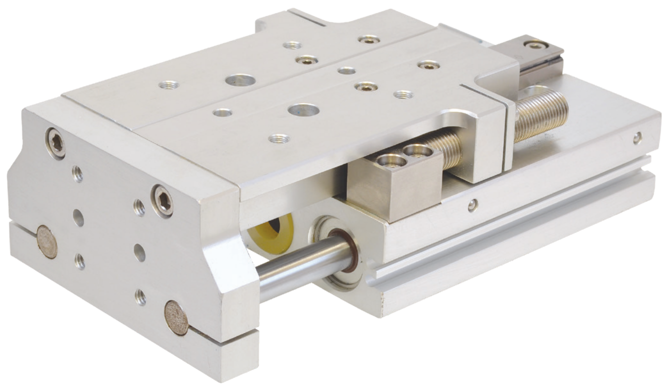
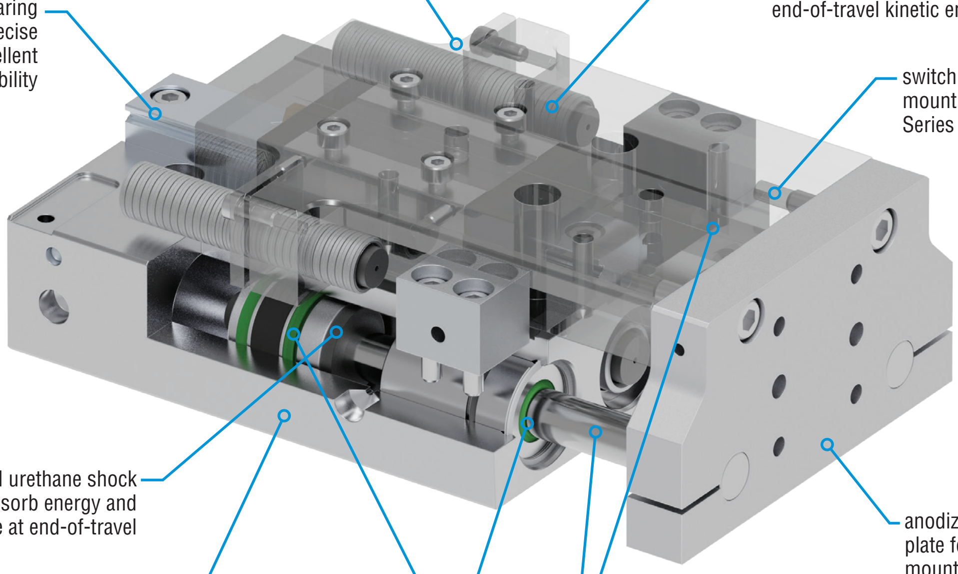
STP



Major Benefits

- Built for high speed, high accuracy, and high load applications
- Precision movement
- All adjustments made from rear of slide
- Travel adjustments stop load evenly, eliminating internal side loads for maximum life and position accuracy
- Five bore sizes with three travel lengths per bore size
- Direct mounting of same bore sizes without tool plates



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TO ORDER SPECIFY:
Product, Series, Bearing Type, Carriage Style, Design No., Size, Travel, Travel Adjustment, Shock Absorber Installed, and Options.

S T P D 5 25 x 50 - AR - NE1x - M-Q6

PRODUCT
S - Slide

SERIES
T - Compact Thruster

BEARING TYPE
P - Profile rail

CARRIAGE STYLE
D - Dual stop

DESIGN NO.
1 - Imperial
5 - Metric

BORE SIZE
08
12
16
20
25

BORE SIZE	TRAVEL IMPERIAL (in)	TRAVEL METRIC (mm)
08	1, 2, 3	25, 50, 75
12	1, 2-1/2, 4	25, 60, 100
16	1-1/2, 3, 5	38, 75, 125
20	2, 4, 6	50, 100, 150
25	2, 4, 6	50, 100, 150

TRAVEL ADJUSTMENT OPTION
AE1 - Travel adjustment and shock pad on extend, position 1
AE2 - Travel adjustment and shock pad on extend, position 2
AR - Travel adjustment and shock pad on retract

SHOCK ABSORBER INSTALLED OPTION
NE1x - Shock absorber installed on extend, position 1
NE2x - Shock absorber installed on extend, position 2
NRx - Shock absorber installed on retract

"x" indicates shock absorber dampening constant (2 or 3) which must be specified by the customer.

MISCELLANEOUS OPTIONS
J3 - Transitional fit dowel holes
J8 - Precision fit dowel holes
M - Magnet for use with PHD Series JC1 Switches
Q6 - Complete corrosion resistant guide shafts (see note 1)

NOTE:
1) Q6 not needed on size 08. Shafts are Q6 compatible as standard.

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

SHOCK ABSORBER REPLACEMENTS

BORE SIZE	PART NO.
08	68149-01-x
12	68149-01-x
16	68015-01-x
20	70861-01-x
25	67127-01-x

"x" indicates shock absorber dampening constant (2 or 3) which must be specified by the customer.

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.

CAD & Sizing Assistance

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

SPECIFICATIONS	SERIES STP
OPERATING PRESSURE	20 psi min to 150 psi max [1.4 bar min to 10 bar max] air
OPERATING TEMPERATURE	20° to 180°F [-6° to +82°C]
TRAVEL TOLERANCE	+0.098/-0.000 [+2.5/-0.0 mm]
REPEATABILITY	±0.001 of original position
VELOCITY	30 to 36 in/sec [0.75 m/sec] extend, 24 in/sec [0.61 m/sec] retract, (zero load at 87 psi [6 bar])
LUBRICATION	Factory lubricated for life
MAINTENANCE	Field repairable

SIZE	TRAVEL		SHAFT DIAMETER		BORE DIAMETER		EXTEND PISTON AREA		RETRACT PISTON AREA		BASE WEIGHT		TYPICAL DYNAMIC LOAD	
	in	mm	in	mm	in	mm	in^2	mm^2	in^2	mm^2	lb	kg	lb	N
08	1	25	0.157	4	0.315	8	0.16	101	0.12	75	0.55	0.25	0-2	0-9
	2	50									0.81	0.37		
	3	75									1.01	0.46		
12	1	25	0.236	6	0.472	12	0.35	229	0.27	172	1.12	0.51	2-4	8-18
	2-1/2	60									1.71	0.78		
	4	100									2.26	1.03		
16	1-1/2	38	0.315	8	0.630	16	0.62	402	0.47	302	2.10	0.95	4-8	18-36
	3	75									2.68	1.22		
	5	125									3.63	1.65		
20	2	50	0.394	10	0.787	20	0.97	628	0.73	470	3.62	1.64	8-16	36-71
	4	100									5.24	2.38		
	6	150									6.64	3.01		
25	2	50	0.472	12	0.984	25	1.52	982	1.17	756	5.46	2.48	16-32	71-142
	4	100									7.55	3.43		
	6	150									9.55	4.34		

NOTE: Thrust capacity, allowable mass, and dynamic moment capacity must be considered when selecting a slide. Refer to PHD's sizing software or pages 111 to 120 for complete sizing and selection information.

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 (Extend or Retract)	in^2	mm^2

SIZE	TRAVEL		OPTION ADDERS					
			-AR		-NRx		-AEx OR -NEx	
	in	mm	lb	kg	lb	kg	lb	N
08	1	25	0.03	0.014	0.11	0.05	0.06	0.03
	2	50	0.04	0.018	0.11	0.05		
	3	75	0.05	0.023	0.11	0.05		
12	1	25	0.10	0.05	0.09	0.04	0.09	0.04
	2-1/2	60	0.15	0.07	0.178	0.08		
	4	100	0.20	0.09	0.298	0.14		
16	1-1/2	38	0.22	0.10	0.19	0.09	0.13	0.06
	3	75	0.29	0.13	0.26	0.12		
	5	125	0.40	0.18	0.37	0.17		
20	2	50	0.65	0.30	0.32	0.15	0.27	0.12
	4	100	0.85	0.39	0.512	0.23		
	6	150	1.03	0.47	0.687	0.31		
25	2	50	0.57	0.26	0.42	0.19	0.29	0.13
	4	100	0.87	0.39	0.73	0.33		
	6	150	1.16	0.53	1.02	0.46		

Application & Sizing Assistance

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

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SLIDE SELECTION

There are three major factors to consider when selecting a slide: thrust capacity, allowable static and dynamic moment capacity, and table deflection (as either pitch, yaw, or roll).

1 THRUST CAPACITY

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

2 STATIC AND DYNAMIC MOMENT CAPACITY

The maximum static moments for all units are listed in the static moment chart below and must not be exceeded. The maximum allowable dynamic moment is equal to 1/10 the maximum static moment in consideration of the load inertia. Calculate static and dynamic moments of the system using the following equations and diagrams:

Mp (Pitch) = (Ah + CG) x LOAD or (Av + CG) x LOAD
My (Yaw) = (Ah + CG) x LOAD or CG x LOAD
Mr (Roll) = (Av + CG) x LOAD or CG x LOAD

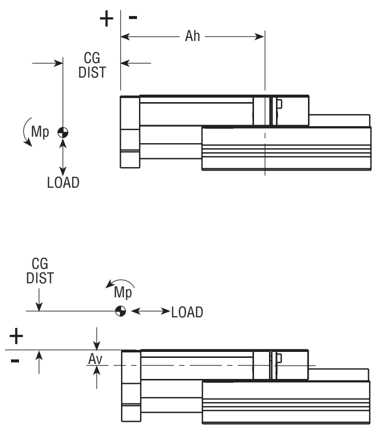
(continued on following pages)

