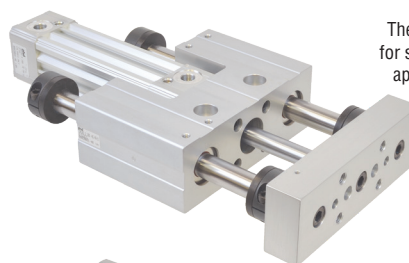


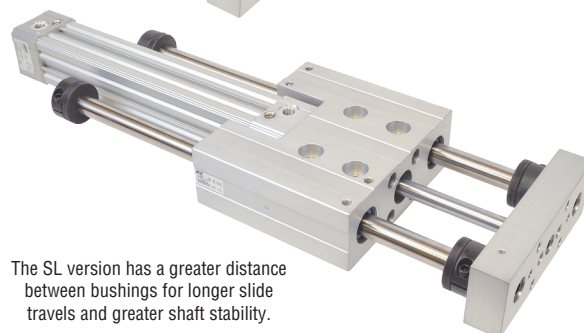
SK, SL

Major Benefits

- Offered in short or long body
- Can be ordered with standard or oversize shafts
- Standard dowel pin holes for ease of mounting
- Several switch options
- Six bore sizes
- Versatile unit with more than 30 standard options
- Now with improved seal and bearing support



The SK version is compact and ideal for short travel in horizontal or vertical application, where slide length and weight are critical.



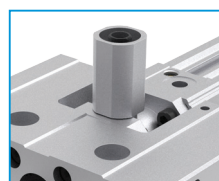
The SL version has a greater distance between bushings for longer slide travels and greater shaft stability.

The cylinder features...

The HUSHCONTROL Advantage

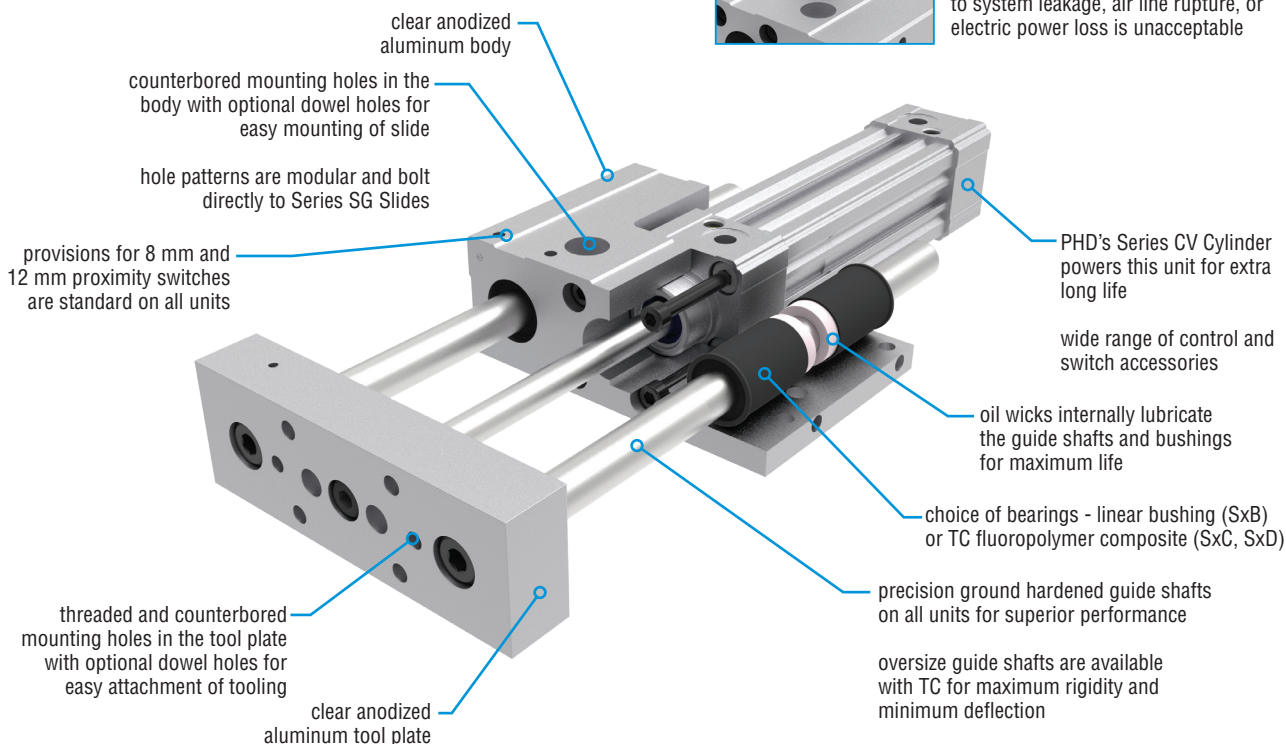
Only PHD Series CV Cylinders are offered with the Hushcontrol Advantage. Hushcontrol is achieved when optional cushions and Port Controls® are ordered with the standard shock pads.

- Superior speed and deceleration control of piston rod and attached loads.
- Significantly lowers noise levels even at high cycle speeds.



Rodlok can be added to securely hold a static tool plate in place at any point of travel desired

ideal for applications where rod drift due to system leakage, air line rupture, or electric power loss is unacceptable



ORDERING DATA: Series SK/SL Slides

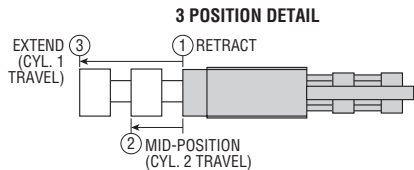
With Cylinder Example: SKB83x100-M-AR-GM-BS
Without Cylinder Example: SKB83x100-H12-AR-GM-BS



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

TO ORDER SPECIFY:

Product, Series, Type, Three Position Unit, Slide Size, Slide Travel, Mid-Position Travel, Tool Plate Extension, and Options.



SLIDE TRAVEL [mm]

SIZE	SERIES SK	SERIES SL
1	25 to 300	25 to 300
2	25 to 300	25 to 300
3	25 to 300	25 to 450
4	50 to 450	50 to 600
5	50 to 450	50 to 600
6	50 to 550	50 to 700

Available in 5 mm increments.
Minimum travel required for all SK or SL Slides for use with ISO cylinders is:
Size 1 25 mm Size 4 50 mm
Size 2 25 mm Size 5 50 mm
Size 3 25 mm Size 6 50 mm

WITH CYLINDER OPTIONS

- DB - Cushion controls both directions (standard locations are 1 & 5) See note 5.
- DE - Cushion control extend only (standard in location 1)
- DR - Cushion control retract only (standard in location 5)
- E - Magnetic piston for Series JC1 radial sensing switches (for size 1 only)
- H47 - Rodlok cylinder with locking device adaptor (not available on size 1)
- L9 - Imperial ports (metric ports standard) (see catalog for port sizes)
- M - Magnetic piston for Series JC1 reed and teachable switches on size 1 and Series 6250 Reed Switches on all other sizes (2 through 6)
- PB - Port Controls® both directions (standard locations are 1 & 5) See note 5. (not available on size 1) (see catalog for port sizes)
- PE - Port Controls® extend only (standard in location 1) (not available on size 1)
- PR - Port Controls® retract only (standard in location 5) (not available on size 1)
- UBxx - Ports location (standard locations are 1 & 5) (not available on 3-pos. unit)

WITHOUT CYLINDER OPTION

This option is required for slide with user-supplied ISO Cylinder.
H11 - Slide for VDMA/ISO cylinders (sizes 4, 5, and 6 only)
H12 - Slide for 6432 ISO cylinder (sizes 1, 2, and 3 only)

PRODUCT	THREE POSITION UNIT	DESIGN NO.
S - Slide	(specify only if needed)	8

S K B E 8 3 x 100 x 50 x 25 - DB - M - AR - GM - BS

SERIES
K - Short Body
L - Long Body

SLIDES WITH LINEAR BALL BUSHINGS

TYPE	SLIDE SIZE	BORE SIZE DIA. [mm]	SHAFT SIZE DIA. [mm]
B	1	19	8
B	2	20	10
B	3	25	12
B	4	32	16
B	5	40	20
B	6	50	25

SLIDES WITH TC COMPOSITE BUSHINGS

TYPE	SLIDE SIZE	BORE SIZE DIA. [mm]	SHAFT SIZE DIA. [mm]
C	1	19	8
D	1	19	10 (oversize)
C	2	20	10
D	2	20	12 (oversize)
C	3	25	12
D	3	25	16 (oversize)
C	4	32	16
D	4	32	20 (oversize)
C	5	40	20
D	5	40	25 (oversize)
C	6	50	25
D	6	50	30 (oversize)
E	6	50	35 (oversize)

MID-POSITION TRAVEL
Specify for 3 position units.
Travel from retract position 1 to mid-position 2.

TOOL PLATE EXTENSION
Additional distance between tool plate and bearing body in 1 mm increments. Leave blank if additional extension is not required. Minimum tool plate extension for all SK slides only with ISO cylinders is 50 mm (if tool extension is required).

NOTES:

- 1) -BR and -GG options not available with tool plate extension.
- 2) *Shock pads come standard with the travel adjustment options and do not need to be specified separately when travel adjustment is ordered.
- 3) **Shock absorber ready options include shock absorber stop brackets mounted on the shaft and a stop collar on the opposite shaft.
- 4) Shock absorbers, proximity switches, and all mounting kits must be ordered separately.
- 5) Cushion and port controls are available on -DB and -PB options only (locations 1 & 5) on 3-position units.

SLIDE OPTIONS

- AE - Travel Adjustment and Shock Pads on extension*
- AR - Travel Adjustment and Shock Pads on retraction*
- BR - Shock Pads on retraction*
- BS - Shock Pads on extension for use with option -GM or -GO only*
- BT - Shock Pads on retraction for use with option -GN or -GO only*
- GG - Travel Adjustment and Shock Pads on extension with provisions for Proximity Switch mounting in both directions*
- GH - Travel Adjustment and Shock Pads on retraction with provisions for Proximity Switch mounting on retract only*
- GI - Travel Adjustment and Shock Pads with provisions for Proximity Switch mounting in both directions*
- GM - Provisions for Shock Absorber mounting on extension**
- GN - Provisions for Shock Absorber mounting on retraction**
- GO - Provisions for Shock Absorber mounting on extension and retraction**
- J3 - Transitional fit dowel holes (in both tool plate and housing)
- J8 - Precision fit dowel holes (in both tool plate and housing)
- Q1 - Corrosion resistant guide shafts (ends unplated)

SERIES JC1xDx MAGNETIC SWITCHES (SIZE 1)

PART NO.	DESCRIPTION
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 (M12)
JC1HDP-5	PNP (Source), Radial Sensing, 5 meter cable
JC1HDP-K	PNP (Source), Radial Sensing, Quick Connect
JC1HDN-5	NPN (Sink), Radial Sensing, 5 meter cable
JC1HDN-K	NPN (Sink), Radial Sensing, Quick Connect

NOTE: Switches must be ordered separately.

CORDSETS FOR SERIES JC1xDx SWITCHES

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.

SERIES JC1ST TWO POSITION TEACHABLE MAGNETIC SWITCHES (SIZE 1)

PART NO.	DESCRIPTION
JC1STP-2	PNP (Source), Solid State, 12-30 VDC, 2 meter cable
JC1STP-K	PNP (Source), Solid State, 12-30 VDC, Quick Connect

NOTE: Switches must be ordered separately.

CORDSET FOR SERIES JC1ST SWITCHES

PART NO.	DESCRIPTION
81284-1-001	M8, 4 pin, Straight Female Connector, 5 meter cable

NOTE: Cordsets are ordered separately.

JC1 SWITCH MOUNTING BRACKET

SLIDE SIZE	BRACKET NO.
1	92100

NOTE: Brackets are ordered separately.

CAD & Sizing Assistance

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

SPECIFICATIONS	SERIES SK/SL
OPERATING PRESSURE	20 psi min to 150 psi max [1.4 bar min to 10 bar max] air
OPERATING TEMPERATURE	-20° to +180°F [-29° to +82°C]
TRAVEL TOLERANCE	Nominal travel +0.098/-0.000 in [+2.5/-0.0 mm]*
3-POSITION	Mid-location ±0.039 in [±1 mm]*
REPEATABILITY	±0.001 in [±0.025 mm] of original position
VELOCITY	80 in/sec [2 m/sec] max., zero load at 87 psi [6 bar]
LUBRICATION	Factory lubricated for life
MAINTENANCE	Field repairable

SIZE	TYPE	SHAFT DIAMETER		BORE DIAMETER		EFFECTIVE AREA			SERIES SK BASE WEIGHT		SERIES SL BASE WEIGHT		TRAVEL WEIGHT ADDER		TYPICAL DYNAMIC LOAD	
		in	mm	in	mm	DIRECTION	in ²	mm ²	lb	kg	lb	kg	in/lb	kg/mm	lb	N
1	B	0.315	8	0.750	19.1	EXTEND RETRACT	0.44 0.37	285 236	1.76	0.80	2.32	1.05	0.10	0.002	6.7	32
	C	0.315	8						1.76	0.80	2.32	1.05	0.10	0.002		
	D	0.394	10						1.90	0.86	2.45	1.11	0.12	0.002		
2	B	0.394	10	0.787	20	EXTEND RETRACT	0.49 0.41	314 264	3.35	1.52	4.23	1.92	0.17	0.003	7.8	36
	C	0.394	10						3.35	1.52	4.23	1.92	0.17	0.003		
	D	0.472	12						3.53	1.60	3.53	1.60	0.20	0.004		
3	B	0.472	12	0.984	25	EXTEND RETRACT	0.76 0.64	491 412	4.12	1.87	5.38	2.44	0.20	0.004	13.4	62
	C	0.472	12						4.12	1.87	5.38	2.44	0.20	0.004		
	D	0.630	16						4.52	2.05	5.93	2.69	0.28	0.005		
4	B	0.630	16	1.260	32	EXTEND RETRACT	1.25 1.07	804 691	6.73	3.05	8.16	3.70	0.39	0.007	20.2	89
	C	0.630	16						6.73	3.05	8.16	3.70	0.39	0.007		
	D	0.787	20						7.39	3.35	9.02	4.09	0.56	0.010		
5	B	0.787	20	1.575	40	EXTEND RETRACT	1.95 1.64	1257 1056	10.56	4.79	12.86	5.83	0.56	0.010	33.7	151
	C	0.787	20						10.56	4.79	12.86	5.83	0.56	0.010		
	D	0.984	25						11.60	5.26	14.09	6.39	0.73	0.013		
6	B	0.984	25	1.969	50	EXTEND RETRACT	3.04 2.56	1963 1649	19.01	8.62	23.84	10.81	0.73	0.013	56	250
	C	0.984	25						19.01	8.62	23.84	10.81	0.73	0.013		
	D	1.181	30						20.59	9.34	25.78	11.69	0.90	0.016		
	E	1.378	35						22.25	10.09	27.87	12.64	1.12	0.020		

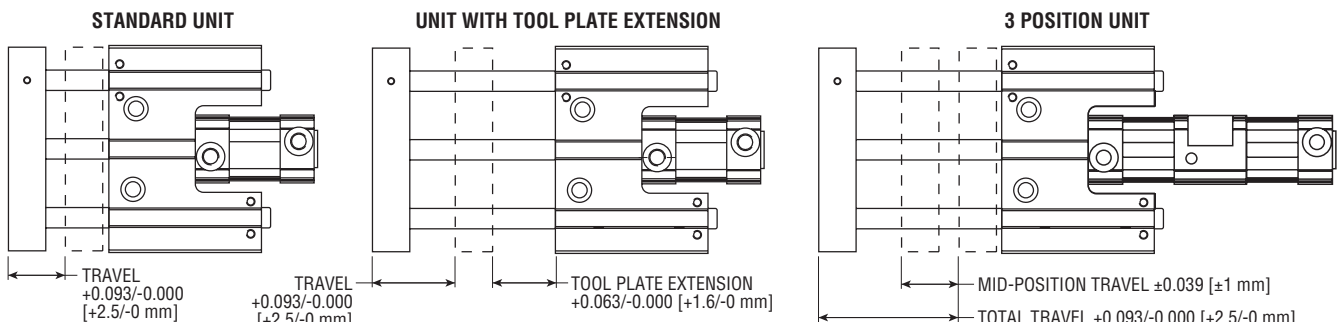
NOTE: Thrust capacity, allowable mass, and dynamic moment capacity must be considered when selecting a slide. Refer to PHD's sizing software or pages 69 to 79 for complete sizing and selection information.

ISO CYLINDER NOTES (-H11 or -H12 option):

- 1) Cylinder supplied by user.
- 2) Cylinder rod extensions are not required. Slide units have a rod adaptor coupling standard for each specific unit at the correct length (-H11, -H12).
- 3) For repeatability, consult the cylinder manufacturer.
- 4) Minimum travel required for all Series SK or SL Slides with ISO cylinders is:

Size	1	25 mm	4	50 mm
	2	25 mm	5	50 mm
	3	25 mm	6	50 mm
- 5) Slide travel will be 0.019 to 0.039 [0.5 to 1 mm] less than the ISO cylinder stroke on -H11 or -H12 units when properly adjusted.

TOLERANCES*



NOTE: *All travel tolerance values measured at 60 ±4 psi [4 ±0.27 bar] due to impact seal design in cylinder.

SLIDE SELECTION

There are three major factors to consider when selecting a slide:

1

BUSHING LOAD CAPACITY

Use the Maximum Rolling load graphs for the relevant bushing (pages 71 to 76) and the maximum static side load calculation (below) to determine if the slide bushings can handle the total payload. Bushing loads shown are based on a service life of 5,000 kilometers of slide travel.

