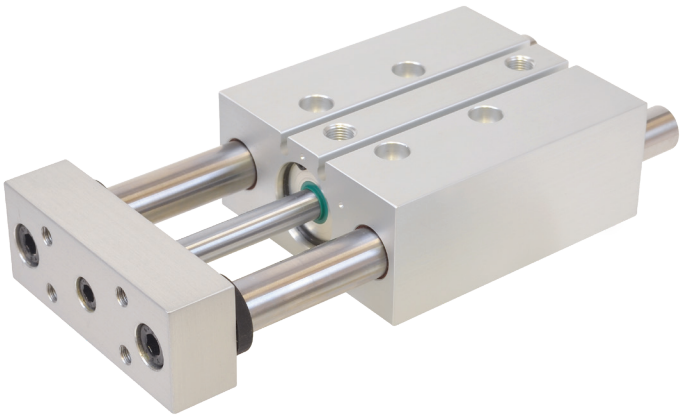
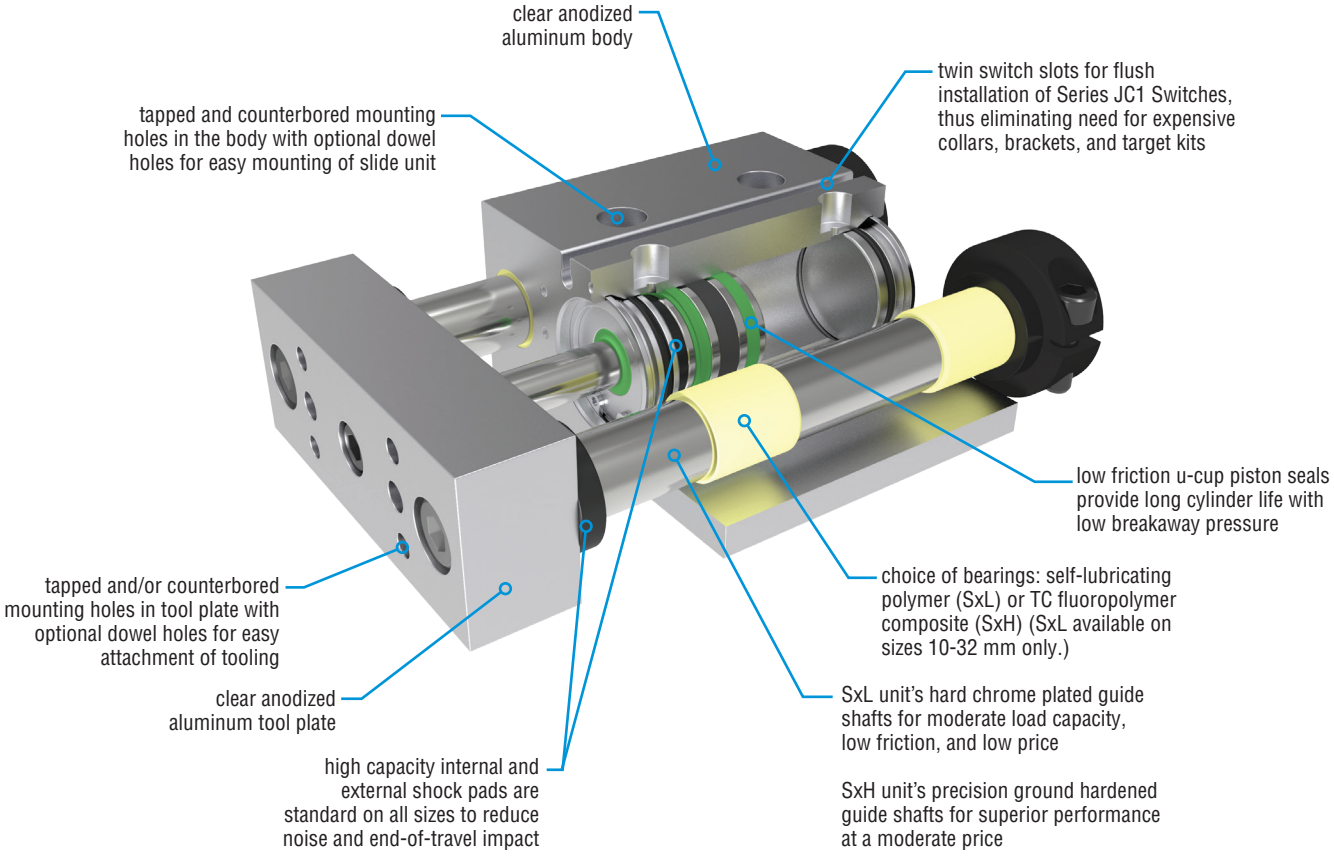
# SxL, SxH

## Major Benefits

- Choose from two bearing types (two bearings per shaft, four total)
- Eight bore sizes
- No metal-to-metal contact
- Completely corrosion resistant options provide protection in harsh environments
- All units incorporate twin switch slots for flush switch mounting





**TO ORDER SPECIFY:**
Product, Series, Type, Design No., Bore Size, Travel, and Options

**PRODUCT**
S - Slide

**TYPE**
L - Polymer bushing (see note 1)
H - Heavy duty precision TC composite bushing

**BORE SIZE (mm)**
10
14
20
25
32
40
50
63

**CORROSION RESISTANCE**
Q6 - Total corrosion resistant guide shafts
Z1 - Total corrosion resistant unit

**MAGNET**
M - Magnet for use with PHD Series JC1 Switches

**DOWEL HOLES**
(see availability table below)
J3 - Transitional fit
J4 - Clearance fit (imperial only)
J8 - Precision fit (metric only)

**S A L 1 10 x 1/2 - Z1 - AE - M - J3**

**SERIES**
A - Threaded tool plate
B - Counterbore holes in tool plate

**DESIGN NO.**
1 - Imperial - ports and mounting holes are imperial
5 - Metric - ports and mounting holes are metric

**TRAVEL ADJUSTMENT**
AE - Extend travel adjustment

**TRAVEL** (see note 4)

| UNIT & BORE SIZE | IMPERIAL (in) | | METRIC (mm) | |
|---|---|---|---|---|
| **SAL/SBL** | **STANDARD** | | **STANDARD** | |
| 10 | 1/2, 1, 1-1/2 | | 12, 25, 40 | |
| 14 | 1/2, 1, 1-1/2 | | 12, 25, 40 | |
| 20, 25, 32 | 1, 2, 3 | | 25, 50, 75 | |
| **SAH/SBH** | **STANDARD** | **LONG** | **STANDARD** | **LONG** |
| 10 | 1/2, 1, 1-1/2 | 2, 3, 4 | 12, 25, 40 | – |
| 14 | 1/2, 1, 1-1/2 | 2, 3, 4, 5, 6 | 12, 25, 40 | – |
| 20, 25, 32 | 1, 2, 3 | 4, 5, 6, 7, 8 | 25, 50, 75 | – |
| 40, 50, 63 | 1, 2, 3 | 4, 5, 6, 7, 8 | 50, 75 | 100 |

**NOTES:**
1) L - Polymer bushing not available on size 40, 50, & 63 mm bore units.
2) Shock pads are standard on extend and retract for all sizes. Retract shock pads are located on the guide shafts. Extend shock pad is located internally on the piston.
3) -AE option (stop collars) is recommended for high cycle speed applications and high load applications. Extend shock pads are included with the -AE option to remove impact load from the piston rod.
4) **Long travel units are available standard on imperial units. 100 mm long travel units are available on metric sizes 40, 50, & 63. Contact PHD for longer travel metric units.

⚠ Options may affect unit length. See dimensional pages and option information details.

## JC1 SOLID STATE AND REED SWITCHES

| JC1 SWITCH | DESCRIPTION |
|---|---|
| JC1SDN-5 | NPN DC Solid State, 5 meter cable |
| JC1SDP-5 | PNP DC Solid State, 5 meter cable |
| JC1SDN-K | NPN DC Solid State, Quick Connect |
| JC1SDP-K | PNP DC Solid State, Quick Connect |
| JC1RDU-5 | PNP or NPN DC Reed, 5 meter cable |
| JC1RDU-K | PNP or NPN DC Reed, Quick Connect |
| JC1ADU-K | AC Reed, Quick Connect |

**NOTE:** See Switches and Sensors section for additional switch information and complete specification. Switches must be ordered separately.

## JC1 SOLID STATE AND REED CORDSETS

| PART NO. | DESCRIPTION |
|---|---|
| 63549-02 | M8, 3 pin, Straight Female Connector, 2 meter cable |
| 63549-05 | M8, 3 pin, Straight Female Connector, 5 meter cable |
| 81284-1-010 | M12, 4 pin, Straight Female Connector, 2 meter cable |

**NOTE:** Cordsets are ordered separately.

## DOWEL HOLE AVAILABILITY

| DESIGN NO. | ITEM | DOWEL HOLES | | | |
|---|---|---|---|---|---|
| | | | J3 | J4 | J8 |
| 1 (IMPERIAL) | HOUSING | (J3 STD) | STD | OPT | — |
| | SAx TOOL PLATE | NONE | OPT | OPT | — |
| | SBx TOOL PLATE | (J3 STD) | STD | OPT | — |
| 5 (METRIC) | HOUSING | PD | OPT | — | OPT |
| | SAx TOOL PLATE | PD | OPT | — | OPT |
| | SBx TOOL PLATE | PD | OPT | — | OPT |

**NOTES:**
1) See dowel hole diameters table for dimensional information.
2) STD = Standard OPT = Optional PD = Production Diameter

## CAD & Sizing Assistance

Use PHD's free online Product Sizing and CAD Configurator at **phdinc.com/myphd**

| SPECIFICATIONS | SERIES SxL / SxH |
|---|---|
| OPERATING PRESSURE | 30 to 150 psi [2 to 10 bar] |
| OPERATING TEMPERATURE | -20° to +180°F [-29° to +82°C] |
| TRAVEL TOLERANCE | Nominal travel +0.080/-0.000 in [+2/-0 mm] |
| LUBRICATION | Factory lubricated for rated life |
| MAINTENANCE | Field repairable |

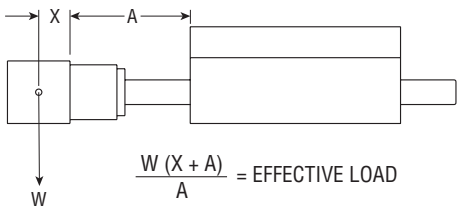
**CYLINDER FORCE CALCULATIONS**

| | Imperial F = P x A | Metric F = 0.1 x P x A |
|---|---|---|
| F = Cylinder Force | lbs | N |
| P = Operating Pressure | psi | bar |
| A = Effective Area | $in^2$ | $mm^2$ |

