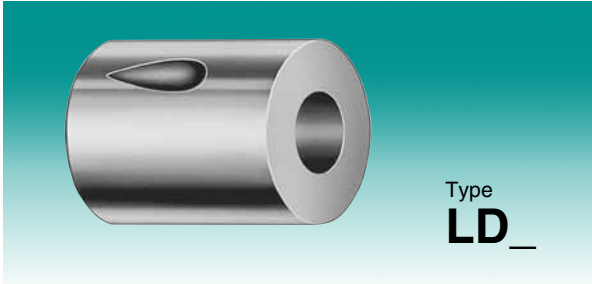
D	A°
37	5°
50	7.5°
62-100	10°



Angles of 5° and 7.5° also available on .625 and larger diameters. (Specify **XA** and angle after **WS**.)

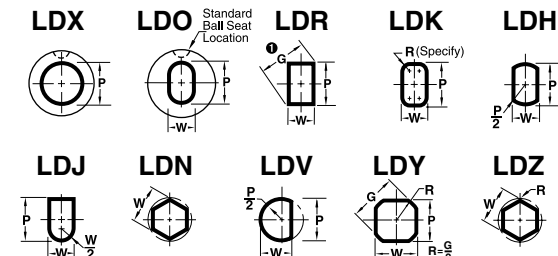
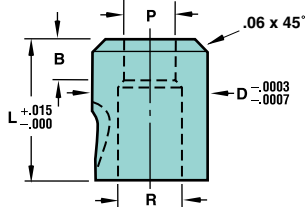
Die Buttons

Ball Lock



Material
Steel: A2, M2, RC 60-63
Round P $\pm .0005$ $\pm .0000$ P to D
Shape P, W $\pm .001$ $\pm .000$ P to D

Body				Round	Shape	L
D	Code	Min. B	Max. R	Range P	Min. W Max. P/G	1.187
.5000	50	.156	.228	.064 - .195	.048 - .195	118
.6250	62	.187	.312	.126 - .285	.064 - .285	118
.7500	75	.187	.375	.196 - .345	.095 - .345	118
.8750	87	.187	.468	.286 - .435	.125 - .435	118
1.0000	100	.250	.578	.346 - .545	.125 - .545	118
1.2500	125	.250	.687	.436 - .655	.187 - .655	118
1.5000	150	.250	.812	.546 - .780	.187 - .780	118
1.7500	175	.312	1.062	.656-1.035	.187-1.035	118



Check your P&W dimensions to be certain the diagonal G does not exceed the maximum shown.

Specify:	Qty.	Type	D Code	L	P (or P&W)	Steel
Example:	10	LDX	125	118	P.625	A2

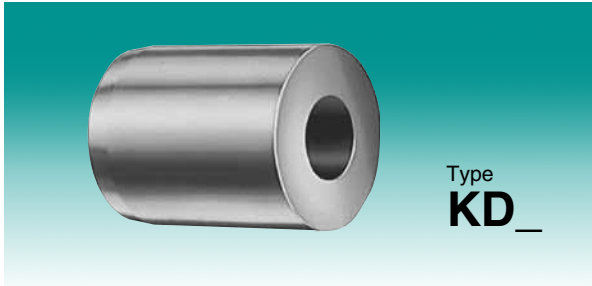
Note: The standard ball seat location is at 90°. Alternate locations of 0°, 180°, or 270° can be specified at no additional cost. For additional information, see “Locking Devices” on p. 40.

Standard Alterations

Die Buttons

Die Buttons

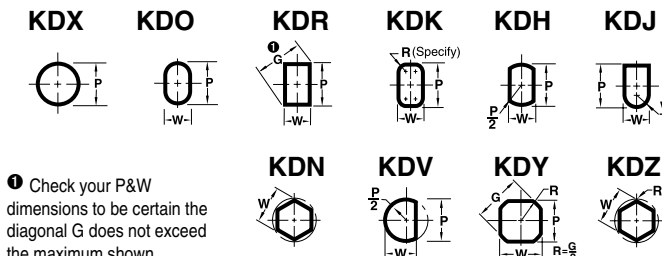
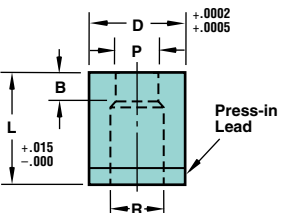
Press Fit



Material
Steel: A2, M2, RC 60-63
Round P $\pm .0005$ $\pm .0000$ P to D
Shape P, W $\pm .001$ $\pm .000$ P to D
 $D \leq 1.75$ $\pm .0002$ $\pm .0006$

Specify:	Qty.	Type	D Code	L	P (or P&W)	Steel
Example:	5	KDR	50	100	P.250, W.093	A2

Body						L							
D	Code	Min. B	Max. R	Round Range P	Shape Min. W Max. P/G	.750	.875	.937	1.000	1.125	1.250	1.375	1.500
.2500	25	.156	.156	.064 - .135	.048 - .135								
.3125	31	.156	.191	.064 - .171	.048 - .171								
.3750	37	.156	.228	.064 - .195	.048 - .195								
.4375	43	.156	.281	.064 - .250	.048 - .250								
.5000	50	.156	.312	.064 - .285	.064 - .285								
.6250	62	.187	.390	.136 - .365	.095 - .365								
.7500	75	.187	.468	.136 - .435	.118 - .435								
.8750	87	.187	.578	.276 - .545	.125 - .545								
1.0000	100	.250	.703	.356 - .675	.125 - .675								
1.2500	125	.250	.828	.500 - .800	.187 - .800								
1.5000	150	.250	1.093	.616-1.050	.187-1.050								
1.7500	175	.312	1.430	.750-1.400	.187-1.400								
2.0000	200	.312	1.630	.875-1.600	.187-1.600								
2.2500	225	.312	1.830	1.000-1.800	.187-1.800								
2.5000	250	.312	2.030	1.125-2.000	.187-2.000								
2.7500	275	.312	2.230	1.250-2.200	.187-2.200								



Check your P&W dimensions to be certain the diagonal G does not exceed the maximum shown.

Standard Alterations

Ball Lock press fit die buttons are available in sizes other than those shown in the chart above.

When ordering, you are asked to specify different designations for various non-standard dimensions. For example, if the P and W dimensions are outside the standard range, an “X” is placed in front of the P or W dimension, e.g., “XP” and/or “XW.” If the point length is other than standard, designate “XB” as the land length. Also see “Standard Alterations” on the front of the pullout tab in this section for other special order designators.

Dayton Slug Control

Dayton Slug Control is a guaranteed method for reducing the risk of pulling slugs to the die surface during withdrawal of the punch. A series of grooves is designed inside the die button. There, the slugs are trapped until they fall freely through the relief. The use of Dayton Slug Control has no effect on hole size, and will not require any changes in current regrind practices.

Our guarantee: *Use Dayton Slug Control in a stamping die now pulling slugs. If, for any reason, you are not completely satisfied, we will refund the full cost of the Slug Control alteration.* (We cannot guarantee the retention of slugs when clearance exceeds 10% per side.)

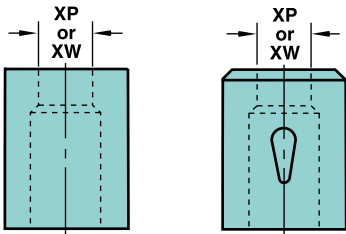
Ordering

Dayton Slug Control is easy to specify and order. Simply add the information that is unique to your application to the die button catalog number. Please specify XSC for alteration and show material thickness (inches) and clearance per side (percentage).

Catalog Number		Your Specs		
Inch	KDX 62 100 P.250	XSC	MT.0625	CS 5
Type D L P		Alt. Code	Mat'l Thickness (inches)	Clear Per Side (%)

For additional information, contact your Dayton distributor.

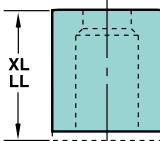
XP, XW P and W Dimensions Larger or Smaller than Standard



Body Code	Press Fit				Ball Lock			
	Min. P	Min. W	Max. P/G	R	Min. P	Min. W	Max. P/G	R
25	.064	.048	.167	.191				
37	.064	.048	.250	.281				
50	.064	.064	.344	.375	.064	.048	.250	.281
62	.136	.095	.453	.500	.126	.064	.344	.375
75	.136	.118	.562	.594	.150	.095	.453	.500
87	.276	.125	.656	.703	.175	.125	.562	.594
100	.356	.125	.750	.781	.200	.125	.656	.703
125	.500	.187	.935	.969	.250	.187	.750	.781
150	.616	.187	1.200	1.230	.300	.187	.935	.969
175	.750	.187	1.400	1.430	.350	.187	1.200	1.230
200	.875	.187	1.600	1.630				
225	1.000	.187	1.800	1.830				
250	1.125	.187	2.000	2.030				
275	1.250	.187	2.200	2.230				

XL Overall Length Shortened

Stock removal does not alter land length on KD_. Minimum overall length = .25. Not available on Ball Lock Die Buttons.

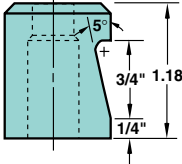


LL Precision Overall Length

Same as XL except overall length is held to $\pm .001$. Not available on Ball Lock Die Buttons.

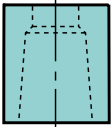
WS Whistle Stop (5° standard angle)

The Whistle Stop alteration is ground through the ball seat, subject to the same limitations as other standard and custom ball seat locations. The XP alteration is not available with the WS alteration. Example: LDX75, 118, P.328, M2, WS.



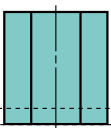
XSC Slug Control eliminates slug pulling

(When ordering Dayton Slug Control, please specify XSC in place of the standard die button code, as well as your specifications. See the “How to Order” example on the front of this tab.)



XBL Straight Through Land

The land length (B) equals the overall length. Can be used for bushings, guides and a variety of other applications. *Round die buttons only

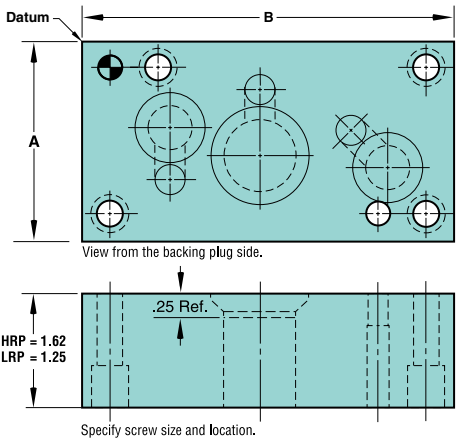
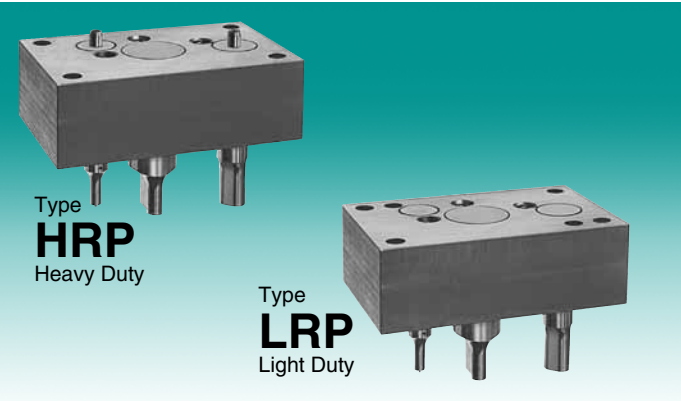


XN DayTride® A unique wear-resistant surface treatment for M2 & PS only.