2

SHAFT DEFLECTION

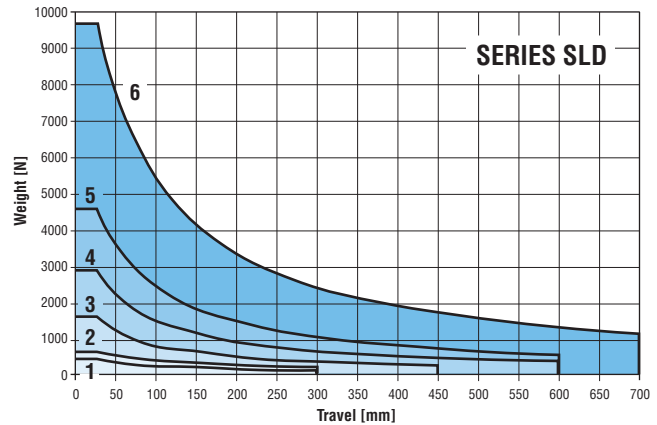
Use the Deflection Graphs (pages 71 to 76) to determine if the slide has acceptable deflection for the application.

3

AIR CYLINDER THRUST

Use the effective piston area (see chart on previous page) of the slide's cylinder to determine if thrust is sufficient for the applied load.

MAXIMUM STATIC LOAD CAPACITY



The graphs on pages 71 to 76 provide complete sizing information.

SK MAXIMUM LOADS & UNIT WEIGHTS

T = Travel in mm

UNIT SIZE	SLIDE MODEL	MAX. STATIC SIDE LOAD (N)	UNIT WEIGHT* (kg)
1	SKB	$\frac{15930}{T + 95.4}$	$0.80 + (0.0018 \times T)$
1	SKC	$\frac{14560}{T + 52.3}$	$0.80 + (0.0018 \times T)$
1	SKD	$\frac{28500}{T + 52.3}$	$0.86 + (0.0022 \times T)$
2	SKB	$\frac{29260}{T + 118}$	$1.52 + (0.003 \times T)$
2	SKC	$\frac{28500}{T + 57.8}$	$1.52 + (0.003 \times T)$
2	SKD	$\frac{49000}{T + 57.8}$	$1.60 + (0.0035 \times T)$
3	SKB	$\frac{42900}{T + 117}$	$1.87 + (0.0035 \times T)$
3	SKC	$\frac{48900}{T + 50.5}$	$1.87 + (0.0035 \times T)$
3	SKD	$\frac{116300}{T + 50.5}$	$2.05 + (0.005 \times T)$
4	SKB	$\frac{124400}{T + 122}$	$3.05 + (0.007 \times T)$
4	SKC	$\frac{116300}{T + 53.8}$	$3.05 + (0.007 \times T)$
4	SKD	$\frac{195100}{T + 53.8}$	$3.35 + (0.010 \times T)$
5	SKB	$\frac{242000}{T + 133}$	$4.79 + (0.010 \times T)$
5	SKC	$\frac{227000}{T + 54.2}$	$4.79 + (0.010 \times T)$
5	SKD	$\frac{325000}{T + 54.2}$	$5.26 + (0.013 \times T)$
6	SKB	$\frac{435000}{T + 115}$	$8.62 + (0.013 \times T)$
6	SKC	$\frac{444000}{T + 64.6}$	$8.62 + (0.013 \times T)$
6	SKD	$\frac{687000}{T + 64.6}$	$9.34 + (0.016 \times T)$
6	SKE	$\frac{765000}{T + 64.6}$	$10.09 + (0.020 \times T)$

SL MAXIMUM LOADS & UNIT WEIGHTS

T = Travel in mm

UNIT SIZE	SLIDE MODEL	MAX. STATIC SIDE LOAD (N)	UNIT WEIGHT* (kg)
1	SLB	$\frac{13510}{T + 52.7}$	$1.05 + (0.0018 \times T)$
1	SLC	$\frac{14560}{T + 52.3}$	$1.05 + (0.0018 \times T)$
1	SLD	$\frac{28500}{T + 52.3}$	$1.11 + (0.0022 \times T)$
2	SLB	$\frac{21080}{T + 58.7}$	$1.92 + (0.003 \times T)$
2	SLC	$\frac{28500}{T + 57.8}$	$1.92 + (0.003 \times T)$
2	SLD	$\frac{49000}{T + 57.8}$	$1.60 + (0.0035 \times T)$
3	SLB	$\frac{55070}{T + 152}$	$2.44 + (0.0035 \times T)$
3	SLC	$\frac{48900}{T + 50.5}$	$2.44 + (0.0035 \times T)$
3	SLD	$\frac{116300}{T + 50.5}$	$2.69 + (0.005 \times T)$
4	SLB	$\frac{94000}{T + 63.5}$	$3.70 + (0.007 \times T)$
4	SLC	$\frac{116300}{T + 53.8}$	$3.70 + (0.007 \times T)$
4	SLD	$\frac{226000}{T + 53.8}$	$4.09 + (0.010 \times T)$
5	SLB	$\frac{219000}{T + 79}$	$5.83 + (0.010 \times T)$
5	SLC	$\frac{227000}{T + 54.2}$	$5.83 + (0.010 \times T)$
5	SLD	$\frac{360000}{T + 54.2}$	$6.39 + (0.013 \times T)$
6	SLB	$\frac{443000}{T + 89}$	$10.81 + (0.013 \times T)$
6	SLC	$\frac{444000}{T + 64.6}$	$10.81 + (0.013 \times T)$
6	SLD	$\frac{767000}{T + 64.6}$	$11.69 + (0.016 \times T)$
6	SLE	$\frac{868000}{T + 64.6}$	$12.64 + (0.020 \times T)$

*Slide weights shown are calculated using a PHD Cylinder as the power source. Weight of unit with ISO cylinder would be similar.

PHD'S TC BUSHING

PHD offers the unique **TC** bushings as an alternative to traditional linear ball bushings. **TC** bushings offer the following advantages.

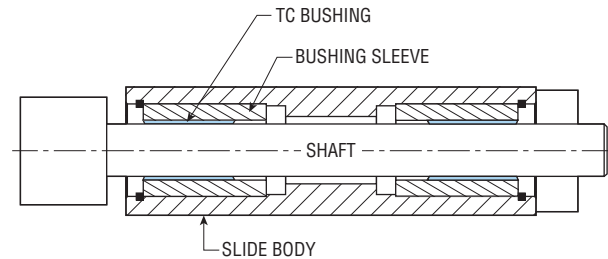
- **TC** bushings are maintenance free and self lubricating.
- The bushing design permits oversize shafts to be used in the slide body, saving space, and decreasing shaft deflection.
- The ability to carry static loads up to 2 times greater than traditional linear bushings.
- Can be used in harsh environments where dirt, grit, metal particles, and metal cutting fluids can damage or destroy other bushings.
- **TC** bushings are almost impervious to static shock loads—there are no ball bushings to damage or Brinell the shafts.
- End-of-travel shaft vibration is minimal compared to ball bushings (see graph below).
- Slides with PHD's **TC** bushings cost less than units with traditional ball bushings.

TOOL PLATE VIBRATION

Tool plate vibration occurs on all slides when the tool plate reaches full extension and the sudden stop causes the shafts to oscillate. Vibration is measured by the amplitude of the oscillation and its duration. This vibration may be critical in applications where precise tool plate location and fast cycle times are required.

Tests have shown that compared with linear ball bushings, PHD **TC** bushings with oversize shafts damp out this vibration in 1/3 to 1/2 the time with 1/3 less overall tool plate movement. The graphs below show an actual comparison for a PHD size 3 slide between the **TC** bushings with oversize shafts and linear ball bushings.

The test was run with a 150 mm travel slide in a vertical application with a 2.3 kilogram off-center load. The unit was cycled in 170 milliseconds using stop collars with no cushions.



LUBRICATION

All slides are permanently lubricated at the factory for service under normal conditions. PHD Cylinders can be run using unlubricated air. Use of lubricated air with the cylinders will extend life. Optimum life can be obtained on Series SK/SL Slides by periodic lubrication (every 25 million inches of travel) of the shafts. PHD suggests a lightweight oil. Silicon-based lubricants should **NOT** be used on units with PHD's **TC** bushings.

FRICTION

In horizontal applications, a **TC** bushing has a higher breakaway pressure required than a linear bushing. Breakaway pressure is affected by several factors including the load at the tool plate, slide travel and the total moving load. The following formulas yield approximate maximum breakaway pressure for the SK/SL Slides.

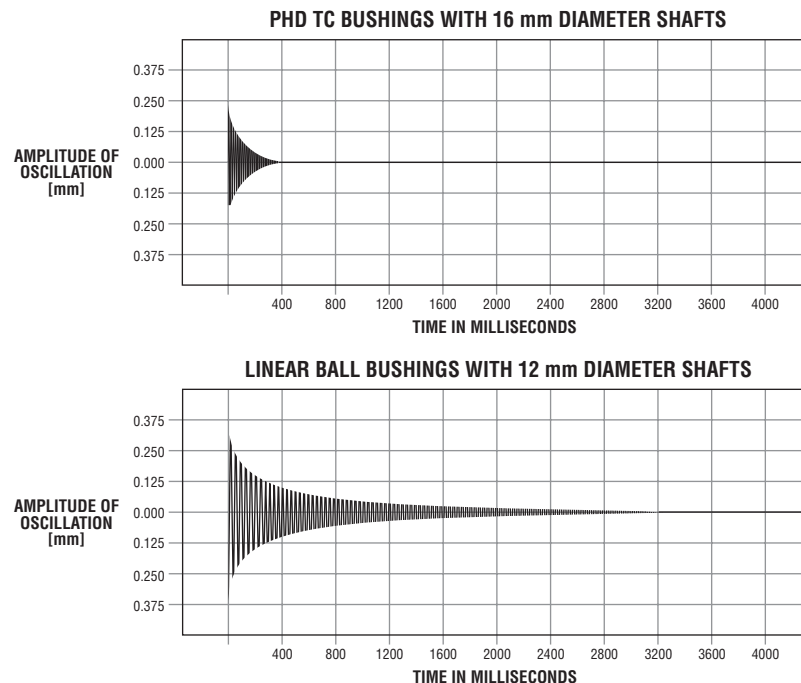
$$1.38 + ((T \times L_{TP} / A) + L_{TM}) B = \text{Breakaway Pressure (bar)}$$

T = Total travel + tool plate extension (mm)

L_{TM} = Total moving load (N)

L_{TP} = Load at tool plate (N)

MODEL	A	B
SKC81 & SKD81	46	0.0136
SLC81 & SLD81	71	0.0136
SKC82 & SKD82	60	0.0121
SLC82 & SLD82	87	0.0121
SKC83 & SKD83	67	0.0073
SLC83 & SLD83	102	0.0073
SKC84 & SKD84	77	0.0041
SLC84 & SLD84	107	0.0041
SKC85 & SKD85	84	0.0025
SLC85 & SLD85	114	0.0025
SKC85, SKD86, & SKE86	127	0.0015
SLC85, SLD86, & SLE86	177	0.0015

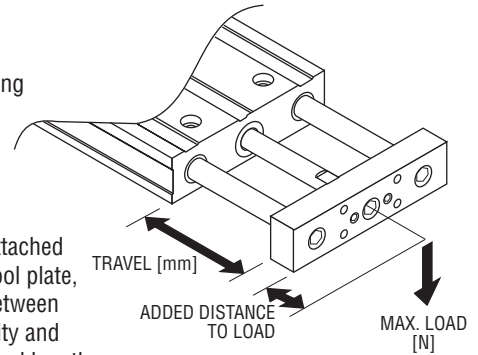


MAXIMUM ROLLING LOAD & DEFLECTION GRAPHS, SIZE 1

The following graphs are designed to provide a quick and easy method of selecting and comparing each SK and SL Slide. Maximum load versus travel is shown with various deflection curves to determine shaft deflection for the application. The linear ball bushing load ratings shown are derated by a factor of 1.2 from the bearing manufacturer's ratings to provide a design safety factor. Consult PHD for applications which exceed maximum load ranges shown. Maximum loads are based on a service life of 5,000 kilometers of linear travel at 0.6 meter/sec average velocity.

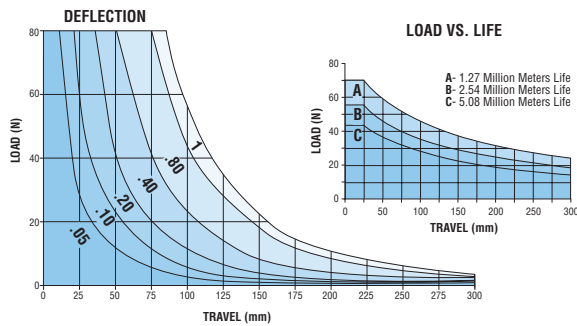
The deflection figures given in these graphs are based on the effect of external loads. Shaft straightness, shaft weight, and bearing alignment will affect the accuracy of the tool plate location.

Consult PHD for applications requiring high precision tool plate location.

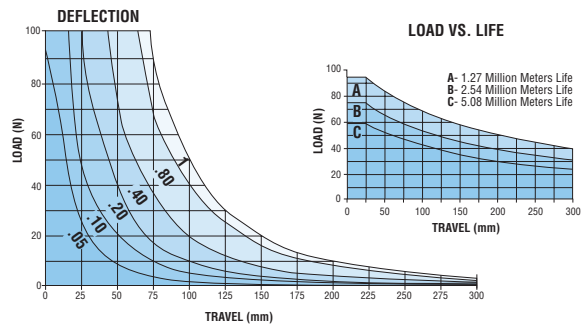


When the load is attached to the face of the tool plate, add the distance between load center of gravity and tool plate to the travel length and use the total as the travel length in the following graphs.

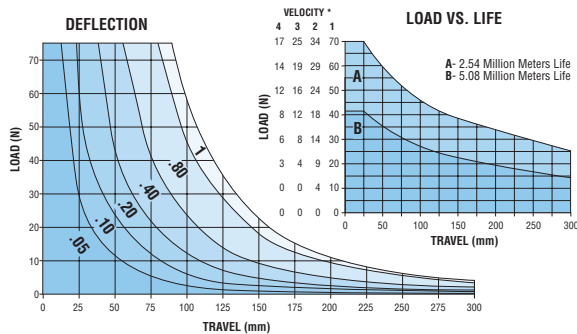
SKB81



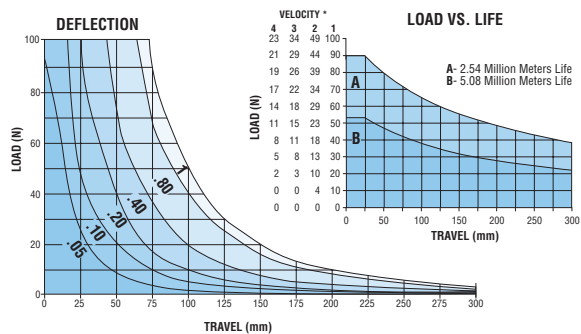
SLB81



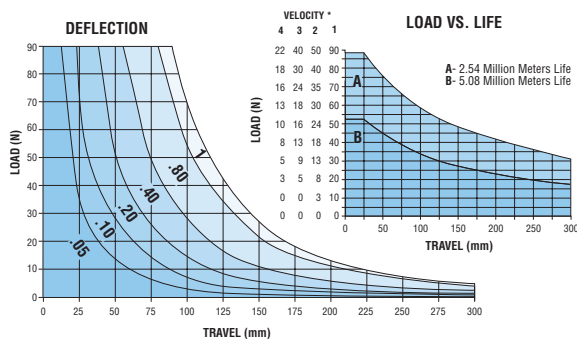
SKC81



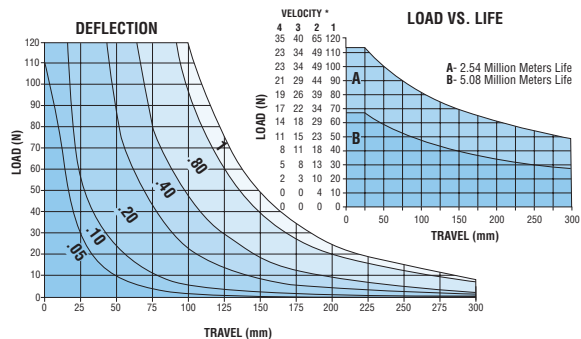
SLC81



SKD81



SLD81



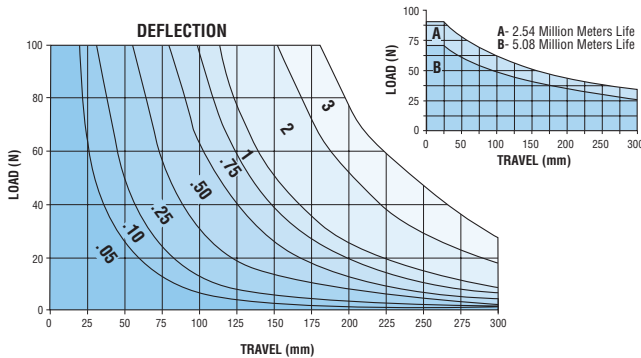
* LOAD VS. LIFE VELOCITY (mm/sec)
1 = 300 2 = 600 3 = 900 4 = 1200

The scales of the load and travel axes change from graph to graph for maximum clarity.