| SIZE | TRAVEL | | SHAFT DIAMETER | | BORE DIAMETER | | EFFECTIVE AREA | | | BASE WEIGHT | | MAX. STATIC LOAD SxL | | MAX. STATIC LOAD SxH | | TYPICAL DYNAMIC LOAD | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | in | mm | in | mm | in | mm | DIRECTION | $in^2$ | $mm^2$ | lb | kg | lb | N | lb | N | lb | N |
| 10 | 1/2 | 12 | 0.236 | 6 | 0.394 | 10 | EXTEND<br>RETRACT | 0.122<br>0.091 | 78.7<br>58.7 | 0.28 | 0.13 | 60 | 267 | 82 | 365 | 1 - 2 | 4.5 - 8.9 |
| | 1 | 25 | | | | | | | | 0.36 | 0.16 | 44 | 196 | 59 | 262 | | |
| | 1-1/2 | 40 | | | | | | | | 0.44 | 0.20 | 34 | 151 | 46 | 205 | | |
| | 2 | — | | | | | | | | 0.52 | — | — | — | 37 | — | | |
| | 3 | — | | | | | | | | 0.68 | — | — | — | 27 | — | | |
| | 4 | — | | | | | | | | 0.84 | — | — | — | 21 | — | | |
| 14 | 1/2 | 12 | 0.394 | 10 | 0.551 | 14 | EXTEND<br>RETRACT | 0.238<br>0.195 | 154<br>126 | 0.79 | 0.36 | 210 | 934 | 344 | 1530 | 2 - 6 | 8.9 - 26.7 |
| | 1 | 25 | | | | | | | | 0.95 | 0.43 | 190 | 845 | 254 | 1130 | | |
| | 1-1/2 | 40 | | | | | | | | 1.11 | 0.50 | 150 | 667 | 202 | 898 | | |
| | 2 | — | | | | | | | | 1.27 | — | — | — | 165 | — | | |
| | 3 | — | | | | | | | | 1.59 | — | — | — | 123 | — | | |
| | 4 | — | | | | | | | | 1.91 | — | — | — | 98 | — | | |
| | 5 | — | | | | | | | | 2.23 | — | — | — | 81 | — | | |
| | 6 | — | | | | | | | | 2.55 | — | — | — | 69 | — | | |
| 20 | 1 | 25 | 0.472 | 12 | 0.787 | 20 | EXTEND<br>RETRACT | 0.487<br>0.409 | 314<br>264 | 1.72 | 0.78 | 280 | 1245 | 378 | 1681 | 6 - 12 | 26.7 - 53.4 |
| | 2 | 50 | | | | | | | | 2.26 | 1.03 | 190 | 845 | 260 | 1156 | | |
| | 3 | 75 | | | | | | | | 2.80 | 1.27 | 150 | 667 | 198 | 881 | | |
| | 4 | — | | | | | | | | 3.34 | — | — | — | 158 | — | | |
| | 5 | — | | | | | | | | 3.88 | — | — | — | 133 | — | | |
| | 6 | — | | | | | | | | 4.42 | — | — | — | 114 | — | | |
| | 7 | — | | | | | | | | 4.96 | — | — | — | 100 | — | | |
| | 8 | — | | | | | | | | 5.50 | — | — | — | 89 | — | | |
| 25 | 1 | 25 | 0.630 | 16 | 0.984 | 25 | EXTEND<br>RETRACT | 0.761<br>0.639 | 491<br>412 | 2.79 | 1.27 | 423 | 1882 | 738 | 3284 | 10 - 16 | 44.5 - 71.2 |
| | 2 | 50 | | | | | | | | 3.62 | 1.64 | 419 | 1865 | 489 | 2176 | | |
| | 3 | 75 | | | | | | | | 4.45 | 2.02 | 323 | 1437 | 380 | 1691 | | |
| | 4 | — | | | | | | | | 5.27 | — | — | — | 312 | — | | |
| | 5 | — | | | | | | | | 6.10 | — | — | — | 264 | — | | |
| | 6 | — | | | | | | | | 6.92 | — | — | — | 229 | — | | |
| | 7 | — | | | | | | | | 7.75 | — | — | — | 202 | — | | |
| | 8 | — | | | | | | | | 8.58 | — | — | — | 180 | — | | |
| 32 | 1 | 25 | 0.787 | 20 | 1.260 | 32 | EXTEND<br>RETRACT | 1.247<br>1.071 | 805<br>691 | 3.89 | 1.76 | 528 | 2349 | 1325 | 5894 | 12 - 25 | 53.4 - 111 |
| | 2 | 50 | | | | | | | | 4.97 | 2.25 | 523 | 2326 | 950 | 4226 | | |
| | 3 | 75 | | | | | | | | 6.05 | 2.74 | 520 | 2313 | 750 | 3336 | | |
| | 4 | — | | | | | | | | 7.13 | — | — | — | 605 | — | | |
| | 5 | — | | | | | | | | 8.21 | — | — | — | 515 | — | | |
| | 6 | — | | | | | | | | 9.24 | — | — | — | 445 | — | | |
| | 7 | — | | | | | | | | 10.32 | — | — | — | 393 | — | | |
| | 8 | — | | | | | | | | 11.40 | — | — | — | 352 | — | | |
| 40 | 1 | — | 0.984 | 25 | 1.575 | 40 | EXTEND<br>RETRACT | 1.948<br>1.636 | 1256.8<br>1055.5 | 6.86 | — | — | — | 1947 | — | 16 - 75 | 71 - 334 |
| | 2 | 50 | | | | | | | | 8.57 | 3.86 | — | — | 1740 | 7740 | | |
| | 3 | 75 | | | | | | | | 10.28 | 4.64 | — | — | 1374 | 6112 | | |
| | 4 | 100 | | | | | | | | 11.99 | 5.41 | — | — | 1136 | 5053 | | |
| | 5 | — | | | | | | | | 13.70 | — | — | — | 968 | — | | |
| | 6 | — | | | | | | | | 15.41 | — | — | — | 843 | — | | |
| | 7 | — | | | | | | | | 17.12 | — | — | — | 747 | — | | |
| | 8 | — | | | | | | | | 18.83 | — | — | — | 671 | — | | |
| 50 | 1 | — | 1.181 | 30 | 1.969 | 50 | EXTEND<br>RETRACT | 3.043<br>2.556 | 1963.2<br>1649.0 | 10.94 | — | — | — | 2888 | — | 25 - 100 | 111 - 445 |
| | 2 | 50 | | | | | | | | 13.43 | 6.08 | — | — | 2859 | 12717 | | |
| | 3 | 75 | | | | | | | | 15.92 | 7.21 | — | — | 2282 | 10151 | | |
| | 4 | 100 | | | | | | | | 18.41 | 8.34 | — | — | 1899 | 8447 | | |
| | 5 | — | | | | | | | | 20.90 | — | — | — | 1626 | — | | |
| | 6 | — | | | | | | | | 23.39 | — | — | — | 1422 | — | | |
| | 7 | — | | | | | | | | 25.88 | — | — | — | 1263 | — | | |
| | 8 | — | | | | | | | | 28.37 | — | — | — | 1137 | — | | |
| 63 | 1 | — | 1.374 | 34.9 | 2.480 | 63 | EXTEND<br>RETRACT | 4.832<br>4.345 | 3117.4<br>2803.2 | 17.26 | — | — | — | 3823 | — | 75 - 150 | 334 - 668 |
| | 2 | 50 | | | | | | | | 20.64 | 9.34 | — | — | 3805 | 16925 | | |
| | 3 | 75 | | | | | | | | 24.03 | 10.87 | — | — | 3555 | 15813 | | |
| | 4 | 100 | | | | | | | | 27.41 | 12.41 | — | — | 2964 | 13185 | | |
| | 5 | — | | | | | | | | 30.79 | — | — | — | 2542 | — | | |
| | 6 | — | | | | | | | | 34.18 | — | — | — | 2225 | — | | |
| | 7 | — | | | | | | | | 37.56 | — | — | — | 1978 | — | | |
| | 8 | — | | | | | | | | 40.94 | — | — | — | 1781 | — | | |

## EFFECTIVE LOAD

All of the loads in this catalog are given at the front of the extended tool plate. When the load is attached to the tool plate, use the following formula and chart to calculate the effective load. **This method of finding the effective load must be used for all the load carrying specifications and charts in this catalog.**



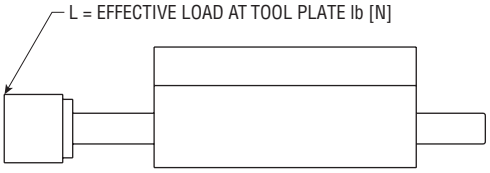

| SIZE | TRAVEL | | A | |
|---|---|---|---|---|
| | in | mm | in | mm |
| 10 | 1/2 | 12 | 0.937 | 23.8 |
| | 1 | 25 | 1.437 | 36.5 |
| | 1-1/2 | 40 | 1.937 | 49.2 |
| | 2 | — | 2.437 | — |
| | 3 | — | 3.437 | — |
| | 4 | — | 4.437 | — |
| 14 | 1/2 | 12 | 1.062 | 27.0 |
| | 1 | 25 | 1.562 | 39.7 |
| | 1-1/2 | 40 | 2.062 | 52.4 |
| | 2 | — | 2.562 | — |
| | 3 | — | 3.562 | — |
| | 4 | — | 4.562 | — |
| | 5 | — | 5.562 | — |
| | 6 | — | 6.562 | — |

| SIZE | TRAVEL | | A | |
|---|---|---|---|---|
| | in | mm | in | mm |
| 20 | 1 | 25 | 1.875 | 47.6 |
| | 2 | 50 | 2.875 | 73.0 |
| | 3 | 75 | 3.875 | 98.4 |
| | 4 | — | 4.875 | — |
| | 5 | — | 5.875 | — |
| | 6 | — | 6.875 | — |
| | 7 | — | 7.875 | — |
| | 8 | — | 8.875 | — |
| 25 | 1 | 25 | 2.074 | 52.7 |
| | 2 | 50 | 3.074 | 78.1 |
| | 3 | 75 | 4.074 | 103.5 |
| | 4 | — | 5.074 | — |
| | 5 | — | 6.074 | — |
| | 6 | — | 7.074 | — |
| | 7 | — | 8.074 | — |
| | 8 | — | 9.074 | — |
| 32 | 1 | 25 | 2.188 | 55.6 |
| | 2 | 50 | 3.188 | 81.0 |
| | 3 | 75 | 4.188 | 106.4 |
| | 4 | — | 5.188 | — |
| | 5 | — | 6.188 | — |
| | 6 | — | 7.188 | — |
| | 7 | — | 8.188 | — |
| | 8 | — | 9.188 | — |

| SIZE | TRAVEL | | A | |
|---|---|---|---|---|
| | in | mm | in | mm |
| 40 | 1 | — | 2.341 | — |
| | 2 | 50 | 3.431 | 86.3 |
| | 3 | 75 | 4.431 | 111.3 |
| | 4 | 100 | 5.431 | 136.3 |
| | 5 | — | 6.431 | — |
| | 6 | — | 7.431 | — |
| | 7 | — | 8.431 | — |
| | 8 | — | 9.431 | — |
| 50 | 1 | — | 2.627 | — |
| | 2 | 50 | 3.627 | 91.3 |
| | 3 | 75 | 4.627 | 116.3 |
| | 4 | 100 | 5.627 | 141.3 |
| | 5 | — | 6.627 | — |
| | 6 | — | 7.627 | — |
| | 7 | — | 8.627 | — |
| | 8 | — | 9.627 | — |
| 63 | 1 | — | 2.687 | — |
| | 2 | 50 | 3.687 | 92.8 |
| | 3 | 75 | 4.687 | 117.8 |
| | 4 | 100 | 5.687 | 142.8 |
| | 5 | — | 6.687 | — |
| | 6 | — | 7.687 | — |
| | 7 | — | 8.687 | — |
| | 8 | — | 9.687 | — |

## BREAKAWAY

Breakaway pressure is affected by several factors including the load at the tool plate, slide travel, and lubrication condition of the unit. The following formulas yield approximate breakaway pressure for the Series SxL/SxH Slides.




### APPROXIMATE BREAKAWAY PRESSURE

| SIZE | SxL | | SxH | |
|---|---|---|---|---|
| | psi | bar | psi | bar |
| 10 | (L x 7.03) + 20 | (L x 0.109) + 1.38 | (L x 8.34) + 20 | (L x 0.129) + 1.38 |
| 14 | (L x 2.87) + 20 | (L x 0.044) + 1.38 | (L x 3.48) + 20 | (L x 0.054) + 1.38 |
| 20 | (L x 1.17) + 20 | (L x 0.018) + 1.38 | (L x 1.47) + 20 | (L x 0.023) + 1.38 |
| 25 | (L x 0.69) + 20 | (L x 0.011) + 1.38 | (L x 0.87) + 20 | (L x 0.013) + 1.38 |
| 32 | (L x 0.37) + 20 | (L x 0.006) + 1.38 | (L x 0.48) + 20 | (L x 0.008) + 1.38 |
| 40 | — | — | (L x 0.31) + 20 | (L x 0.0046) + 1.38 |
| 50 | — | — | (L x 0.19) + 20 | (L x 0.0029) + 1.38 |
| 63 | — | — | (L x 0.10) + 20 | (L x 0.0015) + 1.38 |

## Application & Sizing Assistance

Use PHD's free online Product Sizing and Application at **www.phdinc.com/apps/sizing**

All dimensions are reference only unless specifically toleranced.

## SLIDE SPEEDS

Slide speeds and time required for the slide to extend or retract are dependent upon many application conditions. The table below shows the approximate speed and time for units with no load and with a typical attached load weight as listed to the right of the table.

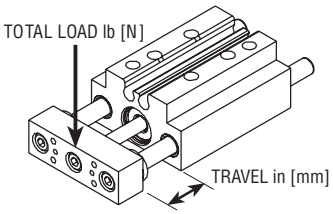
**NOTE:** Flow controls are highly recommended to control impact velocity within maximum allowable kinetic energy as specified on page 32.