STATIC MOMENT CHART

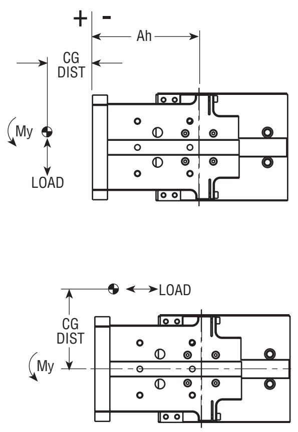
SIZE	TRAVEL		MAX PITCH MOMENT (Mp)		MAX YAW MOMENT (My)		MAX ROLL MOMENT (Mr)		MOMENT ARM Ah		MOMENT ARM Av	
	in	mm	in-lb	Nm	in-lb	Nm	in-lb	Nm	in	mm	in	mm
08	1	25	42.4	4.8	42.4	4.8	67	7.6	2.442	62.0	0.335	8.5
	2	50	168	19.0	141	15.9	76	8.6	3.830	97.3		
	3	75	227	25.6	190	21.5	76	8.6	4.914	124.8		
12	1	25	146	16.5	124	14.0	127	14.4	2.717	69.0	0.453	11.5
	2-1/2	60	351	39.7	298	33.7	181	20.5	4.557	115.7		
	4	100	474	53.6	403	45.5	181	20.5	6.308	160.2		
16	1-1/2	38	238	26.9	200	22.6	271	30.6	3.711	94.3	0.492	12.5
	3	75	488	55.1	410	46.3	271	30.6	5.049	128.2		
	5	125	664	75.0	558	63.0	271	30.6	7.292	185.2		
20	2	50	497	56.2	418	47.2	550	62.2	4.286	108.9	0.61	15.5
	4	100	1290	145.8	1084	122.5	733	82.9	6.721	170.7		
	6	150	1772	200.2	1488	168.1	733	82.9	9.034	229.5		
25	2	50	796	89.9	668	75.5	991	112	4.488	114.0	0.748	19.0
	4	100	1592	179.9	1338	151.2	991	112	6.811	173.0		
	6	150	2112	238.6	1774	200.4	991	112	9.194	233.5		

For more detail in determining table deflection, see following pages.

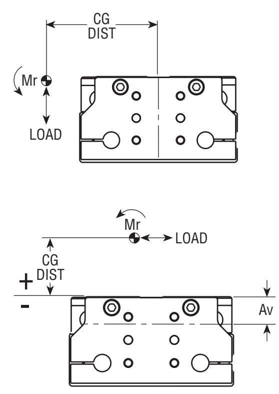
PITCH



YAW

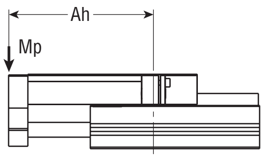


ROLL



3 STATIC DEFLECTIONS IN PITCH

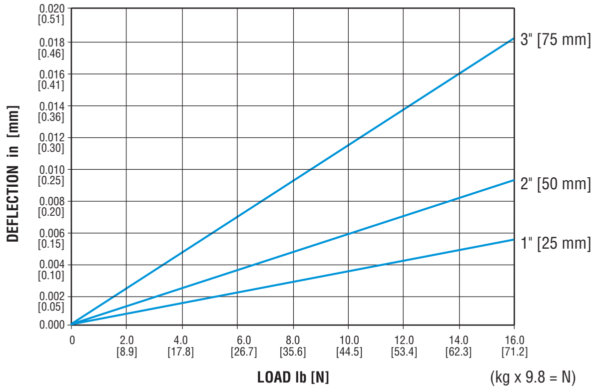
The graphs on this page show table pitch deflection due to static moment loads applied at distance Ah from bearing center while the unit is extended.



SIZE	TRAVEL		MOMENT ARM Ah	
	in	mm	in	mm
08	1	25	2.442	62.0
	2	50	3.830	97.3
	3	75	4.914	124.8
12	1	25	2.717	69.0
	2-1/2	60	4.557	115.7
	4	100	6.308	160.2
16	1-1/2	38	3.711	94.3
	3	75	5.049	128.2
	5	125	7.292	185.2
20	2	50	4.286	108.9
	4	100	6.721	170.7
	6	150	9.034	229.5
25	2	50	4.488	114.0
	4	100	6.811	173.0
	6	150	9.194	233.5

All tabulated and plotted values are typical and were determined empirically.

SIZE 08



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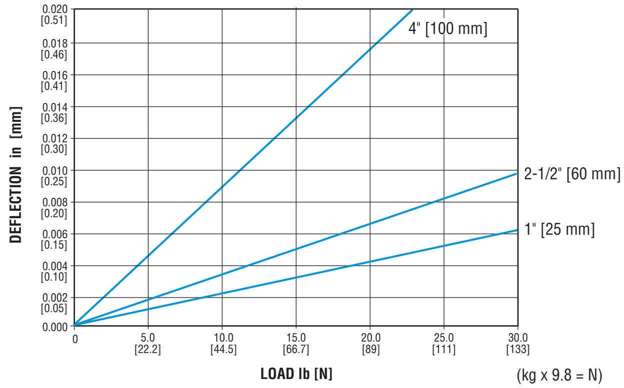

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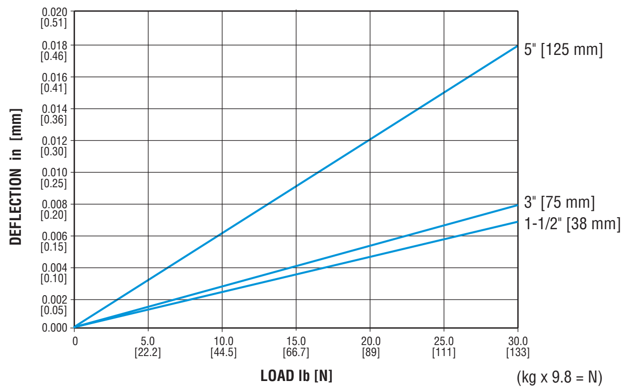

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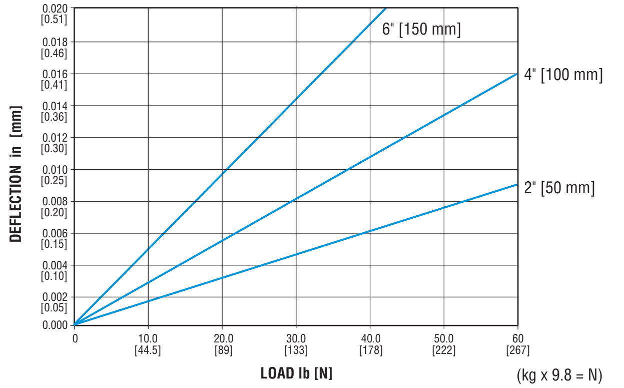

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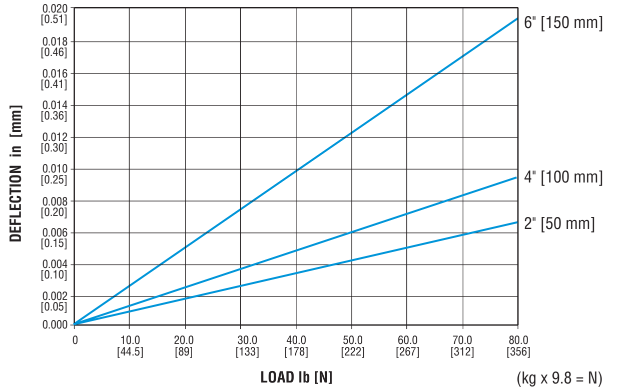

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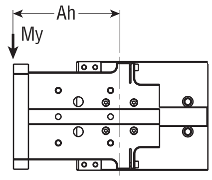
3 STATIC DEFLECTIONS IN YAW

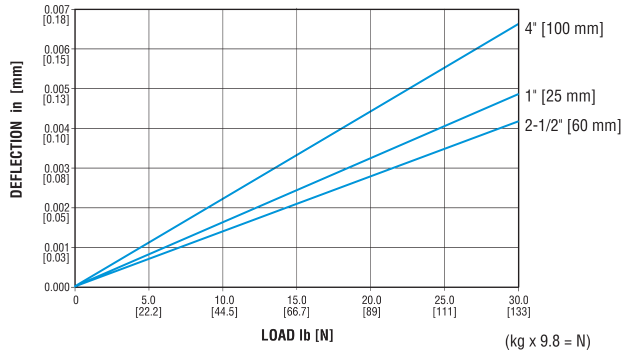
The graphs on this page show table yaw deflection due to static moment loads applied at distance Ah from bearing center with the unit extended.



SIZE	TRAVEL		MOMENT ARM Ah	
	in	mm	in	mm
08	1	25	2.442	62.0
	2	50	3.830	97.3
	3	75	4.914	124.8
12	1	25	2.717	69.0
	2-1/2	60	4.557	115.7
	4	100	6.308	160.2
16	1-1/2	38	3.711	94.3
	3	75	5.049	128.2
	5	125	7.292	185.2
20	2	50	4.286	108.9
	4	100	6.721	170.7
	6	150	9.034	229.5
25	2	50	4.488	114.0
	4	100	6.811	173.0
	6	150	9.194	233.5

All tabulated and plotted values are typical and were determined empirically.