MAXIMUM ROLLING LOAD & DEFLECTION GRAPHS, SIZE 2

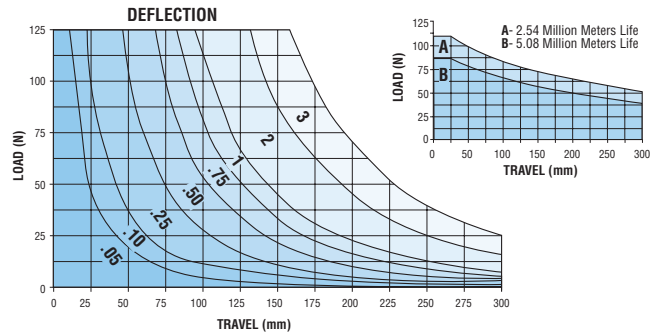
SKB82

LOAD VS. LIFE



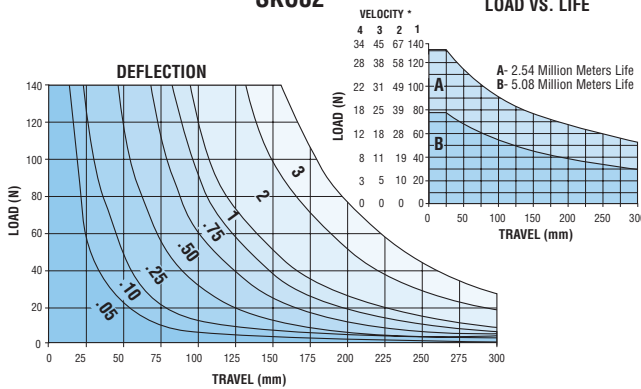
SLB82

LOAD VS. LIFE



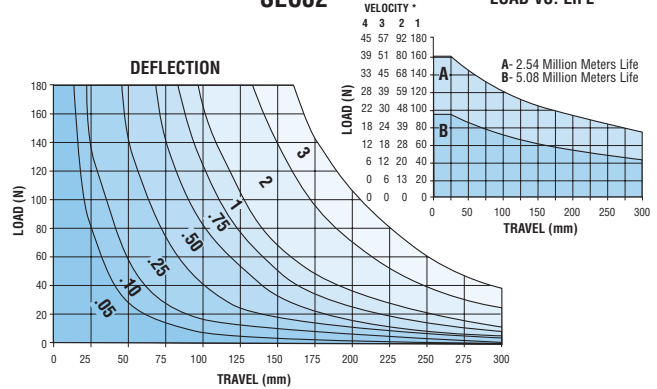
SKC82

LOAD VS. LIFE



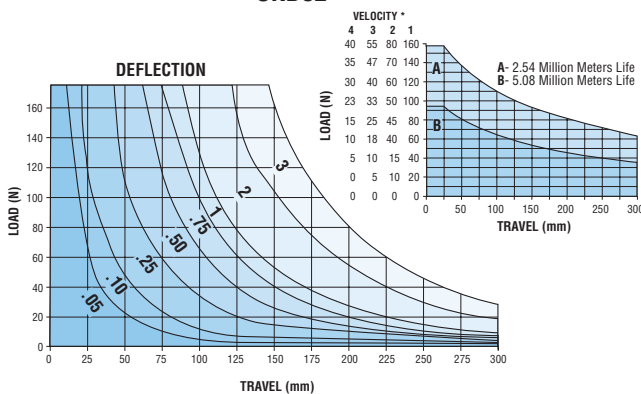
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LOAD VS. LIFE



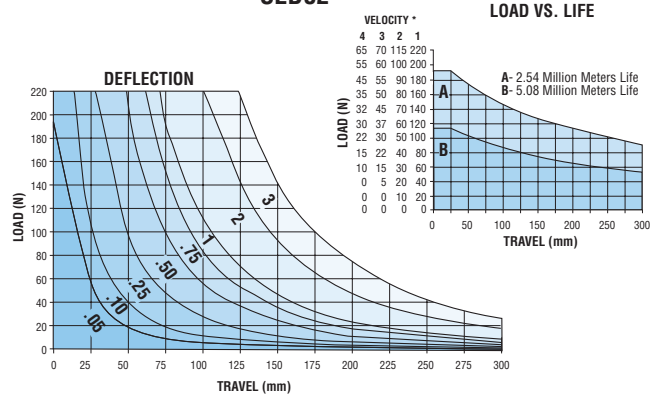
SKD82

LOAD VS. LIFE



SLD82

LOAD VS. LIFE

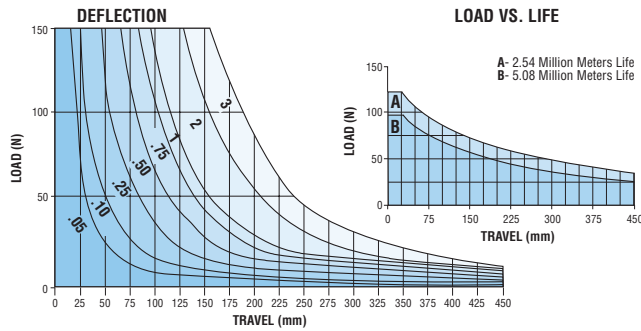


* **LOAD VS. LIFE VELOCITY (mm/sec)**
1 = 300 2 = 600 3 = 900 4 = 1200

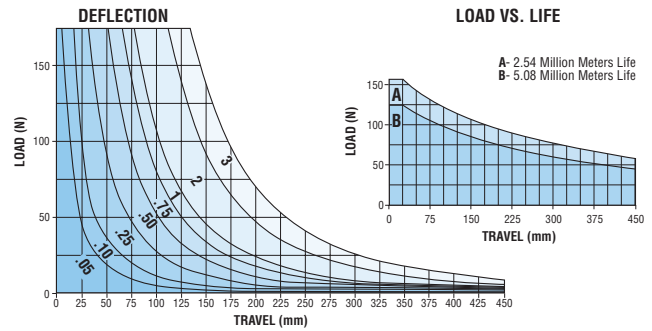
The scales of the load and travel axes change from graph to graph for maximum clarity.

MAXIMUM ROLLING LOAD & DEFLECTION GRAPHS, SIZE 3

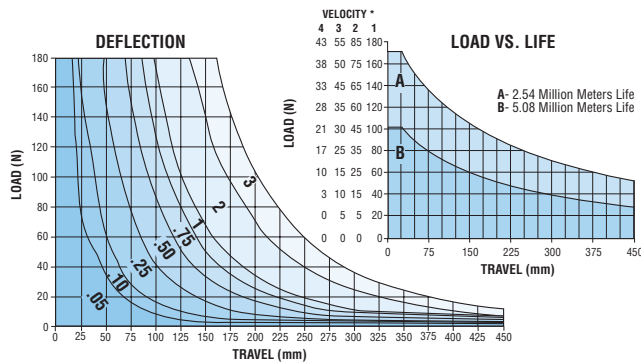
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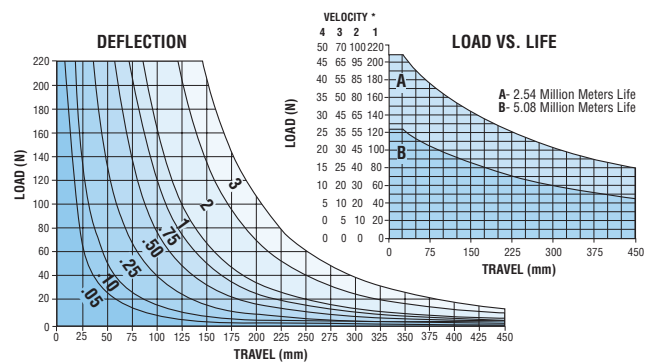
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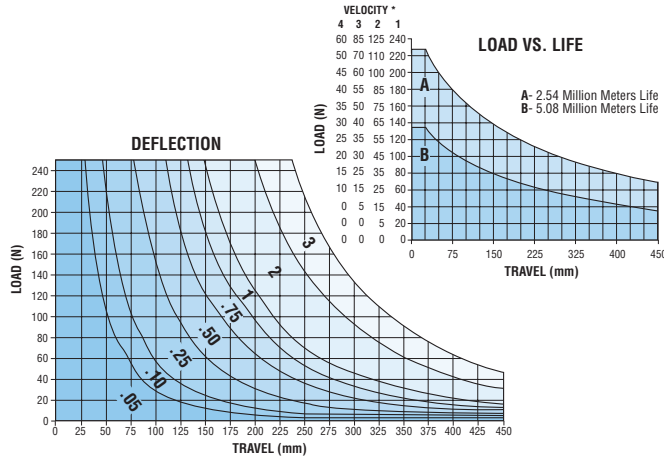
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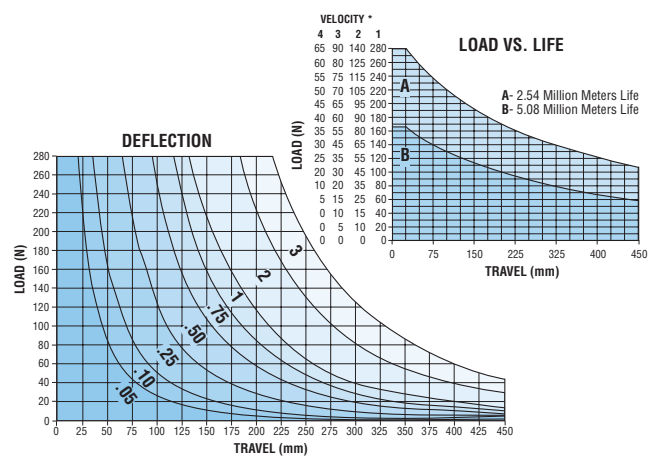
SLC83



SKD83



SLD83

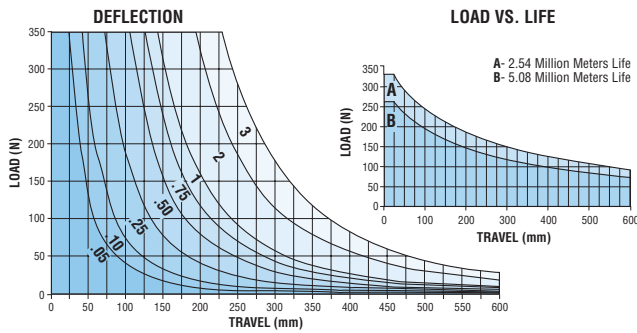


* **LOAD VS. LIFE VELOCITY (mm/sec)**
1 = 300 2 = 600 3 = 900 4 = 1200

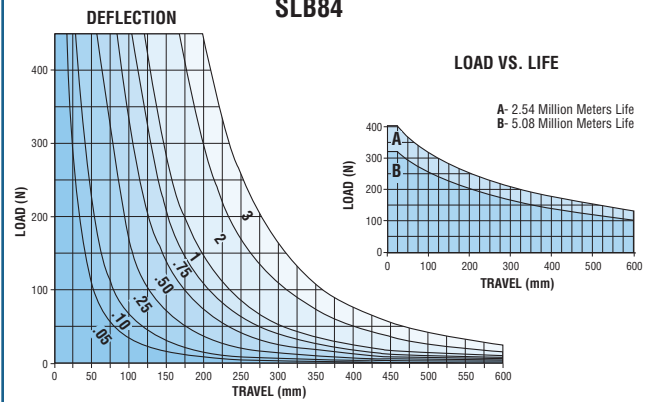
The scales of the load and travel axes change from graph to graph for maximum clarity.

MAXIMUM ROLLING LOAD & DEFLECTION GRAPHS, SIZE 4

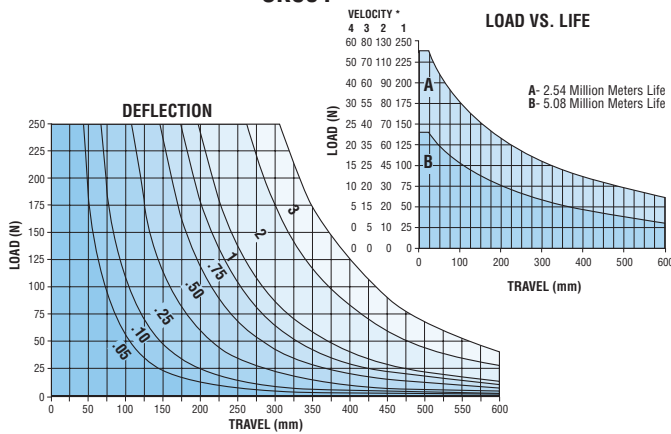
SKB84



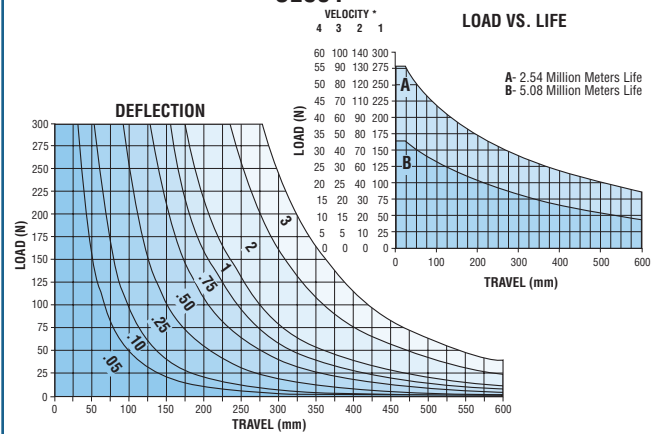
SLB84



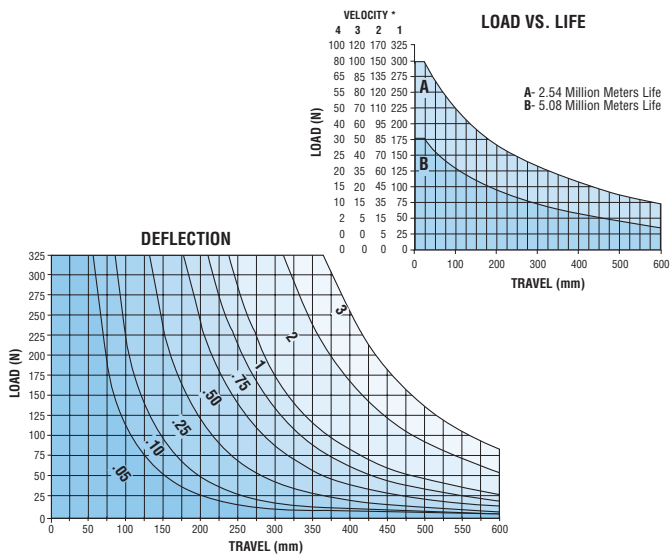
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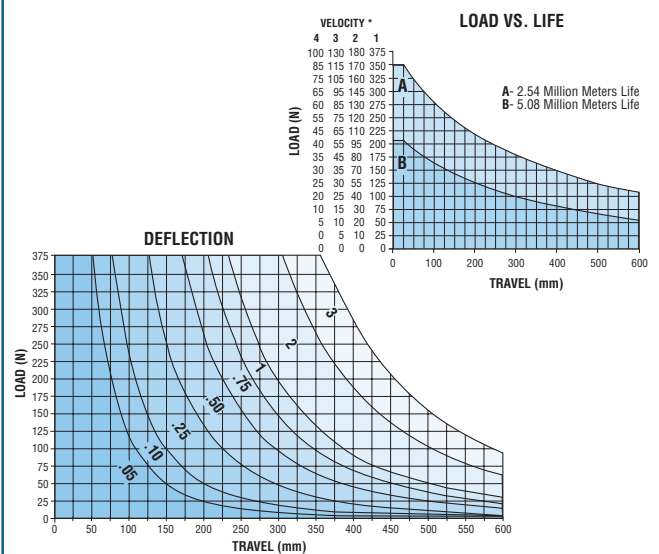
SLC84



SKD84



SLD84

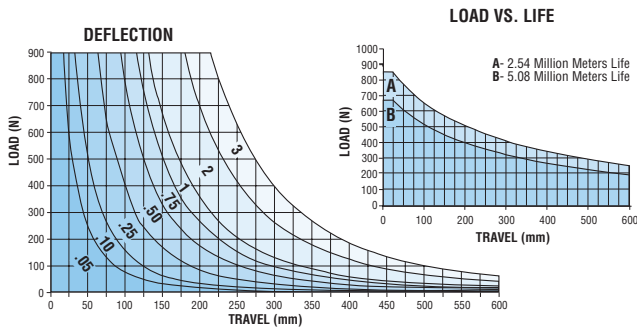


* LOAD VS. LIFE VELOCITY (mm/sec)
1 = 300 2 = 600 3 = 900 4 = 1200

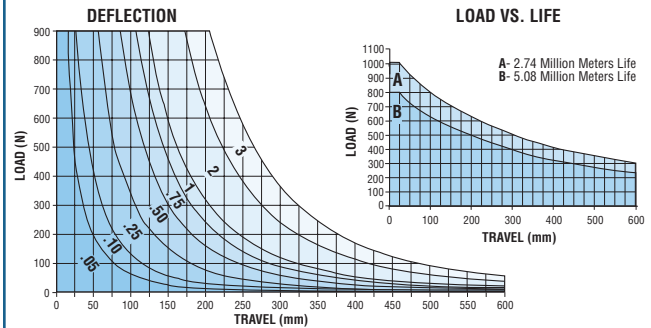
The scales of the load and travel axes change from graph to graph for maximum clarity.