| SIZE | TRAVEL | | NO LOAD, MAX VELOCITY | | | | | | WITH GIVEN LOAD TOTAL, MAX KE WITH -AE OPTION | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | EXTEND | | | RETRACT | | | EXTEND | | | RETRACT | | | TOTAL MOVING LOAD WEIGHT | |
| | | | TIME | PEAK SPEED | | TIME | PEAK SPEED | | TIME | IMPACT SPEED | | TIME | IMPACT SPEED | | | |
| | in | mm | sec | in/sec | m/sec | sec | in/sec | m/sec | sec | in/sec | m/sec | sec | in/sec | m/sec | lb | N |
| 10 | 1/2 | 12 | 0.023 | 86 | 2.18 | 0.026 | 84 | 2.13 | 0.085 | 24 | 0.61 | 0.085 | 24 | 0.61 | 2 | 8.9 |
| | 1 | 25 | 0.030 | 105 | 2.67 | 0.033 | 100 | 2.54 | 0.113 | 24 | 0.61 | 0.119 | 24 | 0.61 | | |
| | 1-1/2 | 40 | 0.037 | 130 | 3.30 | 0.040 | 120 | 3.05 | 0.140 | 24 | 0.61 | 0.152 | 24 | 0.61 | | |
| | 2 | — | 0.044 | 130 | 3.30 | 0.047 | 120 | 3.05 | 0.165 | 24 | 0.61 | 0.166 | 24 | 0.61 | | |
| | 3 | — | 0.058 | 130 | 3.30 | 0.061 | 120 | 3.05 | 0.216 | 24 | 0.61 | 0.217 | 24 | 0.61 | | |
| | 4 | — | 0.072 | 130 | 3.30 | 0.075 | 120 | 3.05 | 0.268 | 24 | 0.61 | 0.269 | 24 | 0.61 | | |
| 14 | 1/2 | 12 | 0.024 | 82 | 2.08 | 0.024 | 82 | 2.08 | 0.082 | 24 | 0.61 | 0.082 | 24 | 0.61 | 4 | 17.8 |
| | 1 | 25 | 0.032 | 98 | 2.49 | 0.032 | 98 | 2.49 | 0.113 | 24 | 0.61 | 0.114 | 24 | 0.61 | | |
| | 1-1/2 | 40 | 0.040 | 120 | 3.05 | 0.040 | 120 | 3.05 | 0.143 | 24 | 0.61 | 0.145 | 24 | 0.61 | | |
| | 2 | — | 0.048 | 120 | 3.05 | 0.048 | 120 | 3.05 | 0.165 | 24 | 0.61 | 0.166 | 24 | 0.61 | | |
| | 3 | — | 0.064 | 120 | 3.05 | 0.064 | 120 | 3.05 | 0.216 | 24 | 0.61 | 0.217 | 24 | 0.61 | | |
| | 4 | — | 0.080 | 120 | 3.05 | 0.080 | 120 | 3.05 | 0.268 | 24 | 0.61 | 0.269 | 24 | 0.61 | | |
| | 5 | — | 0.096 | 120 | 3.05 | 0.096 | 120 | 3.05 | 0.320 | 24 | 0.61 | 0.321 | 24 | 0.61 | | |
| | 6 | — | 0.112 | 120 | 3.05 | 0.112 | 120 | 3.05 | 0.371 | 24 | 0.61 | 0.372 | 24 | 0.61 | | |
| 20 | 1 | 25 | 0.040 | 100 | 2.54 | 0.040 | 100 | 2.54 | 0.139 | 24 | 0.61 | 0.143 | 24 | 0.61 | 10 | 44.5 |
| | 2 | 50 | 0.056 | 110 | 2.79 | 0.056 | 110 | 2.79 | 0.191 | 24 | 0.61 | 0.195 | 24 | 0.61 | | |
| | 3 | 75 | 0.072 | 110 | 2.79 | 0.072 | 110 | 2.79 | 0.242 | 24 | 0.61 | 0.246 | 24 | 0.61 | | |
| | 4 | — | 0.088 | 110 | 2.79 | 0.088 | 110 | 2.79 | 0.294 | 24 | 0.61 | 0.298 | 24 | 0.61 | | |
| | 5 | — | 0.104 | 110 | 2.79 | 0.104 | 110 | 2.79 | 0.346 | 24 | 0.61 | 0.350 | 24 | 0.61 | | |
| | 6 | — | 0.120 | 110 | 2.79 | 0.120 | 110 | 2.79 | 0.397 | 24 | 0.61 | 0.401 | 24 | 0.61 | | |
| | 7 | — | 0.136 | 110 | 2.79 | 0.136 | 110 | 2.79 | 0.449 | 24 | 0.61 | 0.453 | 24 | 0.61 | | |
| | 8 | — | 0.152 | 110 | 2.79 | 0.152 | 110 | 2.79 | 0.501 | 24 | 0.61 | 0.505 | 24 | 0.61 | | |
| 25 | 1 | 25 | 0.044 | 78 | 1.98 | 0.047 | 78 | 1.98 | 0.132 | 24 | 0.61 | 0.137 | 24 | 0.61 | 16 | 71.2 |
| | 2 | 50 | 0.067 | 75 | 1.91 | 0.070 | 75 | 1.91 | 0.184 | 24 | 0.61 | 0.189 | 24 | 0.61 | | |
| | 3 | 75 | 0.090 | 72 | 1.83 | 0.093 | 72 | 1.83 | 0.235 | 24 | 0.61 | 0.240 | 24 | 0.61 | | |
| | 4 | — | 0.113 | 72 | 1.83 | 0.116 | 72 | 1.83 | 0.287 | 24 | 0.61 | 0.292 | 24 | 0.61 | | |
| | 5 | — | 0.136 | 72 | 1.83 | 0.139 | 72 | 1.83 | 0.339 | 24 | 0.61 | 0.344 | 24 | 0.61 | | |
| | 6 | — | 0.159 | 72 | 1.83 | 0.162 | 72 | 1.83 | 0.390 | 24 | 0.61 | 0.395 | 24 | 0.61 | | |
| | 7 | — | 0.182 | 72 | 1.83 | 0.185 | 72 | 1.83 | 0.442 | 24 | 0.61 | 0.447 | 24 | 0.61 | | |
| | 8 | — | 0.205 | 72 | 1.83 | 0.208 | 72 | 1.83 | 0.494 | 24 | 0.61 | 0.499 | 24 | 0.61 | | |
| 32 | 1 | 25 | 0.051 | 50 | 1.27 | 0.057 | 42 | 1.07 | 0.126 | 24 | 0.61 | 0.132 | 24 | 0.61 | 25 | 111.2 |
| | 2 | 50 | 0.082 | 48 | 1.22 | 0.093 | 40 | 1.02 | 0.178 | 24 | 0.61 | 0.184 | 24 | 0.61 | | |
| | 3 | 75 | 0.113 | 46 | 1.17 | 0.129 | 38 | 0.97 | 0.229 | 24 | 0.61 | 0.235 | 24 | 0.61 | | |
| | 4 | — | 0.144 | 46 | 1.17 | 0.165 | 38 | 0.97 | 0.281 | 24 | 0.61 | 0.287 | 24 | 0.61 | | |
| | 5 | — | 0.175 | 46 | 1.17 | 0.201 | 38 | 0.97 | 0.333 | 24 | 0.61 | 0.339 | 24 | 0.61 | | |
| | 6 | — | 0.206 | 46 | 1.17 | 0.237 | 38 | 0.97 | 0.384 | 24 | 0.61 | 0.390 | 24 | 0.61 | | |
| | 7 | — | 0.237 | 46 | 1.17 | 0.273 | 38 | 0.97 | 0.436 | 24 | 0.61 | 0.442 | 24 | 0.61 | | |
| | 8 | — | 0.268 | 46 | 1.17 | 0.309 | 38 | 0.97 | 0.488 | 24 | 0.61 | 0.494 | 24 | 0.61 | | |
| 40 | 1 | — | 0.064 | 68 | 1.73 | 0.070 | 61 | 1.55 | 0.131 | 24 | 0.61 | 0.142 | 24 | 0.61 | 35 | 156 |
| | 2 | 50 | 0.091 | 82 | 2.08 | 0.100 | 71 | 1.80 | 0.183 | 24 | 0.61 | 0.194 | 24 | 0.61 | | |
| | 3 | 75 | 0.118 | 99 | 2.51 | 0.130 | 84 | 2.13 | 0.234 | 24 | 0.61 | 0.245 | 24 | 0.61 | | |
| | 4 | 100 | 0.145 | 89 | 2.26 | 0.160 | 74 | 1.88 | 0.286 | 24 | 0.61 | 0.297 | 24 | 0.61 | | |
| | 5 | — | 0.172 | 78 | 1.98 | 0.190 | 63 | 1.60 | 0.338 | 24 | 0.61 | 0.349 | 24 | 0.61 | | |
| | 6 | — | 0.199 | 68 | 1.73 | 0.220 | 59 | 1.50 | 0.389 | 24 | 0.61 | 0.400 | 24 | 0.61 | | |
| | 7 | — | 0.226 | 59 | 1.50 | 0.250 | 54 | 1.37 | 0.441 | 24 | 0.61 | 0.452 | 24 | 0.61 | | |
| | 8 | — | 0.253 | 59 | 1.50 | 0.280 | 54 | 1.37 | 0.493 | 24 | 0.61 | 0.504 | 24 | 0.61 | | |
| 50 | 1 | — | 0.066 | 76 | 1.93 | 0.072 | 69 | 1.75 | 0.198 | 24 | 0.61 | 0.256 | 24 | 0.61 | 47 | 209 |
| | 2 | 50 | 0.099 | 74 | 1.88 | 0.105 | 57 | 1.45 | 0.250 | 24 | 0.61 | 0.308 | 24 | 0.61 | | |
| | 3 | 75 | 0.132 | 71 | 1.80 | 0.138 | 57 | 1.45 | 0.301 | 24 | 0.61 | 0.359 | 24 | 0.61 | | |
| | 4 | 100 | 0.165 | 68 | 1.73 | 0.171 | 55 | 1.40 | 0.353 | 24 | 0.61 | 0.411 | 24 | 0.61 | | |
| | 5 | — | 0.198 | 65 | 1.65 | 0.204 | 52 | 1.32 | 0.405 | 24 | 0.61 | 0.463 | 24 | 0.61 | | |
| | 6 | — | 0.231 | 60 | 1.52 | 0.237 | 50 | 1.27 | 0.456 | 24 | 0.61 | 0.514 | 24 | 0.61 | | |
| | 7 | — | 0.264 | 57 | 1.45 | 0.270 | 47 | 1.19 | 0.508 | 24 | 0.61 | 0.566 | 24 | 0.61 | | |
| | 8 | — | 0.297 | 54 | 1.37 | 0.303 | 44 | 1.12 | 0.560 | 24 | 0.61 | 0.618 | 24 | 0.61 | | |
| 63 | 1 | — | 0.092 | 62 | 1.57 | 0.092 | 57 | 1.45 | 0.146 | 24 | 0.61 | 0.169 | 24 | 0.61 | 61 | 272 |
| | 2 | 50 | 0.134 | 58 | 1.47 | 0.140 | 54 | 1.37 | 1.98 | 24 | 0.61 | 0.221 | 24 | 0.61 | | |
| | 3 | 75 | 0.176 | 54 | 1.37 | 0.188 | 52 | 1.32 | 0.249 | 24 | 0.61 | 0.272 | 24 | 0.61 | | |
| | 4 | 100 | 0.218 | 50 | 1.27 | 0.236 | 48 | 1.22 | 0.301 | 24 | 0.61 | 0.324 | 24 | 0.61 | | |
| | 5 | — | 0.260 | 48 | 1.22 | 0.284 | 48 | 1.22 | 0.353 | 24 | 0.61 | 0.376 | 24 | 0.61 | | |
| | 6 | — | 0.302 | 48 | 1.22 | 0.332 | 48 | 1.22 | 0.404 | 24 | 0.61 | 0.427 | 24 | 0.61 | | |
| | 7 | — | 0.344 | 48 | 1.22 | 0.380 | 48 | 1.22 | 0.456 | 24 | 0.61 | 0.479 | 24 | 0.61 | | |
| | 8 | — | 0.386 | 48 | 1.22 | 0.428 | 48 | 1.22 | 0.508 | 24 | 0.61 | 0.531 | 24 | 0.61 | | |

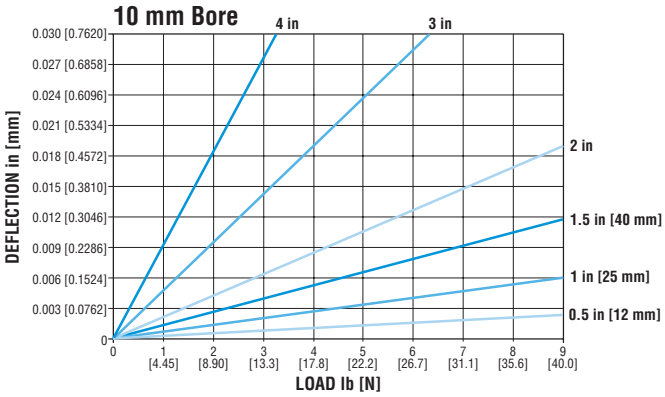
**NOTE:** The approximate tabled time and speed is based on:
1) Sizes 08 - 32 mm - 1) line pressure 87 psi, 2) Valve rated at 1.35 $CV^2$, 3) 0.28 I.D. tubing, 4) Horizontal operation
2) Sizes 40 & 50 mm - 1) line pressure 87 psi, 2) Value rated at 5.1 $CV^2$, 3) 0.281 I.D. tubing, 4) Horizontal operation
3) Size 63 mm - 1) line pressure 87 psi, 2) Value rated at 5.1 $CV^2$, 3) 0.39 I.D. tubing, 4) Horizontal operation

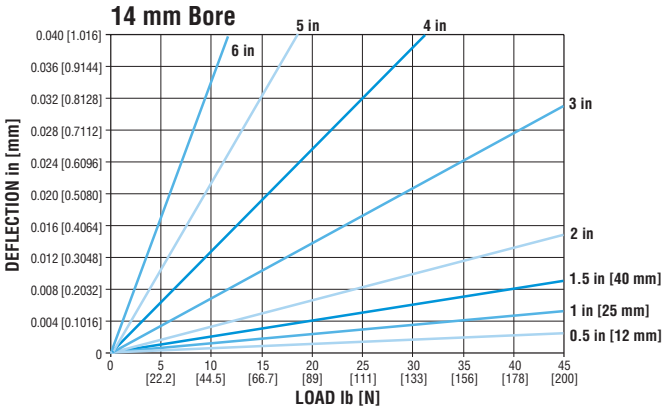
## LOAD VS. DEFLECTION GRAPHS

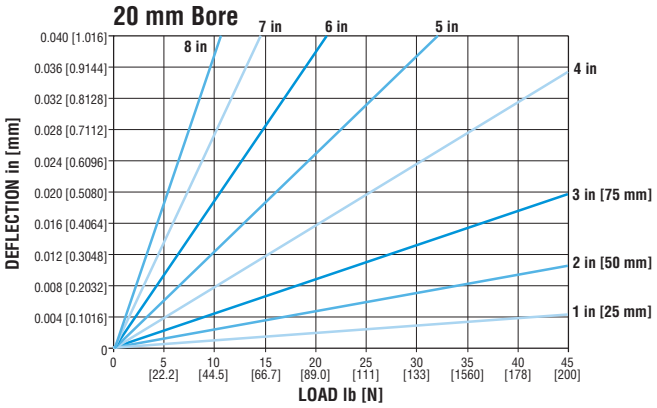
The following graphs provide a quick and easy method of sizing and comparing each Series SxL and SxH slide. Use the deflection graphs to determine shaft deflection at the applied load. The deflection figures given in these graphs are based on the effect of external loads at the tool plate. **NOTE:** Use the effective load formulas on page 26 to find the effective total load values.