SIZE 12



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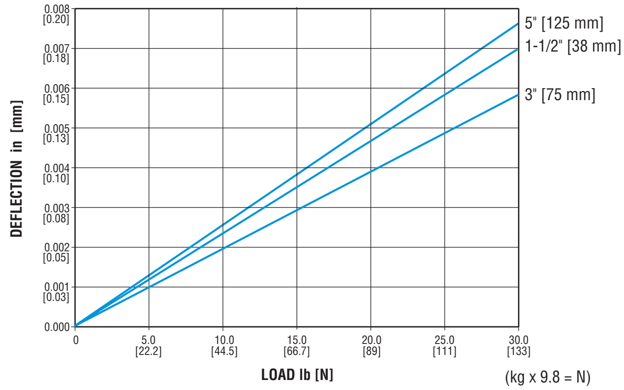

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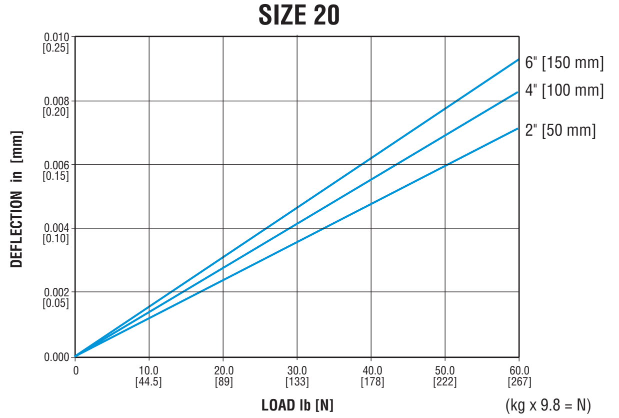

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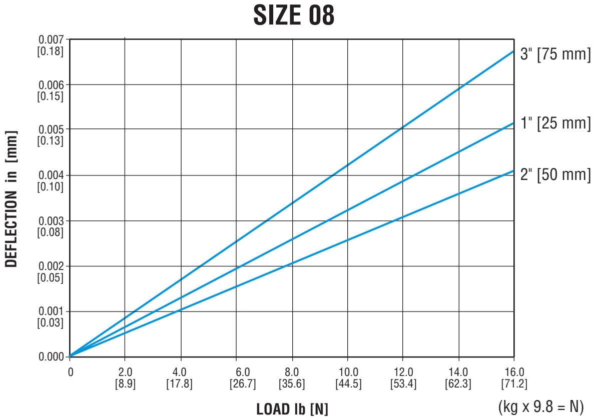

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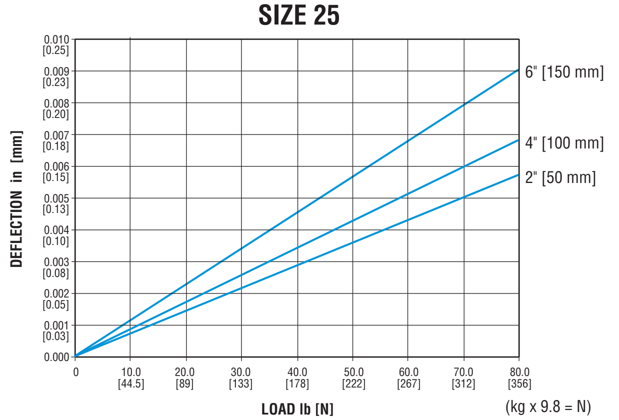
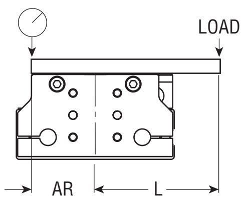


3 STATIC DEFLECTION IN ROLL

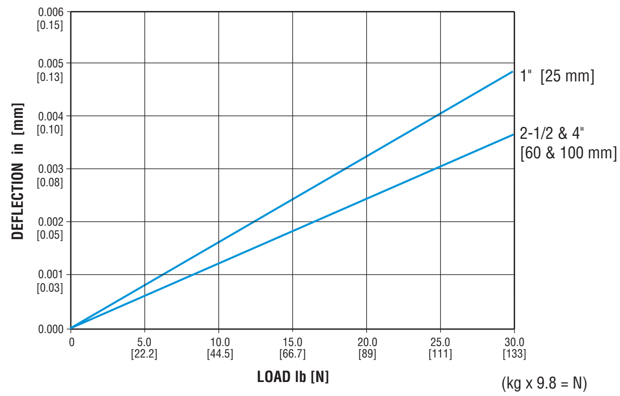
The graphs on this page show table roll deflection due to static moment loads applied at distance L from the center of the bearing. Values plotted in graphs were measured at point indicated.



SIZE	TRAVEL		DISTANCE L		DISTANCE AR	
	in	mm	in	mm	in	mm
08	1	25	2	51	0.827	21.0
	2	50				
	3	75				
12	1	25	2.5	64	1.042	26.5
	2-1/2	60				
	4	100				
16	1-1/2	38	3.5	89	1.418	36.0
	3	75				
	5	125				
20	2	50	4.5	114	1.515	38.5
	4	100				
	6	150				
25	2	50	6	152	1.811	46.0
	4	100				
	6	150				

All tabulated and plotted values are typical and were determined empirically.

SIZE 12



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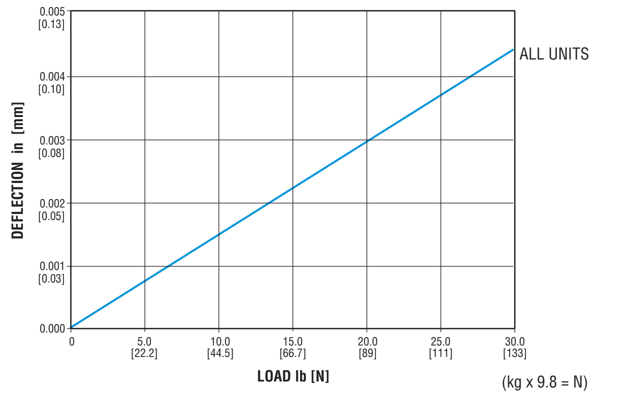

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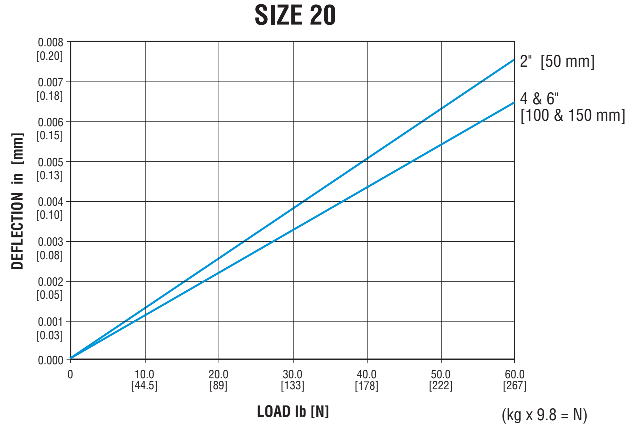

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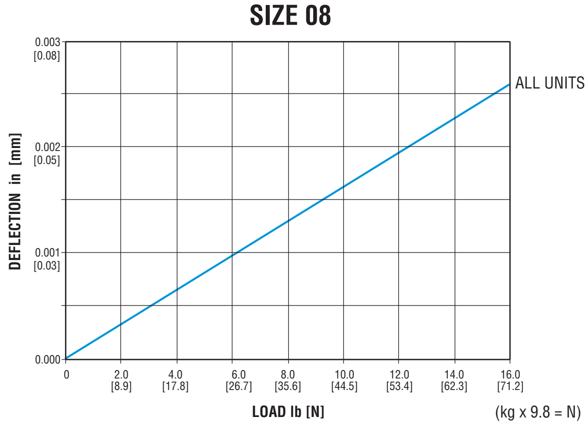

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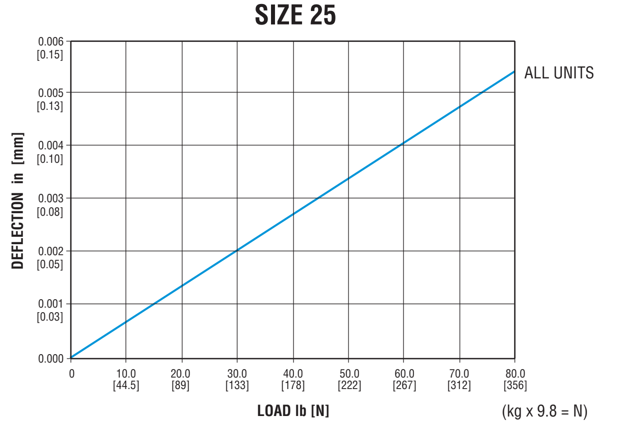

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SIZING EXAMPLE: PITCH

IMPERIAL EXAMPLE:
Determine the pitch deflection of a STPD125 x 6 slide at the center of gravity (CG) of a 10 lb load weight attached to the tool plate. The CG of the load is 2" further from the tool plate.

Calculate the moment of the application and the equivalent load at distance Ah.

Mp = Load x (Ah distance + CG distance)
= 10 x (9.194 + 2) = 112 in-lb
Equivalent load = (Mp / Ah) = 112 / 9.194 = 12 lb
Read the graph for a 12 lb load, deflection is approximately 0.003".
Deflection Ratio = Deflection at tool plate / Ah distance
= 0.003 / 9.194 = 3.26×10^{-4}
Deflection at load = Deflection Ratio x (Ah + CG)
= 3.26×10^{-4} x (9.194 + 2) = 0.0037"

METRIC EXAMPLE:
Determine the pitch deflection of a STPD525 x 150 slide at the center of gravity (CG) of a 45 N load weight attached to the tool plate. The CG of the load is 50 mm further from the tool plate.

Calculate the moment of the application and the equivalent load at distance Ah.

Mp = Load x (Ah distance + CG distance) / 1000
= 45 x (233.5 + 50) / 1000 = 12.76 Nm
Equivalent load = (Mp / Ah) x 1000 = 12.76 / 233.5 x 1000 = 55 N
Read the graph for a 55 N load, deflection is approximately 0.08 mm.
Deflection Ratio = Deflection at tool plate / Ah distance
= 0.08 / 233.5 = 3.4×10^{-4}
Deflection at load = Deflection Ratio x (Ah + CG)
= 3.4×10^{-4} x (233.5 + 50) = 0.096 mm

SIZING EXAMPLE: YAW

IMPERIAL EXAMPLE:
Determine the yaw deflection of a STPD125 x 6 slide at the center of gravity (CG) of a 10 lb load weight attached to the tool plate. The CG of the load is 2" further from the tool plate.

Calculate the moment of the application and the equivalent load at distance Ah.

Mp = Load x (Ah distance + CG distance)
= 10 x (9.194 + 2) = 112 in-lb
Equivalent load = (My / Ah) = 112 / 9.194 = 12 lb
Read the graph for a 12 lb load, deflection is approximately 0.0015".
Deflection Ratio = Deflection at tool plate / Ah distance
= 0.0015 / 9.194 = 1.63×10^{-4}
Deflection at load = Deflection Ratio x (Ah + CG)
= 1.63×10^{-4} x (9.194 + 2) = 0.0018"

METRIC EXAMPLE:
Determine the yaw deflection of a STPD525 x 150 slide at the center of gravity (CG) of a 45 N load weight attached to the tool plate. The CG of the load is 50 mm further from the tool plate.