MAXIMUM ROLLING LOAD & DEFLECTION GRAPHS, SIZE 5

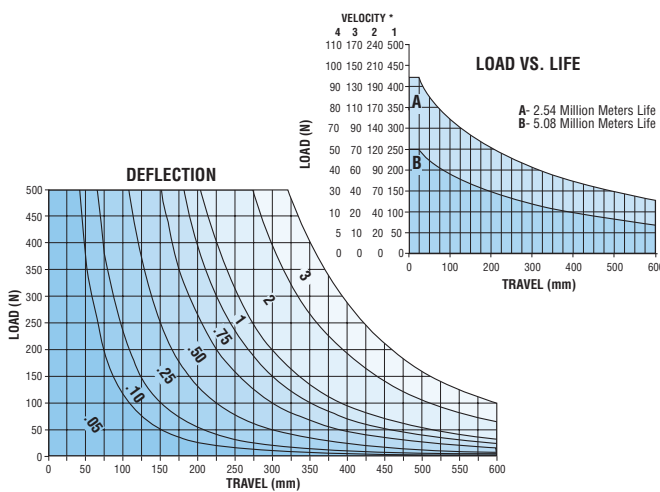
SKB85



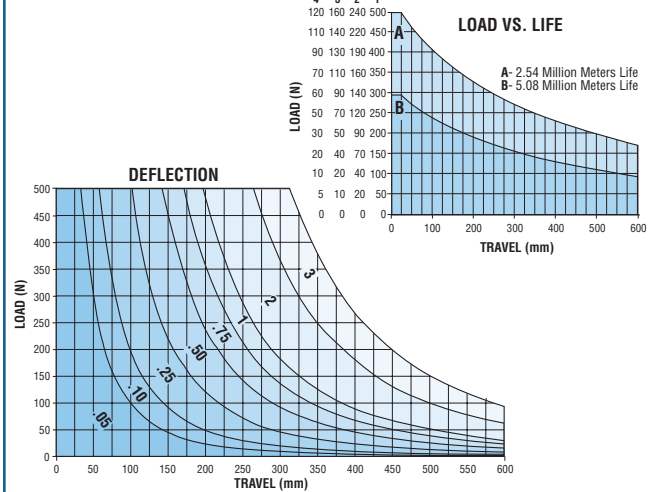
SLB85



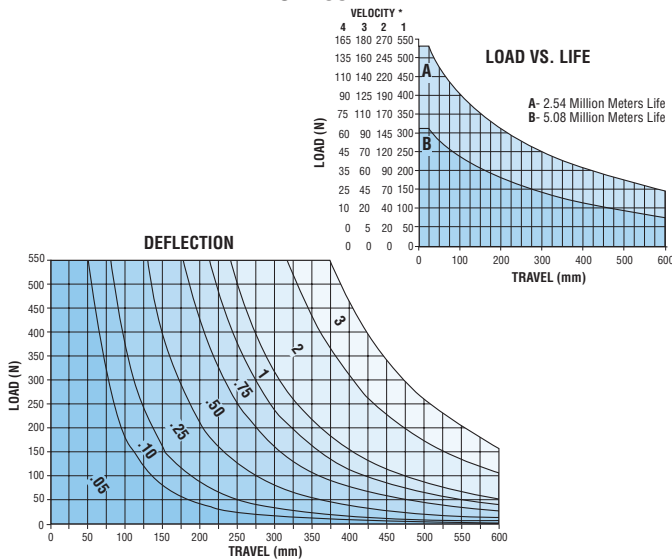
SKC85



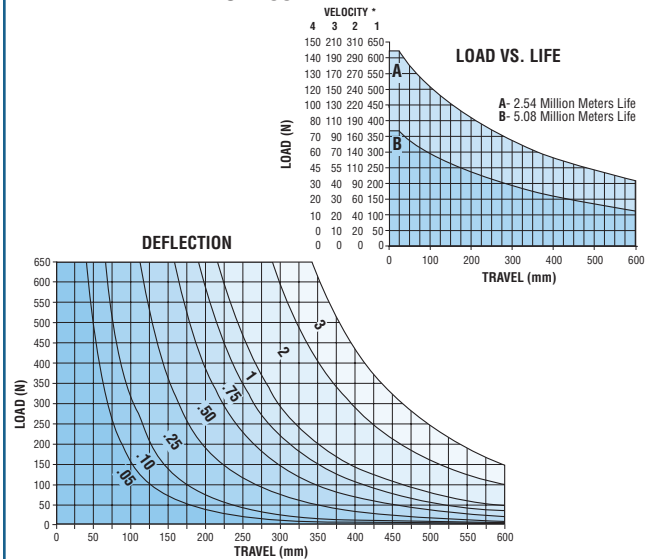
SLC85



SKD85



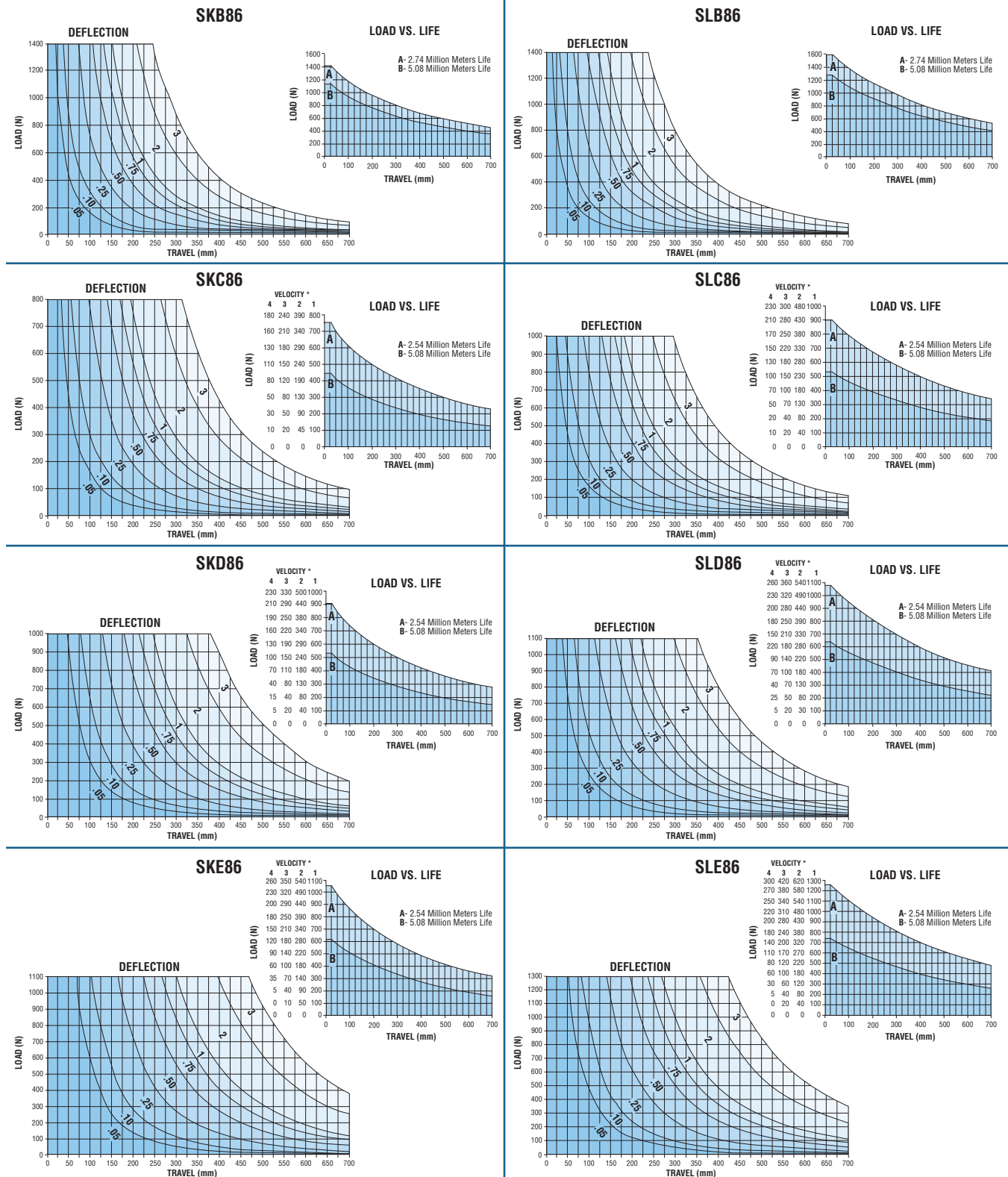
SLD85



* LOAD VS. LIFE VELOCITY (mm/sec)
1 = 300 2 = 600 3 = 900 4 = 1200

The scales of the load and travel axes change from graph to graph for maximum clarity.

MAXIMUM ROLLING LOAD & DEFLECTION GRAPHS, SIZE 6



* LOAD VS. LIFE VELOCITY (mm/sec)
1 = 300 2 = 600 3 = 900 4 = 1200

The scales of the load and travel axes change from graph to graph for maximum clarity.

SHOCK ABSORBER SELECTION GUIDE

To determine stopping capacity, calculate total moving weight.
From Table 1, determine shaft and tool plate weight (W_M).
Multiply the travel by the travel adder + base weight.
Example for SxB83 x 100: $W_M = (100 \times 0.0023) + 0.76 = 0.99$ kg
Add W_M to attached load (payload) = Total Moving Weight (W_{TM})
 $0.99 + 5.0 = 5.99$ kg

Using Kinetic Energy Graphs below, plot the total moving weight and impact velocity. If the value is less than slide with cylinder, cushion, or travel adjustment curves, that type of deceleration is adequate. If it is greater than these curves, hydraulic shock absorbers are required.

To determine the correct hydraulic shock, complete the calculation on the next page.

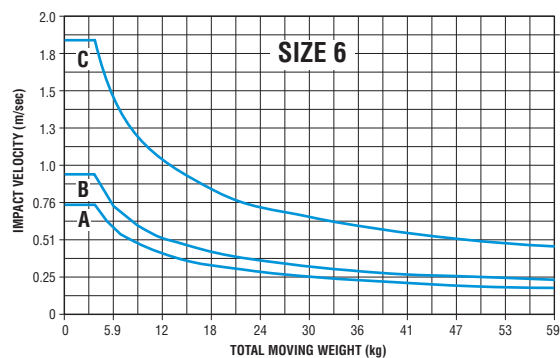
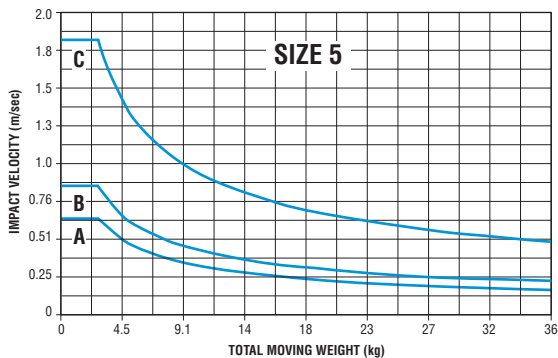
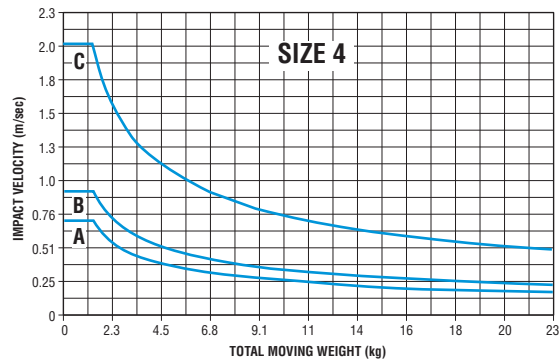
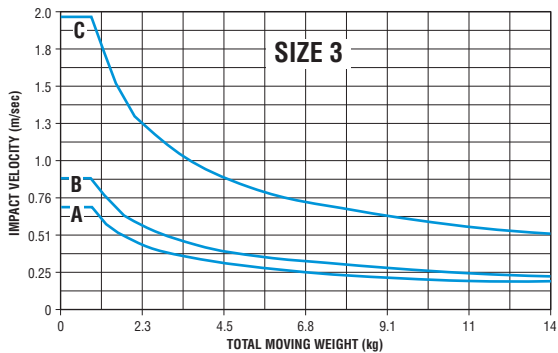
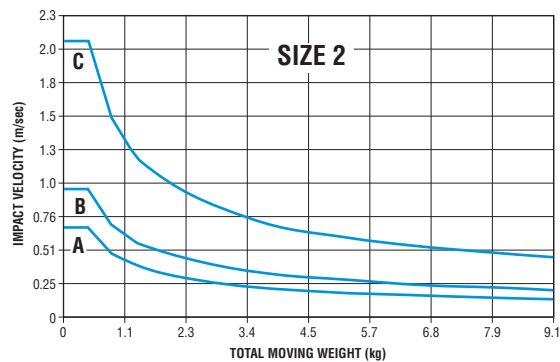
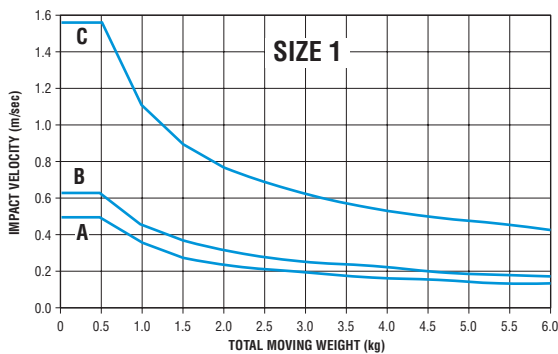
PHD suggests hydraulic shock absorbers for all applications where the center of gravity of the payload is off the slide centerline by more than 50 mm and travelling at speeds greater than 0.25 m/sec.

TABLE 1

SLIDE SIZE	BASE WT. kg	TRAVEL ADDER kg/mm	CYL. BORE (PHD)	CYL. BORE H11/H12
SxB & SxC 81	0.38	0.0012	19	16
SxD 81	0.41	0.0016		
SxB & SxC 82	0.58	0.0018	20	20
SxD 82	0.67	0.0023		
SxB & SxC 83	0.76	0.0023	25	25
SxD 83	1.08	0.0037		
SxB & SxC 84	1.37	0.0047	32	32
SxD 84	1.75	0.0065		
SxB & SxC 85	2.26	0.0065	40	40
SxD 85	2.88	0.0093		
SxB & SxC 86	3.95	0.0093	50	50
SxD 86	4.95	0.0127		
SxE 86	6.02	0.0167		

Moving weight adders for slide kinetic energy calculation include tool plate, coupling, two collars, and shafts.

MAXIMUM ALLOWABLE KINETIC ENERGY GRAPHS



A = SLIDE WITH CYLINDER B = SLIDE WITH TRAVEL ADJUSTMENTS C = SLIDE WITH CYLINDER WITH CUSHIONS

SHOCK ABSORBER SPECIFICATIONS CHART

SLIDE SIZE	PHD SHOCK ABSORBER NO.	STROKE m	THREAD TYPE	ET TOTAL ENERGY PER CYCLE Nm	ETC TOTAL ENERGY PER HOUR Nm	Eg PROPELLING FORCE N	SHOCK ABSORBER WEIGHT kg
1	57056-01-x	0.016	M14 x 1.5	3.5	34000	530	0.07
2	57056-02-x	0.022	M20 x 1.5	8.5	53700	890	0.20
3	57056-02-x	0.022	M20 x 1.5	13.5	53700	890	0.20
4	57056-03-x	0.025	M25 x 1.5	25.0	70000	1500	0.28
5	57056-03-x	0.025	M25 x 1.5	44.0	70000	1500	0.28
6	57056-04-x	0.040	M25 x 1.5	98.0	75000	2200	0.45

SYMBOLS DEFINITIONS

C = Number of cycles per hour
 d = Cylinder bore diameter (in)
 Ek = Kinetic energy (in-lb)
 Et = Total energy per cycle, Ek + Ew (in-lb)
 EtC = Total energy per hour (in-lb/hr)
 Ew = Work or drive energy (in-lb)
 F_D = Propelling force (lb)
 P = Operating pressure (psi)
 S = Stroke of shock absorber (in)
 V = Impact velocity (in/sec)
 W_{TM} = Total moving weight (lb)

SHOCK ABSORBER SIZING CALCULATION:

Follow the next six steps to size shock absorbers.

STEP 1: Identify the following parameters. These must be known for all energy absorption calculations. Variations or additional information may be required in some cases.

- The total moving weight to be stopped in kg (W_{TM})
- The slide velocity (V) at impact with the shock absorber in m/sec
- External propelling force (F_D) in N
- Number of cycles per hour (C)
- Orientation of the application's motion (i.e., horizontal or vertical application). See next page.

STEP 2: Calculate the kinetic energy of the total moving weight.

$$E_k = (W_{TM} / 2) \times V^2$$

STEP 3: Calculate the propelling force (F_D).

Horizontal application: $F_D = 0.0785 \times d^2 \times P$

Vertical application: $F_D = (0.0785 \times d^2 \times P) + 9.8 \times W_{TM}$

Calculate the work energy input (E_w) from any external (propelling) forces acting on the load, using the stroke of the shock absorber selected. $E_w = F_D \times S$

STEP 4: Calculate the total energy.

$$E_t = E_k + E_w$$

Use Shock Absorber Specifications Chart to verify that the selected unit has an E_t capacity greater then the value just calculated. If not, reduce velocity, pressure, moving weight, or select a larger slide.

STEP 5: Calculate the total energy that must be absorbed per hour (E_{tC}).