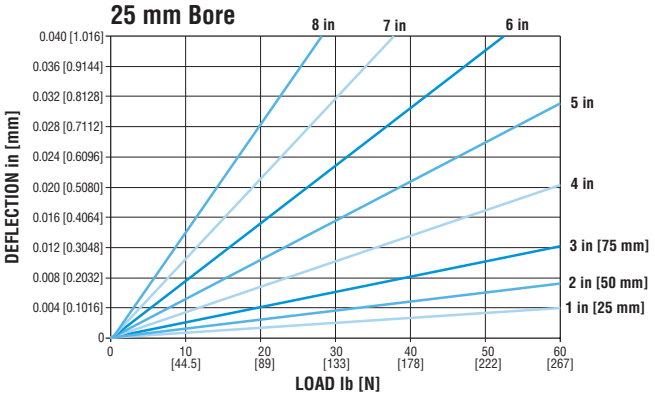


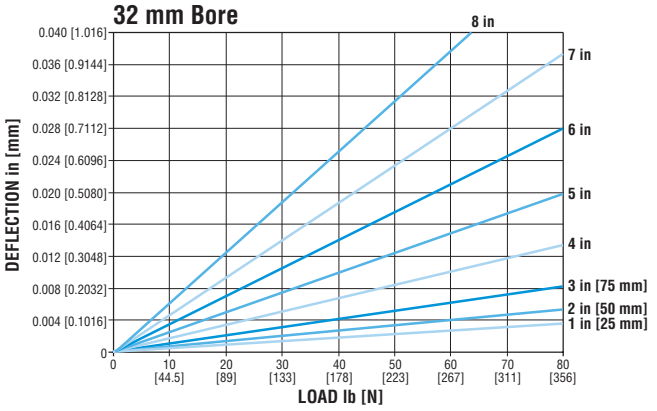

*(graphs continued on next page)*

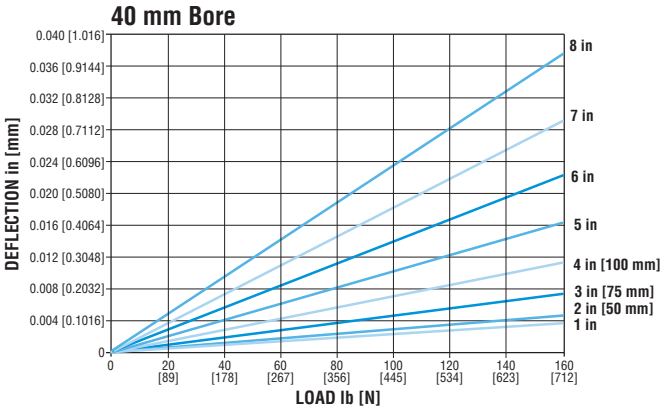


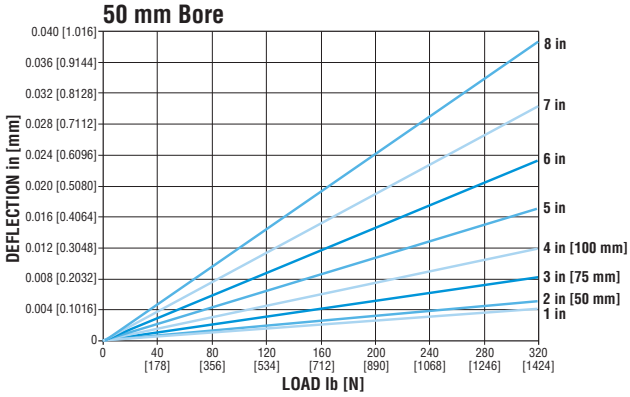



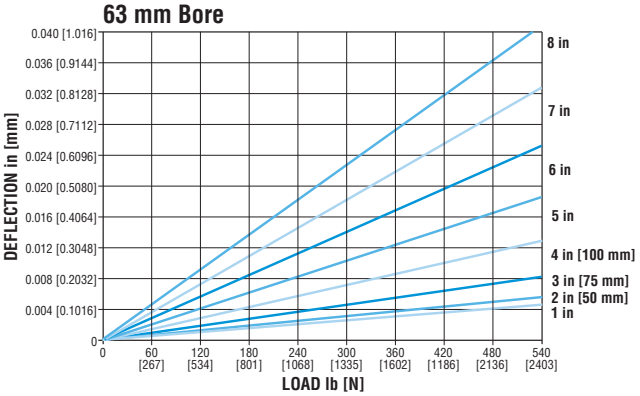



## LOAD VS. DEFLECTION GRAPHS *(continued)*

### 50 mm Bore



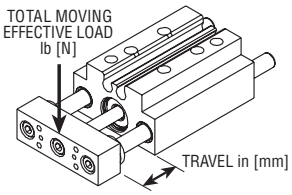

### 63 mm Bore



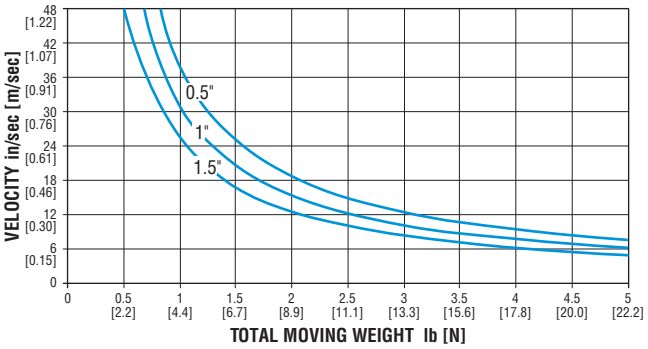

## DYNAMIC LOAD VS. VELOCITY GRAPHS

Use the Load vs. Velocity Graphs to determine appropriate load and velocity for each size and stroke.

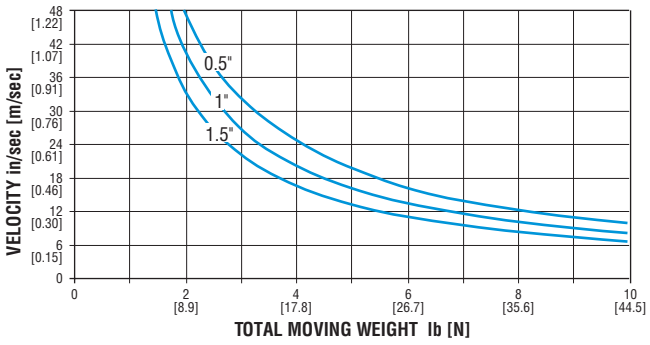
**NOTE:** Use the effective load formulas to find the effective total load value. Use this value in the charts. Numbers are for initially lubricated bearings. If bearings are periodically lubricated, higher life expectancy and/or higher velocity may be achieved.



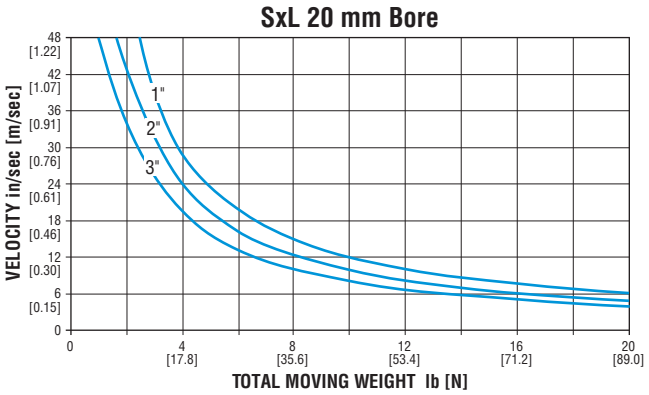

### SxL 10 mm Bore



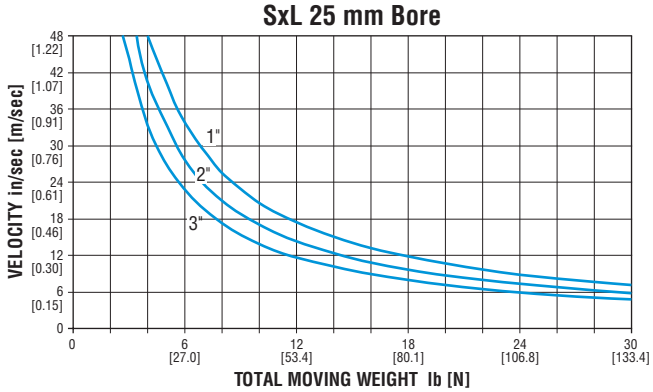

### SxL 14 mm Bore



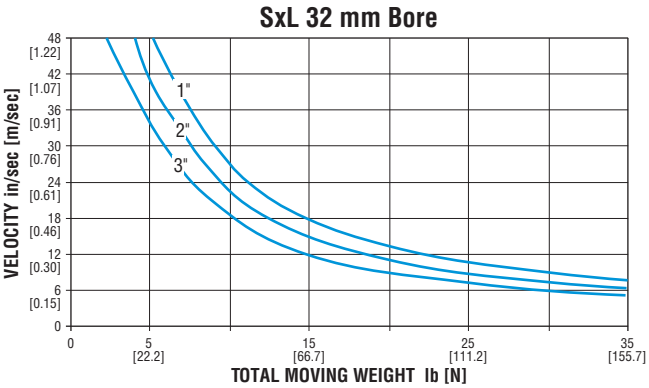

### SxL 20 mm Bore




### SxL 25 mm Bore

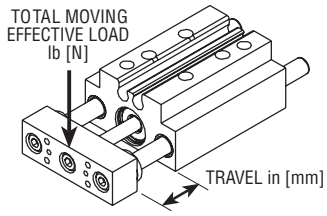


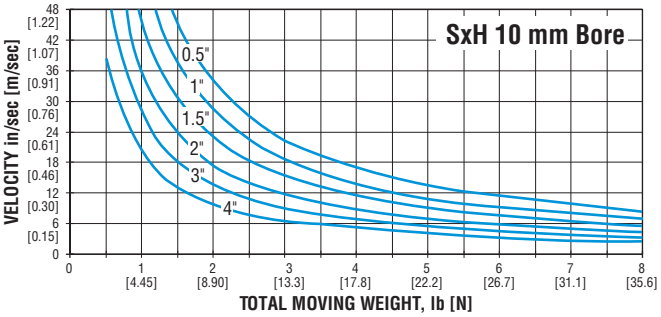

### SxL 32 mm Bore

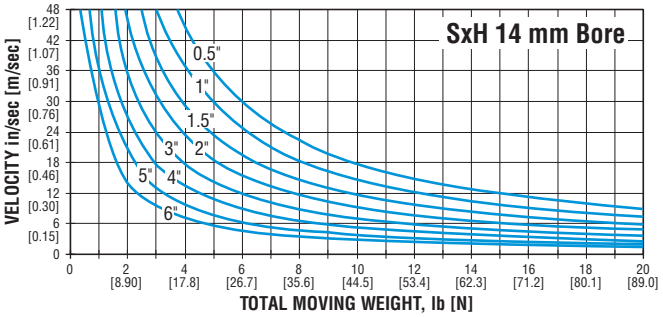


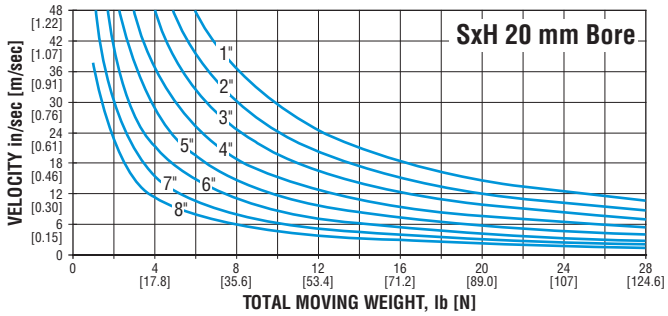
## DYNAMIC LOAD VS. VELOCITY GRAPHS

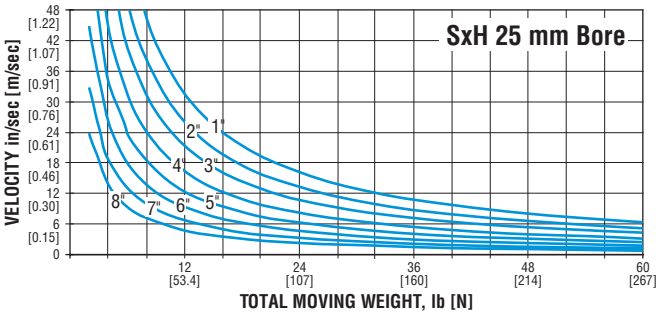
Use the Load vs. Velocity Graphs to determine appropriate load and velocity for each size and stroke. **NOTE:** Use the effective load formulas to find the effective total load value. Use this value in the charts. Numbers are for initially lubricated bearings. If bearings are periodically lubricated, higher life expectancy and/or higher velocity may be achieved.

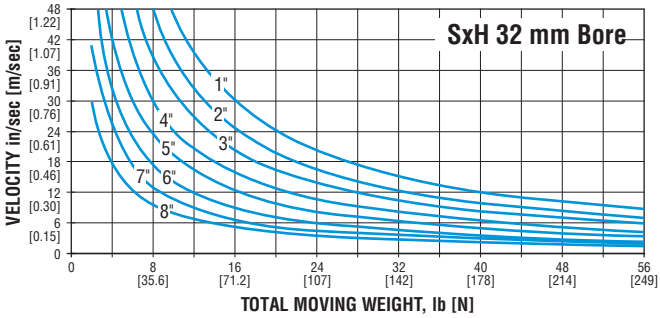


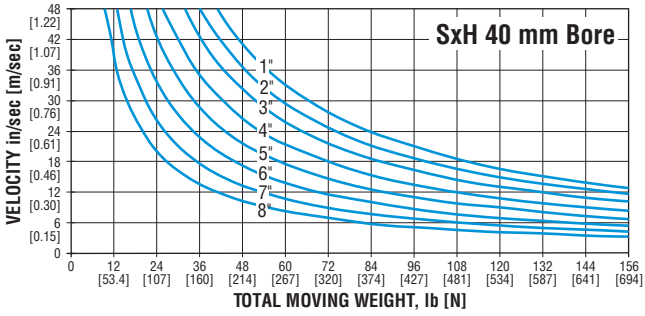



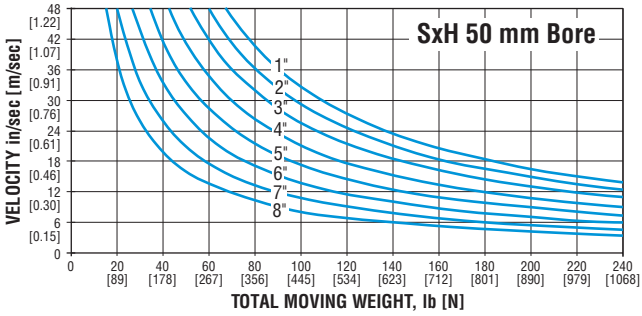



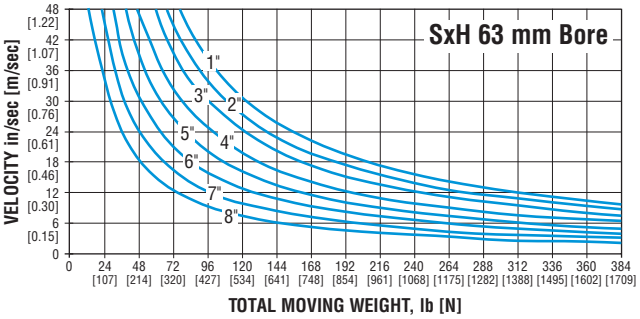



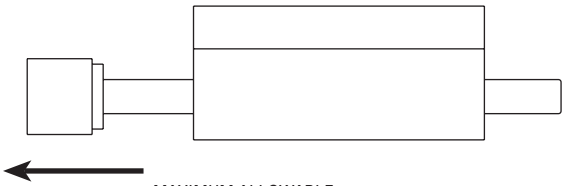



## STOPPING CAPACITY

To determine stopping capacity, use the Maximum Allowable Kinetic Energy Graphs. Plot the total moving load and impact velocity per the two listed conditions below. If the kinetic energy is greater than these curves, external load stops are required.