Calculate the moment of the application and the equivalent load at distance Ah.

My = Load x (Ah distance + CG distance) / 1000
= 45 x (233.5 + 50) / 1000 = 12.76 Nm
Equivalent load = (My / Ah) x 1000 = 12.76 / 233.5 x 1000 = 55 N
Read the graph for a 55 N load, deflection is approximately 0.04 mm.
Deflection Ratio = Deflection at tool plate / Ah distance
= 0.04 / 233.5 = 1.71×10^{-4}
Deflection at load = Deflection Ratio x (Ah + CG)
= 1.71×10^{-4} x (233.5 + 50) = 0.048 mm

SIZING EXAMPLE: ROLL

IMPERIAL EXAMPLE:
Determine the roll deflection of a STPD125 x 6 slide at the center of gravity (CG) of a 10 lb load weight at 4" from the center of the slide.

Calculate the moment of the application and the equivalent load at distance L.

Mr = Load x Distance to CG of load
= 10 x 4 = 40 in-lb
Equivalent load at L = Mr / L = 40 / 6 = 6.66 lb
Read the graph for a 6.7 lb load, deflection is approximately 0.0005". (This is at AR distance of 1.811)
Deflection Ratio = Deflection at AR / AR distance
= 0.0005/1.811= 2.76×10^{-4}
Deflection at load = Deflection Ratio x (CG distance)
= 2.76×10^{-4} x 4 = 0.0011"

METRIC EXAMPLE:
Determine the roll deflection of a STPD525 x 150 slide at the center of gravity (CG) of a 45 N load weight at 102 mm from center of the slide.

Calculate the moment of the application and the equivalent load at distance L.

Mr = Load x Distance to CG of load / 1000
= 45 x 102 / 1000 = 4.59 Nm
Equivalent load at L = (Mr / L) x 1000 = (4.59 / 152) x 1000 = 30.2 N
Read the graph for a 30.2 N load, deflection is approximately 0.013 mm. (This is at AR distance of 46 mm.)
Deflection Ratio = Deflection at AR / AR distance
= 0.013 / 46 = 2.82×10^{-4}
Deflection at load = Deflection Ratio x (CG distance)
= 2.82×10^{-4} x 102 = 0.029 mm

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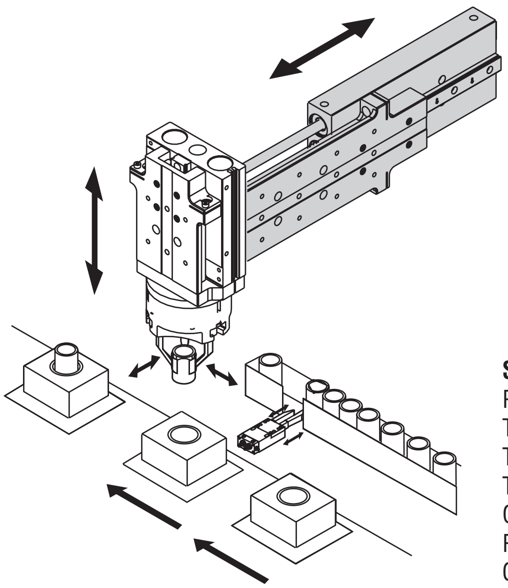
+32(0) 2 266 13 13



IMPERIAL

Step 1: Determine Application Data
Pick and place application as shown.
Total Weight of vertical slide = 4.8 lb
Total Weight of gripper and tooling = 0.6 lb
Total Weight of gripped object = 0.1 lb
Operating pressure = 80 psi
Required Travel = 5"
CG Dist = 1"

Step 2: Determine the Total Weight of the system and the required thrust of the slide.

Calculate the Total Weight of the system:

Weight of attached slide =	4.8
Weight of gripper and tooling =	0.6
Weight of gripped object =	0.1
Total Weight =	5.5 lb

Since the application is horizontal, thrust calculation is not required at this step due to very low friction values.

Size 16 would be the minimum requirement based on the necessary travel.

Step 3: Determine static and dynamic moment capacity. First check size 16 for moment capacity.

From the Static Moment Chart for Yaw moment, Maximum yaw moment (My) for a 5" travel = 558 in-lb and Ah = 7.292"

My = (Ah + CG) x LOAD (Total Weight)
My Static = (7.292 + 1) x 5.5 = 45.6 in-lb, okay statically
My Dynamic = 558/10 = 55.8 in-lb, okay dynamically

Since Dynamic moment of the system is less than 55.8, the size 16 can be used.

Step 4: Determine the amount of Deflection
From the yaw deflection graphs, determine the amount of deflection at the tool plate by using the Total Weight calculated above and finding the crossing point for a size 16 x 5.

Approximately 0.004 of deflection at the tool plate for this application.

Note: Dynamic forces from the attached slide and gripper can cause higher deflections than the value just calculated depending on deceleration methods.

Step 5: Calculate Stopping Capacity - see next page.

METRIC

Step 1: Determine Application Data
Pick and place application as shown.
Total Weight of vertical slide = 21.4 N
Total Weight of gripper and tooling = 2.7 N
Total Weight of gripped object = 0.4 N
Operating pressure = 5.5 bar
Required Travel = 125 mm
CG Dist = 25 mm

Step 2: Determine the Total Weight of the system and the required thrust of the slide.

Calculate the Total Weight of the system:

Weight of attached slide =	21.4
Weight of gripper and tooling =	2.7
Weight of gripped object =	0.4
Total Weight =	24.5 N

Since the application is horizontal, thrust calculation is not required at this step due to very low friction values.

Size 16 would be the minimum requirement based on the necessary travel.

Step 3: Determine static and dynamic moment capacity. First check size 16 for moment capacity.

From the Static Moment Chart for Yaw moment, Maximum yaw moment (My) for a 125 mm travel = 63 Nm and Ah = 185.2 mm

My = (Ah + CG) x LOAD (Total Weight)
My Static = (0.1852 + 0.025) x 24.5 = 5.1 Nm, okay statically
My Dynamic = 63/10 = 6.3 Nm, okay dynamically

Since Dynamic moment of the system is less than 6.3, the size 16 can be used.

Step 4: Determine the amount of Deflection
From the yaw deflection graphs, determine the amount of deflection at the tool plate by using the Total Weight calculated above and finding the crossing point for a size 16 x 125.

Approximately 0.10 mm of deflection at the tool plate for this application.

Note: Dynamic forces from the attached slide and gripper can cause higher deflections than the value just calculated depending on deceleration methods.

Step 5: Calculate Stopping Capacity - see next page.

STOPPING CAPACITY SELECTION

To determine stopping capacity, calculate total moving weight. From Table 1, determine slide standard moving weight, add any additional weight adders due to options and add attached payload. This will be total moving weight W_{TM}.

Example: STPD125 x 2 -AE1-AE2 with 10 lb load
[STPD525 x 50-AE1-AE2 with 44.5 N load]

W_{TM} = 2.6 lb + 0.29 lb + 0.29 lb + 10 lb = 13.18 lb
[11.6 N + 1.29 N + 1.29 N + 44.5 N = 58.68 N]

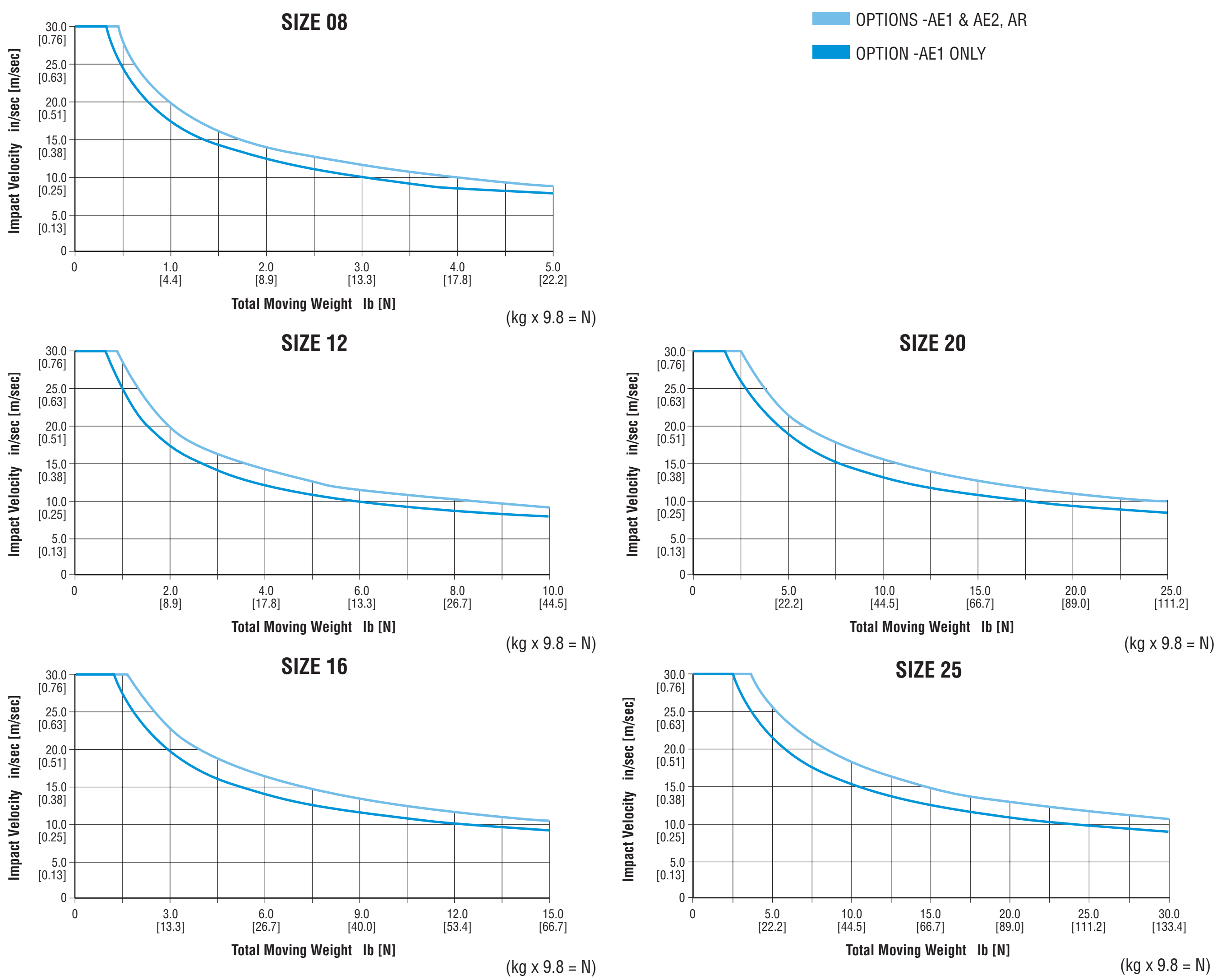
Using the Kinetic Energy Graphs below, plot the total moving weight against impact velocity. If the value plotted is below the curve, then shock pads are an adequate deceleration method. If it is above the curve, hydraulic shock absorbers are required.