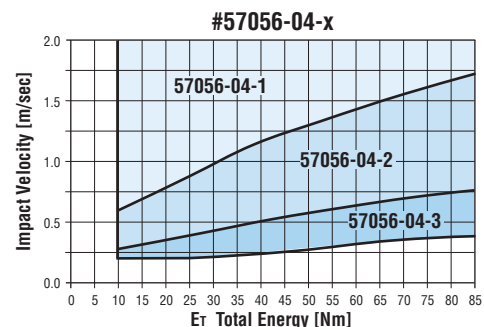
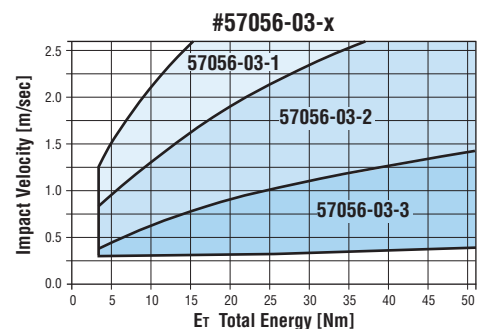
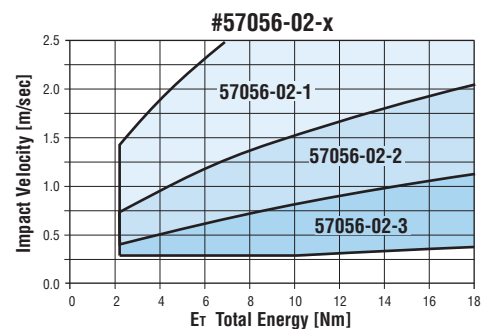
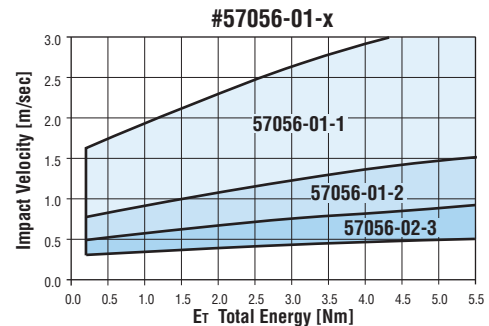
$$E_{tC} = E_t \times C$$

Use Shock Absorber Specifications Chart to verify that the selected unit has an E_{tC} capacity greater then the value just calculated. If not, reduce the cycles per hour or select a larger slide.

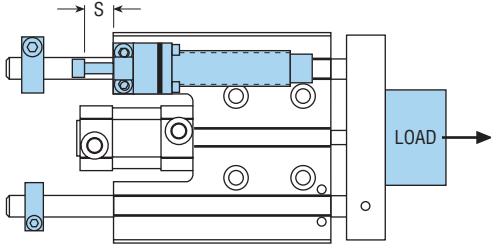
STEP 6: Determine the damping constant for the selected shock absorber. Using the appropriate Shock Absorber Performance Graph, locate the intersection point for impact velocity (V) and total energy (E_t). The shaded area (-1, -2, or -3) that the point falls in is the correct damping constant for the application.

NOTE: The total energy per cycle (E_t) is based on the slide and its components. Applications with E_t larger than listed are not recommended.

PHD SHOCK ABSORBER PERFORMANCE GRAPHS



SHOCK ABSORBER SELECTION GUIDE SIZING EXAMPLES



HORIZONTAL APPLICATION

STEP 1: Application Data

Example: SxB84 x 100 mm travel and 2 kg payload

(W_{TM}) Weight = 3.84 kg (Total Moving Weight)

(V) Velocity = 2.0 m/sec (Speed of Travel)

(d) Cylinder Bore Diameter = 32 mm

(P) Operating Pressure = 6 bar

(C) Cycles/Hr = 200 c/hr

$$W_M = 1.37 + (0.0047 \times 100 \text{ mm})$$

$$W_M = 1.84 \text{ kg}$$

$$W_{TM} = 1.84 + 2 \text{ kg}$$

$$W_{TM} = 3.84 \text{ kg}$$

STEP 2: Calculate kinetic energy.

$$E_K = (W_{TM} / 2) \times V^2$$

$$E_K = (3.84 / 2) \times 2.0^2$$

$$E_K = 7.68 \text{ Nm}$$

STEP 3: Calculate work energy.

$$F_D = 0.0785 \times d^2 \times P$$

$$F_D = 0.0785 (32^2) \times 6$$

$$F_D = 482.3 \text{ N}$$

$$E_W = F_D \times S$$

$$E_W = 482.3 \text{ N} \times 0.025$$

$$E_W = 12.06 \text{ Nm}$$

STEP 4: Calculate total energy.

$$E_T = E_K + E_W$$

$$E_T = 7.3 + 12.06$$

$$E_T = 19.36 \text{ Nm}$$

Since 19.36 is less than E_T in Shock Absorber Specifications Chart, proceed.

STEP 5: Total energy absorbed per hour

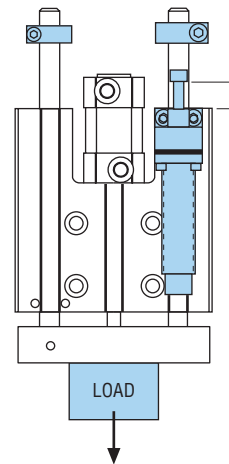
$$E_{TC} = E_T \times C$$

$$E_{TC} = 19.36 \times 200$$

$$E_{TC} = 3872 \text{ Nm/hr}$$

Since 3872 is less than E_{TC} in Shock Absorber Specifications Chart, proceed.

STEP 6: Choose proper damping constant for correct shock absorber on Shock Absorber Performance Graphs (see previous page). #57056-03-1 is the correct unit for the application.



VERTICAL APPLICATION

STEP 1: Application Data

Example: SxB84 x 160 mm travel with a 4 kg payload

(W_{TM}) Weight = 6.12 kg (Total Moving Weight)

(V) Velocity = 0.50 m/sec (Speed of Travel)

(d) Cylinder Bore Diameter = 32 mm

(P) Operating Pressure = 6 bar

(C) Cycles/Hour = 400 c/hr

STEP 2: Calculate kinetic energy.

$$E_K = (W_{TM} / 2) \times V^2$$

$$E_K = (6.12 / 2) \times 0.50^2$$

$$E_K = 0.76 \text{ Nm}$$

STEP 3: Calculate work energy.

$$F_D = (0.07854 \times d^2 \times P) + 9.8 \times W_{TM}$$

$$F_D = 482.5 + 59.98$$

$$F_D = 542.5 \text{ N}$$

$$E_W = F_D \times S$$

$$E_W = 542.5 \times 0.025$$

$$E_W = 13.6 \text{ Nm}$$

STEP 4: Calculate total energy.

$$E_T = E_K + E_W$$

$$E_T = 0.76 + 13.6$$

$$E_T = 14.36 \text{ Nm}$$

Since 14.36 is less than E_T in Shock Absorber Specifications Chart, proceed.

STEP 5: Total energy absorbed per hour

$$E_{TC} = E_T \times C$$

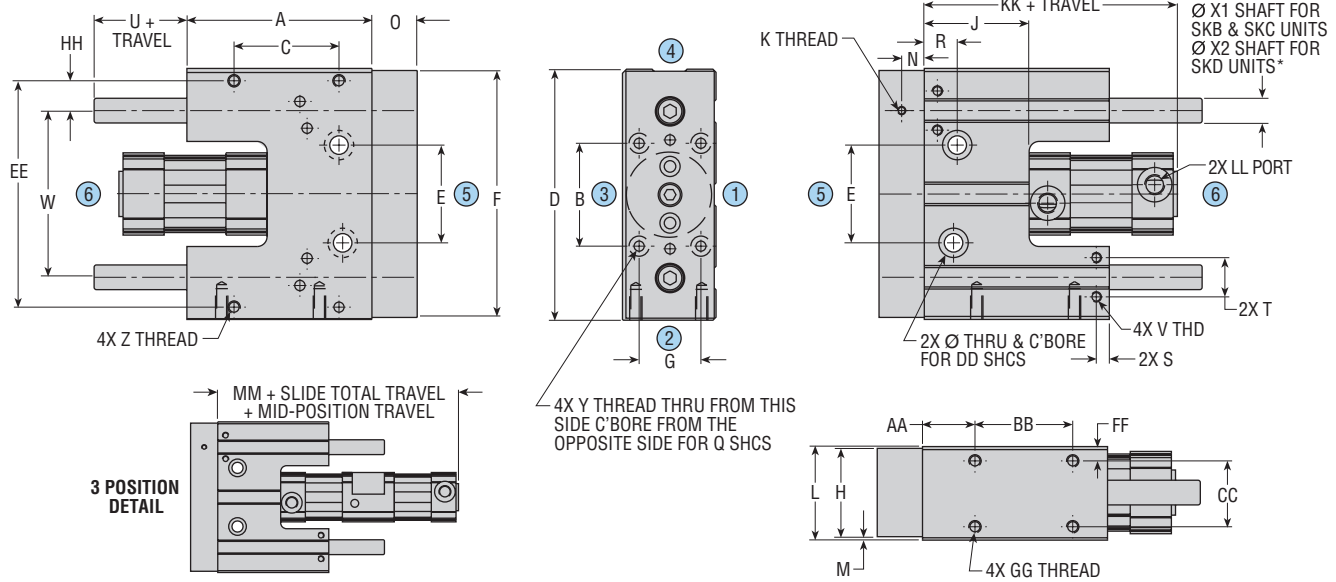
$$E_{TC} = 14.36 \times 400$$

$$E_{TC} = 5744 \text{ Nm/hr}$$

Since 5744 is less than E_{TC} in Shock Absorber Specifications Chart, proceed.

STEP 6: Choose proper damping constant for correct shock absorber on Shock Absorber Performance Graphs (see previous page). #57056-03-3 is the correct unit for this application.

DIMENSIONS: Series SK Slides



LETTER DIM.	SIZE					
BORE	1	2	3	4	5	6
A	65	82.5	89.9	100	115	150
B	39	38.5	50	47.5	58	65
C	39	51	51	70	63	100
D	90	107	122	143	173	215
E	38.5	50	47.5	58	65	80
F	88	105	120	141	171	213
G	16.5	23	30	32	36	45
H	29	38.1	42.9	48	60	70.1
J	39.9	45	51	48	54.9	66
K	M4 x 0.7 x 6.5 mm DP	M4 x 0.7 x 10 mm DP	M4 x 0.7 x 6.5 mm DP	M4 x 0.7 x 11 mm DP	M4 x 0.7 x 11 mm DP	M4 x 0.7 x 11 mm DP
L	31	39.9	45	50.5	62	73
M	1	1	1	1	1	1.5
N	9.2	5	11	10.1	8.5	7.4
O	23.5	24	22	25	30	35
Q	M3	M4	M5	M6	M8	M10
R	20	23	15.6	22	22.5	25.5
S	6.4	10.9	6.7	8.1	9.5	12.4
T	15.4	19.1	19.1	27.0	27.0	34.9
U	39	39	45	45	45	51
V	M4 x 0.7 x 8 mm DP	M5 x 0.8 x 9.5 mm DP	M5 x 0.8 x 9.5 mm DP	M6 x 1.0 x 15 mm DP	M6 x 1.0 x 15 mm DP	M8 x 1.25 x 16 mm DP
W	61.5	76	81	97	117	143
X1*	8	10	12	16	20	25
X2	10	12	16	20	25	30
Y	M4 x 0.7	M5 x 0.8	M6 x 1.0	M8 x 1.25	M10 x 1.5	M12 x 1.75
Z	M4 x 0.7 x 7 mm DP	M5 x 0.8 x 9 mm DP	M6 x 1.0 x 10 mm DP	M8 x 1.25 x 16 mm DP	M10 x 1.5 x 19 mm DP	M12 x 1.75 x 20 mm DP
AA	14	12	25.1	31.5	33	44.5
BB	38.5	50	47.5	58	65	65
CC	23	30	32	36	45	50
DD	M5	M6	M8	M10	M12	M12
EE	80	95	110	128	154	197
FF	4	4.9	6.0	7.3	8.5	11.5
GG	M4 x 0.7 x 8 mm DP	M5 x 0.8 x 12 mm DP	M6 x 1.0 x 15 mm DP	M8 x 1.25 x 16 mm DP	M10 x 1.5 x 20 mm DP	M12 x 1.75 x 20 mm DP
HH	9.25	9.5	14.5	15.5	18.5	27
KK	103	116	125	148	166	178
LL	1/8 BSPP	G 1/8 BSPP	G 1/8 BSPP	G 1/8 BSPP	G 1/4 BSPP	G 1/4 BSPP
MM	158	206	218	260.0	289	324

NOTES:

- 1) DIMENSIONS MAY BE AFFECTED BY OPTIONS. FOR OPTION DIMENSIONS SEE OPTION PAGES.
- 2) ALL DIMENSIONS ARE CENTERED ON THE CENTERLINE OF THE SLIDE UNLESS OTHERWISE SPECIFIED
- 3) *FOR SIZE 6 ONLY WITH SKE DOUBLE OVERSIZE SHAFT = 35 mm
- 4) FOR PORT AND NEEDLE LOCATIONS, SEE OPTION PAGES.
- 5) ALL UNITS, EXCEPT PORT WITH PORT CONTROL ON SAME SIDE, COMPLY WITH DIN 3852 PART 2 PORT SPECIFICATIONS FOR SHORT STUD AND LARGE SEALING SURFACE.
- 6) DIMENSIONS ARE IN mm
- 7) NUMBERS ENCLOSED BY A CIRCLE INDICATE POSITION
- 8) FOR DOWEL HOLE LOCATIONS, SEE PAGE 90.
- 9) FOR OPTIONS BR, AR, GH, GI, GN AND GO, ADD BETWEEN DIMENSIONS O AND A, O AND KK, AND O AND MM.
- 10) FOR OPTIONS H47, DE, DR AND DB, ADD TO KK AND MM DIMENSIONS.

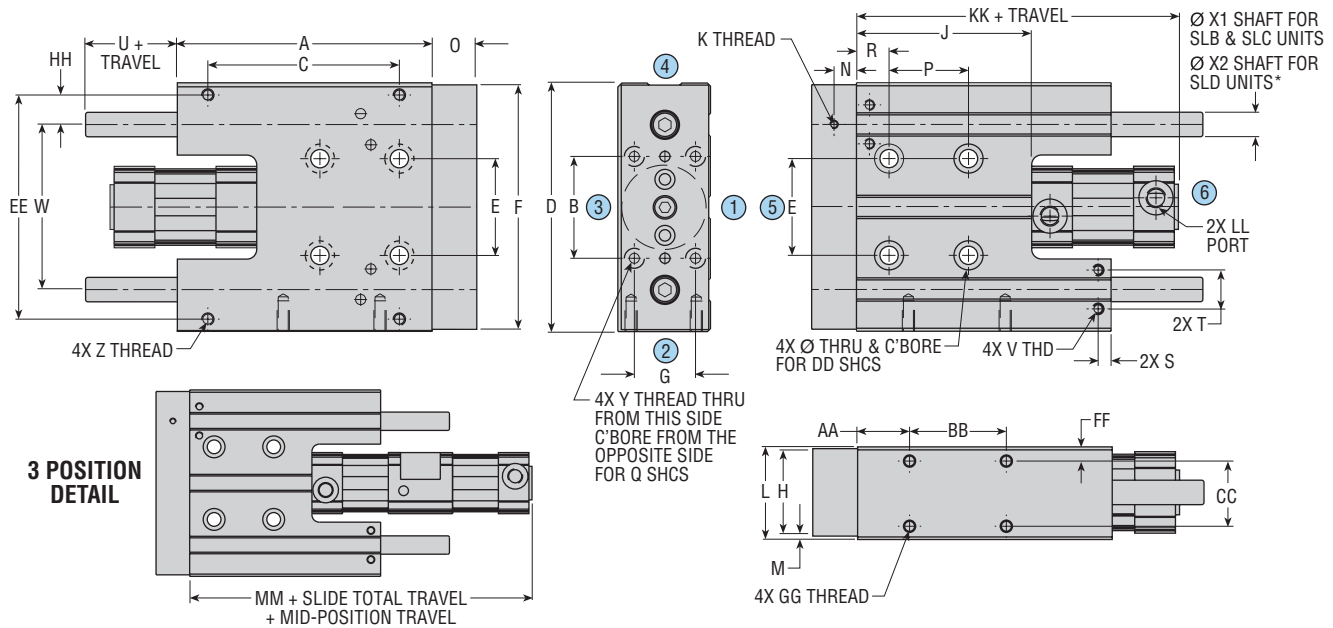
OPTION ADDERS (SEE NOTES 9 & 10)						
SIZE	BR	AR, GH, GI, GN, GO	H47	DE, DR	DB	
1	6	19	—	12.7	25.4	
2	6	19	40	—	—	
3	6	22	44	—	—	
4	6	22	48	—	—	
5	6	22	55	—	—	
6	6	25	70	—	—	

CAD & Sizing Assistance

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

All dimensions are reference only unless specifically tolerated.