See p.38 for Die Button Blanks.

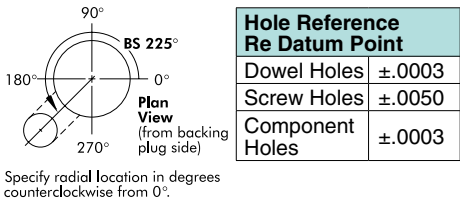
Multi-Position™ Retainers

Heavy Duty/Light Duty



Type	W	L													
		2.50	2.75	3.00	3.25	3.50	3.75	4.00	5.00	6.00	7.00	8.00	9.00	10.00	12.00
HRP LRP	2.00	2025	2027	2030	2032	2035	2037	2040	2050	2060	2070	2080	2090	2010	2012
	2.75		2727	2730	2732	2735	2737	2740	2750	2760	2770	2780	2790	2710	2712
	3.00		3027	3030	3032	3035	3037	3040	3050	3060	3070	3080	3090	3010	3012
	4.00							4040	4050	4060	4070	4080	4090	4010	4012
	6.00									6060	6070	6080	6090	6010	6012
	8.00											8080	8090	8010	8012

Ball Hole Locations



Punch Shape	Ball Hole Class	Radial Tolerance
Round	B	±5°
Shape	BB	±0°5'

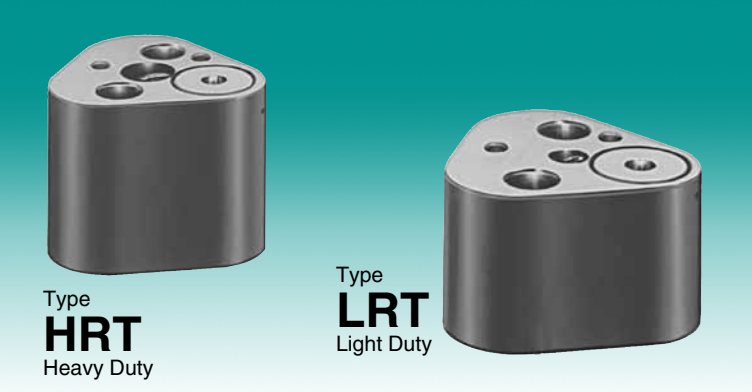
The Ball Hole Class B is standard, unless otherwise specified.

Space Requirements

TYPE	D	A	B	H
HRP	.375	.57	.375	.625
	.500	.69	.500	.750
	.625	.69	.500	.875
	.750	.69	.500	1.000
	.875	.69	.500	1.125
	1.000	.69	.500	1.250
LRP	.250	.44	.250	.500
	.375	.44	.250	.625
	.500	.50	.312	.750
	.625	.50	.312	.875
	.750	.57	.375	1.000
	.875	.57	.375	1.125
	1.000	.57	.375	1.250

True Position® Retainers

Heavy Duty/Light Duty



TRUE POSITION®

The industry standard interchangeable retainer

True Position® Retainer sets include:

- 1 Ball
- 1 Spring
- 2 Screws
- 2 Dowels
- 1 Ball Release Set Screw

Catalog Number		D	A	B	G	K	R	S	U	X	Y	Screw Size
HRT	Light Duty	.2500	1.75	1.72	.438	.750	.38	.47	1.060	.354	.295	5/16-18
		.3750	1.75	1.72	.438	.750	.38	.47	1.060	.354	.295	5/16-18
		.5000	2.00	1.97	.562	.750	.50	.60	1.180	.472	.256	3/8-16
		.6250	2.12	2.09	.625	.750	.56	.66	1.250	.532	.236	3/8-16
		.7500	2.38	2.34	.688	.750	.69	.79	1.320	.650	.197	3/8-16
	LRT	.8750	2.50	2.47	.688	.750	.75	.85	1.400	.728	.197	3/8-16
		1.0000	2.75	2.72	.781	.938	.88	.97	1.600	.866	.276	1/2-13
		1.2500	2.75	2.72	.781	.938	.88	.97	1.600	.866	.276	1/2-13

Features/Benefits

The *in-line dowel* assures precise punch-to-die button alignment, giving you higher quality parts, longer punch life, and reduced production downtime.

The True Position® Retainer *eliminates hand fitting*, cutting mounting time by nearly 50%. Simply pull the retainer from its box, and screw it into the die set. True Position® gives you true dimensional accuracy every time.

Only *one dowel is required for round punches*, which reduces machining time by up to 50%. Shaped punches use the secondary dowel for precise alignment.

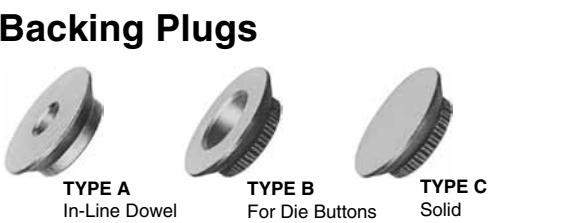
The *precision-ground ball hole* assures perfect alignment of any punch shape, even if the retainer is replaced.

The True Position® Retainer allows *complete interchangeability between Heavy Duty and Light Duty retainers* in the event of an engineering change.

Use of the True Position® Retainer can *cut retainer inventory requirements by 50%*.

Standard Alterations

Multi-Position™ Retainers



The three Backing Plugs shown above are used with Multi-Position™, True Position®, and End and Square Retainers—both heavy duty and light duty. To determine which backing plug is used with a specific type of retainer, see “Accessories—Retainers” on p. 36.

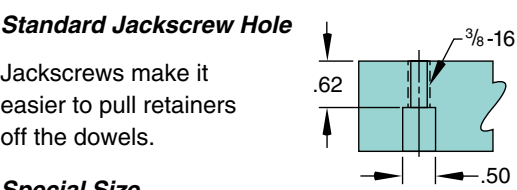
The Type C Solid Backing Plug is standard with all Multi-Position™ Retainers. The Type A Backing Plug with dowels for location can be specified; this eliminates the need for dowels in the retainer. Die Button Retainers require a detailed drawing.

True Position® Retainers

Don't waste time and money building a retainer for just one punch. Fitting isolated punches or pilots onto a die set is quick and easy with True Position® Retainers. These cost-effective time-savers can be mounted with screws from either top or bottom, eliminating the need to build and fit one-of-a-kind retainers.

True Position® Retainers are recognized as the standard in the industry for interchangeable retainers. All are quality built; ground top to bottom; and hardened to approximately RC 58-60.

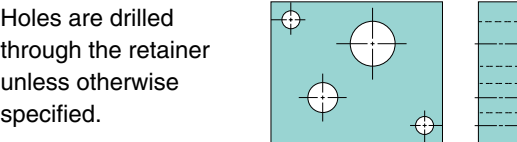
True Position® gives you true dimensional accuracy each and every time!



Special Size
Any amount of material can be removed from the sides of the retainer for a custom size. Edges are saw cut ±.03.

Clearance Holes

Clearance holes or tapped holes can be detailed, as shown in the order example.



Location ±.010
Diameter +.015
 -.000

The following alterations require detailed drawings:

Notches

Notches to clear other tooling can be added to any side of the retainer. Notches are saw cut ±.03.

Angles

As with notches, angles can be added to clear other tooling in the die. Angles are saw cut ±.03.

Single Punch Retainer
with Backing Plate

True Position®



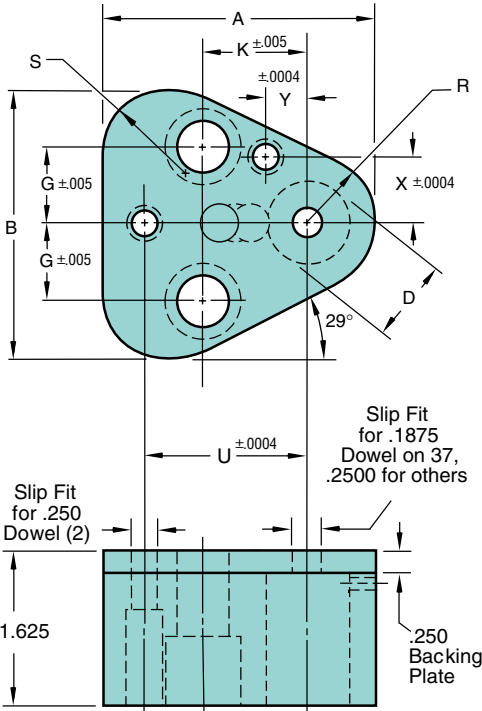
- Retainer sets include:
- 1 Ball
 - 1 Spring
 - 2 Screws
 - 2 Dowels
 - 1 Ball Release Set Screw

HOW TO ORDER			
Specify:	Qty.	Code	D
Example: 23 HRTB 37			

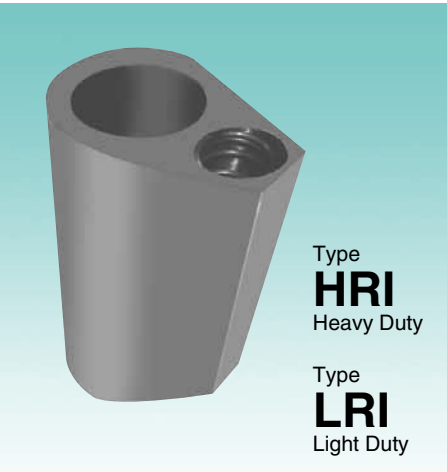
Back Plate	Code	D	A	B	G	K	R	S	U	X	Y	Screw Size
HRTB	37	.3750	1.75	1.72	.438	.750	.38	.47	1.060	.354	.295	5/16-18
HRTB	50	.5000	2.00	1.97	.562	.750	.50	.60	1.180	.472	.256	3/8-16
HRTB	62	.6250	2.12	2.09	.625	.750	.56	.66	1.250	.532	.236	3/8-16
HRTB	75	.7500	2.38	2.34	.688	.750	.69	.79	1.320	.650	.197	3/8-16
HRTB	87	.8750	2.50	2.47	.688	.750	.75	.85	1.400	.728	.197	3/8-16
HRTB	100	1.0000	2.75	2.72	.781	.938	.88	.97	1.600	.866	.276	1/2-13
HRTB	125	1.2500	2.75	2.72	.781	.938	.88	.97	1.600	.866	.276	1/2-13

Features/Benefits

HRTB True Position® Retainers come complete with an *integrated, hardened backing plate*. With all the features of the original True Position® Retainer, the HRTB satisfies the needs of applications where more bearing surface is desired. True Position® gives you true dimensional accuracy each and every time!