MAXIMUM ALLOWABLE
KINETIC ENERGY

## KINETIC ENERGY FORMULA

**Imperial: in-lb = 1/2 x $\frac{W}{386}$ x $V^2$**

**Metric: Nm = 1/2 x $\frac{W}{9.8}$ x $V^2$**

(W) Weight = Total weight of moving load, lb [N]
(V) Velocity = Velocity at impact, in/sec [m/sec]

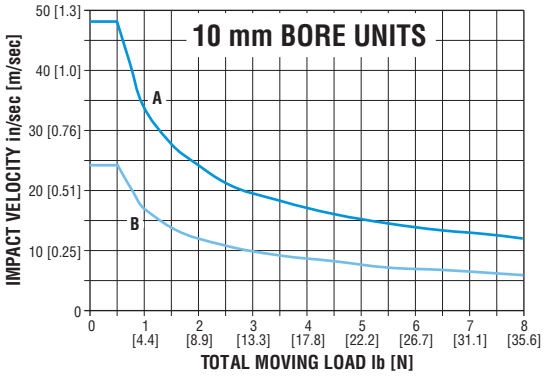
## CONDITIONS

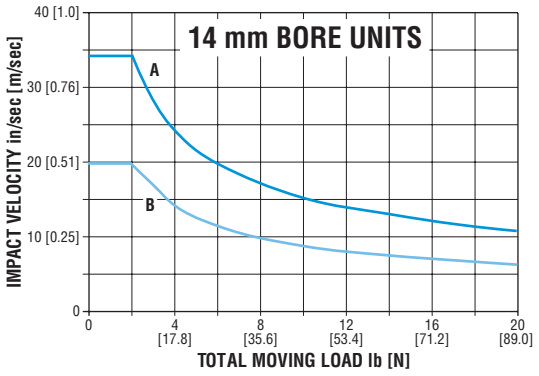
A = 1) Plain unit retract
2) Plain unit extend with -AE option
B = Plain unit extend

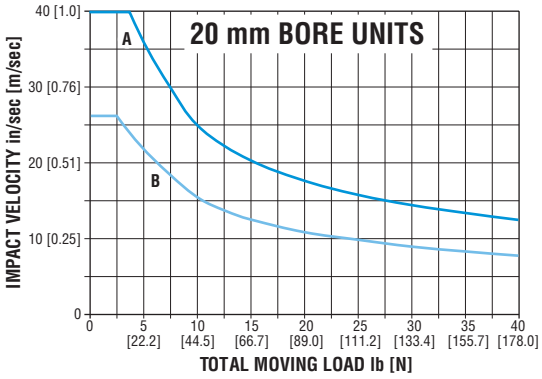
## KE WEIGHT TABLE

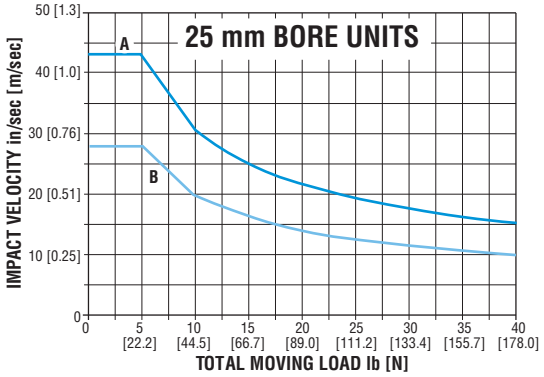
| SIZE | TRAVEL | | Sxx MOVING WEIGHT | | -AE WEIGHT ADDERS | | PISTON AREA EXTEND | | PISTON AREA RETRACT | |
|---|---|---|---|---|---|---|---|---|---|---|
| | in | mm | lb | N | lb | N | $in^2$ | $mm^2$ | $in^2$ | $mm^2$ |
| 10 | 1/2 | 12 | 0.12 | 0.53 | 0.06 | 0.27 | 0.122 | 78.7 | 0.091 | 58.7 |
| | 1 | 25 | 0.15 | 0.67 | | | | | | |
| | 1-1/2 | 40 | 0.18 | 0.80 | | | | | | |
| | 2 | — | 0.21 | — | | | | | | |
| | 3 | — | 0.27 | — | | | | | | |
| | 4 | — | 0.33 | — | | | | | | |
| 14 | 1/2 | 12 | 0.34 | 1.51 | 0.10 | 0.44 | 0.238 | 153 | 0.195 | 125 |
| | 1 | 25 | 0.41 | 1.82 | | | | | | |
| | 1-1/2 | 40 | 0.48 | 2.14 | | | | | | |
| | 2 | — | 0.55 | — | | | | | | |
| | 3 | — | 0.69 | — | | | | | | |
| | 4 | — | 0.83 | — | | | | | | |
| | 5 | — | 0.97 | — | | | | | | |
| | 6 | — | 1.11 | — | | | | | | |
| 20 | 1 | 25 | 0.83 | 3.69 | 0.22 | 0.98 | 0.487 | 314 | 0.409 | 263 |
| | 2 | 50 | 1.05 | 4.67 | | | | | | |
| | 3 | 75 | 1.27 | 5.65 | | | | | | |
| | 4 | — | 1.49 | — | | | | | | |
| | 5 | — | 1.71 | — | | | | | | |
| | 6 | — | 1.93 | — | | | | | | |
| | 7 | — | 2.15 | — | | | | | | |
| | 8 | — | 2.37 | — | | | | | | |
| 25 | 1 | 25 | 1.48 | 6.58 | 0.34 | 1.51 | 0.761 | 491 | 0.639 | 412 |
| | 2 | 50 | 1.87 | 8.30 | | | | | | |
| | 3 | 75 | 2.25 | 10.03 | | | | | | |
| | 4 | — | 2.64 | — | | | | | | |
| | 5 | — | 3.03 | — | | | | | | |
| | 6 | — | 3.42 | — | | | | | | |
| | 7 | — | 3.80 | — | | | | | | |
| | 8 | — | 4.19 | — | | | | | | |
| 32 | 1 | 25 | 2.38 | 10.59 | 0.37 | 1.65 | 1.247 | 804 | 1.071 | 691 |
| | 2 | 50 | 2.98 | 13.26 | | | | | | |
| | 3 | 75 | 3.57 | 15.88 | | | | | | |
| | 4 | — | 4.17 | — | | | | | | |
| | 5 | — | 4.77 | — | | | | | | |
| | 6 | — | 5.37 | — | | | | | | |
| | 7 | — | 5.97 | — | | | | | | |
| | 8 | — | 6.57 | — | | | | | | |
| 40 | 1 | — | 4.197 | — | 0.970 | 4.31 | 1.948 | 1257 | 1.636 | 1055 |
| | 2 | 50 | 5.145 | 22.89 | | | | | | |
| | 3 | 75 | 6.093 | 27.10 | | | | | | |
| | 4 | 100 | 7.041 | 31.32 | | | | | | |
| | 5 | — | 7.989 | — | | | | | | |
| | 6 | — | 8.937 | — | | | | | | |
| | 7 | — | 9.885 | — | | | | | | |
| | 8 | — | 10.833 | — | | | | | | |
| 50 | 1 | — | 7.048 | — | 1.602 | 7.13 | 3.043 | 1963 | 2.556 | 1649 |
| | 2 | 50 | 8.426 | 37.48 | | | | | | |
| | 3 | 75 | 9.804 | 43.61 | | | | | | |
| | 4 | 100 | 11.182 | 49.74 | | | | | | |
| | 5 | — | 12.560 | — | | | | | | |
| | 6 | — | 13.938 | — | | | | | | |
| | 7 | — | 15.316 | — | | | | | | |
| | 8 | — | 16.694 | — | | | | | | |
| 63 | 1 | — | 10.140 | — | 2.164 | 9.63 | 4.832 | 3117 | 4.345 | 2803 |
| | 2 | 50 | 11.955 | 53.18 | | | | | | |
| | 3 | 75 | 13.770 | 61.25 | | | | | | |
| | 4 | 100 | 15.585 | 69.33 | | | | | | |
| | 5 | — | 17.400 | — | | | | | | |
| | 6 | — | 19.215 | — | | | | | | |
| | 7 | — | 21.030 | — | | | | | | |
| | 8 | — | 22.845 | — | | | | | | |

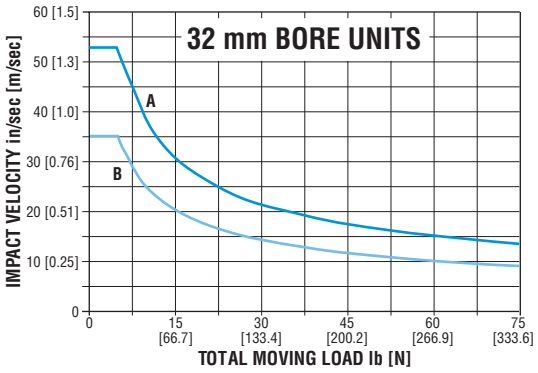
## MAXIMUM ALLOWABLE KINETIC ENERGY GRAPHS

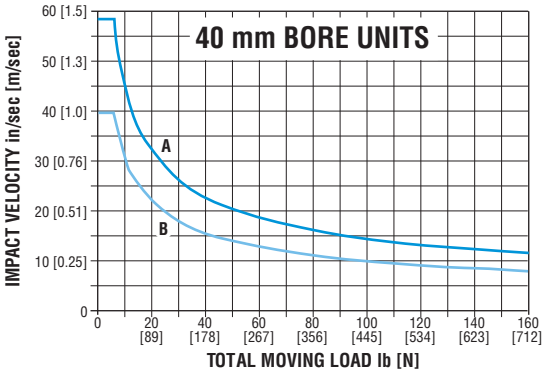


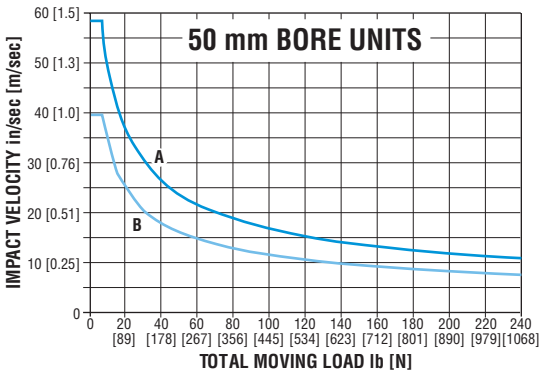



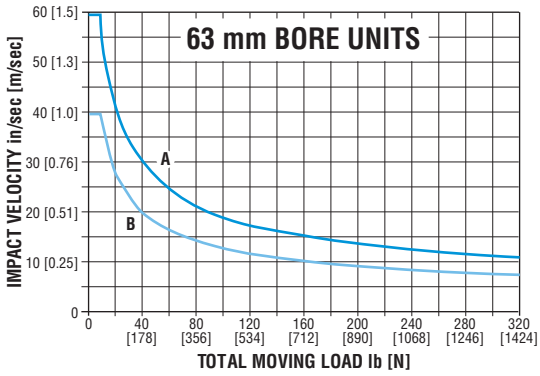



## CONVEYOR STOPPER SELECTION

The values in the table below assist in selecting the correct size and travel of a slide based on the weight and velocity of the object to be stopped on a conveyor. Calculate the kinetic energy using the formula given, then select a slide with a value less than or equal to the values given in the table.

| SIZE | TRAVEL | | MAXIMUM KINETIC ENERGY | | | |
|---|---|---|---|---|---|---|
| | | | SxL | | SxH | |
| | in | mm | in-lb | Nm | in-lb | Nm |
| 10 | 1/2 | 12 | 0.50 | 0.06 | 0.93 | 0.11 |
| | 1 | 25 | 0.65 | 0.07 | 1.16 | 0.13 |
| | 1-1/2 | 40 | 0.58 | 0.07 | 1.06 | 0.12 |
| | 2 | — | — | — | 1.47 | — |
| | 3 | — | — | — | 1.71 | — |
| | 4 | — | — | — | 2.00 | — |
| 14 | 1/2 | 12 | 1.08 | 0.12 | 2.89 | 0.33 |
| | 1 | 25 | 2.41 | 0.27 | 4.30 | 0.49 |
| | 1-1/2 | 40 | 2.30 | 0.26 | 4.17 | 0.47 |
| | 2 | — | — | — | 4.39 | — |
| | 3 | — | — | — | 5.13 | — |
| | 4 | — | — | — | 6.15 | — |
| | 5 | — | — | — | 7.01 | — |
| | 6 | — | — | — | 8.00 | — |
| 20 | 1 | 25 | 2.79 | 0.32 | 6.67 | 0.75 |
| | 2 | 50 | 3.29 | 0.37 | 7.66 | 0.87 |
| | 3 | 75 | 3.30 | 0.37 | 8.45 | 0.95 |
| | 4 | — | — | — | 9.63 | — |
| | 5 | — | — | — | 10.97 | — |
| | 6 | — | — | — | 12.35 | — |
| | 7 | — | — | — | 13.73 | — |
| | 8 | — | — | — | 15.07 | — |
| 25 | 1 | 25 | 5.59 | 0.63 | 13.95 | 1.58 |
| | 2 | 50 | 10.42 | 1.18 | 14.20 | 1.60 |
| | 3 | 75 | 10.43 | 1.18 | 14.44 | 1.63 |
| | 4 | — | — | — | 16.31 | — |
| | 5 | — | — | — | 17.90 | — |
| | 6 | — | — | — | 19.76 | — |
| | 7 | — | — | — | 21.45 | — |
| | 8 | — | — | — | 22.88 | — |
| 32 | 1 | 25 | 5.23 | 0.59 | 27.41 | 3.10 |
| | 2 | 50 | 9.74 | 1.10 | 28.20 | 3.19 |
| | 3 | 75 | 14.37 | 1.62 | 29.88 | 3.38 |
| | 4 | — | — | — | 30.20 | — |
| | 5 | — | — | — | 32.82 | — |
| | 6 | — | — | — | 34.60 | — |
| | 7 | — | — | — | 36.49 | — |
| | 8 | — | — | — | 38.41 | — |
| 40 | 1 | — | — | — | 39.95 | — |
| | 2 | 50 | — | — | 40.24 | 4.55 |
| | 3 | 75 | — | — | 42.14 | 4.76 |
| | 4 | 100 | — | — | 44.16 | 4.99 |
| | 5 | — | — | — | 46.64 | — |
| | 6 | — | — | — | 48.99 | — |
| | 7 | — | — | — | 50.37 | — |
| | 8 | — | — | — | 52.34 | — |
| 50 | 1 | — | — | — | 51.06 | — |
| | 2 | 50 | — | — | 61.47 | 6.94 |
| | 3 | 75 | — | — | 63.68 | 7.20 |
| | 4 | 100 | — | — | 66.17 | 7.48 |
| | 5 | — | — | — | 69.49 | — |
| | 6 | — | — | — | 72.78 | — |
| | 7 | — | — | — | 74.51 | — |
| | 8 | — | — | — | 77.21 | — |
| 63 | 1 | — | — | — | 60.06 | — |
| | 2 | 50 | — | — | 71.16 | 8.04 |
| | 3 | 75 | — | — | 92.79 | 10.48 |
| | 4 | 100 | — | — | 102.13 | 11.54 |
| | 5 | — | — | — | 109.50 | — |
| | 6 | — | — | — | 114.83 | — |
| | 7 | — | — | — | 118.09 | — |
| | 8 | — | — | — | 119.43 | — |

## IMPERIAL EXAMPLE:

Determine the appropriate slide in order to stop a 10 lb pallet, moving down a conveyor at 24 inches per second. Impact load distance "X" from tool plate = 2 inches.