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

TABLE 1

SIZE	TRAVEL		STP MOVING WEIGHT		WEIGHT ADDERS -AE1, -AE2, -NE1x, -NE2x		PISTON AREA EXTEND		PISTON AREA RETRACT	
	in	mm	lb	N	lb	N	in²	mm²	in²	mm²
08	1	25	0.24	1.1	0.06	0.27	0.16	101	0.12	75
	2	50	0.36	1.6						
	3	75	0.40	1.8						
12	1	25	0.42	1.9	0.09	0.42	0.35	226	0.26	170
	2-1/2	60	0.60	2.7						
	4	100	0.78	3.4						
16	1-1/2	38	0.9	4.0	0.13	0.58	0.62	402	0.47	302
	3	75	1.1	4.9						
	5	125	1.4	6.2						
20	2	50	1.4	6.2	0.20	0.91	0.97	628	0.73	471
	4	100	1.9	8.5						
	6	150	2.4	10.7						
25	2	50	2.6	11.6	0.29	1.29	1.52	982	1.17	756
	4	100	3.6	16.0						
	6	150	4.3	19.1						

MAXIMUM ALLOWABLE KINETIC ENERGY GRAPHS FOR SHOCK PADS



SHOCK ABSORBER SPECIFICATIONS CHART

SIZE	PHD SHOCK ABSORBER NO.	STROKE		THREAD TYPE	E_T TOTAL ENERGY PER CYCLE		E_TC TOTAL ENERGY PER HOUR		F_G MAX PROPELLING FORCE	
		in	m		in-lb	Nm	in-lb	Nm	in	N
08 & 12	68149-01-x	0.210	0.0053	M8 x 1	20	2.26	50,000	5654	45	200
16	68015-01-x	0.240	0.0061	M10 x 1	40	4.52	110,000	12439	80	356
20	70861-01-x	0.400	0.0102	M12 x 1	65	7.35	250,000	28269	120	534
25	67127-01-x	0.448	0.0114	M14 x 1.5	135	15.26	260,000	29400	200	890

SYMBOLS DEFINITIONS

- C = Number of cycles per hour
- D = Cylinder bore diameter inch [mm]
- E_K = Kinetic energy in-lb [Nm]
- E_T = Total energy per cycle, E_K + E_W in-lb [Nm]
- E_TC = Total energy per hour in-lb/hr [Nm/hr]
- E_W = Work or drive energy in-lb [Nm]
- F_D = Propelling force lb [N]
- F_G = Max Propelling force lb [N]
- P = Operating pressure psi [bar]
- S = Stroke of shock absorber inch [m]
- V = Impact velocity in/sec [m/sec]
- W_{TM} = Total moving weight lb [N or kg]

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.

A) The total moving weight (W_{TM}) to be stopped. (completed from prior page)
B) The slide velocity (V) at impact with the shock absorber.
C) Number of cycles per hour.
D) Orientation of the application's motion (i.e. horizontal or vertical application). See the next two pages.
E) Operating pressure

STEP 2: Calculate the kinetic energy of the total moving weight.
IMPERIAL: E_K (in-lb) = 0.5 x W_{TM} x V^2 / 386
METRIC: E_K (Nm) = 0.5 x W_{TM} x V^2 / 9.8

STEP 3: Calculate the propelling force (FD) for both extend and retract. Refer to previous page for Effective Piston Areas.
Horizontal application: F_D = Effective Piston Area x P
Vertical application: F_D = (Effective Piston Area x P) ± W_{TM}
+ indicates working with gravity, - indicates working against gravity

Note: when using mm^2 and bar units, it will be necessary to multiply the Effective Piston Area x P by a factor of 0.1 to obtain the correct unit of measure.

Use Shock Absorber Specifications Chart to verify that the selected unit has an F_G capacity greater than the value just calculated. If not, select a larger shock absorber or slide.

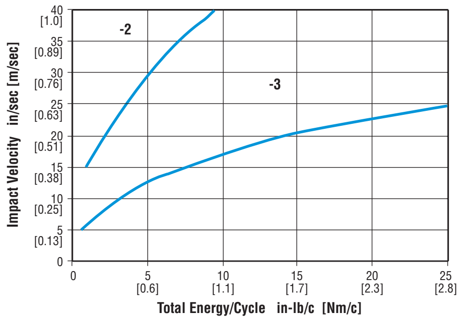
Calculate the work energy input (E_W = F_D x S) using the travel of the shock absorber selected.

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 than the value just calculated. If not, select a larger shock absorber or slide.

STEP 5: Calculate the total energy that must be absorbed per hour (E_TC). E_TC = E_T x C
Use Shock Absorber Specifications Chart to verify that the selected unit has an E_TC capacity greater than the value just calculated. If not, select a larger shock absorber or 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 area (-2 or -3) that the point falls in is the correct damping constant for the application.

SIZE 08 & 12



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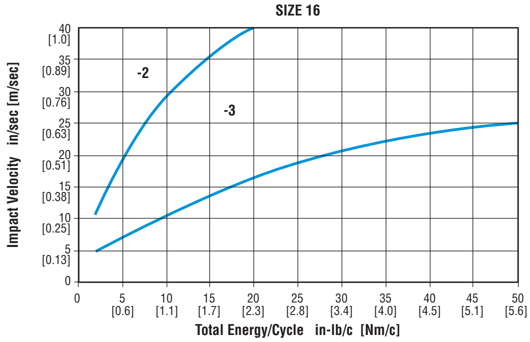

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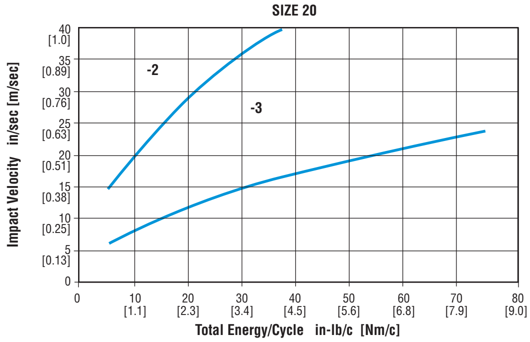

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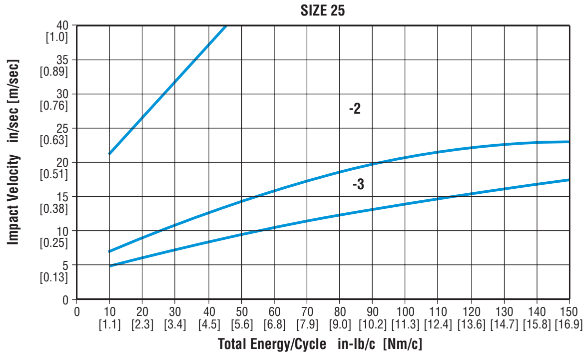
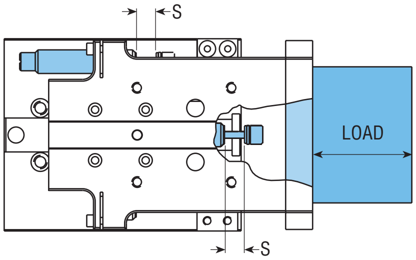


SIZING EXAMPLE: HORIZONTAL APPLICATION



IMPERIAL

STEP 1: Application Data
Example: STPD125 x 6 -NEx-NRx
with a 20 lb payload on extend and 1 lb on retract.

A) W_{TM} = Total moving weight = std moving + option adder + load
Extend = 2.6 lb + 0.29 lb + 20 lb = 22.89 lb
Retract = 2.6 lb + 0.29 lb + 1 lb = 3.89 lb
B) Velocity at impact: V_E = 15 in/sec (extend), V_R = 20 in/sec (retract)
C) Number of cycles/hour: C = 800 cycles/hr
D) Application type: Horizontal
E) Operating pressure: 80 psi

STEP 2: Calculate the kinetic energy
$E_K = 0.5 \times W_{TM} \times V^2 / 386$
Extend = 0.5 x 22.89 x 152 / 386 = 6.67 in-lb
Retract = 0.5 x 3.89 x 202 / 386 = 2.02 in-lb

STEP 3: Calculate the propelling force and work energy
F_D= Effective Piston Area x Operating Pressure
Extend = 1.52 x 80 = 121.6 lb
Retract = 1.17 x 80 = 93.6 lb

Use the Shock Absorber Specifications Chart to verify that the selected unit has an F_G capacity greater than the value just calculated.

$E_W = F_D \times S$
Extend = 121.6 x 0.448 = 54.5 in-lb
Retract = 93.6 x 0.448 = 41.9 in-lb

STEP 4: Calculate the total energy: $E_T = E_K + E_W$
Extend = 6.67 + 54.5 = 61.17 in-lb
Retract = 2.02 + 41.9 = 43.92 in-lb

Use the Shock Absorber Specifications Chart to verify that the selected unit has an E_T capacity greater than the value just calculated.