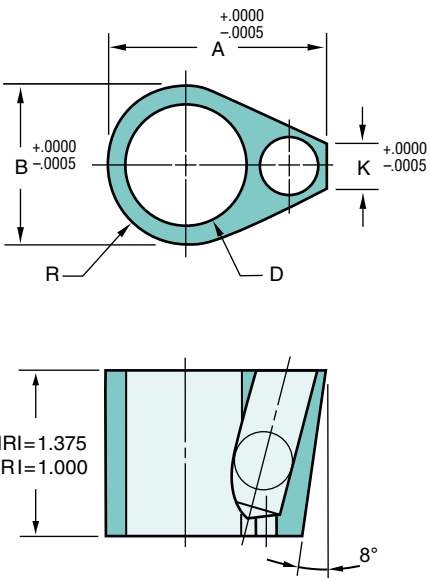


EZ Fit™ Retainer Inserts



HOW TO ORDER			
Specify:	Qty.	Type	Code
Example: 5 HRI 37			
	12	LRI	62

Heavy Duty					
Type	Punch Hole Dia. D	Code	A	B	K
HRI	0.3750	37	1.0630	0.6250	0.3882
	0.5000	50	1.3190	0.7500	0.5250
	0.6250	62	1.4570	0.9000	0.4698
	0.7500	75	1.6040	1.0600	0.4202
	0.8750	87	1.7320	1.1950	0.4182
	1.0000	100	1.8700	1.3200	0.4111
	1.2500	125	2.1260	1.5700	0.3951



Light Duty					
Type	Punch Hole Dia. D	Code	A	B	K
LRI	0.2500	25	0.7750	0.4375	0.3125
	0.3750	37	0.9000	0.5625	0.3125
	0.5000	50	1.1200	0.7500	0.3125
	0.6250	62	1.2500	0.8750	0.3125
	0.7500	75	1.4700	1.0700	0.3125
	0.8750	87	1.6000	1.1950	0.3125
	1.0000	100	1.7200	1.3200	0.3125

Features/Benefits

Dayton EZ Fit™ Ball Lock Retainer Inserts give you the ability to build, reconfigure, and custom-make retainers in-house as die specifications change. In addition, the unique single-piece teardrop shape, combined with both a straight and an angled wedge side, holds your ball lock punch securely in place.

EZ Fit™ reduces costs and downtime—and simplifies tooling changeover.

™ EZ Fit is a trademark of Dayton Progress Corporation. Mfg. under Patent No. 6,679,147.

True Position® Retainers



The *in-line dowel assures precise punch-to-die button alignment*, giving you higher quality parts, longer punch life, and reduced production downtime.

The True Position® Retainer *eliminates hand fitting*, cutting mounting time by nearly 50%. Simply pull the retainer from its box, and screw it into the die set.

Only *one dowel is required for round punches*, which reduces machining time by up to 50%. Shaped punches use the secondary dowel for precise alignment.

The *precision-ground ball hole assures perfect alignment of any punch shape*, even if the retainer is replaced.

The True Position® Retainer allows complete *inter-changeability between Heavy Duty and Light Duty retainers* in the event of an engineering change.

Use of the True Position® Retainer can *cut retainer inventory requirements by 50%*.

Backing Plates

The Backing Plates are standard with Dayton's HRTB True Position® Single Punch Retainers. The Backing Plate has the same function as the backing plug model True Position® Retainer, i.e., to prevent the punch shank from penetrating the punch plate.

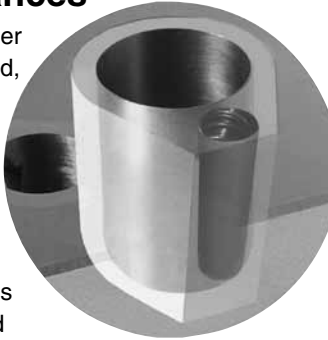
For optimum resistance on impact HRTB Retainers have integrated, hardened Backing Plates. The Backing Plates cover the entire surface of the retainer, spreading the load over a large area.

EZ Fit™ Retainer Inserts

Tighter Tolerances

Dayton EZ Fit™ Retainer Inserts utilize a patented, state-of-the-art design that assures tighter, more precise tolerances than other retainer inserts on the market. The unique teardrop shape provides a single, tightly secured receptacle for the punch. One side of the piece (the flat side) is cut at an 8° angle to create a wedge shape. The hole in the retainer is wire cut to create a snug fit. (See cutaway.)

EZ Fit™ Retainer Inserts are also ideal for repairing or making engineering changes.



Repair/Engineering Changes

When job specifications change, the location(s) of the punches in the die set change, and reconfigured retainers are required. This means ordering new retainers or modifying existing retainers in-house. This can slow the process; often requires specialized equipment and knowledge; and the integrity of the original retainer can be compromised.

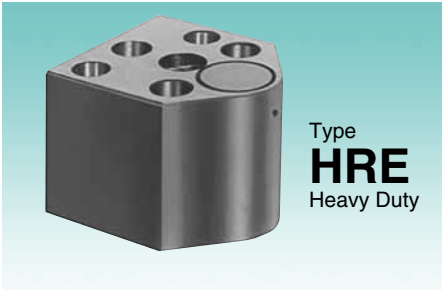
Now—with the help of the all-new Dayton EZ Fit™ Ball Lock Retainer Insert—this process can be simplified and completed in-house at a fraction of the cost of replacing existing retainers.

In-house Modifications

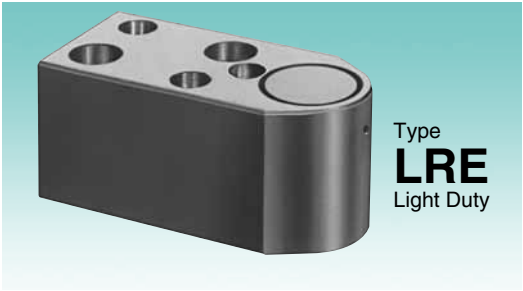
To retrofit the EZ Fit™ Insert, simply wire cut the hole to the specified size and install. (See instructions at www.daytonlamina.com/ezfit for EDM wire cutting.) The process is quick, easy, effective, and far less expensive than part replacement costs.

End Retainers

Heavy Duty/Light Duty



Type
HRE
Heavy Duty



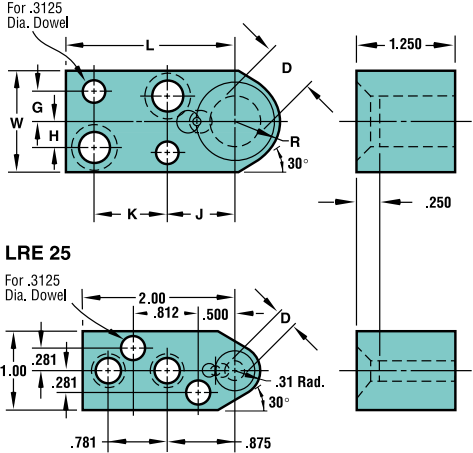
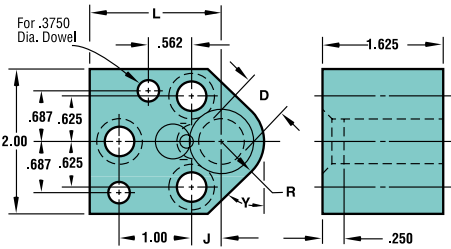
Type
LRE
Light Duty

HOW TO ORDER

Specify:	Qty.	Type	D
Example:	15	HRE	100
	12	LRE	87

Retainer sets include:

- Backing Plug
- Ball
- Spring
- Screws
- Dowels



Catalog Number						
Type	D	L	J	R	Y	Screw Size
HRE	.5000	1.75	.375	.50	40°	3/8-16
	.6250	1.81	.438	.56	45°	3/8-16
	.7500	1.88	.500	.69	60°	3/8-16
	.8750	1.94	.562	.75	60°	3/8-16
	1.0000	2.00	.625	.81	60°	3/8-16
	1.2500	2.12	.750	1.00	—	3/8-16

Catalog Number										
Type	D	G	H	J	K	L	R	W	Screw Size	
LRE	.2500	See Drawing							1/4-20	
	.3750	.375	.281	.906	.969	2.25	.38	1.25	3/8-16	
	.5000	.375	.281	.906	.969	2.25	.50	1.25	3/8-16	
	.6250	.375	.281	.906	.969	2.25	.56	1.25	3/8-16	
	.7500	.438	.344	1.125	1.000	2.50	.69	1.38	3/8-16	
	.8750	.438	.344	1.125	1.000	2.50	.75	1.50	3/8-16	
	1.0000	.438	.344	1.125	1.000	2.50	.81	1.62	3/8-16	
	1.2500	.438	.344	1.125	1.000	2.50	.81	1.62	3/8-16	

Note: Screw and Dowel Locations ± .005.

Square Retainers

Heavy Duty/Light Duty



Type
HRS
Heavy Duty



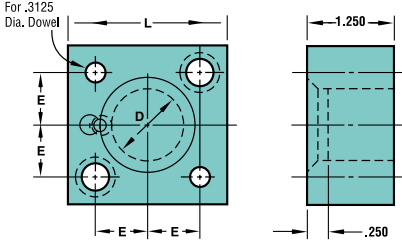
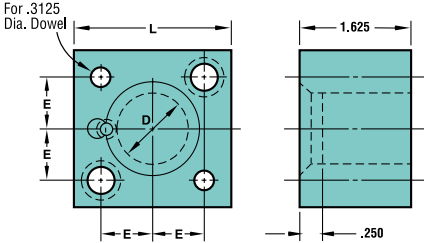
Type
LRS
Light Duty

HOW TO ORDER

Specify:	Qty.	Type	D
Example:	12	HRS	62
	8	LRS	37

Retainer sets include:

- Backing Plug
- Ball
- Spring
- Screws
- Dowels



Catalog Number				
Type	D	L	E	Screw Size
HRS	.5000	1.88	.562	3/8-16
	.6250	2.00	.625	3/8-16
	.7500	2.12	.688	3/8-16
	.8750	2.38	.750	1/2-13
	1.0000	2.38	.750	1/2-13
	1.2500	2.62	.812	1/2-13

Catalog Number				
Type	D	L	E	Screw Size
LRS	.2500	1.25	.312	1/4-20
	.3750	1.38	.375	5/16-18
	.5000	1.50	.438	5/16-18
	.6250	1.62	.500	5/16-16
	.7500	1.88	.562	3/8-16
	.8750	2.00	.625	3/8-16
	1.0000	2.25	.750	3/8-16
	1.2500	2.25	.750	3/8-16
*LRS	1.5000	2.75	1.000	3/8-16
	1.7500	2.75	1.000	3/8-16

*May be furnished with Backing Plate instead of Backing Plug.

