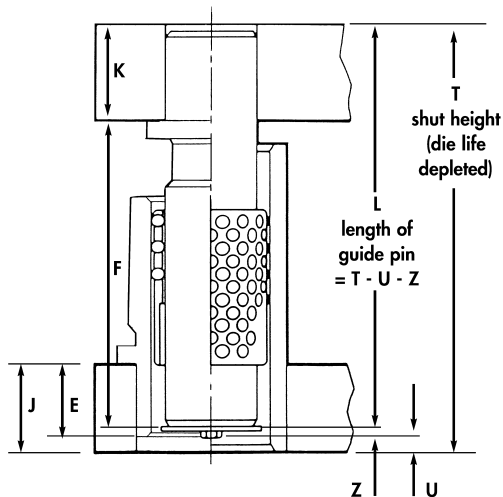


Selecting Components



Guide Pins

1. Calculate **L** using one of the following formulas:

$$L = T - (U + Z) \text{ for assembly with sleeve bushings}$$

$$L = T - (U + Z) - J + E \text{ for demountable bushings}$$

2. For straight pins, select a length equal to **L**. If **L** is not a standard length, choose a longer pin and cut to **L**, or choose a shorter length and recess the pin in the punch holder to **L**, making sure that the minimum press fit length is at least equal to the pin diameter.
3. For demountable pins, select a length so that **K + F** is as close as possible to **L** without exceeding it.

Guide Pin Length Selection

| Nominal Guide Pin Diameter O | Type I Cages | | Type II Cages | | E |
|---------------------------------|--------------|-----|---------------|------|----|
| | U | Z | U | Z | |
| 25 | 3 | 7 | 3.5 | 10.5 | 30 |
| 32 | 3 | 7 | 3.5 | 10.5 | 30 |
| 40 | 3 | 9.5 | 4 | 13 | 30 |
| 50 | 3 | 9.5 | 4 | 13 | 50 |
| 63 | 3 | 9.5 | 4 | 13 | 50 |
| 80 | 3 | 9.5 | 4 | 13 | -- |

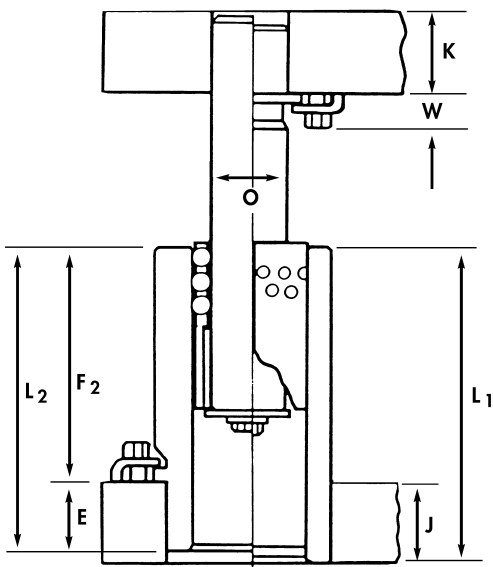
Bushings

1. If the tool's working stroke is short and there are no off-center loads, choose the shortest bushing. Find the stroke in the selection chart and read down that column until it intersects the color bar. The bushing you need is listed on that line.
2. If rigidity and resistance to side load are required, choose the longest bushing. Check that the top of the bushing will not hit the underside of the punch holder (or clamping screw in the case of demountable pins) at minimum shut height.

CAUTION: Make sure the top of the bushing does not strike the punch holder or the demountable pin clamp screw, either when the die is new or die life is depleted. If it does, select the next shorter bushing.

Cages

1. For Type I cages, choose the length whose color code in the adjacent selection chart matches that of the bushing you have selected.
2. For Type II cages, the selection chart on page 39 automatically gives you the correct cage. It is listed on the same line as the bushing you have selected.