DIMENSIONS: Series SL Slides



LETTER DIM.	SIZE					
	1	2	3	4	5	6
BORE	19	20	25	32	40	50
A	89.9	110	125	130	145	200
B	39	38.5	50	47.5	58	65
C	64	78.5	94	96	105	150
D	90	107	122	143	173	215
E	38.5	50	47.5	58	65	80
F	88	105	120	141	171	213
G	16.5	23	30	32	36	45
H	29	38.1	42.9	48	60	70.1
J	67	77	86	85.1	95	116
K	M4 x 0.7 x 6.5 mm DP	M4 x 0.7 x 10 mm DP	M4 x 0.7 x 6.5 mm DP	M4 x 0.7 x 11 mm DP	M4 x 0.7 x 11 mm DP	M4 x 0.7 x 11 mm DP
L	31	40	45	50.5	62	73
M	1	1	1	1	1	1.5
N	9.2	5	11	10.1	8.5	7.4
O	23.5	24	22	25	30	35
P	34.5	35	39	36	40.5	55
Q	M3	M4	M5	M6	M8	M10
R	20	23	15.6	22	22.5	25.5
S	6.4	10.9	6.7	8.1	9.5	12.4
T	15.4	19.1	19.1	27.0	27.0	34.9
U	39	39	45	45	45	51
V	M4 x 0.7 x 8 mm DP	M5 x 0.8 x 9.5 mm DP	M5 x 0.8 x 9.5 mm DP	M6 x 1.0 x 15 mm DP	M6 x 1.0 x 15 mm DP	M8 x 1.25 x 16 mm DP
W	61.5	76	81	97	117	143
X1*	8	10	12	16	20	25
X2	10	12	16	20	25	30
Y	M4 x 0.7	M5 x 0.8	M6 x 1.0	M8 x 1.25	M10 x 1.5	M12 x 1.75
Z	M4 x 0.7 x 7 mm DP	M5 x 0.8 x 9 mm DP	M6 x 1.0 x 10 mm DP	M8 x 1.25 x 16 mm DP	M10 x 1.5 x 19 mm DP	M12 x 1.75 x 20 mm DP
AA	14	12	25.1	31.5	33	44.5
BB	38.5	50	47.5	58	65	65
CC	23	30	32	36	45	50
DD	M5	M6	M8	M10	M12	M12
EE	80	95	110	128	154	197
FF	4	4.9	6.0	7.3	8.5	11.5
GG	M4 x 0.7 x 8 mm DP	M5 x 0.8 x 12 mm DP	M6 x 1.0 x 15 mm DP	M8 x 1.25 x 16 mm DP	M10 x 1.5 x 20 mm DP	M12 x 1.75 x 20 mm DP
HH	9.25	9.5	14.5	15.5	18.5	27
KK	130	148	160	185	206	228
LL	1/8 BSPP	G 1/8 BSPP	G 1/8 BSPP	G 1/8 BSPP	G 1/4 BSPP	G 1/4 BSPP
MM	185	238	253	297	329	374

NOTES:

- 1) DIMENSIONS MAY BE AFFECTED BY OPTIONS. FOR OPTION DIMENSIONS SEE OPTION PAGES.
- 2) ALL DIMENSIONS ARE CENTERED ON THE CENTERLINE OF THE SLIDE UNLESS OTHERWISE SPECIFIED
- 3) *FOR SIZE 6 ONLY WITH SLE DOUBLE OVERSIZE SHAFT = 35 mm
- 4) FOR PORT AND NEEDLE LOCATIONS, SEE OPTION PAGES.
- 5) ALL UNITS, EXCEPT PORT WITH PORT CONTROL ON SAME SIDE, COMPLY WITH DIN 3852 PART 2 PORT SPECIFICATIONS FOR SHORT STUD AND LARGE SEALING SURFACE.
- 6) DIMENSIONS ARE IN mm
- 7) NUMBERS ENCLOSED BY A CIRCLE INDICATE POSITION
- 8) FOR DOWEL HOLE LOCATIONS, SEE PAGE 90.
- 9) FOR OPTIONS BR, AR, GH, GI, GN AND GO, ADD BETWEEN DIMENSIONS O AND A, O AND KK, AND O AND MM.
- 10) FOR OPTIONS H47, DE, DR AND DB, ADD TO KK AND MM DIMENSIONS.

OPTION ADDERS (SEE NOTES 9 & 10)						
SIZE	BR	AR, GH, GI, GN, GO	H47	DE, DR	DB	
1	6	19	—	12.7	25.4	
2	6	19	40	—	—	
3	6	22	44	—	—	
4	6	22	48	—	—	
5	6	22	55	—	—	
6	6	25	70	—	—	

CAD & Sizing Assistance

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

All dimensions are reference only unless specifically tolerated.

CYLINDER OPTIONS: Series SK/SL Slides

DB

CUSHION CONTROL IN BOTH DIRECTIONS
(Standard location 1 & 5)

DE

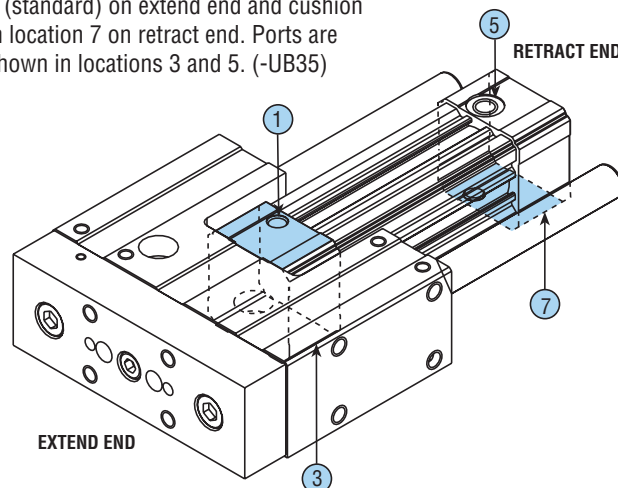
CUSHION CONTROL ON EXTEND ONLY
(Standard location 1, N/A on 3-position units)

DR

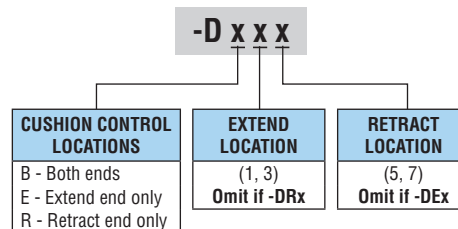
CUSHION CONTROL ON RETRACT ONLY
(Standard location 5, N/A on 3-position units)

PHD cushions are designed for smooth deceleration at the ends of cylinder stroke. When the cushion is activated, the remaining volume in the cylinder must exhaust past an adjustable needle valve which controls the amount of deceleration. The effective cushion length for each bore size is shown in the table below. To specify alternative cushion control locations on the head or cap, see the option code below right.

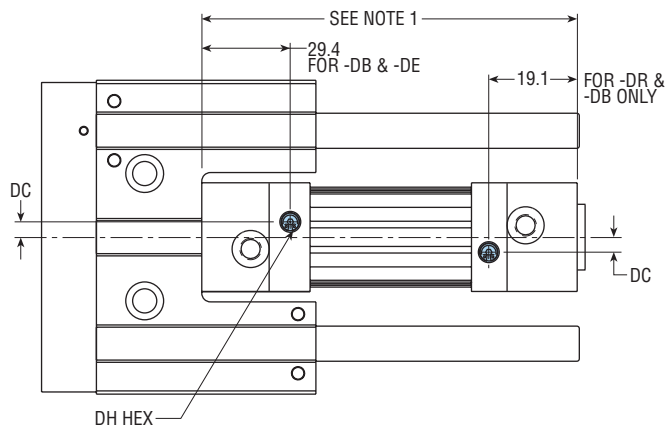
Unit shown is -DB17, cushion in location 1 (standard) on extend end and cushion in location 7 on retract end. Ports are shown in locations 3 and 5. (-UB35)



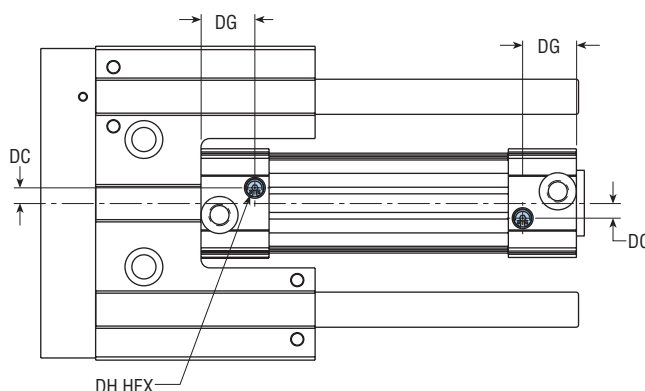
CUSHION CONTROL OPTIONS



SIZE 1



SIZES 2-6



LETTER DIMENSION	SIZE					
	1 mm	2 mm	3 mm	4 mm	5 mm	6 mm
DC	3.4	4.8	5.7	7.0	10.0	9.0
DG	—	14.8	14.2	24.5	27.5	26.5
DH	—	2.5	2.5	2.51	2.5	2.5
EFFECTIVE CUSHION LENGTH*	20	11.2	11.9	5.2	20.5	22.1

NOTES:

- 1) For -DE and -DR, add 12.7 mm to standard length. For -DB, add 25.4 to standard length on size 1 only.
- 2) *-AE and -AR options may decrease effective cushion length depending on position of stop collars.

All dimensions are reference only unless specifically tolerated.

CYLINDER OPTIONS: Series SK/SL Slides

FOR SIZES 2 - 6 (not available on size 1)

PB

PORT CONTROLS® ON BOTH ENDS
(Standard location 1 & 5)

PE

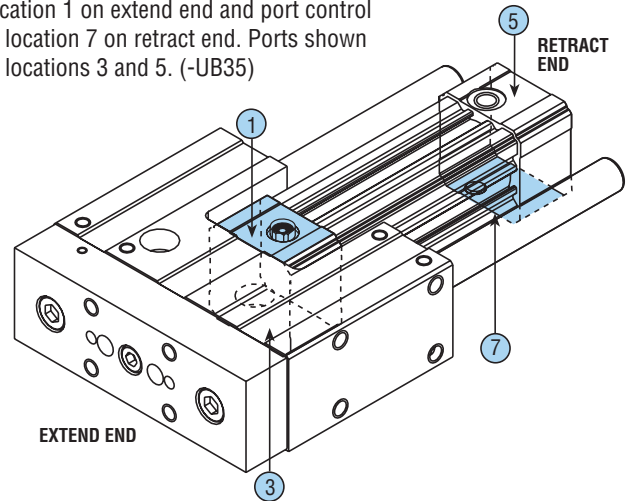
PORT CONTROLS® ON EXTEND ONLY
(Standard location 1, N/A on 3-position units)

PR

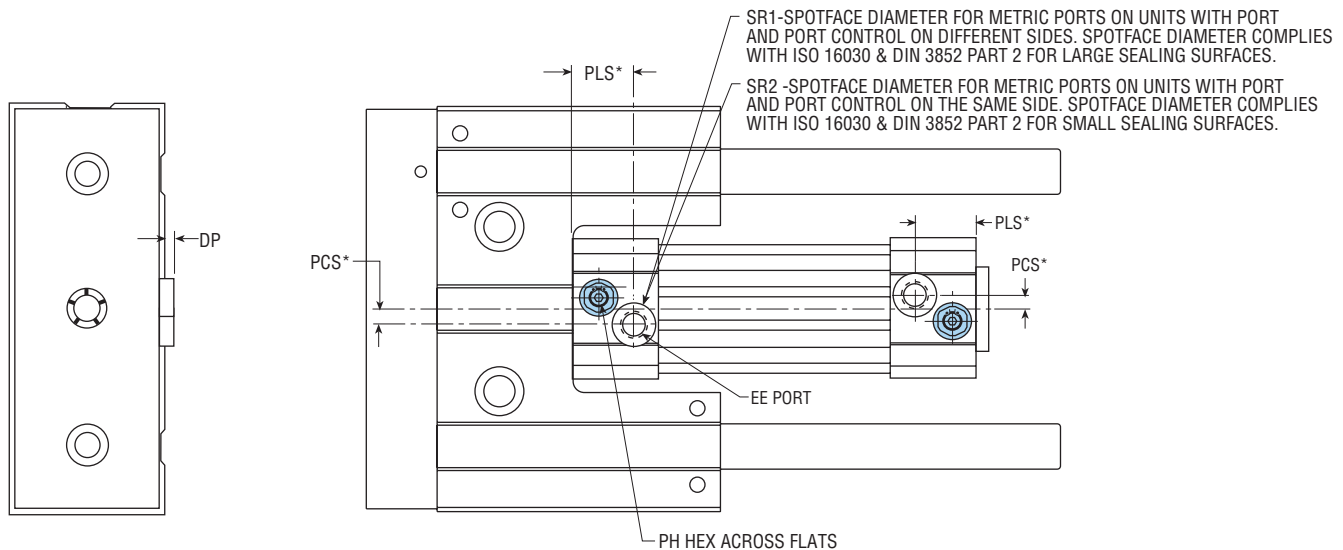
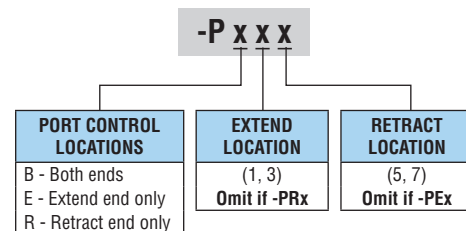
PORT CONTROLS® ON RETRACT ONLY
(Standard location 5, N/A on 3-position units)

PHD's Port Control® is a built-in flow control for regulating the speed of the slide through its entire stroke. The Port Control operates on the "meter-out" principle and features an adjustable needle in a cartridge with a check seal. The self-locking needle has micrometer threads and is adjustable under pressure. The needle determines the orifice size which controls the exhaust flow rate of the actuator. The check seal expands while air is exhausting from the actuator, forcing the air to exhaust past the adjustable needle. The check seal collapses to allow a free flow of incoming air. The PHD Port Control saves space and eliminates the cost of fittings and installation for external flow control valves. Refer to the option code to specify port control locations.

Unit shown is -PB17, port control in location 1 on extend end and port control in location 7 on retract end. Ports shown in locations 3 and 5. (-UB35)



PORT CONTROL OPTIONS



LETTER DIM	SIZE				
	2 mm	3 mm	4 mm	5 mm	6 mm
EE*	M5	M5	G 1/8	G 1/4	G 1/4
PCS*	7.0	7.0	5.0	6.0	6.0
PH	2.5	2.5	2.5	2.5	2.5
PLS*	14.5	14.5	22.0	23.5	23.0
SR1	16.5	16.5	19.0	25.0	25.0
SR2	9.0	9.0	16.5	19.0	19.0
DP	1.7	0.7	3.8	3.1	0.6

*Dimensions shown are for units with port and port control in the same location. For units with other port and port control combinations, standard port location dimensions apply. Ports may be located on either side of the slide centerline depending on port control and cushion option combinations.

All dimensions are reference only unless specifically toleranced.

FOR SIZE 1 ONLY

E

MAGNETIC PISTON FOR SERIES JC1 RADIAL SENSING SWITCHES

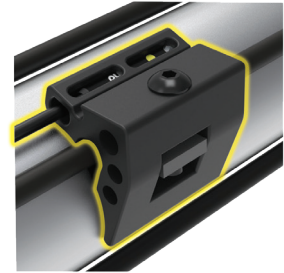
This option equips the cylinder with a magnetic band on the piston for use with PHD Series JC1 radial sensing switches.

M

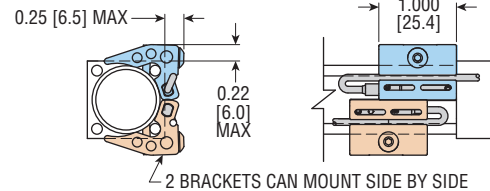
MAGNETIC PISTON FOR SERIES JC1 REED & TEACHABLE SWITCHES

This option equips the cylinder with a magnetic band on the piston for use with PHD Series JC1 reed and teachable switches.

Cylinder-mounted switches are an easy and convenient way of interfacing the slide to various programmable controllers or logic systems. **See the Switches section for specific switch information.**



SWITCH BRACKET 92100



SERIES JC1xDx MAGNETIC SWITCHES

PART NO.	DESCRIPTION
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 (M12)
JC1HDP-5	PNP (Source), Radial Sensing, 5 meter cable
JC1HDP-K	PNP (Source), Radial Sensing, Quick Connect
JC1HDN-5	NPN (Sink), Radial Sensing, 5 meter cable
JC1HDN-K	NPN (Sink), Radial Sensing, Quick Connect

NOTE: Switches must be ordered separately.

CORDSETS FOR SERIES JC1xDx SWITCHES

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.

SERIES JC1ST TWO POSITION TEACHABLE MAGNETIC SWITCHES

PART NO.	DESCRIPTION
JC1STP-2	PNP (Source), Solid State, 12-30 VDC, 2 meter cable
JC1STP-K	PNP (Source), Solid State, 12-30 VDC, Quick Connect

NOTE: Switches must be ordered separately.

CORDSET FOR SERIES JC1ST SWITCHES

PART NO.	DESCRIPTION
81284-1-001	M8, 4 pin, Straight Female Connector, 5 meter cable

NOTE: Cordsets are ordered separately.

FOR SIZES 2 - 6

M

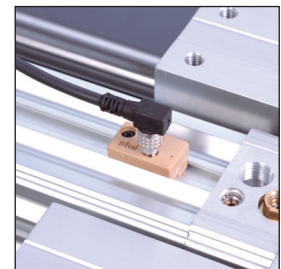
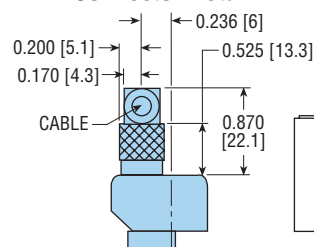
MAGNET FOR PHD SERIES 6250 REED AND SOLID STATE SWITCHES

This option equips the cylinder with a magnetic band on the piston for use with PHD Reed and Solid State Switches listed below. These switches mount easily to the cylinder using "T" slots in the body. **See the Switches section for complete switch information.**

PART NO.	DESCRIPTION	COLOR
62505-1-02	NPN (Sink) DC Solid State, 2 meter cable	Brown
62506-1-02	PNP (Source) DC Solid State, 2 meter cable	Tan
62515-1	NPN (Sink) DC Solid State, Quick Connect	Brown
62516-1	PNP (Source) DC Solid State, Quick Connect	Tan

PART NO.	DESCRIPTION	COLOR
62507-1-02	AC/DC Reed, 2 meter cable	Silver
62517-1	AC/DC Reed, Quick Connect	Silver

Connector Detail



LETTER DIM	SIZE				
	2 mm	3 mm	4 mm	5 mm	6 mm
B	0.236 [6.0]	0.236 [6.0]	0.236 [6.0]	0.276 [7.0]	0.197 [5.0]
D	0.228 [5.8]	0.228 [5.8]	0.228 [5.8]	0.228 [5.8]	0.228 [5.8]
F	0.374 [9.5]	0.374 [9.5]	0.374 [9.5]	0.374 [9.5]	0.374 [9.5]

Numbers in [] are for metric units and are in mm.

All dimensions are reference only unless specifically tolerated.