Note: Screw and Dowel Locations ± .005.

Classified Shapes

Classified shapes (83 common shapes, no detailing required) are available on all punches and die buttons, as indicated in this catalog. The 83 available common shapes are shown here and on p. 33. Also, see the outside of the pullout tab for notes and drawing references.

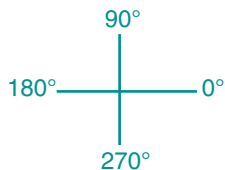
Ordering Information

*Corner Dimensions

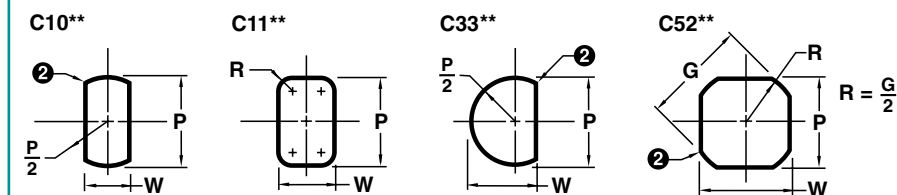
Dimensions should be the theoretical sharp corners for shapes C22, C24, C34, C61, and C88. However, some reduction of these dimensions will result from fitting the punch and die button under conditions where the clearance is .0025 or less per side.

†Shape Center

Shapes are centered on the punch shanks as shown. Shapes in guide bushings and die buttons are also centered as shown with the exception of shapes C22 and C34. Due to clearance, the P dimension on these shapes will not be centered.



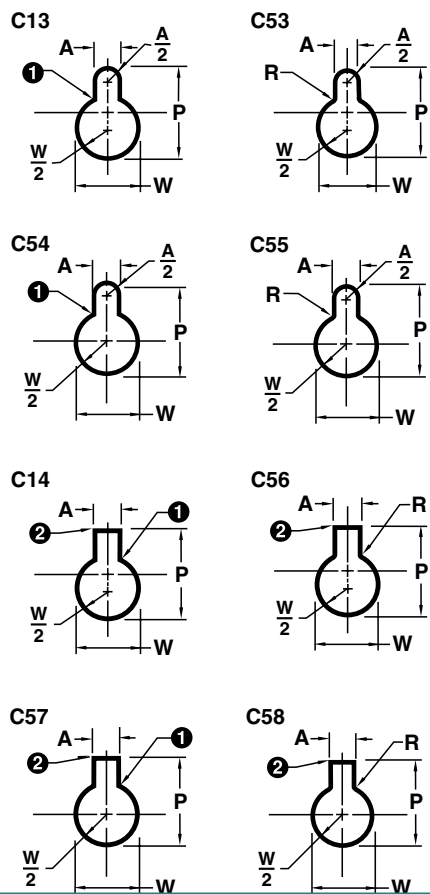
Flatted Rounds



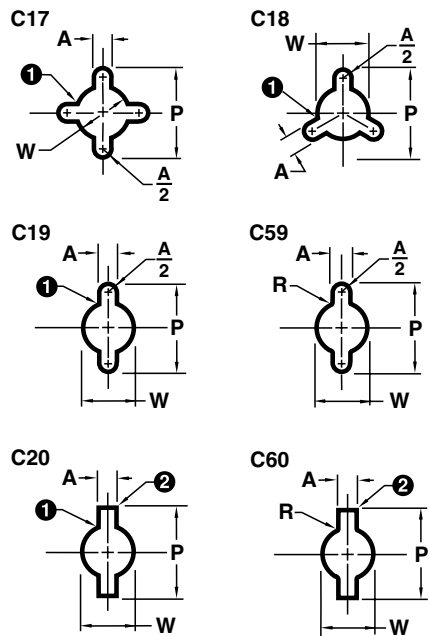
** Now standard. See product pages.

Ball Lock

Mono Lobes

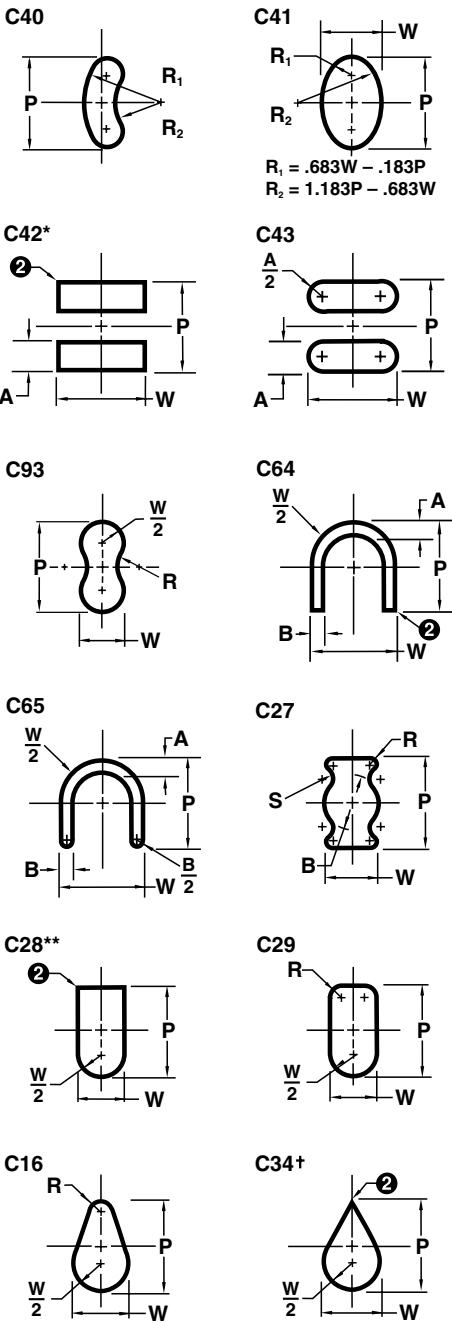


Multi Lobes

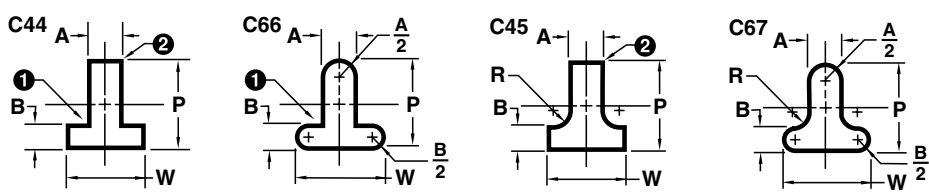


Classified Shapes

Miscellaneous

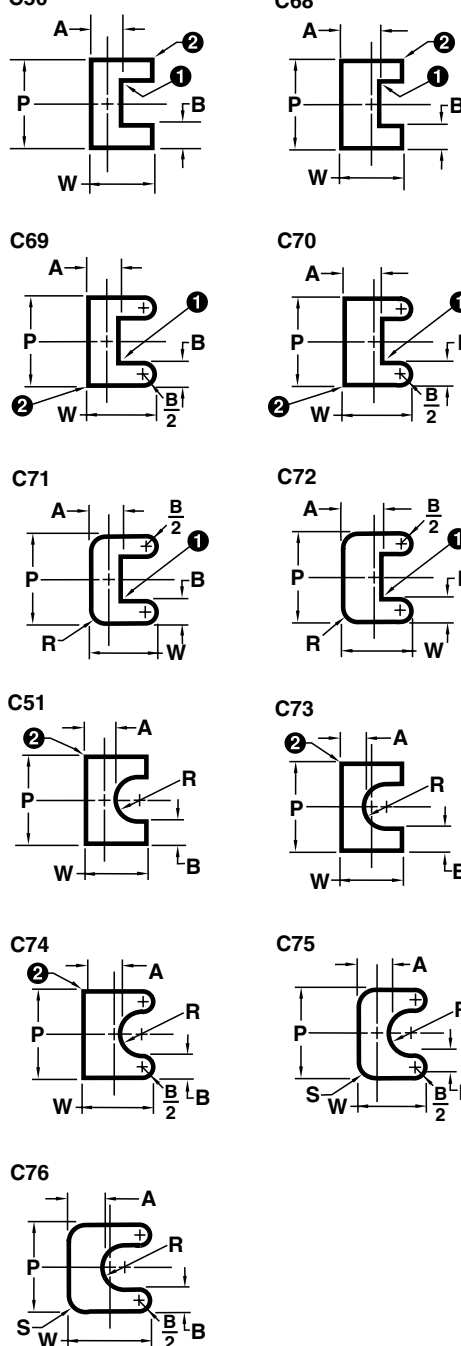


Ts

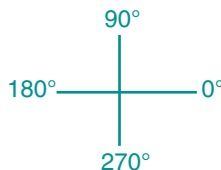
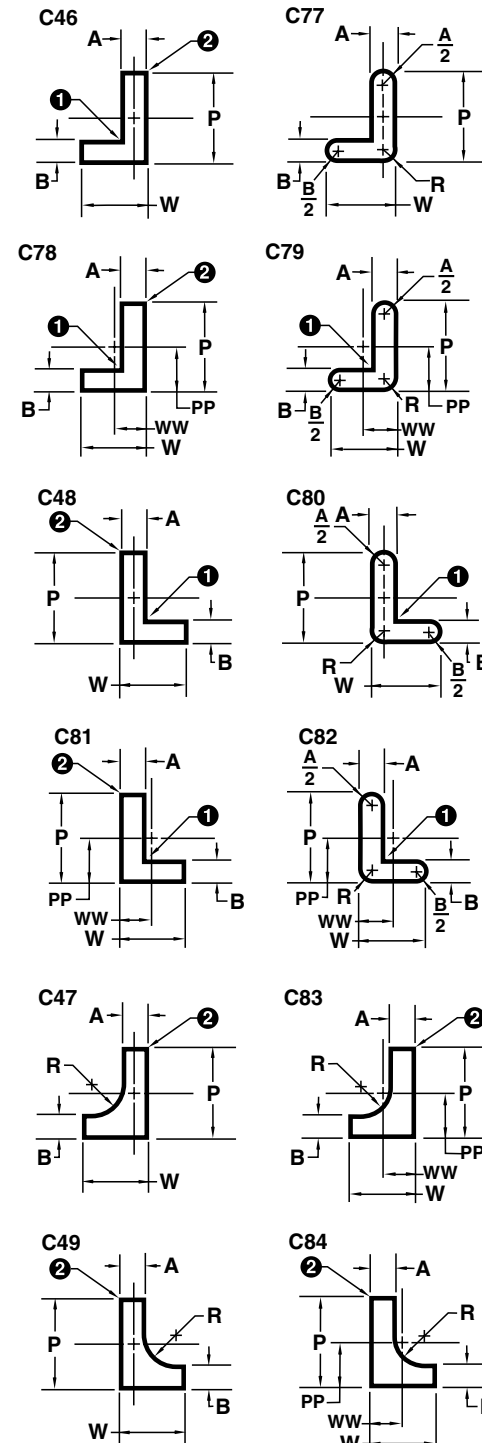


*See "Corner Dimensions" note on p. 32.