**1) Determine KE of moving pallet.**

$$KE = 0.5 \times (10 / 386) \times 24^2 = 7.46 \text{ in-lb}$$

From Maximum Kinetic Energy table, select SxL132 x 2.

**2) Determine system deflection due to kinetic energy of moving load by finding spring rate "k" of this slide at impact load distance "X."**

Step 1) Find equivalent load at tool plate based on a given load, at "X" offset, using effective load table.

$$L_E = \frac{W (X + A)}{A} = \frac{10 (2 + 3.188)}{3.188} = 16.27 \text{ lb}$$

Step 2) Find deflection at tool plate for given equivalent load by reading graphs (0.0012) or by formula.

deflection at tool plate = $d_{tp}$ = (rise / run) x load = (0.0057 / 80) x 16.27 = 0.0012

Step 3) Find deflection at load point.
$d_L = (d_{tp} / A) \times (A + X) =$
$(0.0012 / 3.188) \times (2 + 3.188) = 0.002$

Step 4) Find spring rate ("k") of slide at load point.
k = L / d = 10 lb / 0.002 in = 5000 lb/in

Step 5) Calculate deflection due to stopping moving load.
$d = \sqrt{(KE / (0.5 \times k))} = \sqrt{(7.46 / (0.5 \times 5000))} = 0.0546$

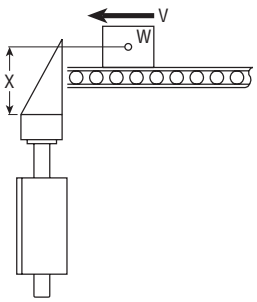
**3) Determine static load at tool plate due to KE of moving load.**

Step 1) Static Load = (KE / (0.5 x d)) =
(7.46 / (0.5 x .0546)) = 273 lb

Step 2) Find equivalent load at tool plate
EL = W (x + A) / A = 273 (2 + 3.188) / 3.188 = 444.26 lb

## KINETIC ENERGY FORMULA FOR ENERGY STORED BY A SPRING

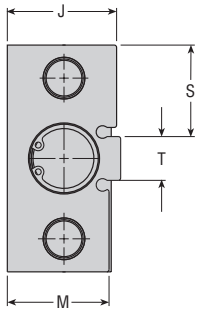
**$KE = 0.5 \times k \times d^2$**
**k = spring rate = Load / distance**
**$KE = 0.5 \times (L / d) \times d^2$**
**L = lb [N]  d = in [m]**



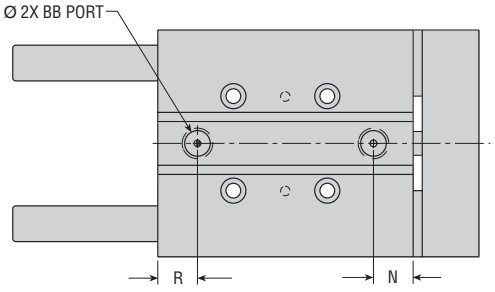

## KINETIC ENERGY FORMULA FOR WEIGHT IN MOTION

**Imperial: in-lb = 1/2 x (W / 386) x $V^2$**
**Metric: Nm = 1/2 x (W / 9.8) x $V^2$**

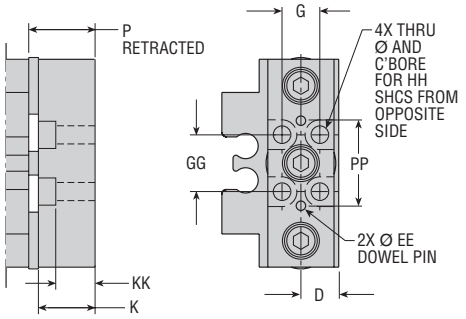
(W) Weight = Weight of object on conveyor to be stopped, lb [N]
(V) Velocity = Velocity of object on conveyor to be stopped, in/sec [m/sec]



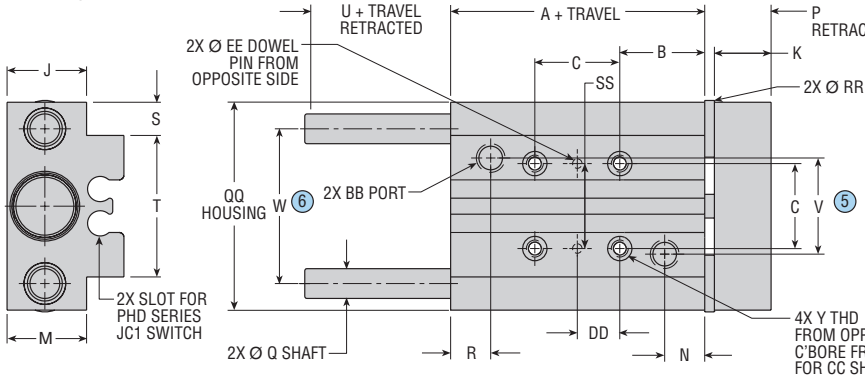

**SIZES 14 through 63**



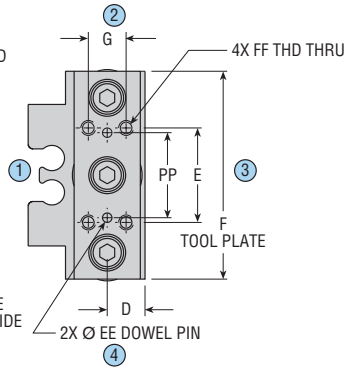

**SIZES 14 through 63**




**SERIES SBx (TOOL PLATE)**

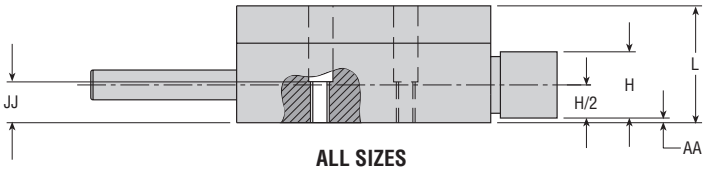



**SIZE 10** **SIZE 10**




**SERIES SAx (TOOL PLATE)**

**NOTE:**
CIRCLED NUMBERS INDICATE POSITION.




**ALL SIZES**

## IMPERIAL Ø EE DOWEL PIN HOLE SIZE

| SIZE | Ø EE DOWEL HOLE | STANDARD | J3 OPTION TRANSITIONAL | J4 OPTION CLEARANCE FIT | J8 OPTION PRECISION FIT |
|---|---|---|---|---|---|
| 10 | 0.0937 x 0.20 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 14 | 0.1250 x 0.24 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 20 | 0.1875 x 0.35 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 25 | 0.2500 x 0.47 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 32 | 0.2500 x 0.47 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 40 | 0.3125 x 0.63 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 50 | 0.3125 x 0.63 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 63 | 0.375 x 0.79 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |

## METRIC Ø EE DOWEL PIN HOLE SIZE

| SIZE | Ø EE DOWEL HOLE | STANDARD | J3 OPTION TRANSITIONAL | J4 OPTION CLEARANCE FIT | J8 OPTION PRECISION FIT |
|---|---|---|---|---|---|
| 10 | 2.5 x 5 DP | +0.010 / -0.024 | +0.033 / +0.008 | — | +0.010 / -0.000 |
| 14 | 3 x 6 DP | +0.010 / -0.024 | +0.033 / +0.008 | — | +0.010 / -0.000 |
| 20 | 4 x 9 DP | +0.010 / -0.024 | +0.033 / +0.008 | — | +0.012 / -0.000 |
| 25 | 6 x 12 DP | +0.010 / -0.024 | +0.033 / +0.008 | — | +0.012 / -0.000 |
| 32 | 6 x 12 DP | +0.010 / -0.024 | +0.033 / +0.008 | — | +0.012 / -0.000 |
| 40 | 8 x 16 DP | +0.010 / -0.024 | +0.033 / +0.008 | — | +0.015 / -0.000 |
| 50 | 8 x 16 DP | +0.010 / -0.024 | +0.033 / +0.008 | — | +0.015 / -0.000 |
| 63 | 10 x 20 DP | +0.010 / -0.024 | +0.033 / +0.008 | — | +0.015 / -0.000 |

* ALL IMPERIAL HOUSINGS AND SB TOOL PLATES HAVE J3 DOWEL HOLES AS STANDARD, SA TOOL PLATE - NONE

## DOWEL PIN AVAILABILITY

| DESIGN NO. | ITEM | DOWEL HOLES | | | |
|---|---|---|---|---|---|
| | | | J3 | J4 | J8 |
| IMPERIAL | HOUSING | (J3 STD) | STD | OPT | — |
| | SAx TOOL PLATE | NONE | OPT | OPT | — |
| | SBx TOOL PLATE | (J3 STD) | STD | OPT | — |
| METRIC | HOUSING | PD | OPT | — | OPT |
| | SAx TOOL PLATE | PD | OPT | — | OPT |
| | SBx TOOL PLATE | PD | OPT | — | OPT |

PD = PRODUCTION Ø OPT = OPTIONAL STD = STANDARD

## CAD & Sizing Assistance

Use PHD's free online Product Sizing and CAD Configurator at **phdinc.com/myphd**

All dimensions are reference only unless specifically toleranced.