FOR SIZES 2 - 6 (not available on size 1)

H47 RODLOK SLIDE AND RODLOK

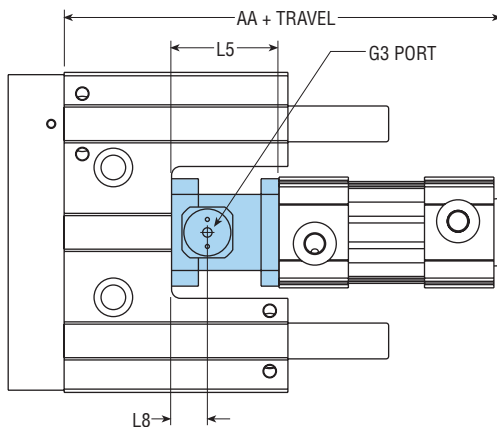
PHD's Rodlok is ideal for locking the tool plate while in a static/stationary position. When the pressure is removed from the port of the Rodlok, the mechanism will grip the piston rod of the cylinder and prevent it from moving. The loads are held indefinitely without power. Rodlok performance is application and environment sensitive (Cleanliness of rod or Rodlok will also affect performance). THE RODLOK IS NOT DESIGNED TO BE USED AS A PERSONAL SAFETY DEVICE.

SIZE	STATIC LOCKING FORCE* (N)
2	350
3	400
4	600
5	1000
6	1500

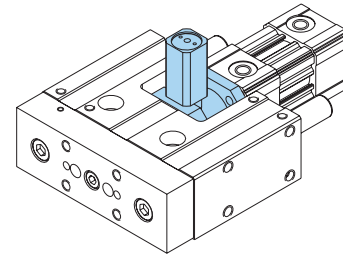
NOTE: *Locking force indicated above is the actual locking force with a dry, clean rod and does not include any safety factor.

OPERATING PRESSURE

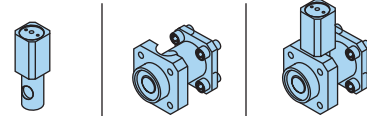
The operating pressure for the locking device is different than the operating pressure for the slide to which it is attached. The locking device of the Rodlok is designed with an operating pressure range of 4 bar minimum to 10 bar maximum. The Series SK/SL Slide with a Rodlok attached has an operating pressure range of 3 bar minimum to 10 bar maximum.



The Rodlok locking device and adaptor can be purchased separately as kits. See Rodlok Kits chart above. The locking device and adaptor are not available with a corrosion resistant (-Z1 option) finish.



RODLOK KITS



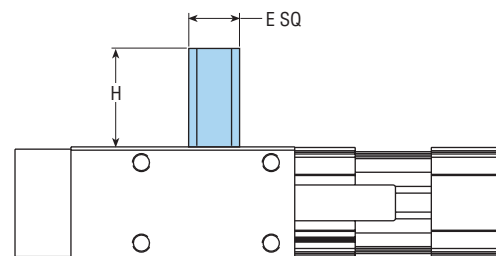
SIZE	LOCKING DEVICE KIT	ADAPTOR KIT*	COMPLETE RODLOK*
2	63459-07-1	63460-07-1	63461-07-1
3	63459-08-1	63460-08-1	63461-08-1
4	63459-01-1	63460-01-1	63461-01-1
5	63459-02-1	63460-02-1	63461-02-1
6	63459-03-1	63460-03-1	63461-03-1

NOTES:

- *Kits ship with cylinder mounting hardware
- Part numbers listed above are intended for replacement purposes only and are to be used specifically on slides with the -H47 option.

SIZE	DEVICE WEIGHT		ADAPTOR WEIGHT		TOTAL WEIGHT	
	lb	kg	lb	kg	lb	kg
2	0.14	0.06	0.14	0.06	0.31	0.14
3	0.14	0.06	0.16	0.07	0.36	0.16
4	0.20	0.09	0.28	0.13	0.57	0.26
5	0.30	0.14	0.44	0.20	0.93	0.42
6	0.54	0.24	0.84	0.38	1.76	0.80

NOTE: Total weight includes rod adder for -H67/-H47 cylinder.



LETTER DIM	SIZE				
	2 mm	3 mm	4 mm	5 mm	6 mm
H	35.5	35.5	40.7	40.0	48
E	20.5	20.5	25.0	27.5	32.5
G3	M5	M5	G 1/8	G 1/8	G 1/8
L5	40	44	48	55	70
L8	11	13	16	19.5	21
AA	156	169	196	221	248

All dimensions are reference only unless specifically tolerated.

CYLINDER OPTIONS: Series SK/SL Slides

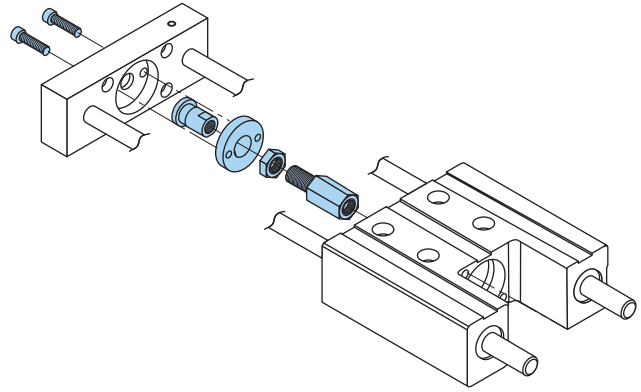
H11

SLIDE ONLY (WITHOUT CYLINDER)
SIZES 84, 85, AND 86
 for VDMA/ISO cylinders 32, 40, 50 mm bores

H12

SLIDE ONLY (WITHOUT CYLINDER)
SIZES 81, 82, AND 83
 for ISO 6432 cylinders 16, 20, 25 mm bores

These options provide the slide mechanism only without a cylinder. Included with options -H11 and -H12 is all the hardware required for mounting standard ISO cylinders to the slide. A self-aligning rod coupling and rod length adapter are also provided, making it easy to attach the appropriate ISO cylinder. (No extra rod extension required.)



L9

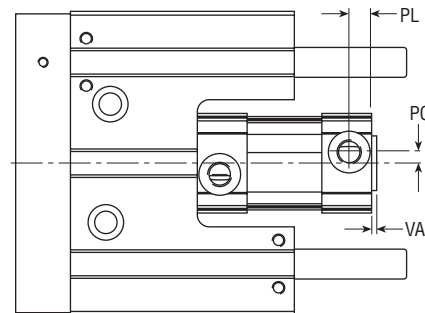
NPT PORTS

This option provides NPT ports on metric units instead of the standard BSPP ports. The NPT ports are located in the same location as the BSPP ports.

SIZE	OPTIONAL NPT PORT	STANDARD BSPP PORT
1	1/8	G 1/8
2	1/8*	G 1/8*
3	1/8*	G 1/8*
4	1/8	G 1/8
5	1/4	G 1/4
6	1/4	G 1/4

*When port controls are specified on the same face as ports, the standard metric port is M5 and the -L9 option provides a 10-32 port.

STANDARD PORT LOCATIONS



SIZE	PC	PL	VA
2	4.2	9.0	2
3	4.5	9.0	2
4	5.0	16.0	4
5	6.0	18.5	4
6	6.0	18.5	4

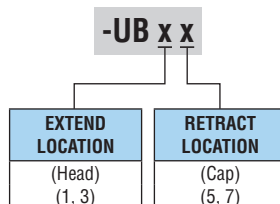
For size 1, ports are on centerline of cylinder.

UB

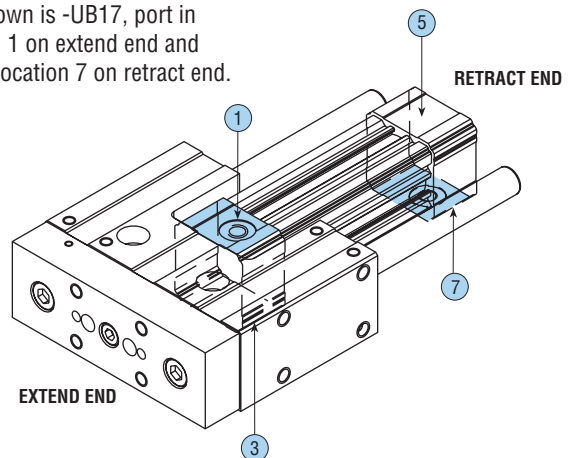
ALTERNATE PORT LOCATION (N/A on 3-position units)

With this option, alternate port locations can be specified, providing increased flexibility and user convenience. See option code below to specify port locations.

PORT LOCATION OPTIONS



Unit shown is -UB17, port in location 1 on extend end and port in location 7 on retract end.



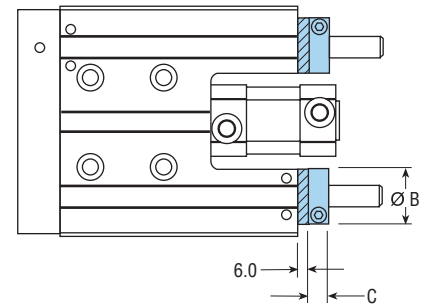
All dimensions are reference only unless specifically tolerated.

AE

TRAVEL ADJUSTMENT AND SHOCK PADS ON EXTENSION

Two travel adjustment stop collars with polyurethane shock pads are used for adjustment of slide extension. The travel adjustment stop collars allow precise adjustment while the shock pads eliminate metal-to-metal contact, thereby reducing noise.

SIZE	LETTER DIMENSION						
	Ø B			C			
	SxB, SxC	SxD	SxE	SxB, SxC	SxD	SxE	
1	22.0	25.0	—	9.0	10.0	—	
2	25.0	28.0	—	10.0	11.0	—	
3	28.0	35.0	—	11.0	13.0	—	
4	35.0	42.0	—	13.0	15.0	—	
5	42.0	48.0	—	15.0	15.0	—	
6	48.0	54.0	63.0	15.0	15.0	19.0	

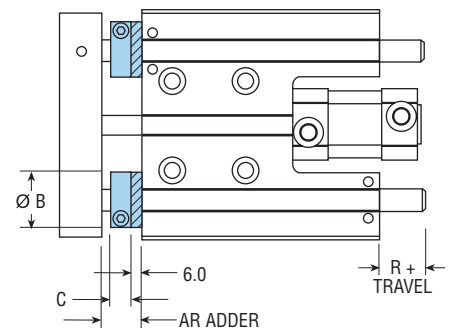


AR

TRAVEL ADJUSTMENT AND SHOCK PADS ON RETRACTION

This option provides two travel adjustment collars with polyurethane shock pads for retraction only. The travel adjustment stop collars allow precise adjustment while the shock pads eliminate metal-to-metal contact.

SIZE	LETTER DIMENSION											
	Ø B			C			AR ADDER			R		
	SxB, SxC	SxD	SxE	SxB, SxC	SxD	SxE	SxB, SxC	SxD	SxE	SxB, SxC	SxD	SxE
1	22.0	25.0	—	9.0	10.0	—	19.0	19.0	—	20.0	20.0	—
2	25.0	28.0	—	10.0	11.0	—	19.0	19.0	—	20.0	20.0	—
3	28.0	35.0	—	11.0	13.0	—	22.0	22.0	—	23.0	23.0	—
4	35.0	42.0	—	13.0	15.0	—	22.0	22.0	—	23.0	23.0	—
5	42.0	48.0	—	15.0	15.0	—	22.0	22.0	—	23.0	23.0	—
6	48.0	54.0	63.0	15.0	15.0	19.0	25.0	25.0	25.0	26.0	26.0	26.0

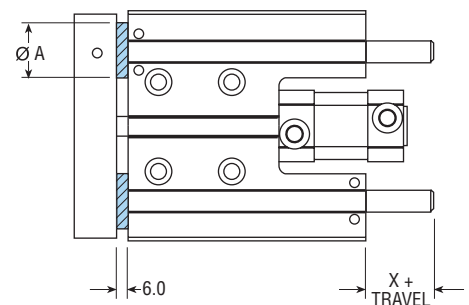


BR

SHOCK PADS ON RETRACTION

This option provides polyurethane shock pads on retraction only, eliminating metal-to-metal contact as the tool plate reaches the slide body. This option greatly reduces noise and shock upon slide retraction. Not available with tool plate extension.

SIZE	LETTER DIMENSION			
	Ø A			X
	SxB, SxC	SxD	SxE	
1	22.0	22.0	—	33.0
2	22.0	28.5	—	33.0
3	28.5	35.0	—	39.0
4	35.0	41.0	—	39.0
5	41.0	47.5	—	39.0
6	47.5	51.0	51.0	45.0



All dimensions are reference only unless specifically tolerated.

BS

SHOCK PADS ON EXTENSION

The -BS option adds shock pads on extension to either the -GM or -GO shock absorber option. The shock pads are assembled between the shock stop (and stop collar) and the slide body. The purpose of this option is to complement the shock absorber by eliminating metal-to-metal contact at the end of slide extension. Shock pads do not affect length adders for shock absorber options.

BT

SHOCK PADS ON RETRACTION

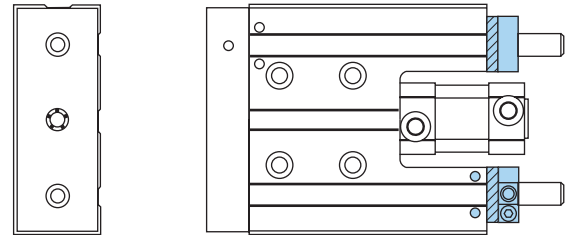
The -BT option adds shock pads on retraction to either the -GN or -GO shock absorber option. The shock pads are assembled between the shock stop (and stop collar) and the slide body. The purpose of this option is to complement the shock absorber by eliminating metal-to-metal contact at the end of slide retraction. Shock pads do not affect length adders for shock absorber options.

GG

TRAVEL ADJUSTMENT AND SHOCK PADS ON EXTENSION

This is the same as option -AE, but also includes provision for 8 mm proximity switch targets and brackets on both ends. Switches and bracket kits must be ordered separately. See page 91 for bracket/target kits and for 8 mm switch ordering information.

Not available with tool plate extension. With tool plate extension use -GH option.

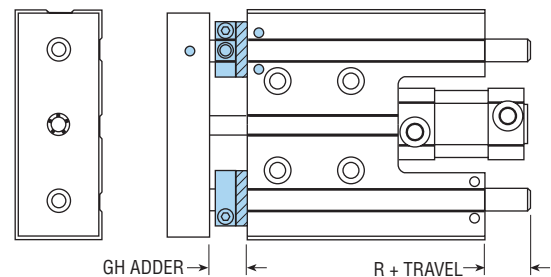


GH

TRAVEL ADJUSTMENT AND SHOCK PADS ON RETRACTION

This option provides both travel adjustment and provision for an 8 mm proximity switch in the retract direction only. Switches and bracket kits must be ordered separately. See page 91 for bracket/target kits and for 8 mm switch ordering information. Same as -AR option with switch brackets and target.

SIZE	GH	R
1	19.0	20.0
2	19.0	20.0
3	22.0	23.0
4	22.0	23.0
5	22.0	23.0
6	25.0	26.0

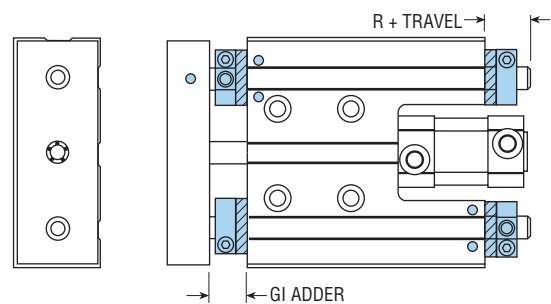


GI

TRAVEL ADJUSTMENTS, SHOCK PADS ON BOTH ENDS

This option provides the ultimate in adjustability, noise absorption, and proximity switch capability in both extension and retraction. Switches and bracket kits must be ordered separately. See page 91 for bracket/target kits and for 8 mm switch ordering information.

SIZE	GI	R
1	19.0	20.0
2	19.0	20.0
3	22.0	23.0
4	22.0	23.0
5	22.0	23.0
6	25.0	26.0



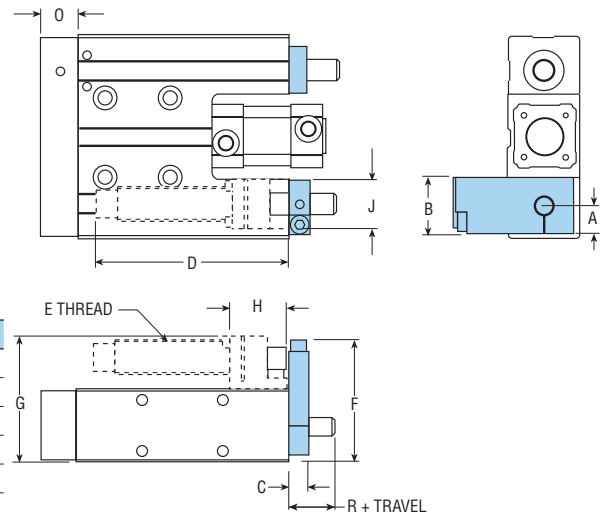
All dimensions are reference only unless specifically tolerated.

GM

SHOCK ABSORBER READY ON EXTENSION

This option provides for mounting a bracket for a shock absorber in the extension direction. This includes mounting holes in the slide body, a shock absorber stop on one shaft, and a stop collar on the other shaft. The shock absorber and shock mounting kit must be ordered separately. This arrangement allows the shock absorber to double as a travel adjustment in the extension direction. See page 92 for shock kit and shock absorber ordering information.