Us

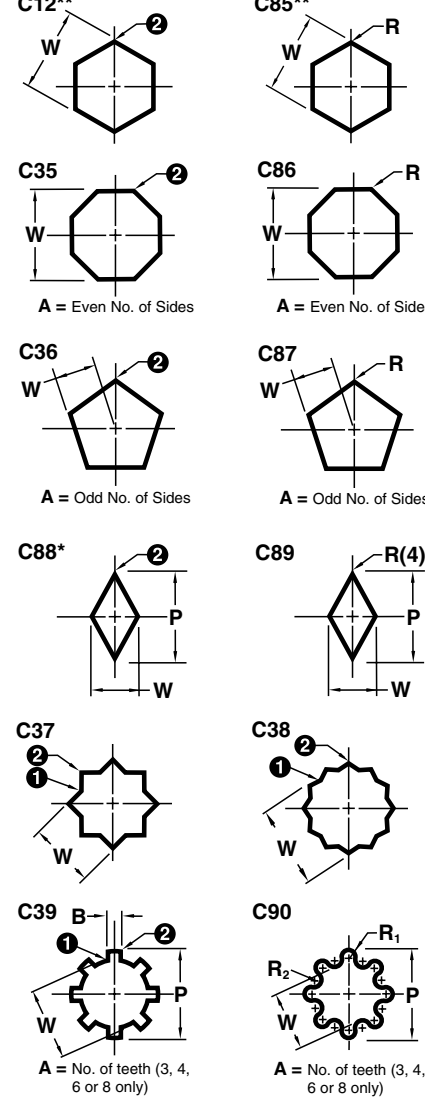


Ls

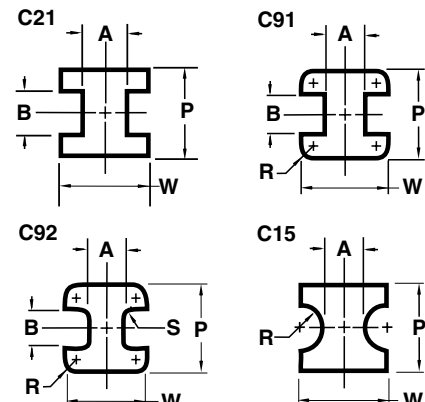


Ball Lock

Polygons

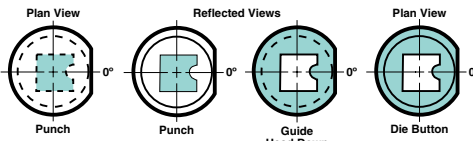


Duo Tees



Classified Shapes Ordering Information

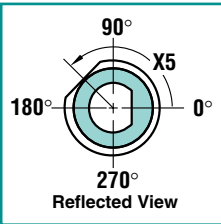
Reflected View— Punches and Guides



The reflected view is used for punches and guides. It is the view as seen in a mirror held below a punch or guide in its operating position. It is the same as a plan view from the head end, in which the point shape is shown dotted. A reflected view is shown with solid lines.

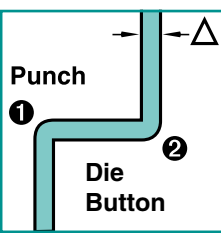
Orientation and Locking

The locking device orientation is standard at 0°. For types of locking methods and custom locations, see p. 40.



Clearance

Normal grinding methods produce ① .007 max fillet on the punch and ② .007 max fillet on the die button with matching corner shape on the die button and punch, respectively. When ordering die buttons, please specify punch dimensions and clearance per side (Δ).



Form Punch Shapes

Dayton Progress Form Punches are available on round punches (i.e., those designated as standard “X” shaped punches). When ordering, change the “X” designator to a “W.” In addition, specify other dimensions, as shown in

the example below. Specify alterations, if applicable. The shapes shown below are standard, but are not the only shapes Dayton provides. Others are available with a detailed drawing attached to the order.

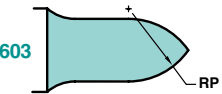
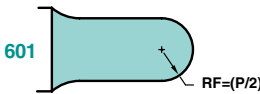
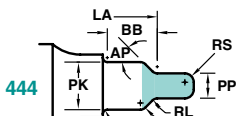
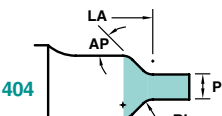
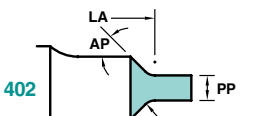
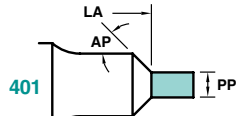
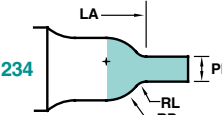
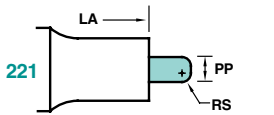
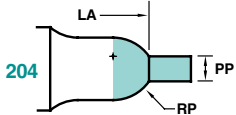
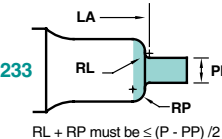
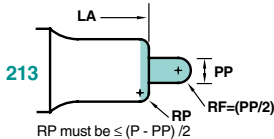
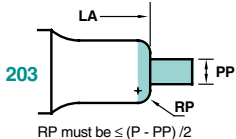
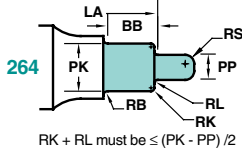
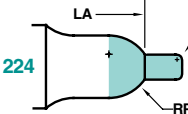
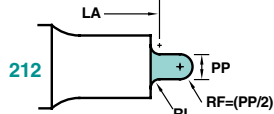
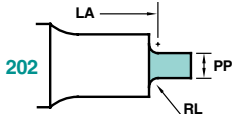
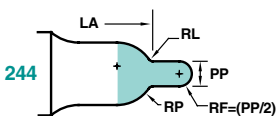
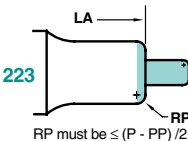
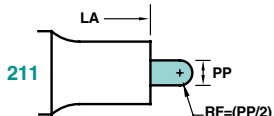
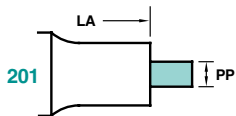
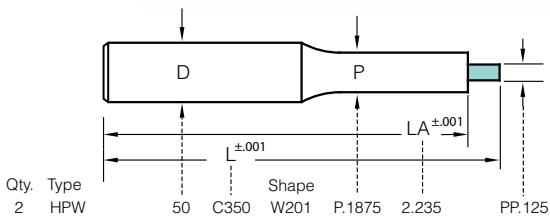
Form Punches are also available on standard punch blanks. Form Punches other than those are available as specials.



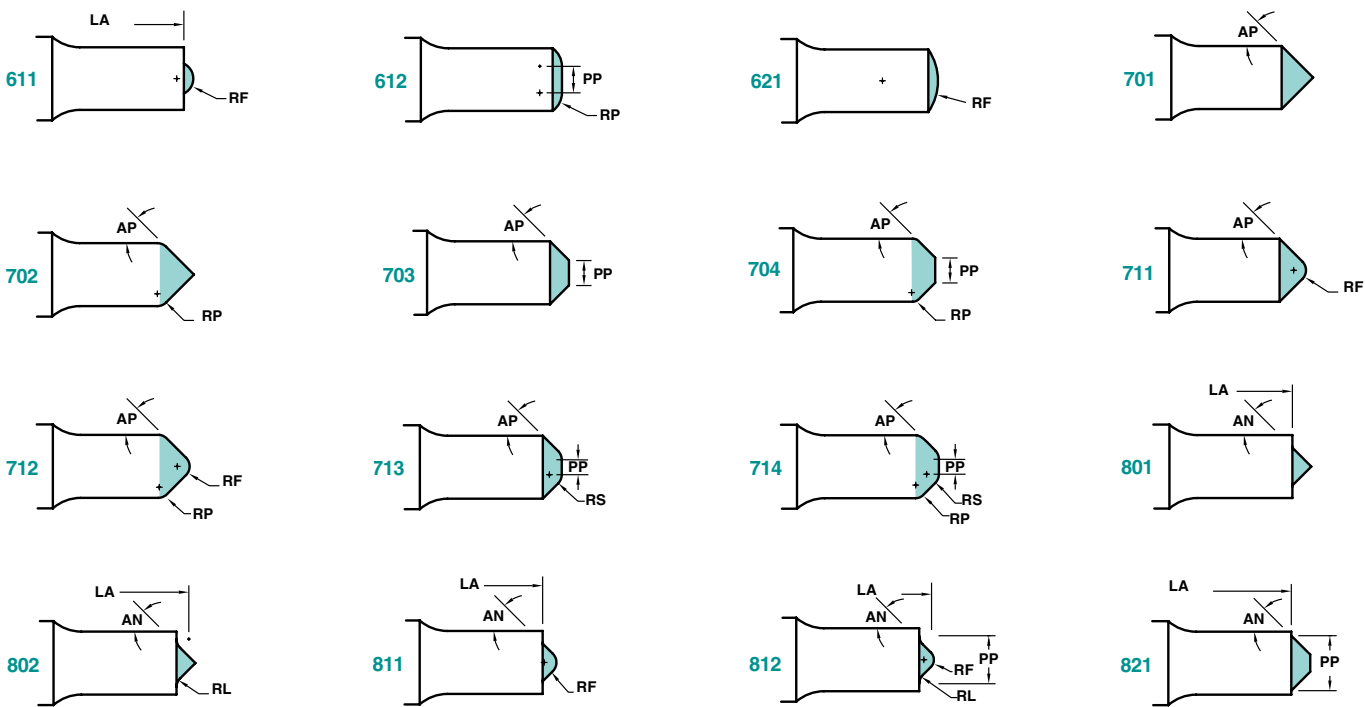
HOW TO ORDER

Specify: Qty. Type Code L Steel W Shape P PP LA Alterations
Example: 2 HPW 50 B350 M2 W201 P.1875 PP.1250 LA2.235 XNT

“P” is the point dimension of the product. The “P” dimensions are not shown below. When “P” = “D,” shank tolerance applies.