Type I Cages

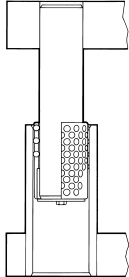
| Nominal Pin Diameter O | Demountable Bushing | | | Straight Sleeve L ₁ | Ball Cage C | Stroke "S" at maximum shut height (new dies) | | | | | | | | | | | Die Life X | | | |
|---------------------------|---------------------|----|----------------|-----------------------------------|----------------|--|----|----|----|-----|-----|-----|-----|--|--|--|---------------|--|----|--|
| | F ₂ | E | L ₂ | | | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | | | | | | | |
| 25 | 35 | 30 | 65 | 65 | 36 | | | | | | | | | | | | | | 10 | |
| | 50 | 30 | 80 | 80 | | | | | | | | | | | | | | | | |
| | 65 | 30 | 95 | 95 | | | | | | | | | | | | | | | | |
| | | | | 110 | | | | | | | | | | | | | | | | |
| | | | | 130 | | 48 | | | | | | | | | | | | | | |
| 32 | 50 | 30 | 80 | 80 | 36 | | | | | | | | | | | | | | 10 | |
| | 65 | 30 | 95 | 95 | | | | | | | | | | | | | | | | |
| | 80 | 30 | 110 | 110 | | | | | | | | | | | | | | | | |
| | | | | 130 | | | | | | | | | | | | | | | | |
| | | | | 150 | | 48 | | | | | | | | | | | | | | |
| 40 | 50 | 30 | 80 | 80 | 48 | | | | | | | | | | | | | | 10 | |
| | 65 | 30 | 95 | 95 | | | | | | | | | | | | | | | | |
| | 80 | 30 | 110 | 110 | | | | | | | | | | | | | | | | |
| | 100 | 30 | 130 | 130 | | | | | | | | | | | | | | | | |
| | | | | 150 | | | | | | | | | | | | | | | | |
| | | | | 170 | | | | | | | | | | | | | | | | |
| 50 | 60 | 50 | 110 | 110 | 70 | | | | | | | | | | | | | | 10 | |
| | 80 | 50 | 130 | 130 | | | | | | | | | | | | | | | | |
| | 100 | 50 | 150 | 150 | | | | | | | | | | | | | | | | |
| | 120 | 50 | 170 | 170 | | | | | | | | | | | | | | | | |
| | | | | 190 | | | | | | | | | | | | | | | | |
| | | | | 215 | | | | | | | | | | | | | | | | |
| | | | | 240 | | 84 | | | | | | | | | | | | | | |
| 63 | 100 | 50 | 150 | 150 | 98 | | | | | | | | | | | | | | 15 | |
| | 120 | 50 | 170 | 170 | | | | | | | | | | | | | | | | |
| | 140 | 50 | 190 | 190 | | | | | | | | | | | | | | | | |
| | | | | 215 | | | | | | | | | | | | | | | | |
| | | | | 240 | | | | | | | | | | | | | | | | |
| 80 | | | | 150 | 98 | | | | | | | | | | | | | | 15 | |
| | | | | 170 | | | | | | | | | | | | | | | | |
| | | | | 190 | | | | | | | | | | | | | | | | |
| | | | | 215 | | | | | | | | | | | | | | | | |
| | | | | 240 | | | | | | | | | | | | | | | | |

If your selection falls in a white square, use Type II or Type III.

Selecting Type II Components

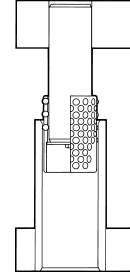
Type I

Continuous Preload



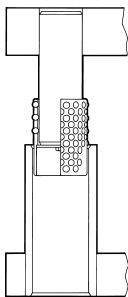
Type IIa

Preload Partially Relieved



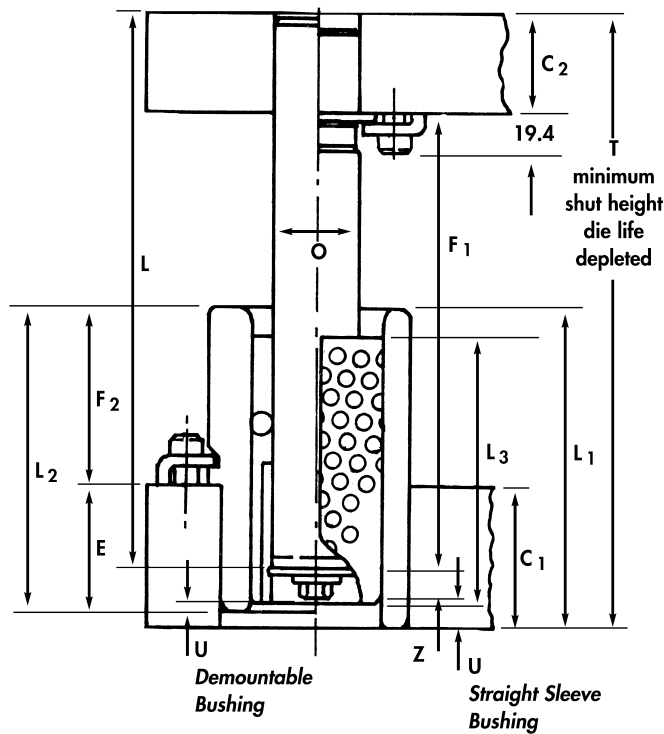
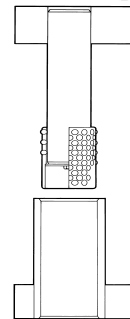
Type IIb

Preload Relieved



Type III

Disengaged



Caution: Be sure bushing does not strike punch holder (or in the case of demountable pins, the clamps retaining the pins) at minimum shut height. If this condition exists, use a shorter bushing and corresponding ball cage.