## IMPERIAL UNIT DIMENSIONS (in) / METRIC UNIT DIMENSIONS (mm)

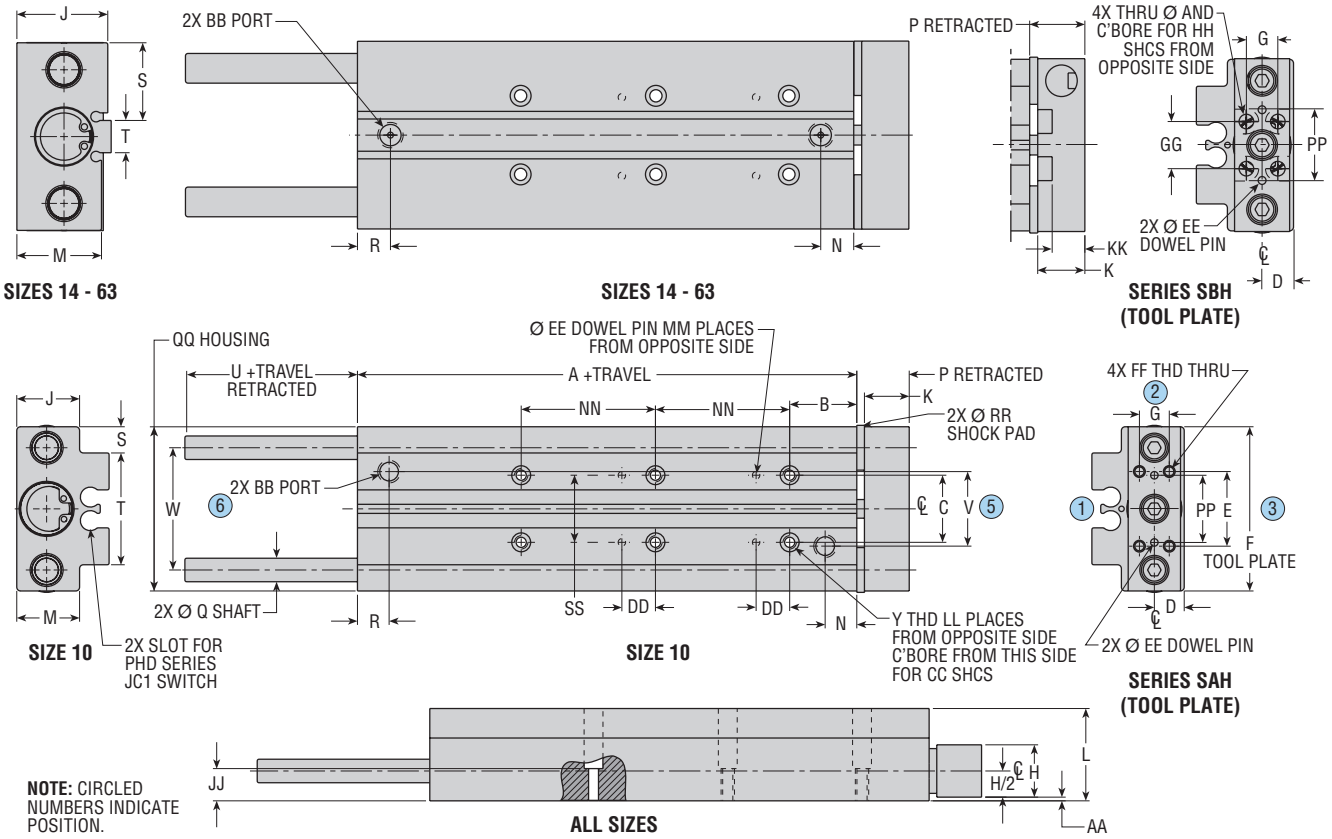
| LETTER | 10 | 14 | 20 | 25 | 32 | 40 | 50 | 63 | 10 | 14 | 20 | 25 | 32 | 40 | 50 | 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 1.181 | 1.378 | 1.875 | 2.126 | 2.126 | 2.402 | 2.701 | 3.445 | 30.0 | 35.0 | 48.0 | 54.0 | 54.0 | 61.0 | 68.6 | 87.5 |
| B | 0.562 | 0.562 | 0.625 | 0.787 | 0.813 | 0.630 | 0.512 | 0.670 | 14.0 | 14.0 | 18.0 | 20.0 | 22.0 | 16.0 | 13.0 | 17.0 |
| C | 0.625 | 0.875 | 1.250 | 1.496 | 1.688 | 2.185 | 2.756 | 3.209 | 16.0 | 22.0 | 30.0 | 38.0 | 42.0 | 55.5 | 70.0 | 81.5 |
| D | 0.375 | 0.500 | 0.750 | 0.820 | 1.000 | 1.063 | 1.319 | 1.575 | 10.0 | 13.0 | 19.0 | 20.8 | 25.0 | 27.0 | 33.5 | 40.0 |
| E | 0.750 | 1.000 | 1.500 | 1.575 | 2.000 | 2.362 | 2.953 | 3.543 | 20.0 | 26.0 | 40.0 | 40.0 | 52.0 | 60.0 | 75.0 | 90.0 |
| F | 1.614 | 2.244 | 2.992 | 3.465 | 3.937 | 5.375 | 6.375 | 7.520 | 41.0 | 57.0 | 76.0 | 88.0 | 100.0 | 136.5 | 161.9 | 191.0 |
| G | 0.375 | 0.500 | 0.750 | 0.787 | 1.000 | 1.260 | 1.575 | 1.969 | 10.0 | 14.0 | 20.0 | 20.0 | 26.0 | 32.0 | 40.0 | 50.0 |
| H | 0.610 | 0.827 | 1.220 | 1.375 | 1.732 | 1.890 | 2.402 | 2.913 | 15.5 | 21.0 | 31.0 | 35.0 | 44.0 | 48.0 | 61.0 | 74.0 |
| J | 0.768 | 0.972 | 1.446 | 1.682 | 1.946 | 2.043 | 2.569 | 3.100 | 20.0 | 25.0 | 36.7 | 42.7 | 49.0 | 51.9 | 65.3 | 78.7 |
| K | 0.375 | 0.500 | 0.750 | 0.875 | 1.000 | 1.181 | 1.378 | 1.437 | 10.0 | 14.0 | 20.0 | 22.2 | 26.0 | 30.0 | 35.0 | 36.5 |
| L | 0.902 | 1.142 | 1.500 | 1.682 | 1.986 | 2.223 | 2.666 | 3.355 | 23.4 | 29.3 | 38.0 | 42.7 | 50.0 | 56.5 | 67.7 | 85.2 |
| M | 0.768 | 0.972 | 1.344 | 1.682 | 1.791 | 2.043 | 2.569 | 3.100 | 20.0 | 25.0 | 34.1 | 42.7 | 45.1 | 51.9 | 65.3 | 78.7 |
| N | 0.282 | 0.342 | 0.525 | 0.575 | 0.575 | 0.728 | 0.797 | 0.984 | 7.2 | 8.7 | 13.3 | 14.6 | 14.6 | 18.5 | 20.2 | 25.0 |
| P | 0.439 | 0.564 | 0.877 | 1.067 | 1.199 | 1.431 | 1.628 | 1.687 | 11.6 | 15.6 | 23.2 | 27.1 | 31.1 | 36.4 | 41.4 | 42.8 |
| Q | 0.236 | 0.394 | 0.472 | 0.629 | 0.787 | 0.984 | 1.181 | 1.374 | 6.0 | 10.0 | 12.0 | 16.0 | 20.0 | 25.0 | 30.0 | 34.9 |
| R | 0.220 | 0.342 | 0.525 | 0.575 | 0.575 | 0.650 | 0.690 | 0.985 | 5.6 | 8.7 | 13.3 | 14.6 | 14.6 | 16.5 | 17.5 | 25.0 |
| S | 0.322 | 0.435 | 1.236 | 1.457 | 1.524 | 2.279 | 2.778 | 3.191 | 8.2 | 11.0 | 31.4 | 37.0 | 38.7 | 57.9 | 70.6 | 81.1 |
| T | 0.971 | 1.364 | 0.513 | 0.629 | 0.879 | 0.954 | 0.939 | 1.258 | 24.7 | 34.7 | 13.0 | 16.0 | 22.3 | 24.2 | 23.9 | 32.0 |
| V | 0.670 | — | — | — | — | — | — | — | 17.0 | — | — | — | — | — | — | — |
| W | 1.181 | 1.614 | 2.126 | 2.598 | 2.875 | 3.818 | 4.606 | 5.394 | 30.0 | 41.0 | 54.0 | 66.0 | 73.0 | 97.0 | 117.0 | 137.0 |
| Y | 6-32 | 10-24 | 1/4-20 | 5/16-18 | 5/16-18 | 3/8-16 | 3/8-16 | 1/2-13 | M4 x 0.7 | M5 x 0.8 | M6 x 1 | M8 x 1.25 | M8 x 1.25 | M10 x 1.5 | M10 x 1.5 | M12 x 1.75 |
| AA | 0.070 | 0.087 | 0.140 | 0.133 | 0.134 | 0.118 | 0.118 | 0.119 | 2.3 | 2.5 | 3.5 | 3.4 | 3.0 | 3.0 | 3.0 | 3.0 |
| BB | 10-32 | 10-32 | 1/8-27 NPT | 1/8-27 NPT | 1/8-27 NPT | 1/8-27 NPT | 1/8-27 NPT | 1/4-18 NPT | M5 x 0.8 | M5 x 0.8 | 1/8-28 BSPP | 1/8-28 BSPP | 1/8-28 BSPP | 1/8-28 BSPP | 1/8-28 BSPP | 1/4-19 BSPP |
| CC | #4 | #6 | #10 | 1/4 | 1/4 | 5/16 | 5/16 | 3/8 | M3 | M4 | M5 | M6 | M6 | M8 | M8 | M10 |
| DD | 0.313 | 0.438 | 0.625 | 0.748 | 0.844 | 1.093 | 1.378 | 1.604 | 8.0 | 11.0 | 15.0 | 19.0 | 21.0 | 27.8 | 35.0 | 40.75 |
| FF | 4-40 | 6-32 | 10-24 | 1/4-20 | 1/4-20 | 5/16-18 | 3/8-16 | 1/2-13 | M3 x 0.5 | M4 x 0.7 | M5 x 0.8 | M6 x 1 | M6 x 1 | M8 x 1.25 | M10 x 1.5 | M12 x 1.75 |
| GG | 0.500 | 0.750 | 1.000 | 1.118 | 1.500 | 1.969 | 2.362 | 2.756 | 10.0 | 18.0 | 24.0 | 28.4 | 38.0 | 50.0 | 60.0 | 70.0 |
| HH | #4 | #6 | #10 | 1/4 | 1/4 | 5/16 | 3/8 | 1/2 | M3 | M4 | M5 | M6 | M6 | M8 | M10 | M12 |
| JJ | 0.512 | 0.769 | 1.104 | 1.421 | 1.520 | 1.625 | 2.000 | 2.500 | 13.5 | 19.5 | 28.0 | 36.1 | 38.2 | 40.0 | 50.0 | 65.0 |
| KK | 0.250 | 0.270 | 0.534 | 0.614 | 0.645 | 0.841 | 0.978 | 0.912 | 6.6 | 8.2 | 14.5 | 15.6 | 17.0 | 21.4 | 24.4 | 23.9 |
| PP | 0.6250 | 0.8750 | 1.2500 | 1.4960 | 1.6880 | 2.1650 | 2.5590 | 3.1500 | 16.00 | 22.00 | 30.00 | 38.00 | 42.00 | 55.00 | 65.00 | 80.00 |
| QQ | 1.615 | 2.234 | 2.985 | 3.543 | 3.927 | 5.512 | 6.496 | 7.640 | 41.0 | 56.7 | 75.8 | 90.0 | 99.8 | 140.0 | 165.0 | 194.0 |
| RR | 0.500 | 0.591 | 0.865 | 0.950 | 1.125 | 1.500 | 1.750 | 2.000 | 12.7 | 15.0 | 22.0 | 24.1 | 28.6 | 38.1 | 44.5 | 50.8 |
| SS | 0.6250 | 0.8750 | 1.2500 | 1.4960 | 1.6880 | 2.1850 | 2.7559 | 3.2087 | 16.00 | 22.00 | 30.00 | 38.00 | 42.00 | 55.50 | 70.00 | 81.50 |

## IMPERIAL U GUIDE SHAFT EXTENSION / METRIC U GUIDE SHAFT EXTENSION

| SIZE TRAVEL | 10 | 14 | 20 | 25 | 32 | 40 | 50 | 63 | SIZE TRAVEL | 10 | 14 | 20 | 25 | 32 | 40 | 50 | 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 0.445 | 0.553 | — | — | — | — | — | — | 12 | 12.7 | 15.5 | — | — | — | — | — | — |
| 1 | 0.445 | 0.553 | 0.731 | 0.892 | 0.825 | 1.124 | 1.167 | 1.282 | 25 | 12.1 | 14.9 | 19.0 | 23.5 | 21.8 | — | — | — |
| 1.5 | 0.595 | 0.703 | — | — | — | — | — | — | 40 | 11.3 | 14.1 | — | — | — | — | — | — |
| 2 | — | — | 0.731 | 0.892 | 0.825 | 1.124 | 1.167 | 1.282 | 50 | — | — | 20.6 | 24.2 | 22.6 | 30.1 | 31.2 | 34.2 |
| 3 | — | — | 0.731 | 0.892 | 0.825 | 1.124 | 1.167 | 1.282 | 75 | — | — | 21.4 | 25.1 | 23.3 | 30.9 | 32.0 | 35.0 |

**NOTE:** SOME FEATURES ARE NOT DIMENSIONALLY THE SAME BETWEEN IMPERIAL & METRIC UNITS.

All dimensions are reference only unless specifically toleranced.




## IMPERIAL Ø EE DOWEL PIN HOLE SIZE

| SIZE | Ø EE DOWEL HOLE | STANDARD | J3 OPTION TRANSITIONAL | J4 OPTION CLEARANCE FIT | J8 OPTION PRECISION FIT |
|---|---|---|---|---|---|
| 10 | 0.0937 x 0.20 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 14 | 0.1250 x 0.24 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 20 | 0.1875 x 0.35 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 25 | 0.2500 x 0.47 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 32 | 0.2500 x 0.47 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 40 | 0.3125 x 0.63 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 50 | 0.3125 x 0.63 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |
| 63 | 0.375 x 0.80 DP | * | +0.0013 / +0.0000 | +0.0038 / +0.0028 | — |

## METRIC Ø EE DOWEL PIN HOLE SIZE

| SIZE | Ø EE DOWEL HOLE | STANDARD | J3 OPTION TRANSITIONAL | J4 OPTION CLEARANCE FIT | J8 OPTION PRECISION FIT |
|---|---|---|---|---|---|
| 10 | — | — | — | — | — |
| 14 | — | — | — | — | — |
| 20 | — | — | — | — | — |
| 25 | — | — | — | — | — |
| 32 | — | — | — | — | — |
| 40 | 8 x 16 DP | +0.010 / -0.024 | +0.033 / +0.008 | — | +0.015 / +0.000 |
| 50 | 8 x 16 DP | +0.010 / -0.024 | +0.033 / +0.008 | — | +0.015 / +0.000 |
| 63 | 10 x 20 DP | +0.010 / -0.024 | +0.033 / +0.008 | — | +0.015 / +0.000 |

* ALL IMPERIAL HOUSINGS AND SB TOOL PLATES HAVE J3 DOWEL HOLES AS STANDARD, SA TOOL PLATE - NONE

## DOWEL PIN AVAILABILITY

| DESIGN NO. | ITEM | DOWEL HOLES | | | |
|---|---|---|---|---|---|
| | | | J3 | J4 | J8 |
| IMPERIAL | HOUSING | (J3 STD) | STD | OPT | — |
| | SAx TOOL PLATE | NONE | OPT | OPT | — |
| | SBx TOOL PLATE | (J3 STD) | STD | OPT | — |
| METRIC | HOUSING | PD | OPT | — | OPT |
| | SAx TOOL PLATE | PD | OPT | — | OPT |
| | SBx TOOL PLATE | PD | OPT | — | OPT |

D = PRODUCTION Ø  OPT = OPTIONAL  STD = STANDARD

## CAD & Sizing Assistance

Use PHD's free online Product Sizing and CAD Configurator at **phdinc.com/myphd**

All dimensions are reference only unless specifically toleranced.