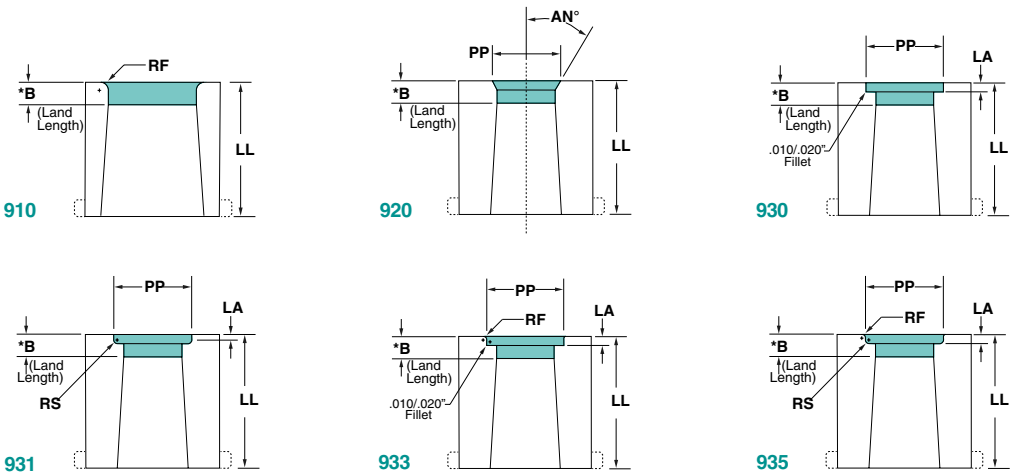
Form Punch Shapes



Form Die Button Shapes

Dayton Die Buttons are available for all the Form Punches shown here, i.e., round punches designated as standard “X” shaped punches. When ordering, please

change the “X” designator to a “W.” Die Buttons are available as headed or headless with a counterbore relief, or as headed or headless with a tapered relief.



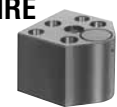
*B (Land Length) will be per catalog standard, unless XB is ordered. O.A.L. will be held to LL tolerance, i.e., ±.001.

HOW TO ORDER

Specify: Qty. Type Code LL Steel W Shape P PP LA RS RF AN° Alterations
Example: 4 LDW 125 118 M2 W935 .50 .625 .15 .05 .03 XNT

Accessories

Retainers

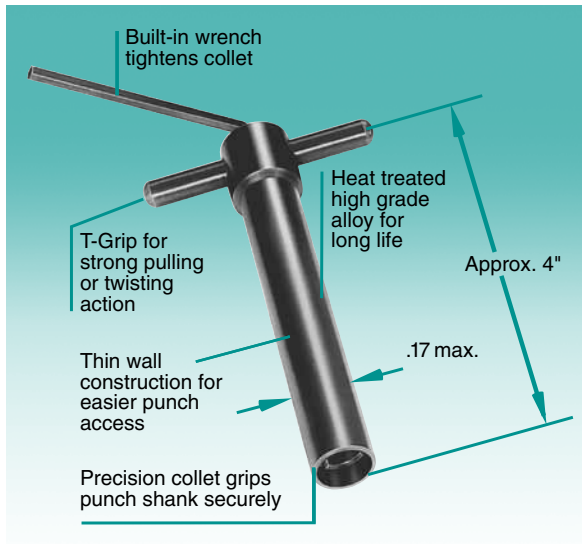
		Backing Plugs			Socket Head Cap Screw	Retainer Nut	Dowel	Ball Release Screw	Ball	Standard Spring	Extra Heavy Duty Spring	Booster Spring	Retainer Drill Bushing	
		Type A Standard in Single-hole Retainers	Type B Optional for Die Buttons	Type C Standard in Multi-Position™ Retainers										
Reg. U.S. Pat. & TM Office														
Heavy Duty HRT 	37	573345			574112 5/16-18 x 1 3/4	574953 5/16-18	574015 3/16 x 3/4	575275 10-24 x 1	813109 3/8 Dia.	573922	573981	269026	572683	
	50	573426												572756
	62	573493			574198 3/8-16 x 2	830097 3/8-16	574031 1/4 x 3/4		813168 1/2 Dia.	573949	574007	269042	572837	
	75	573566											572918	
	87	573647											572985	
	100	573728			574279 1/2-13 x 2	830127 1/2-13							573051	
	125	573795											573124	
HRS 	50			573434	574198 3/8-16 x 2	830097 3/8-16	817007 5/16 x 1 1/2	813168 1/2 Dia.	573949	574007	269042			
	62			573507										
	75			573574										
	87			573655	574279 1/2-13 x 2	830127 1/2-13								
	100			573736										
	125			573809										
HRE 	50			573434			817015 3/8 x 1 1/2	813168 1/2 Dia.	573949	574007	269042			
	62			573507										
	75			573574	574198 3/8-16 x 2	830097 3/8-16								
	87			573655										
	100			573736										
	125			573809										
Light Duty LRT 	25	573264			505439 5/16-18 x 1 1/2	574953 5/16-18	573973 1/8 x 3/4	575259 8-32 x 1	813028 1/4 Dia.	573876			572616	
	37	573345					574015 3/16 x 3/4						572683	
	50	573426	573442				574031 1/4 x 3/4		813052 5/16 Dia.	573892			572756	
	62	573493	573515		574163 3/8-16 x 1 1/2	830097 3/8-16							572837	
	75	573566	573582						813109 3/8 Dia.	573914			572918	
	87	573647	573663		574252 1/2-13 x 1 3/4	830127 1/2-13							572985	
	100	573728	573744										573051	
LRS 	25			573272	505226 1/4-20 x 1 1/2	830038 1/4-20	817007 5/16 x 1 1/2	813028 1/4 Dia.	573876					
	37			573353										
	50		573442	573434	505439 5/16-18 x 1 1/2	830062 5/16-18				813052 5/16 Dia.	573892			
	62		573515	573507										
	75		573582	573574										
	87		573663	573655										
	100		573744	573736	574163 3/8-16 x 1 1/2	830097 3/8-16				813109 3/8 Dia.	573914			
	125													
	150													
	175													
LRE 	25			573272	505226 1/4-20 x 1 1/2	830038 1/4-20	817007 5/16 x 1 1/2	813028 1/4 Dia.	573876					
	37			573353										
	50		573442	573434						813052 5/16 Dia.	573892			
	62		573515	573507	574163 3/8-16 x 1 1/2	830097 3/8-16								
	75		573582	573574										
	87		573663	573655						813109 3/8 Dia.	573914			
	100		573744	573736										

HOW TO ORDER

Specify: **Qty.** **Product #**
 Example: 150 813109 (Ball for HRT with .3750 dia.)
 28 817007 (Dowel for HRS)
 43 573876 (Spring for LRE with .2500 dia.)

Accessories

Miscellaneous



Punch Pullers

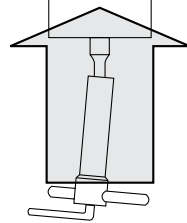
Dayton Punch Pullers simplify and speed the removal of ball lock punches from retainers. You no longer have to improvise with vise grips or other tools that can slip from the punch, making removal difficult or hazardous.

Dayton Punch Pullers are made of high-grade alloy steel and are heat-treated and precision machined for long, reliable service. Dayton Punch Pullers, which can improve performance and save downtime, are available in shank sizes from .250" to 1.250".

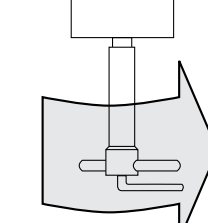
HOW TO ORDER

Specify: Qty. Product #
 Example: 3 818097 (.250 shank diameter with 1.12 max point length)

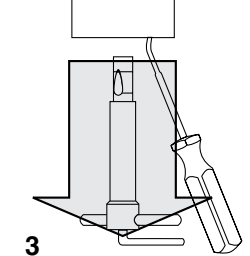
Removes ball lock punches quickly and easily



1
Slide Punch Puller over the shank.



2
Rotate the built-in wrench until tight.



3
Insert release tool and pull down.

Catalog Number	Shank Diameter In Inches	Max. Point Length
818097	.250	1.12
818119	.375	1.31
818127	.500	1.56
818135	.625	1.56
818143	.750	1.56
818151	.875	1.56
818178	1.000	1.81
818186	1.250	1.81

Ball Release Tools



Cat. No. 818038

Angle Tip
(for all retainers)



Cat. No. 818046

Straight Tip
(for all retainers)



Cat. No. 818054 Light Duty
Cat. No. 818062 Heavy Duty

Threaded Tip
(for True Position® Retainers)

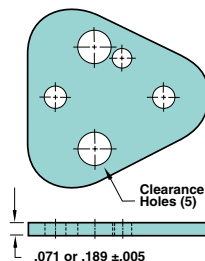
HOW TO ORDER

Specify: Qty. Product #
 Example: 2 818046 (Straight Tip)

Shim/Backing Plate

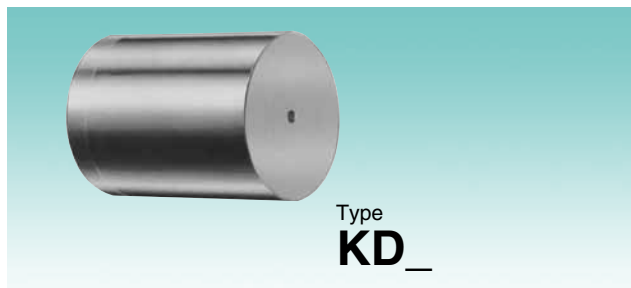
HOW TO ORDER

Specify: Qty. Product #
 Example: 2 URSP 1318



	Thickness T	
D	.189 (Rc54-56)	.071 (Soft)
25	URBP 1048	URSP 1018
37	URBP 1048	URSP 1018
50	URBP 1348	URSP 1318
62	URBP 1648	URSP 1618
75	URBP 2048	URSP 2018
87	URBP 2248	URSP 2218
100	URBP 2548	URSP 2518
125	URBP 3248	URSP 3218

EDM Die Button Blanks



Material

Steel: M2, RC 60-63

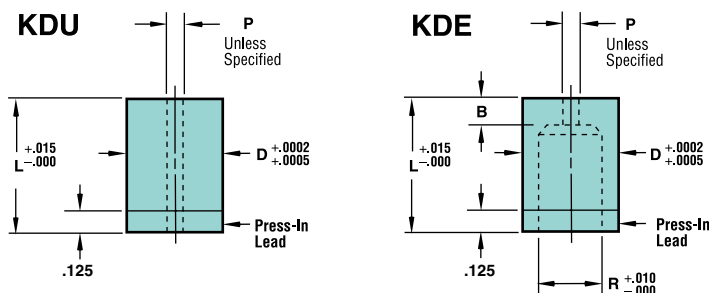
Round P $\pm .005$ $\text{P} \text{ to } D$

D ≥ 1.75 $+.0006$
 $+.0002$

HOW TO ORDER

Specify:	Qty.	Type	D Code	L	P	Steel
Example:	6	KDE	37	100	XP.020	M2
	5	KDU	50	112		M2

Standard "P" will be provided, unless otherwise specified.