SIZE	A	B	C	D	E THREAD	F	G	H	J	O	R
1	13	22.3	12.35	95	M14 x 1.5	55.25	56.5	27.9	23.5	23.5	20.00
2	14.5	28.5	12.35	115	M20 x 1.5	71.25	71.7	30	27.1	24	20.00
3	18	32	12.35	115	M20 x 1.5	76	77	32	30	22	23.00
4	22.1	39	12.35	148	M25 x 1.5	92.9	94	44.5	40.5	25	23.00
5	27	51	16	148	M25 x 1.5	104.5	105.5	44.5	43.5	30	23.00
6	34	63.5	19	164.5	M25 x 1.5	121.5	123.8	76.5	54.6	35	26.00

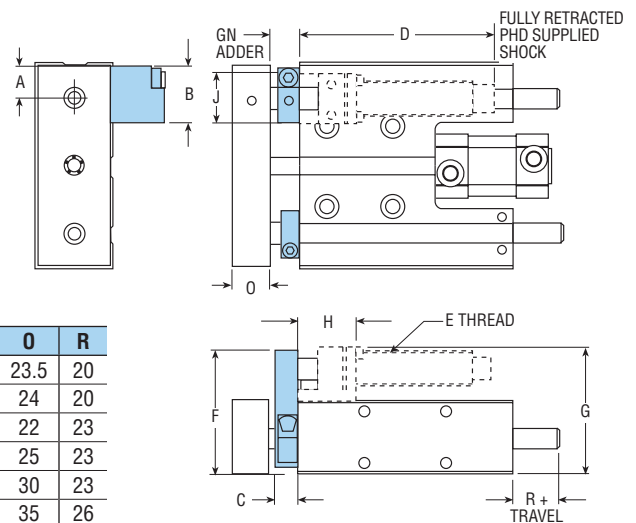


GN

SHOCK ABSORBER READY ON RETRACTION

This option provides for mounting a bracket for a shock absorber in the retraction direction. This includes mounting holes in the slide body, a shock absorber stop on one shaft, and a stop collar on the other shaft. The shock absorber and shock mounting kit must be ordered separately. This arrangement allows the shock absorber to double as a travel adjustment in the retraction direction. See page 92 for shock kit and shock absorber ordering information.

SIZE	A	B	C	D	E THREAD	F	G	GN	H	J	O	R
1	13	22.3	12.35	95	M14 x 1.5	55.25	56.5	19	27.9	23.5	23.5	20
2	14.5	28.5	12.35	115	M20 x 1.5	71.25	71.7	19	30	27.1	24	20
3	18	32	12.35	115	M20 x 1.5	76	77	22	32	30	22	23
4	22.1	39	12.35	148	M25 x 1.5	92.9	94	22	44.5	40.5	25	23
5	27	51	16	148	M25 x 1.5	104.5	105.5	22	44.5	43.5	30	23
6	34	63.5	19	164.5	M25 x 1.5	121.5	123.8	25	76.5	54.6	35	26

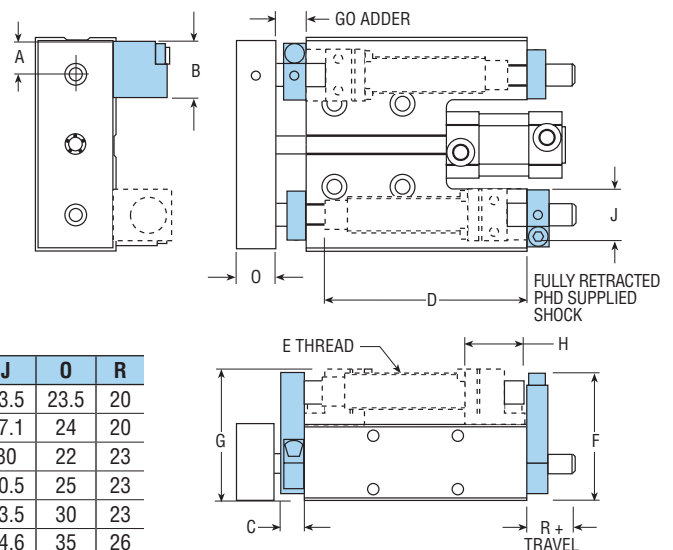


GO

SHOCK ABSORBER READY ON EXTENSION AND RETRACTION

This option provides for mounting brackets for shock absorbers in both the extension and retraction directions. This includes two sets of mounting holes in the slide body, shock absorber stops mounted on the shafts in each direction, and stop collars mounted on the opposite shafts. The shock absorbers and shock mounting kits must be ordered separately. This arrangement allows the shock absorbers to double as travel adjustments in both directions. See page 92 for shock kit and shock absorber ordering information.

SIZE	A	B	C	D	E THREAD	F	G	GO	H	J	O	R
1	13	22.3	12.35	95	M14 x 1.5	55.25	56.5	19	27.9	23.5	23.5	20
2	14.5	28.5	12.35	115	M20 x 1.5	71.25	71.7	19	30	27.1	24	20
3	18	32	12.35	115	M20 x 1.5	76	77	22	32	30	22	23
4	22.1	39	12.35	148	M25 x 1.5	92.9	94	22	44.5	40.5	25	23
5	27	51	16	148	M25 x 1.5	104.5	105.5	22	44.5	43.5	30	23
6	34	63.5	19	164.5	M25 x 1.5	121.5	123.8	25	76.5	54.6	35	26



All dimensions are reference only unless specifically tolerated.

J3

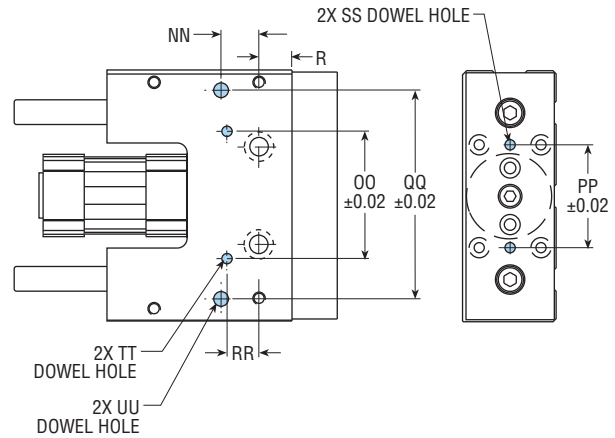
TRANSITIONAL FIT DOWEL PIN HOLES

This option provides a compromise fit between clearance and interference. Transitional fits are used where accuracy of location is important, but a small amount of clearance or interference is permissible.

J8

PRECISION FIT DOWEL HOLES

This option provides an H7 tolerance precision fit with dowel pins. Precision fits are used where accuracy of location is of prime importance, and for parts requiring rigidity and alignment.



SIZE	R	NN	OO	PP	QQ	RR	SS	TT	UU
1	20	17.25	49	39	66	11.5	Ø 5 x 6 mm DP	Ø 5 x 4 mm DP	Ø 5 x 4 mm DP
2	23	17.5	50	49	76.5	15	Ø 5 x 8 mm DP	Ø 5 x 6 mm DP	Ø 8 x 5 mm DP
3	16	19.5	64	50	100.5	16	Ø 5 x 12 mm DP	Ø 6 x 8 mm DP	Ø 8 x 8 mm DP
4	22	18	75	64	114	18	Ø 6 x 10 mm DP	Ø 8 x 8 mm DP	Ø 8 x 8 mm DP
5	22.5	20.25	90	75	139.5	22.5	Ø 8 x 10 mm DP	Ø 10 x 10 mm DP	Ø 8 x 8 mm DP
6	25.5	38	—	90	197	—	Ø 10 x 12 mm DP	—	Ø 10 x 12 mm DP

NOTE: Dowel holes are centered on centerline of slide and located to the nominal values shown ± 0.35 unless otherwise specified.

Ø HOLE	STANDARD TOLERANCE	J3 OPTION TOLERANCE	J8 OPTION TOLERANCE
5 mm	+0.015/-0.010	+0.038/+0.013	+0.013/-0.000
6 mm	+0.015/-0.010	+0.038/+0.013	+0.013/-0.000
8 mm	+0.018/-0.008	+0.041/+0.015	+0.015/-0.000
10 mm	+0.018/-0.008	+0.041/+0.015	+0.015/-0.000

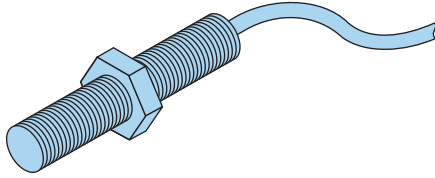
Q1

CORROSION RESISTANT GUIDE SHAFTS

Extremely hard corrosion resistant coating on the guide shafts for use in applications where moisture may corrode untreated hardened and ground shafts. End faces of the shafts remain uncoated. Consult PHD for totally coated shafts.

INDUCTIVE PROXIMITY SWITCHES

See **Switches and Sensors** section for complete switch specifications. Two models of inductive proximity switches are available for use with PHD Models SK and SL Slides (-GG, -GH, -GI options). **12 mm proximity switches are customer supplied.**



PROXIMITY SWITCHES

PART NO.	DESCRIPTION
51422-005-02	8 mm Inductive Proximity Switch NPN (Sink), 10-30 VDC, 2 m cable
51422-006-02	8 mm Inductive Proximity Switch PNP (Source), 10-30 VDC, 2 m cable

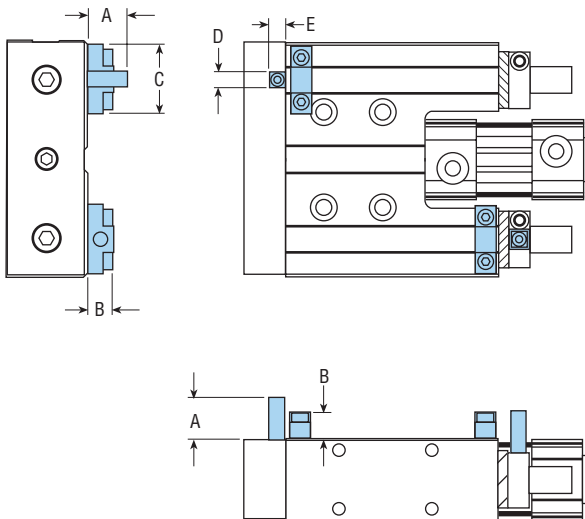
PROXIMITY SWITCH BRACKET AND TARGET KITS

Each kit contains a bracket, target, and hardware for mounting one 8 mm or 12 mm threaded proximity switch on an SK or SL Slide. Switches must be ordered separately. See the Switches section for detailed switch information.

12 mm proximity switches are customer supplied.

SIZE	KIT NUMBERS			
	STANDARD PLATING		Z1 PLATING	
	8 mm	12 mm	8 mm	12 mm
1	56848-05	—	58243-05	—
2	56848-06	65561-02-1	58243-06	65561-02-2
3	56848-01	65561-02-1	58243-01	65561-02-2
4	56848-02	65561-03-1	58243-02	65561-03-2
5	56848-03	65561-03-1	58243-03	65561-03-2
6	56848-04	65561-04-1	58243-04	65561-04-2

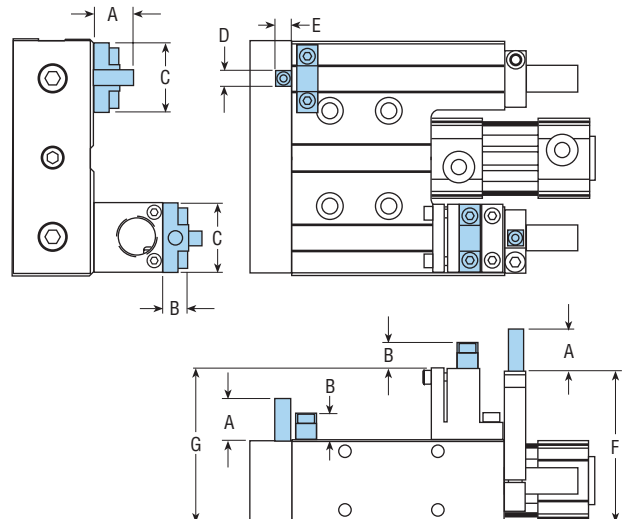
Kit contains all components for one direction only.



UNIT IS SHOWN WITH -GG OPTION AND
2 PROXIMITY SWITCH MOUNTING AND TARGET KITS

8 mm PROXIMITY SWITCH

SIZE	A	B	C	D	E	F	G
1	15	20	25.5	8	8	55.25	56.5
2	18	16	28.5	8	8	71.25	71.7
3	20.5	16	28.5	9.5	9.5	77	77
4	25.5	16	42	9.5	9.5	92.9	94
5	25.5	16	42	9.5	9.5	104.5	105.5
6	27.5	16.5	51	9.5	9.5	121.5	123.8



UNIT IS SHOWN WITH -GM OPTION AND
2 PROXIMITY SWITCH MOUNTING AND TARGET KITS

12 mm PROXIMITY SWITCH

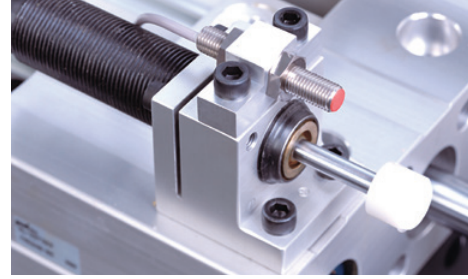
SIZE	A	B	C	D	E	F	G
1	—	—	—	—	—	—	—
2	38.1	31.8	28.5	12.7	8	71.25	71.7
3	38.1	31.8	28.5	12.7	8	77	77
4	25.4	22.5	38	12.7	9.5	92.9	94
5	25.4	22.5	38	12.7	9.5	104.5	105.5
6	28.6	22.5	51	12.7	9.5	121.5	123.8

All dimensions are reference only unless specifically tolerated.

SHOCK ABSORBERS

See individual shock ready options for shock absorber dimensions.

SIZE	PHD NO.
1	57056-01-1, -2, -3
2, 3	57056-02-1, -2, -3
4, 5	57056-03-1, -2, -3
6	57056-04-1, -2, -3

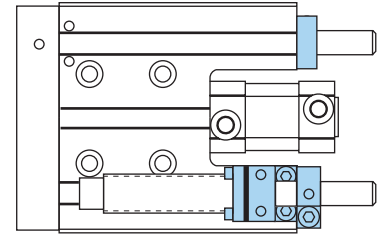


SHOCK ABSORBER MOUNTING KITS

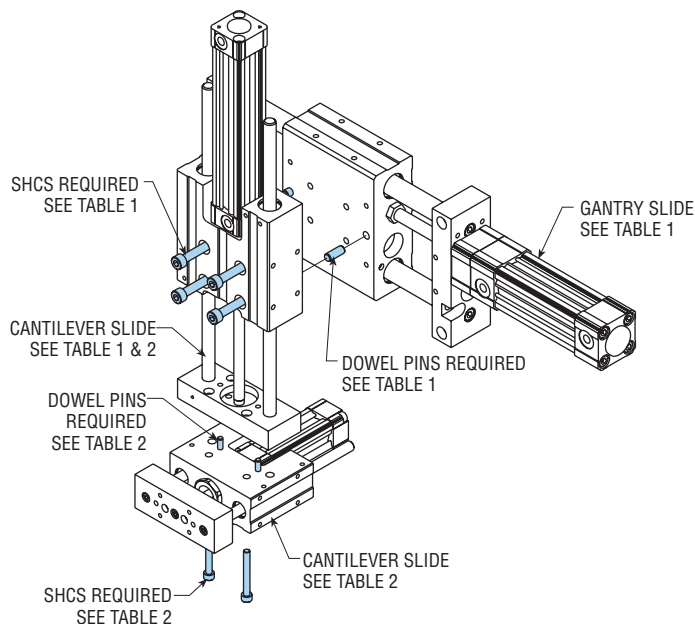
Each mounting kit contains one shock absorber mounting bracket with all necessary hardware for mounting one shock absorber in either direction. Slide unit must be ordered with the shock ready option -GM, -GN, or -GO. Shock absorbers must be ordered separately, see chart.

SIZE	KIT NUMBER
1	57034-04
2	57034-01
3	57034-01
4	57034-02
5	57034-02
6	57034-03

Kit contains all components for standard non-Z1 units for one direction only.



APPLICATION EXAMPLE: Series SK/SL Slides



Modular design of the SK/SL housing allows the unit to bolt and dowel directly to the saddle of the metric Series SG gantry slide without the need for a transition plate. See the chart below for slide compatibility and hardware required. Each kit includes 4 SHCS and 2 dowel pins.

TABLE 1:
SERIES SK/SL SLIDE TO SERIES SG SLIDE

MODULAR DESIGN		HARDWARE KITS	
CANTILEVER	GANTRY	STANDARD	-Z1 OPTION
SK/SLxx81	SGxx92	65578-01-1	65578-01-2
SK/SLxx82	SGxx93	65578-02-1	65578-02-2
SK/SLxx83	SGxx94	65578-03-1	65578-03-2
SK/SLxx84	SGxx95	65578-04-1	65578-04-2
SK/SLxx85	SGxx96	65578-05-1	65578-05-2

TABLE 2:
SERIES SK/SL SLIDE TO SERIES SK/SL SLIDE

MODULAR DESIGN		HARDWARE KITS	
CANTILEVER HOUSING	CANTILEVER TOOL PLATE	STANDARD	-Z1 OPTION
SK/SLxx81	SK/SLxx82	65547-01-1	65547-01-2
SK/SLxx82	SK/SLxx83	65547-02-1	65547-02-2
SK/SLxx83	SK/SLxx84	65547-03-1	65547-03-2
SK/SLxx84	SK/SLxx85	65547-04-1	65547-04-2
SK/SLxx85	SK/SLxx86	65547-05-1	65547-05-2

NOTE: Series SK/SL Slide tool plate may retract past edge of Series SG Slide saddle without tool plate extension or -AR options.