## IMPERIAL UNIT DIMENSIONS (in) / METRIC UNIT DIMENSIONS (mm)

| LETTER | 10 | 14 | 20 | 25 | 32 | 40 | 50 | 63 | 10 | 14 | 20 | 25 | 32 | 40 | 50 | 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 1.181 | 1.378 | 1.875 | 2.126 | 2.126 | 2.402 | 2.701 | 3.445 | 30.0 | 35.0 | 48.0 | 54.0 | 54.0 | 61.0 | 68.6 | 87.5 |
| B | 0.562 | 0.562 | 0.625 | 0.787 | 0.813 | 0.630 | 0.512 | 0.670 | 14.0 | 14.0 | 18.0 | 20.0 | 22.0 | 16.0 | 13.0 | 17.0 |
| C | 0.625 | 0.875 | 1.250 | 1.496 | 1.688 | 2.185 | 2.756 | 3.209 | 16.0 | 22.0 | 30.0 | 38.0 | 42.0 | 55.5 | 70.0 | 81.5 |
| D | 0.375 | 0.500 | 0.750 | 0.820 | 1.000 | 1.063 | 1.319 | 1.575 | 10.0 | 13.0 | 19.0 | 20.8 | 25.0 | 27.0 | 33.5 | 40.0 |
| E | 0.750 | 1.000 | 1.500 | 1.575 | 2.000 | 2.362 | 2.953 | 3.543 | 20.0 | 26.0 | 40.0 | 40.0 | 52.0 | 60.0 | 75.0 | 90.0 |
| F | 1.614 | 2.244 | 2.992 | 3.435 | 3.937 | 5.375 | 6.375 | 7.520 | 41.0 | 57.0 | 76.0 | 88.0 | 100.0 | 136.5 | 161.9 | 191.0 |
| G | 0.375 | 0.500 | 0.750 | 0.787 | 1.000 | 1.260 | 1.575 | 1.969 | 10.0 | 14.0 | 20.0 | 20.0 | 26.0 | 32.0 | 40.0 | 50.0 |
| H | 0.610 | 0.827 | 1.220 | 1.375 | 1.732 | 1.890 | 2.402 | 2.913 | 15.5 | 21.0 | 31.0 | 35.0 | 44.0 | 48.0 | 61.0 | 74.0 |
| J | 0.768 | 0.972 | 1.446 | 1.682 | 1.946 | 2.043 | 2.569 | 3.100 | 20.0 | 25.0 | 36.7 | 42.7 | 49.0 | 51.9 | 65.3 | 78.7 |
| K | 0.375 | 0.500 | 0.750 | 0.875 | 1.000 | 1.181 | 1.378 | 1.437 | 10.0 | 14.0 | 20.0 | 22.2 | 26.0 | 30.0 | 35.0 | 36.5 |
| L | 0.902 | 1.142 | 1.500 | 1.682 | 1.986 | 2.223 | 2.666 | 3.355 | 23.4 | 29.3 | 38.0 | 42.7 | 50.0 | 56.5 | 67.7 | 85.2 |
| M | 0.768 | 0.972 | 1.344 | 1.682 | 1.791 | 2.043 | 2.569 | 3.100 | 20.0 | 25.0 | 34.1 | 42.7 | 45.1 | 51.9 | 65.3 | 78.7 |
| N | 0.282 | 0.342 | 0.525 | 0.575 | 0.575 | 0.728 | 0.797 | 0.984 | 7.2 | 8.7 | 13.3 | 14.6 | 14.6 | 18.5 | 20.2 | 25.0 |
| P | 0.439 | 0.564 | 0.877 | 1.067 | 1.199 | 1.431 | 1.628 | 1.687 | 11.6 | 15.6 | 23.2 | 27.1 | 31.1 | 36.3 | 41.4 | 42.8 |
| Q | 0.236 | 0.394 | 0.472 | 0.629 | 0.787 | 0.984 | 1.181 | 1.374 | 6.0 | 10.0 | 12.0 | 16.0 | 20.0 | 25.0 | 30.0 | 34.9 |
| R | 0.220 | 0.342 | 0.525 | 0.575 | 0.575 | 0.650 | 0.690 | 0.985 | 5.6 | 8.7 | 13.3 | 14.6 | 14.6 | 16.5 | 17.5 | 25.0 |
| S | 0.322 | 0.435 | 1.236 | 1.457 | 1.524 | 2.329 | 2.778 | 3.191 | 8.2 | 11.0 | 31.4 | 37.0 | 38.7 | 57.9 | 70.6 | 81.1 |
| T | 0.971 | 1.364 | 0.513 | 0.629 | 0.879 | 0.954 | 0.939 | 1.258 | 24.7 | 34.7 | 13.0 | 16.0 | 22.3 | 24.2 | 23.9 | 32.0 |
| V | 0.670 | — | — | — | — | — | — | — | 17.0 | — | — | — | — | — | — | — |
| W | 1.181 | 1.614 | 2.126 | 2.598 | 2.875 | 3.818 | 4.606 | 5.394 | 30.0 | 41.0 | 54.0 | 66.0 | 73.0 | 97.0 | 117.0 | 137.0 |
| Y | 6-32 | 10-24 | 1/4-20 | 5/16-18 | 5/16-18 | 3/8-16 | 3/8-16 | 1/2-13 | M4 x 0.7 | M5 x 0.8 | M6 x 1 | M8 x 1.25 | M8 x 1.25 | M10 x 1.5 | M10 x 1.5 | M12 x 1.75 |
| AA | 0.070 | 0.087 | 0.140 | 0.133 | 0.134 | 0.118 | 0.118 | 0.119 | 2.3 | 2.5 | 3.5 | 3.4 | 3.0 | 3.0 | 3.0 | 3.0 |
| BB | 10-32 | 10-32 | 1/8-27 NPT | 1/8-27 NPT | 1/8-27 NPT | 1/8-27 NPT | 1/8-27 NPT | 1/4-18 NPT | M5 x 0.8 | M5 x 0.8 | 1/8-28 BSPP | 1/8-28 BSPP | 1/8-28 BSPP | 1/8-28 BSPP | 1/8-28 BSPP | 1/4-19 BSPP |
| CC | #4 | #6 | #10 | 1/4 | 1/4 | 5/16 | 5/16 | 3/8 | M3 | M4 | M5 | M6 | M6 | M8 | M8 | M10 |
| DD | 0.313 | 0.438 | 0.625 | 0.748 | 0.844 | 1.093 | 1.378 | 1.604 | 8.0 | 11.0 | 15.0 | 19.0 | 21.0 | 27.75 | 35.0 | 40.75 |
| FF | 4-40 | 6-32 | 10-24 | 1/4-20 | 1/4-20 | 5/16-18 | 3/8-16 | 1/2-13 | M3 x 0.5 | M4 x 0.7 | M5 x 0.8 | M6 x 1 | M6 x 1 | M8 x 1.25 | M10 x 1.5 | M12 x 1.75 |
| GG | 0.500 | 0.750 | 1.000 | 1.118 | 1.500 | 1.969 | 2.362 | 2.756 | 10.0 | 18.0 | 24.0 | 28.4 | 38.0 | 50.0 | 60.0 | 70.0 |
| HH | #4 | #6 | #10 | 1/4 | 1/4 | 5/16 | 3/8 | 1/2 | M3 | M4 | M5 | M6 | M6 | M8 | M10 | M12 |
| JJ | 0.512 | 0.769 | 1.104 | 1.421 | 1.520 | 1.625 | 2.000 | 2.500 | 13.5 | 19.5 | 28.0 | 36.1 | 38.2 | 40.0 | 50.0 | 65.0 |
| KK | 0.250 | 0.270 | 0.534 | 0.614 | 0.645 | 0.841 | 0.978 | 0.912 | 6.6 | 8.2 | 14.5 | 15.6 | 17.0 | 21.4 | 24.4 | 23.9 |
| LL | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 |
| MM | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 | TABLE 1 |
| NN | 1.250 | 1.750 | 2.500 | 2.992 | 3.376 | 3.347 | 3.898 | 4.213 | 32.0 | 44.0 | 60.0 | 76.0 | 84.0 | 85.0 | 99.0 | 107.0 |
| PP | 0.6250 | 0.8750 | 1.2500 | 1.4960 | 1.6880 | 2.1650 | 2.5590 | 3.1500 | 16.00 | 22.00 | 30.00 | 38.00 | 42.00 | 54.99 | 65.00 | 80.00 |
| QQ | 1.615 | 2.234 | 2.985 | 3.543 | 3.927 | 5.512 | 6.496 | 7.640 | 41.0 | 56.7 | 75.8 | 90.0 | 99.8 | 140.0 | 165.0 | 194.0 |
| RR | 0.500 | 0.591 | 0.865 | 0.950 | 1.125 | 1.500 | 1.750 | 2.000 | 12.7 | 15.0 | 22.0 | 24.1 | 28.6 | 38.1 | 44.5 | 50.8 |
| SS | 0.6250 | 0.8750 | 1.2500 | 1.4960 | 1.6880 | 2.1850 | 2.7559 | 3.2087 | 16.00 | 22.00 | 30.00 | 38.00 | 42.00 | 55.50 | 70.00 | 81.50 |

## IMPERIAL U GUIDE SHAFT EXTENSION / METRIC U GUIDE SHAFT EXTENSION

| SIZE TRAVEL | 10 | 14 | 20 | 25 | 32 | 40 | 50 | 63 | SIZE TRAVEL | 10 | 14 | 20 | 25 | 32 | 40 | 50 | 63 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 0.445 | 0.553 | — | — | — | — | — | — | 50 | 12.9 | 15.6 | — | — | — | — | — | — |
| 3 | 0.445 | 0.553 | — | — | — | — | — | — | 75 | 13.7 | 16.4 | — | — | — | — | — | — |
| 4 | 0.445 | 0.553 | 0.731 | 0.892 | 0.825 | 1.124 | 1.167 | 1.282 | 100 | 14.5 | 17.2 | 21.4 | 25.9 | 24.2 | 31.7 | 32.8 | 35.8 |
| 5 | 0.445 | 0.553 | 0.731 | 0.892 | 0.825 | 1.124 | 1.167 | 1.282 | 125 | 15.3 | 18.0 | 22.2 | 26.7 | 25.0 | 32.6 | 33.6 | 36.6 |
| 6 | 0.445 | 0.553 | 0.731 | 0.892 | 0.825 | 1.124 | 1.167 | 1.282 | 150 | 16.1 | 18.8 | 23.0 | 27.5 | 25.8 | 33.3 | 32.0 | 37.4 |
| 7 | — | — | 0.731 | 0.892 | 0.825 | 1.124 | 1.167 | 1.282 | 175 | — | — | 23.8 | 28.3 | 26.5 | 34.1 | 35.2 | 38.2 |
| 8 | — | — | 0.731 | 0.892 | 0.825 | 1.124 | 1.167 | 1.282 | 200 | — | — | 24.6 | 29.0 | 27.4 | 35.0 | 36.0 | METRIC |

**NOTE:** SOME FEATURES ARE NOT DIMENSIONALLY THE SAME BETWEEN IMPERIAL & METRIC UNITS.

## TABLE 1 - STROKE RELATED DIMENSIONS

| BORE | 10 mm | | 14 mm | | 20 mm | | 25, 32 mm | | 40, 50, 63 mm | |
|---|---|---|---|---|---|---|---|---|---|---|
| LETTER DIM TRAVEL | LL | MM | LL | MM | LL | MM | LL | MM | LL | MM |
| 2.0 in | 4 | 2 | 4 | 2 | — | — | — | — | — | — |
| 3.0 in | 4 | 2 | 4 | 2 | — | — | — | — | — | — |
| 100 mm | — | — | — | — | — | — | — | — | 4 | 2 |
| 4.0 in | 6 | 4 | 6 | 4 | 4 | 2 | 4 | 2 | 4 | 2 |
| 5.0 in | — | — | 6 | 4 | 6 | 4 | 4 | 2 | 4 | 2 |
| 6.0 in | — | — | 6 | 4 | 6 | 4 | 4 | 2 | 4 | 2 |
| 7.0 in | — | — | — | — | 6 | 4 | 6 | 4 | 6 | 4 |
| 8.0 in | — | — | — | — | 6 | 4 | 6 | 4 | 6 | 4 |

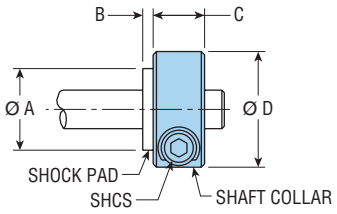
**NOTES:**
1) SEE TABLE ON PREVIOUS PAGE FOR DOWEL HOLE OPTION AVAILABILITY.
2) SEE OPTIONS SECTION FOR J3, J4, & J8 OPTIONS.

All dimensions are reference only unless specifically toleranced.

## AE TRAVEL ADJUSTMENT ON EXTEND

This option provides both travel adjustment stop collars and shock pads on extension only. The travel adjustment stop collars provide infinite adjustment while the shock pads provide excellent noise reduction and energy absorption capability.

**NOTE:** AE travel adjustments are available as a kit. To specify, give the full unit description -H9031. Each travel adjustment kit contains 2 steel shaft collars, 2 shock pads, and 2 SHCS.




| UNIT SIZE | LETTER DIMENSION in [mm] | | | |
|---|---|---|---|---|
| | A | B | C | D |
| 10 | 0.500 [12.7] | 0.064 [1.6] | 0.315 [8.0] | 0.709 [18.0] |
| 14 | 0.591 [15.0] | 0.064 [1.6] | 0.433 [11.0] | 0.875 [22.2] |
| 20 | 0.865 [22.0] | 0.127 [3.2] | 0.512 [13.0] | 1.125 [28.6] |
| 25 | 0.950 [24.1] | 0.192 [4.8] | 0.512 [13.0] | 1.375 [34.9] |
| 32 | 1.125 [28.6] | 0.199 [5.2] | 0.590 [15.0] | 1.500 [38.1] |
| 40 | 1.500 [38.1] | 0.250 [6.4] | 0.708 [18.0] | 2.026 [51.5] |
| 50 | 1.750 [44.5] | 0.250 [6.4] | 0.749 [19.0] | 2.345 [59.6] |
| 63 | 2.000 [50.8] | 0.250 [6.4] | 0.866 [22.0] | 2.750 [69.9] |

### TRAVEL ADJUSTMENT KIT

| UNIT SIZE | KIT NUMBER | | COLLAR SCREWS | |
|---|---|---|---|---|
| | STANDARD | Z1 OPTION | MAX TORQUE in/lb [Nm] | |
| 10 | 73440-1 | 73440-2 | 22 | [2.5] |
| 14 | 73441-1 | 73441-2 | 50 | [5.6] |
| 20 | 73442-1 | 73442-2 | 100 | [11.3] |
| 25 | 74822-1 | 74822-2 | 100 | [11.3] |
| 32 | 73443-1 | 73443-2 | 150 | [16.9] |
| 40 | 79636-1 | 79636-2 | 350 | [39.5] |
| 50 | 79637-1 | 79637-2 | 350 | [39.5] |
| 63 | 79638-1 | 79638-2 | 700 | [79.1] |

## J3 TRANSITIONAL FIT DOWEL PIN HOLES

Transitional fit dowel pin holes in the tool plate and housing provides a compromise fit between clearance and interference. Transitional fits are used where accuracy of location is important, but a small amount of clearance in order to simplify the installation of dowel pins is permissible.

## J4 CLEARANCE FIT DOWEL PIN HOLES

Clearance fit dowel pin holes in the tool plate and housing are used when extra clearance is needed due to inaccuracies of attached tooling. Available on imperial units only.

## J8 PRECISION FIT DOWEL PIN HOLES

H7 tolerance precision fit dowel pin holes in the tool plate and housing are used where accuracy of location is of prime importance Ideal for parts requiring rigidity and alignment. Metric units only.

## Q6 TOTAL CORROSION RESISTANT GUIDE SHAFTS

Stainless steel hard chrome guide shafts on the Series SxL Slides and corrosion resistant coating on the Series SxH Slides for use in applications where moisture may corrode untreated, hardened and ground shafts. For sizes and locations, see dimension pages.

## Z1 TOTAL CORROSION RESISTANT UNIT

Includes Q6 guide shafts with stainless steel or electroless nickel plating on all other externally exposed ferrous parts. Used for protecting the slide from severe or corrosive environments.

## M MAGNET FOR PHD SERIES JC1 SWITCHES

This option equips the unit with a magnetic piston for use with PHD's Series JC1 Switches. The switch housing is completely contained by the slide housing and provides a very compact switch design. The switches mount easily to the slide housing using two small grooves located on the top of the unit and are locked into place with a setscrew. **Hand tighten the setscrew until the switch is securely retained. Do not overtighten.** See Switches and Sensors section for additional switch information and complete specifications.

### JC1 SOLID STATE AND REED SWITCHES

| JC1 SWITCH | DESCRIPTION |
|---|---|
| JC1SDN-5 | NPN DC Solid State, 5 meter cable |
| JC1SDP-5 | PNP DC Solid State, 5 meter cable |
| JC1SDN-K | NPN DC Solid State, Quick Connect |
| JC1SDP-K | PNP DC Solid State, Quick Connect |
| JC1RDU-5 | PNP or NPN DC Reed, 5 meter cable |
| JC1RDU-K | PNP or NPN DC Reed, Quick Connect |
| JC1ADU-K | AC Reed, Quick Connect |

**NOTE:** See Switches and Sensors section for additional switch information and complete specification. Switches must be ordered separately.

### JC1 SOLID STATE AND REED CORDSETS

| PART NO. | DESCRIPTION |
|---|---|
| 63549-02 | M8, 3 pin, Straight Female Connector, 2 meter cable |
| 63549-05 | M8, 3 pin, Straight Female Connector, 5 meter cable |
| 81284-1-010 | M12, 4 pin, Straight Female Connector, 2 meter cable |

**NOTE:** Cordsets are ordered separately.

All dimensions are reference only unless specifically toleranced.