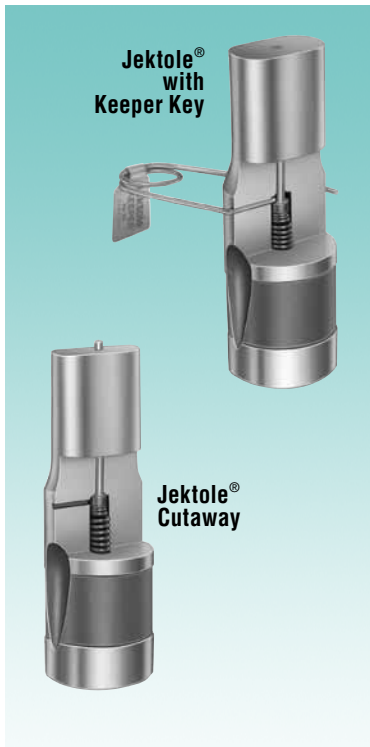
Body		K_U		K_E												
Dia.	Std. P	Optional XP		Std. P	Optional XP		B	R	.75	.87	.93	1.00	1.125	1.25	1.375	1.50
.2500	.031	.020	—	.031	.020	—	.15	.156	75	87	93	100	112	125	137	150
.3125	.031	.020	—	.031	.020	—	.25	.191								
.3750	.031	.020	—	.031	.020	—	.25	.228								
.4375	.031	.020	—	.031	.020	—	.25	.281								
.5000	.062	.020	—	.031	.020	—	.25	.312								
.6250	.062	.020	.031	.093	.020	.031	.25	.391								
.7500	.062	.020	.031	.093	.020	.031	.31	.468								
.8750	.062	.020	.031	.093	.020	.031	.31	.578								
1.0000	.062	.020	.031	.093	.020	.031	.31	.703								
1.2500	.062	.020	.031	.125	.020	.031	.37	.828								
1.5000	.062	.020	.031	.125	.020	.031	.37	1.093								
1.7500	.125	.020	.031	.125	.020	.031	.37	1.430								
2.0000	.125	.020	.031	.125	.020	.031	.37	1.630								
2.2500	.125	.020	.031	.125	.020	.031	.37	1.830								
2.5000	.125	.020	.031	.125	.020	.031	.37	2.030								
2.7500	.125	.020	.031	.125	.020	.031	.37	2.230								

Features/Benefits

Select either round **KDU EDM Die Button Blanks** or round **KDE Die Button Blanks**. Relief hole (R) provides sufficient clearance for slug removal during the stamping process in both types.

KDU Blanks are provided with a small straight through hole. They are commonly used for wire and vertical EDM operations. There are two key advantages with this type of blank: in wire cutting, a tapered relief can be cut instead of a round straight relief; in conventional EDM applications, you can customize the size of the relief to the shape you are cutting.

KDE Blanks are used with conventional (vertical) EDM machines. The hole (P) is used to introduce dielectric to the spark gap for flushing away eroded particles of steel. For the fastest delivery, use the standard (P) dimension given in the chart. If an optional (P) dimension is desired, simply specify "XP," and indicate the dimension.



The Engineered Clearance

Perforating punch-to-die button clearances in metal stamping dies has been universally expressed as a percentage of stock thickness, and for clarity should be articulated as percent per side (Δ = clearance per side).

Standard practice has called for $\Delta 5\%$, and is commonly known as "regular clearance." Regular clearance has been applied almost universally to all applications involving the perforation of ferrous materials.

Jektol[®], the **Engineered Clearance**, is approximately twice regular clearance, i.e., $\Delta 10\text{--}12\%$. This means greater productivity, improved maintenance, and a better return on your tooling investment.

In addition, clearances of up to $\Delta 50\%$ are not uncommon with some hard materials. Clearance tests have been performed by Dayton Progress to prove that increasing the clearance does not lessen hole quality—a common thought by some designers and engineers. Dayton clearance tests do, in fact, prove that the Jektol[®] **Engineered Clearance** provides many advantages and benefits.

Jektol[®] In Production

- Requires less press tonnage
- Reduces the pressure required to strip the punch, which, in turn, reduces punch wear
- Produces minimal burr
- Doubles—often triples—piece output per grind
- Reduces total punch costs

Jektol[®] In Maintenance

- Keeper Key holds pin in retracted position (see photo at left)
- Eliminates the need for disassembly before grinding
- Helps maintain proper pin extension
- Reduces downtime for regrinding

Standard Jektol[®] Data

DIMENSION		J2*	J3	J4	J6	J9	J12
Std. Shank Dia.	D	.250	.250	.375	.500 .625	.750 .875 1.000	1.250
Point Hole Dia.	C	.020	.032	.046	.063	.094	.125
Shank Hole Dia.	E	.086	.109	.141	.172	.221	.275
Pin Extension		.030	.030	.060	.060	.060	.060
Keeper Key No.		920045			920053		**

* Point Diameters < .080 ** Keeper Key not available

Jektol[®] Design Limits

DIMENSION		J2	J3	J4	J6	J9	J12
Min. Shank Dia. (Light Duty)	D	.250	.250	.375	.500	.750	.875
Min. Shank Dia. (Heavy Duty)	D	.375	.375	.375	.500	.750	.875
Min. Point Dia.	P	.040	.064	.092	.126	.188	.250
Max. Point Lgth.	B	1.25	1.50	1.62	1.62	1.62	1.62

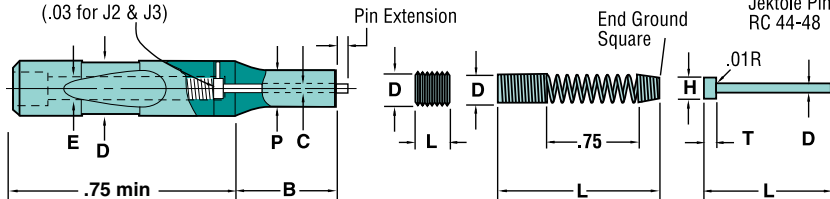
Universal Jektol[®] Components

EJECTOR PINS		J2	J3	J4	J6	J9	J12
Overall Length	L	1.11	1.38	1.94	1.94	2.22	2.22
Pin Diameter	D	.017	.027	.041	.058	.089	.120
Head Diameter	H	.048	.073	.094	.120	.156	.188
Hd. Thickness	T	.031	.047	.062	.062	.094	.094
SPRINGS		J2	J3	J4	J6	J9	J12
Outside Dia.	D	.081	.104	.136	.167	.216	.270
Free Length	L	2.38	2.38	3.19	3.00	3.03	2.56
Pressure (.12Preload)	lbs.	.5	.75	1	1.5	2	2.5
SCREWS		J2	J3	J4	J6	J9	J12
Screw Size	D	#3-48	#5-40	#8-32	#10-32	1/4-28	5/16-24
Screw Length	L	.19	.19	.19	.19	.25	.25

Jektol[®] Components

Punch

Side Hole Dia. = .06
(.03 for J2 & J3)

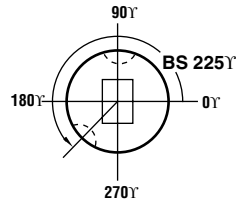


Locking Devices

Orientation

The standard ball seat location is at 90°. Alternate locations of 0°, 180°, or 270° may be specified at no extra cost.

Custom ball seat locations may be specified as "BS" and at the degree required counter-clockwise from 0°. (See drawing on right.)



Views

A plan view is used for the die button, and a reflected view is used for the punch. The reflected view, a mirror image (see p. 32, "Classified Shapes"), simplifies orientation: All locking devices are in the same position.

Identify as "reflected view" on the punch drawing.



How to Specify

This page shows the most common locking devices available for press-fit die buttons—single flat, double flat, and dowel. Select the type, then add the code to the component description. (See "how to order" box on right.)

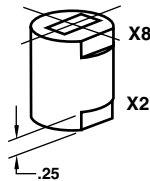
Single Flats X2, X5, X8, X9

The standard key flat locking device is at 0°. Specify "X2" (bottom) or "X8" (top) for die buttons.

Alternate locations of 90°, 180°, or 270° may be specified at no additional cost.

Specify "X2" or "X8" and the degree required.

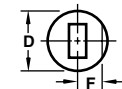
Example: X2—90°.



Custom Location

Specify "X5" (bottom) or "X9" (top) and the degree required counter-clockwise from 0°.

Example: X5—135°.



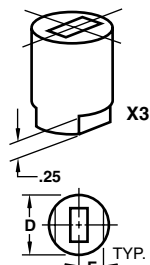
Double Flats X3, X6

The double key flat locking device is at 0°. Specify "X3" for die buttons.

Alternate locations of 90°, 180°, and 270° may be specified at no additional cost.

Specify "X3" and the degree required.

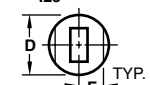
Example: X3—90°.



Custom Location

Specify "X6" for die buttons and the degree required counter-clockwise from 0°.

Example: X6—135°.



F Dimension for Flats for Press-Fit Die Buttons

Body Dia.	25	37	50	62	75	87	100
F	.110	.165	.220	.270	.325	.380	.435
Body Dia.	125	150	175	200	225	250	275
F	.540	.650	.775	.900	1.025	1.150	1.275

Location Tolerance

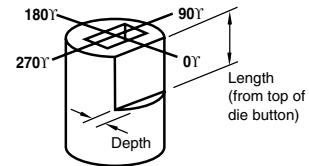
Flat		Dowel	
F	Radial	F	Radial
+ .0005 - .0000	.001/ inch	+ .0005 - .0000	0°-4'

HOW TO ORDER

Specify:	Qty.	Type	D Code	P (or P&W)	Steel	Alteration
Example:	5	KDO	87-100	P.394, W.209	A2	X2
	9	KDR	50-125	P.275, W.092	M2	X83

Additional Flat For Punches and Die Buttons

The depth of the flat is taken from the shank, not the head, on punches.



	Code	Depth	Length
Standard Location	X81	.060	.500
	X82	.060	.625
	X83	.060	.750
	X84	.060	Full Length
	X85	.093	.500
	X86	.093	.625
	X87	.093	.750
	X88	.093	Full Length
	X89		Specify Dimensions
Custom Location	X91	.060	.500
	X92	.060	.625
	X93	.060	.750
	X94	.060	Full Length
	X95	.093	.500
	X96	.093	.625
	X97	.093	.750
	X98	.093	Full Length
	X99		Specify Dimensions

Dowel Slots X0*, X1*, X4, X7, X41, X71

The standard dowel locking device is at 0°. Specify "X4" (.125 dowel) or "X41" (.1875 dowel) for die buttons. Specify "X0" (F=.5D) for die buttons only.

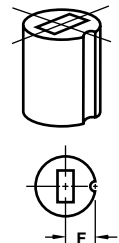
Alternate locations of 90°, 180°, or 270° may be specified at no additional cost. Specify "X0," "X4," or "X41" and the degree required.