STEP 5: Calculate the total energy per hour: $E_TC = E_T \times C$
Extend = 61.17 x 800 = 48,397 in-lb/hr
Retract = 43.92 x 800 = 35,136 in-lb/hr

Use the Shock Absorber Specifications Chart to verify that the selected unit has an E_TC capacity greater that the value calculated.

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

Unit should be ordered with -NE3-NR2 options or select shock 67127-01-3 for extend and shock 67127-01-2 for retract.

METRIC

STEP 1: Application Data
Example: STPD525 x 150 -NEx-NRx
with a 89 N payload on extend and 4.4 N on retract.

A) W_{TM} = Total moving weight = std moving + option adder + load
Extend = 11.6 N + 1.29 N + 89 N = 101.89 N
Retract = 11.6 N + 1.29 N + 4.4 N = 17.29 N
B) Velocity at impact: V_E = 0.381 m/sec (extend), V_R = 0.51 m/sec (retract)
C) Number of cycles/hour: C = 800 cycles/hr
D) Application type: Horizontal
E) Operating pressure: 5.5 bar

STEP 2: Calculate the kinetic energy
$E_K = 0.5 \times W_{TM} \times V^2 / 9.8$
Extend = 0.5 x 101.89 x 0.3812 / 9.8 = 0.75 Nm
Retract = 0.5 x 17.29 x 0.512 / 9.8 = 0.23 Nm

STEP 3: Calculate the propelling force and work energy
F_D = Effective Piston Area x Operating Pressure x 0.1
Extend = 982 x 5.5 x 0.1 = 540 N
Retract = 756 x 5.5 x 0.1 = 416 N

Use the Shock Absorber Specifications Chart to verify that the selected unit has an F_G capacity greater than the value just calculated.

$E_W = F_D \times S$
Extend = 540 x 0.0114 = 6.16 Nm
Retract = 416 x 0.0114 = 4.74 Nm

STEP 4: Calculate the total energy: $E_T = E_K + E_W$
Extend = 0.75 + 6.16 = 6.91 Nm
Retract = 0.23 + 4.74 = 4.97 Nm

Use the Shock Absorber Specifications Chart to verify that the selected unit has an E_T capacity greater than the value just calculated.

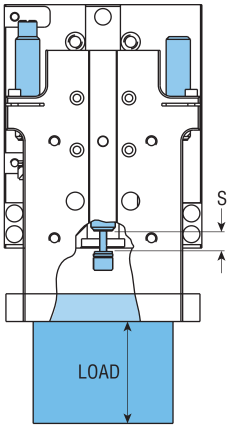
STEP 5: Calculate the total energy per hour: $E_TC = E_T \times C$
Extend = 6.91 x 800 = 5,531 Nm/hr
Retract = 4.97 x 800 = 3,976 Nm/hr

Use the Shock Absorber Specifications Chart to verify that the selected unit has an E_TC capacity greater that the value calculated.

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

Unit should be ordered with -NE3-NR2 options or select shock 67127-01-3 for extend and shock 67127-01-2 for retract.

SIZING EXAMPLE: VERTICAL APPLICATION



IMPERIAL

STEP 1: Application Data
Example: STPD125 x 2 -AE1-NE1x-NRx
with a 30 lb payload on extend and 1 lb on retract

A) W_{TM} = Total moving weight = std moving
+ option adder + load
Extend = 2.6 lb + 0.29 lb + 0.29 lb + 30 lb = 33.18 lb
Retract = 2.6 lb + 0.29 lb + 0.29 lb + 1 lb = 4.18 lb
B) Velocity at impact: V_E = 25 in/sec (extend),
V_R = 20 in/sec (retract)
C) Number of cycles/hour: C = 800 cycles/hr
D) Application type: Vertical
E) Operating pressure: 80 psi

STEP 2: Calculate the kinetic energy
$E_K = 0.5 \times W_{TM} \times V^2 / 386$
Extend = 0.5 x 33.18 x 252 / 386 = 26.9 in-lb
Retract = 0.5 x -4.18 x 202 / 386 = -2.2 in-lb
(working against gravity)

Note: -AR option could replace -NRx option

STEP 3: Calculate the propelling force and work energy
F_D = (Effective Piston Area x Operating Pressure) ± W_{TM}
Extend = (1.52 x 80) + 30 = 151.6 lb (working with gravity)
Retract = (1.17 x 80) - 4.18 = 89.42 lb (working against gravity)

Use the Shock Absorber Specifications Chart to verify that the selected unit has an F_G capacity greater than the value just calculated.

$E_W = F_D \times S$
Extend = 151.6 x 0.448 = 67.9 in-lb
Retract = 89.42 x 0.448 = 40.1 in-lb

STEP 4: Calculate the total energy: $E_T = E_K + E_W$
Extend = 26.9 + 67.9 = 94.8 in-lb
Retract = -2.2 + 40.1 = 37.9 in-lb

Use the Shock Absorber Specifications Chart to verify that the selected unit has an E_T capacity greater than the value just calculated.

STEP 5: Calculate the total energy per hour: $E_TC = E_T \times C$
Extend = 94.8 x 800 = 75,840 in-lb/hr
Retract = 37.9 x 800 = 30,320 in-lb/hr

Use the Shock Absorber Specifications Chart to verify that the selected unit has an E_TC capacity greater that the value calculated.

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

Unit should be ordered with -NE12-NR2 options or select shock 67127-01-2 for extend and shock 67127-01-2 for retract.

METRIC

STEP 1: Application Data
Example: STPD525 x 50 -AE1-NE1x-NRx
with a 133 N payload on extend and 4.4 N on retract

A) W_{TM} = Total moving weight = std moving
+ option adder + load
Extend = 11.6 N + 1.29 N + 1.29 N + 133 N = 147.18 N
Retract = 11.6 N + 1.29 N + 1.29 N + 4.4 N = 18.58 N
B) Velocity at impact: V_E = 0.64 m/sec (extend),
V_R = 0.51 m/sec (retract)
C) Number of cycles/hour: C = 800 cycles/hr
D) Application type: Vertical
E) Operating pressure: 5.5 bar

STEP 2: Calculate the kinetic energy
$E_K = 0.5 \times W_{TM} \times V^2 / 9.8$
Extend = 0.5 x 147.18 x 0.642 / 9.8 = 3.08 Nm
Retract = 0.5 x -18.58 x 0.512 / 9.8 = -0.25 Nm
(working against gravity)

Note: -AR option could replace -NRx option

STEP 3: Calculate the propelling force and work energy
F_D= (Effective Piston Area x Operating Pressure x 0.1) ± W_{TM}
Extend = (982 x 5.5 x 0.1) + 147.18 N = 673 N (working with gravity)
Retract = (756 x 5.5 x 0.1) - 18.58 N = 397 N (working against gravity)

Use the Shock Absorber Specifications Chart to verify that the selected unit has an F_G capacity greater than the value just calculated.

$E_W = F_D \times S$
Extend = 673 x 0.0114 = 7.67 Nm
Retract = 397 x 0.0114 = 4.53 Nm

STEP 4: Calculate the total energy: $E_T = E_K + E_W$
Extend = 3.08 + 7.67 = 10.75 Nm
Retract = -0.25 + 4.53 = 4.28 Nm

Use the Shock Absorber Specifications Chart to verify that the selected unit has an E_T capacity greater than the value just calculated.

STEP 5: Calculate the total energy per hour: $E_TC = E_T \times C$
Extend = 10.75 x 800 = 8,600 Nm/hr
Retract = 4.28 x 800 = 3,424 Nm/hr

Use the Shock Absorber Specifications Chart to verify that the selected unit has an E_TC capacity greater that the value calculated.

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

Unit should be ordered with -NE12-NR2 options or select shock 67127-01-2 for extend and shock 67127-01-2 for retract.

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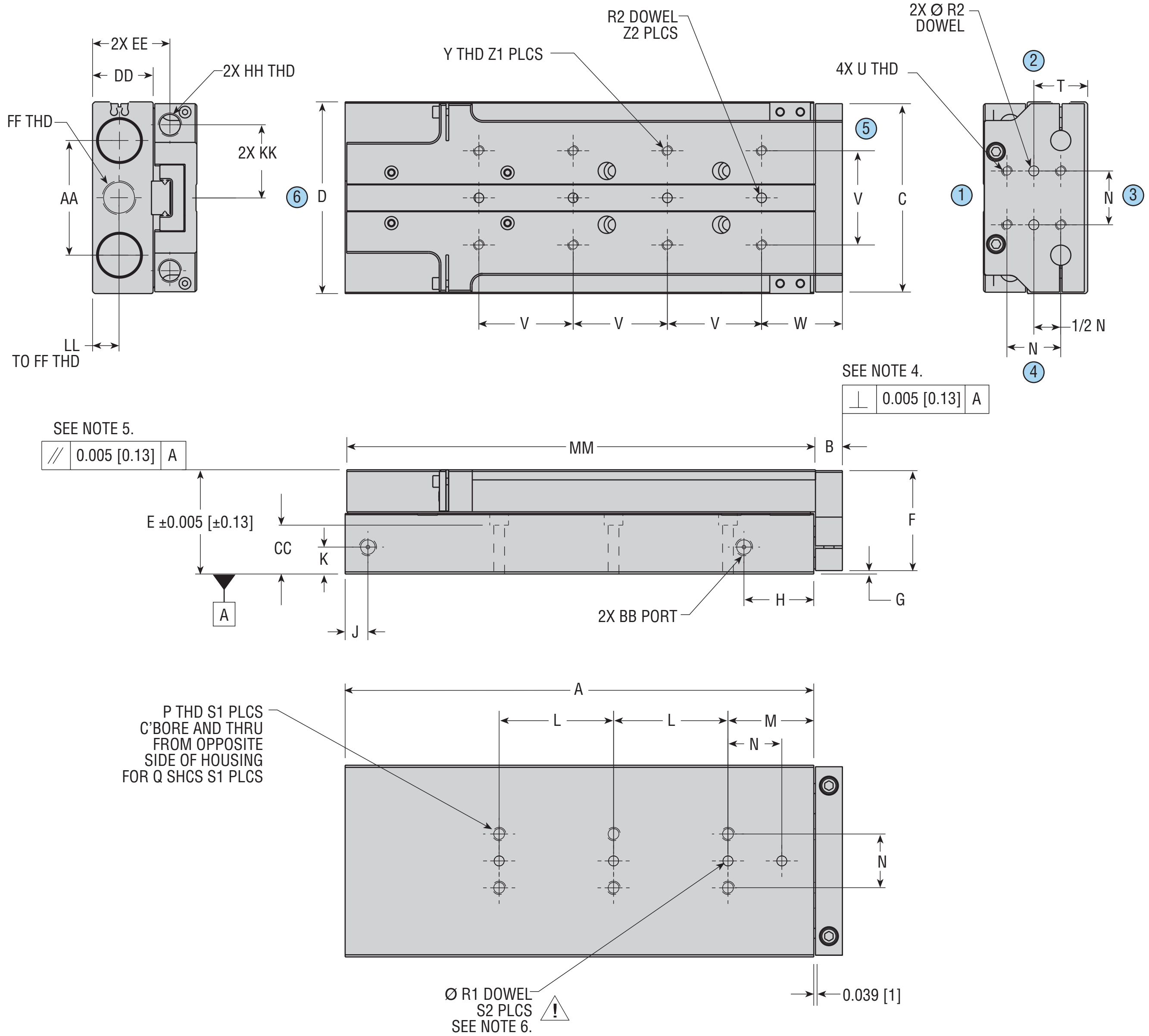