Type II Cages

| Nominal Pin Diameter O | Demountable Bushing | | | Straight Sleeve L ₁ | Ball Cage L ₃ | Stroke "S" at minimum shut height (die life depleted) | | | | | | | | | | | | | | | |
|---------------------------|---------------------|----|----------------|-----------------------------------|-----------------------------|---|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| | F ₂ | E | L ₂ | | | 20 | 40 | 60 | 80 | 100 | 120 | 140 | 160 | 180 | 200 | 220 | 240 | 260 | 280 | 300 | 340 |
| 25 | 35 | 30 | 65 | 65 | 55 | [Bar chart showing die life for 25mm pin diameter] | | | | | | | | | | | | | | | |
| | 50 | 30 | 80 | 80 | 70 | [Bar chart showing die life for 25mm pin diameter] | | | | | | | | | | | | | | | |
| | 65 | 30 | 95 | 95 | 90 | [Bar chart showing die life for 25mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 110 | 100 | [Bar chart showing die life for 25mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 130 | 110 | [Bar chart showing die life for 25mm pin diameter] | | | | | | | | | | | | | | | |
| 32 | 50 | 30 | 80 | 80 | 70 | [Bar chart showing die life for 32mm pin diameter] | | | | | | | | | | | | | | | |
| | 65 | 30 | 95 | 95 | 90 | [Bar chart showing die life for 32mm pin diameter] | | | | | | | | | | | | | | | |
| | 80 | 30 | 110 | 110 | 105 | [Bar chart showing die life for 32mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 130 | 115 | [Bar chart showing die life for 32mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 150 | 125 | [Bar chart showing die life for 32mm pin diameter] | | | | | | | | | | | | | | | |
| 40 | 50 | 30 | 80 | 80 | 70 | [Bar chart showing die life for 40mm pin diameter] | | | | | | | | | | | | | | | |
| | 65 | 30 | 95 | 95 | 85 | [Bar chart showing die life for 40mm pin diameter] | | | | | | | | | | | | | | | |
| | 80 | 30 | 110 | 110 | 105 | [Bar chart showing die life for 40mm pin diameter] | | | | | | | | | | | | | | | |
| | 100 | 30 | 130 | 130 | 115 | [Bar chart showing die life for 40mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 150 | 125 | [Bar chart showing die life for 40mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 170 | 135 | [Bar chart showing die life for 40mm pin diameter] | | | | | | | | | | | | | | | |
| 50 | 60 | 50 | 110 | 110 | 105 | [Bar chart showing die life for 50mm pin diameter] | | | | | | | | | | | | | | | |
| | 80 | 50 | 130 | 130 | 120 | [Bar chart showing die life for 50mm pin diameter] | | | | | | | | | | | | | | | |
| | 100 | 50 | 150 | 150 | 140 | [Bar chart showing die life for 50mm pin diameter] | | | | | | | | | | | | | | | |
| | 120 | 50 | 170 | 170 | 150 | [Bar chart showing die life for 50mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 190 | 160 | [Bar chart showing die life for 50mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 215 | 170 | [Bar chart showing die life for 50mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 240 | 185 | [Bar chart showing die life for 50mm pin diameter] | | | | | | | | | | | | | | | |
| 63 | 100 | 50 | 150 | 150 | 145 | [Bar chart showing die life for 63mm pin diameter] | | | | | | | | | | | | | | | |
| | 120 | 50 | 170 | 170 | 165 | [Bar chart showing die life for 63mm pin diameter] | | | | | | | | | | | | | | | |
| | 140 | 50 | 190 | 190 | 180 | [Bar chart showing die life for 63mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 215 | 190 | [Bar chart showing die life for 63mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 240 | 205 | [Bar chart showing die life for 63mm pin diameter] | | | | | | | | | | | | | | | |
| 80 | | | | 150 | 145 | [Bar chart showing die life for 80mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 170 | 165 | [Bar chart showing die life for 80mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 190 | 180 | [Bar chart showing die life for 80mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 215 | 190 | [Bar chart showing die life for 80mm pin diameter] | | | | | | | | | | | | | | | |
| | | | | 240 | 205 | [Bar chart showing die life for 80mm pin diameter] | | | | | | | | | | | | | | | |