Example: X4—90°.

Custom Location

Specify "X7" (.125 dowel) or "X71" (.1875 dowel) for die buttons. Specify "X1" (F=.5D) for die buttons only. Specify "X1," "X7," or "X71," and the degree required counter-clockwise from 0°.

Example: X71—135°.



F Dimension for Dowels for Press-Fit Die Buttons

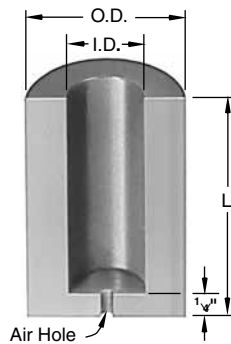
Body Dia.	25	31	37	43	50	62-275
X0*, X1*	.1250	.1562	.1875	.2188	.2500	D/2
X4, X7	.1625	.1875	.2125	.2375	.2625	D/2
X41, X71	.1938	.2188	.2438	.2688	.2938	D/2

Order example:

X0, X1, X4, & X7 — .1250 Dowel X41 & X71 — .1875 Dowel

* Available on headless die buttons only

Urethane Strippers



Air Hole	I.D.
1/16	3/16-1/4
3/32	5/16
1/8	3/8-1

Features/Benefits

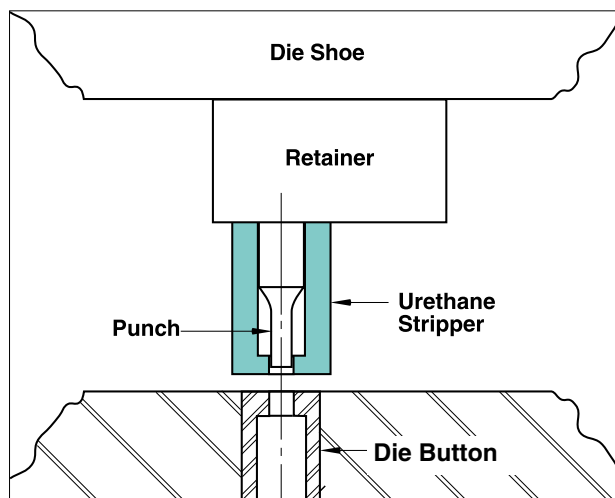
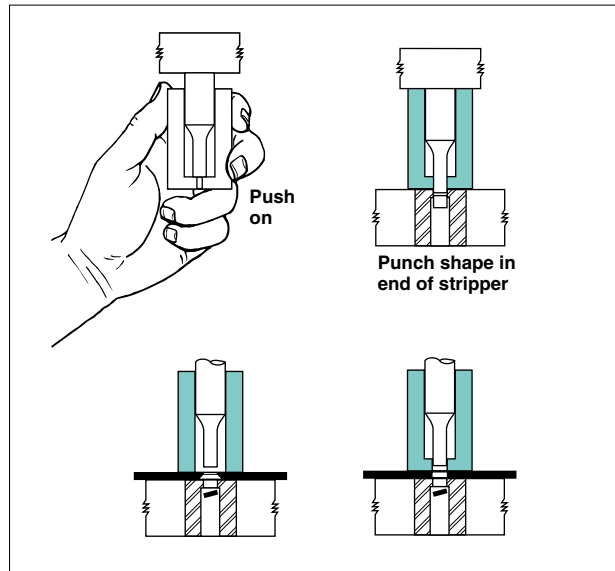
Dayton's durable, yet flexible, Urethane Strippers provide superior stripping over conventional strippers; develop higher load-bearing capacity due to the use of a unique curing agent; are tear- and oil-resistant; provide exceptional dampening of the punch, thus eliminating premature punch failure due to vibration; and are easy to install and replace.

Strip-shape Dayton Urethane Strippers assure positive stripping and dampen punch vibration by gripping around the punch point. The closed-end feature holds the thin stock flat during the stripping cycle, and helps eliminate the potential for rejected parts.

HOW TO ORDER

Specify: Qty. Type I.D. L
Example: 12 USE 37 125

Catalog Number	I.D.	O.D.	L	Pressure at Deflection of		
				1/8	1/4	3/8
USE18-125	3/16	11/16	1 1/4	250	400	—
USE18-150			1 1/2	230	350	—
USE25-125	1/4	3/4	1 1/4	280	475	—
USE25-150			1 1/2	275	465	—
USE25-175			1 3/4	220	375	490
USE31-125	5/16	13/16	1 1/4	320	500	—
USE31-150			1 1/2	300	450	—
USE31-175			1 3/4	270	400	575
USE31-200			2	240	370	600
USE37-125	3/8	7/8	1 1/4	420	695	—
USE37-150			1 1/2	385	625	—
USE37-175			1 3/4	355	575	760
USE37-200			2	310	515	670
USE50-125	1/2	1	1 1/4	520	790	—
USE50-150			1 1/2	450	725	—
USE50-175			1 3/4	435	680	875
USE50-200			2	315	510	650
USE50-225			2 1/4	275	475	600
USE62-125	5/8	1 1/8	1 1/4	600	925	—
USE62-150			1 1/2	520	835	—
USE62-175			1 3/4	480	775	1000
USE62-200			2	440	730	935
USE75-175	3/4	1 1/2	1 3/4	500	800	1200
USE75-200			2	400	700	1100
USE75-225			2 1/4	350	650	1000
USE75-250			2 1/2	325	600	900
USE75-275			2 3/4	300	550	800
USE87-175	7/8	1 3/4	1 3/4	1500	2200	3400
USE87-200			2	1200	1900	2800
USE87-225			2 1/4	1150	1850	2400
USE87-250			2 1/2	900	1450	1900
USE87-275			2 3/4	850	1350	1800
USE100-175	1	2	1 3/4	2000	3000	3500
USE100-200			2	1600	2600	3400
USE100-225			2 1/4	1400	2300	3200
USE100-250			2 1/2	1200	2000	3000
USE100-275			2 3/4	1000	1800	2800



Shear Angles

Shear Angles can be applied to all punch points. These angles are used primarily to reduce slug pulling. Single and Double Shears can be used to reduce the punching force as well as minimize slug pulling. These alterations are prepriced and do not add to the standard delivery of the product.

Shear Angles are also available on Classified Shapes, but are available as special order only.

Standard ball seat location is at 90°.

Simply add the alteration code shown next to the drawings, and the angle desired, to your punch catalog number. Tolerance on all angles is ± 15 minutes.

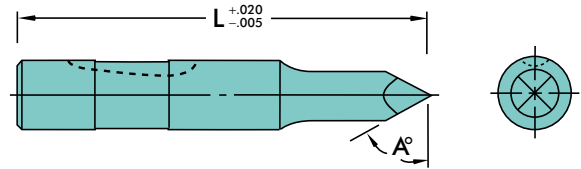
LL not available on XS19, XS21, XS22, and XS23.

HOW TO ORDER

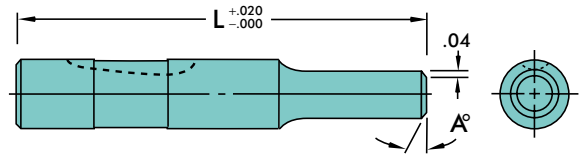
Type	Code	L	P (or P&W)	Steel	Alteration
HPL	100	C350	P.872, W.401	A2	XS23 A3°

For Round Punches Only

XS19 Nail Point

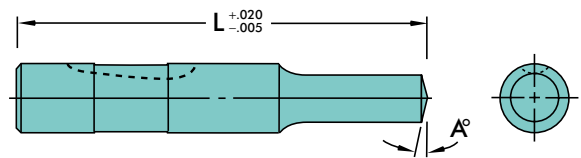


XS20 Chamfer

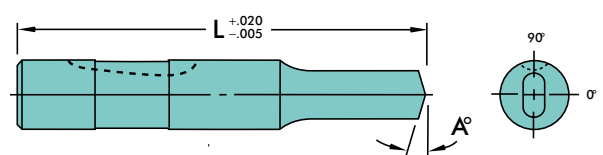


For Round & Shape Punches

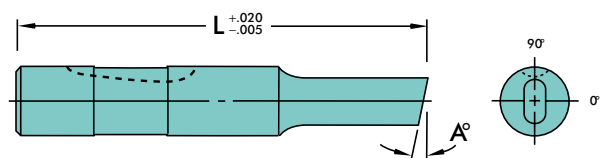
XS21 Conical



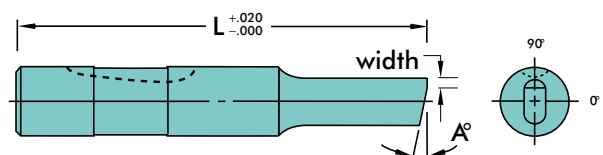
XS22 Double Shear



XS23 Single Shear



XS24 Single Shear Angle with Flat



Shown as reflected view.

VersaPlus® Premium Products

PUNCHES

Standard features on all Dayton VersaPlus® punch products include precision concentricity between the point and the shank (resulting in better punch and die alignment); a super-smooth finish on the point (resulting in less galling and reduced maintenance costs); and state-of-the-art-coatings that provide superior hardness.

Jektol® Punches

VersaPlus® Jektol® Punches permit doubling punch to die button clearance; produce up to three times (or more) the number of hits between sharpenings; and reduce burr heights.

Regular Punches

VersaPlus® Regular Punches provide three times better alignment than other major brands; offer longer tool life; and can significantly improve finished part quality.

Straight Punches

VersaPlus® Straight Punches—Jektol® and Regular—are available in a wide range of sizes; can be designed and formed to accommodate your specific punching needs; and provide longer die runs, less downtime, and reduced maintenance costs.

PILOTS

Standard features on all Dayton VersaPlus® pilots include smoother pick-up action; less hole distortion; and state-of-the-art coatings to provide superior hardness.

Regular Pilots

VersaPlus® Regular Pilots are built to exact tolerances; the parabolic point shape allows for smooth pick-up action; and pilots offer a wide range of unique punching and fabricating applications.

Positive Pick-Up Pilots

VersaPlus® Positive Pick-Up Pilots provide smoother pick-up without the risk of distorting the hole; in addition, the unique design moves the stock farther than conventional pilots.

If optimum performance is a MUST, this may be the only punch you'll ever need!

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VersaPlus® sets the new industry standard for high-performance punches and pilots. VersaPlus® means less downtime, longer production runs, and better value for your stamping dollar.

Commitment to Quality & Customer Satisfaction

Dayton Lamina is a leading manufacturer of tool, die and mold components for the metal-working and plastics industries. As a customer-focused, world-class supplier of choice, we provide the brands, product breadth, distribution network and technical support for all your metal forming needs.

Our goal is to give our customers the most innovative and value-added products and services.



DAYTON Lamina™

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Lamina® LEMPCO

*Dayton Lamina's line of Danly products is available only to North America.

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