NOTES:
1) ALL DIMENSIONS ARE SYMMETRICAL ABOUT CENTERLINE OF DOWEL HOLES UNLESS OTHERWISE SPECIFIED.
2) METRIC INFORMATION SHOWN IN [ ].
3) RUNNING PARALLELISM TO DATUM A IS 0.002 in [0.05 mm] AT 2 in [50 mm] OF TRAVEL.
4) ⊥ = PERPENDICULARITY TOLERANCE, THIS DETERMINES HOW FAR FROM 90° THAT THE INDICATED FEATURES CAN BE TO THE INDICATED DATUM FEATURES. THIS SURFACE IS ORIENTED (90°) TO THE INDICATED DATUM SURFACES WITHIN A TOLERANCE BAND OF 0.005 [0.13].
5) // = PARALLELISM TOLERANCE, THIS TOLERANCE DETERMINES HOW PARALLEL (180°) THAT THE INDICATED FEATURES CAN BE TO THE INDICATED DATUM FEATURES. THE SURFACE IS PARALLEL (180°) TO THE INDICATED DATUM SURFACES WITHIN A TOLERANCE BAND OF 0.005 [0.13].
6) ⚠ CAUTION: PRESSING DOWEL PINS DEEPER THAN DEPTH SPECIFIED MAY CAUSE INTERNAL DAMAGE ON -AR OPTION.
7) CIRCLED NUMBERS INDICATE POSITIONS.

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.

LETTER DIM	SIZE 08			SIZE 12			SIZE 16			SIZE 20			SIZE 25		
TRAVEL	**1 [25]**	**2 [50]**	**3 [75]**	**1 [25]**	**2-1/2 [60]**	**3 [75]**	**1-1/2 [38]**	**3 [75]**	**5 [125]**	**2 [50]**	**4 [100]**	**6 [150]**	**2 [50]**	**4 [100]**	**6 [150]**
A	2.953 [75.0]	4.587 [116.5]	5.866 [149.0]	3.544 [90.0]	5.671 [144.0]	7.795 [198.0]	4.528 [115.0]	6.024 [153.0]	8.544 [217.0]	5.433 [138.0]	8.327 [211.5]	10.965 [278.5]	5.531 [140.5]	8.327 [211.5]	10.965 [278.5]
B	0.315 [8.0]			0.394 [10.0]			0.433 [11.0]			0.512 [13.0]			0.630 [16.0]		
C	2.087 [53.0]			2.559 [65.0]			3.425 [87.0]			3.7 [94.0]			4.409 [112.0]		
D	2.165 [55.0]			2.638 [67.0]			3.506 [89.1]			3.779 [96.0]			4.488 [114.0]		
E	0.983 [25.0]			1.37 [34.8]			1.574 [40.0]			1.969 [50.0]			2.441 [62.0]		
F	0.924 [23.5]			1.271 [32.3]			1.476 [37.5]			1.87 [47.5]			2.341 [59.5]		
G	0.040 [1.0]			0.079 [2.0]			0.079 [2.0]			0.079 [2.0]			0.079 [2.0]		
H	0.924 [23.5]			0.797 [20.2]			1.437 [36.5]			1.2 [30.5]			1.634 [41.5]		
J	0.492 [12.5]			0.797 [20.2]			0.531 [13.5]			1.2 [30.5]			0.532 [13.5]		
K	0.217 [5.5]			0.378 [9.6]			0.453 [11.5]			0.566 [14.4]			0.630 [16.0]		
L	1.102 [28.0]			1.496 [38.0]			1.929 [49.0]			2.205 [56.0]			2.677 [68.0]		
M	1.142 [29.0]			1.024 [26.0]			1.713 [43.5]			1.613 [41.0]			2.008 [51.0]		
N	0.551 [14.0]			0.67 [17.0]			0.905 [23.0]			1.024 [26.0]			1.260 [32.0]		
P	8-32 x 0.394 [M4 x 0.7 x 10]			10-24 x 0.632 [M5 x 0.8 x 16]			1/4-20 x 0.689 [M6 x 1.0 x 17.5]			1/4-20 x 0.910 [M6 x 1.0 x 23]			5/16-18 x 1.142 [M8 x 1.25 x 29]		
Q	#5 [M3]			#6 [M4]			#10 [M5]			#10 [M5]			1/4 [M6]		
R1	3 mm x 2.5 mm DP			4 mm x 2.5 mm DP			5 mm x 3 mm DP			5 mm x 3 mm DP			6 mm x 5.5 mm DP		
R2	3 mm x 3 mm DP			4 mm x 4 mm DP			5 mm x 5 mm DP			5 mm x 5 mm DP			6 mm x 6 mm DP		
S1	4	4	6	4	4	6	4	4	6	4	4	6	4	4	6
S2	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4
T	0.532 [13.5]			0.713 [18.1]			0.905 [23.0]			1.078 [27.4]			1.260 [32.0]		
U	5-40 x 0.315 DP [M3 x 8 DP]			6-32 x 0.394 DP [M4 x 10 DP]			10-24 x 0.433 DP [M5 x 11 DP]			10-24 x 0.512 DP [M5 x 13 DP]			1/4-20 x 0.630 DP [M6 x 16 DP]		
V	0.866 [22.0]			1.102 [28.0]			1.496 [38.0]			1.654 [42.0]			2.205 [56.0]		
W	1.102 [28.0]			1.300 [33.0]			1.378 [35.0]			1.85 [47.0]			1.890 [48.0]		
Y	5-40 x 0.275 DP [M3 x 7 DP]			8-32 x 0.375 DP [M4 x 9.5 DP]			10-24 x 0.375 DP [M5 x 9.5 DP]			10-24 x 0.375 DP [M5 x 9.5 DP]			1/4-20 x 0.500 DP [M6 x 13 DP]		
Z1	4	6	8	4	6	8	4	6	8	4	6	8	4	6	8
Z2	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4
AA	1.142 [29.0]			1.496 [38.0]			1.969 [50.0]			2.264 [57.5]			2.684 [68.2]		
BB	10-32 PORT [M5 x 0.8 PORT]			10-32 PORT [M5 x 0.8 PORT]			10-32 PORT [M5 x 0.8 PORT]			1/8 NPT PORT [1/8 BSPP PORT]			1/8 NPT PORT [1/8 BSPP PORT]		
CC	0.401 [10.2]			0.613 [15.6]			0.684 [17.4]			0.91 [23.1]			1.143 [29.0]		
DD	0.551 [14.0]			0.795 [20.2]			0.906 [23.0]			1.132 [28.8]			1.418 [36.0]		
EE	0.752 [19.1]			1.022 [26.0]			1.181 [30.0]			1.447 [36.8]			1.811 [46.0]		
FF	M6 x 1.0 x 32 DP			7/16-20 x 1.800 DP			M14 x 1.5 x 55 DP			M16 x 1.5 x 57 DP			M20 x 1.5 x 60 DP		
HH	M8 x 1.0 x 12.5 DP			M8 x 1.0 x 12.5 DP			M10 x 1.0 x 18.5 DP			M12 x 1.0 x 19 DP			M14 x 1.5 x 19.5 DP		
KK	0.743 [18.9]			0.955 [24.3]			1.26 [32.0]			1.417 [36.0]			1.712 [43.5]		
LL	0.217 [5.5]			0.319 [8.1]			0.394 [10.0]			0.566 [14.4]			0.63 [16.0]		
MM	2.953 [75.0]	4.587 [116.5]	5.867 [149.0]	3.377 [85.8]	5.670 [144.0]	7.795 [198.0]	4.528 [115.0]	6.024 [153.0]	8.544 [217.0]	5.433 [138.0]	8.327 [211.5]	10.965 [278.5]	5.531 [140.5]	8.327 [211.5]	10.965 [278.5]

NOTE: Metric information shown in [ ].

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.

LDA Solutions for Life
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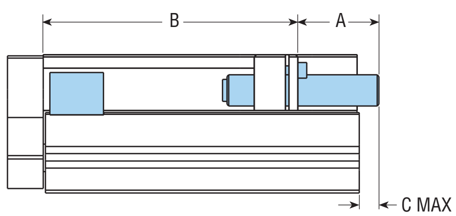
AE1 TRAVEL ADJUSTMENT AND SHOCK PAD ON EXTEND IN POSITION 1

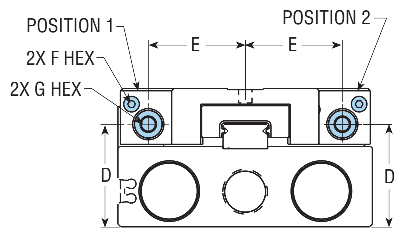
This option provides travel adjustment with a shock pad on extend in position 1. Shock pads provide excellent noise reduction and energy absorption capability. Travel on extend can be reduced by a maximum of 'A' shown in the table below. Adjust travel adjustment screw to the required position using 'G' hex wrench and lock into place using 'F' hex wrench. See page 117 for stopping capacity of the shock pad. Online sizing assistance is available at: www.phdinc.com/apps/sizing.

AE2 TRAVEL ADJUSTMENT AND SHOCK PAD ON EXTEND IN POSITION 2

This option provides travel adjustment with a shock pad on extend in position 2. Shock pads provide excellent noise reduction and energy absorption capability. By using -AE1 and -AE2 options together, yaw moments are greatly reduced and may eliminate the need for a shock absorber. Travel on extend can be reduced by a maximum of 'A' shown in the table below. Adjust travel adjustment screw to the required position using 'G' hex wrench and lock into place using 'F' hex wrench. See page 117 for stopping capacity of the shock pad.

	TRAVEL		A	B	C	D	E	F	G
SIZE	in	mm	in [mm]	in [mm]	in [mm]	in [mm]	in [mm]	HEX	HEX
08	1	25	0.650 [16.5]	2.953 [75.0]	0.591 [15.0]	0.752 [19.1]	0.74 [18.8]	2 mm	3 mm
	2	50	0.827 [21.0]	3.779 [96.0]	–				
	3	75	0.827 [21.0]	4.783 [121.5]	–				
12	1	25	0.749 [19.0]	2.755 [70.0]	0.120 [3.0]	1.022 [26.0]	0.96 [24.4]	2.5 mm	3 mm
	2-1/2	60	0.944 [24.0]	4.490 [114.0]	–				
	4	100	1.122 [28.5]	6.081 [154.5]	–				
16	1-1/2	38	0.945 [24.0]	3.662 [93.0]	0.039 [1.0]	1.181 [30.0]	1.260 [32]	2.5 mm	5 mm
	3	75	1.122 [28.5]	4.981 [126.5]	–				
	5	125	1.102 [28.0]	6.989 [177.5]	–				
20	2	50	1.281 [32.5]	4.152 [105.5]	–	1.447 [36.8]	1.42 [36.1]	2.5 mm	6 mm
	4	100	1.654 [42.0]	6.576 [167.0]	–				
	6	150	1.299 [33.0]	8.896 [226.0]	–				
25	2	50	1.437 [36.5]	4.487 [114.0]	0.354 [9.0]	1.810 [46.0]	1.71 [43.4]	3 mm	6 mm
	4	100	1.181 [30.0]	6.732 [171.0]	–				
	6	150	1.122 [28.5]	8.800 [223.5]	–				





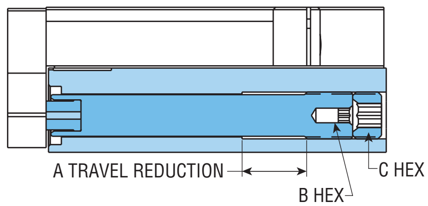
AR TRAVEL ADJUSTMENT AND SHOCK PAD ON RETRACT

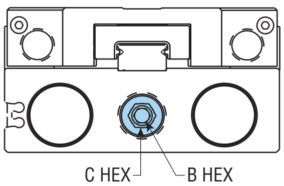
This option provides travel adjustment with a shock pad on retract. Shock pads provide excellent noise reduction and energy absorption capability. Travel on retract can be reduced by a maximum of 'A' shown in the table below. Adjust travel adjustment screw to the required position using 'B' hex wrench and lock into place using 'C' hex wrench. See page 117 for stopping capacity of the shock pad.

SIZE	A	B HEX	C HEX
	in [mm]	(mm)	(mm)
08	0.512 [13.0]	2.5	3
12	0.669 [17.0]	4	5
16	0.984 [25.0]	5	6
20	1.063 [27.0]	6	8
25	1.063 [27.0]	6	10

NOTE: Metric information shown in [ ].

CAUTION: When using dowel pins, do not exceed depth noted on dimensional page. Internal damage to screw may occur.





All dimensions are reference only unless specifically toleranced.

Q6 CORROSION RESISTANT GUIDE SHAFTS (SIZES 12, 16, 20, 25)

This option provides stainless steel guide shafts with hard chrome plating, for use in applications where the standard shaft ends may corrode. (Stainless shafts standard on size 08.)

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 is permissible.

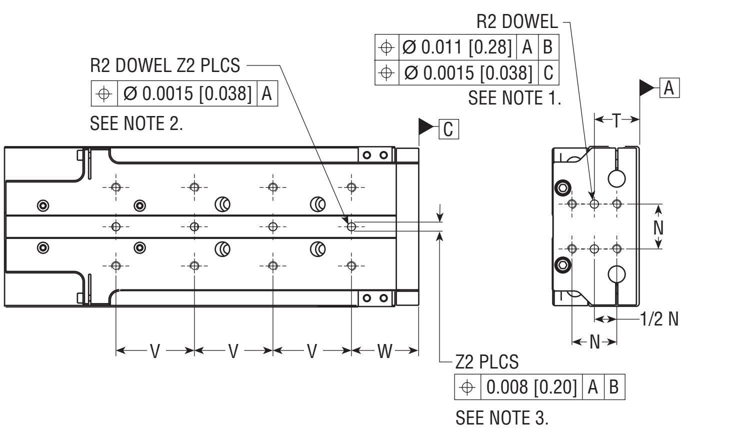
J8 PRECISION FIT DOWEL PIN HOLES

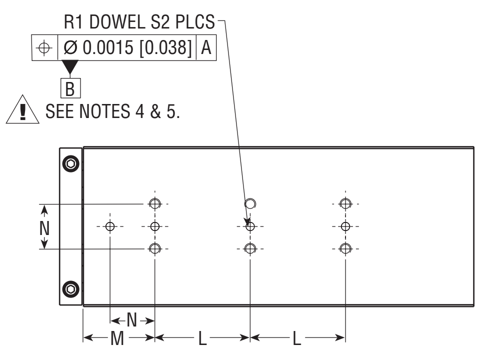
This option provides H7 tolerance precision fit with dowel pins. Precision fits are used where accuracy of location is of prime importance and for parts requiring rigidity and alignment.

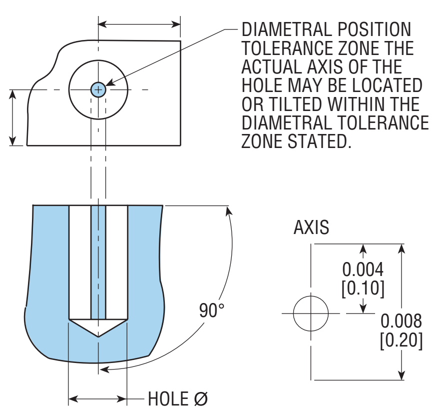
LETTER DIM	SIZE 08			SIZE 12			SIZE 16			SIZE 20			SIZE 25		
TRAVEL	1 [25]	2 [50]	3 [75]	1 [25]	2-1/2 [60]	4 [100]	1-1/2 [38]	3 [75]	5 [125]	2 [50]	4 [100]	6 [150]	2 [50]	4 [100]	6 [150]
L	1.102 [28.0]			1.496 [38.0]			1.929 [49.0]			2.205 [56.0]			2.677 [68.0]		
N	0.551 [14.0]			0.670 [17.0]			0.905 [23.0]			1.024 [26.0]			1.260 [32.0]		
R1	3 mm x 2.5 mm DP			4 mm x 2.5 mm DP			5 mm x 3 mm DP			5 mm x 3 mm DP			6 mm x 5.5 mm DP		
R2	3 mm x 3 mm DP			4 mm x 4 mm DP			5 mm x 5 mm DP			5 mm x 5 mm DP			6 mm x 6 mm DP		
S2	3	3	4	3	3	4	3	3	4	3	3	4	3	3	4
T	0.532 [13.5]			0.713 [18.1]			0.905 [23.0]			1.078 [27.4]			1.260 [32.0]		
V	0.866 [22.0]			1.102 [28.0]			1.496 [38.0]			1.654 [42.0]			2.205 [56.0]		
W	1.102 [28.0]			1.300 [33.0]			1.378 [35.0]			1.851 [47.0]			1.890 [48.0]		
Z2	2	3	4	2	3	4	2	3	4	2	3	4	2	3	4

Ø R DOWEL HOLE	TOLERANCE		
	STANDARD	J3 OPTION	J8 OPTION
3 mm	+0.0006/-0.0004 [+0.015/-0.010]	+0.0013/+0.0003 [+0.033/+0.008]	+0.0004/-0.0000 [+0.010/-0.000]
4 mm	+0.0006/-0.0004 [+0.015/-0.010]	+0.0015/+0.0005 [+0.038/+0.013]	+0.0005/-0.0000 [+0.013/-0.000]
5 mm	+0.0006/-0.0004 [+0.015/-0.010]	+0.0015/+0.0005 [+0.038/+0.013]	+0.0005/-0.0000 [+0.013/-0.000]
6 mm	+0.0006/-0.0004 [+0.015/-0.010]	+0.0015/+0.0005 [+0.038/+0.013]	+0.0005/-0.0000 [+0.013/-0.000]

NOTE:
Metric information shown in [ ].







DIAMETRAL ZONE **BILATERAL ZONE**

NOTES:
1) THE AXIS OF THESE DOWEL HOLES ARE LOCATED TO SURFACE A (DATUM) AND DOWEL HOLE PATTERN B (DATUM) WITHIN A 0.011 DIAMETRAL TOLERANCE ZONE. ADDITIONALLY THE AXIS OF THE HOLES ARE LOCATED TO EACH OTHER AND PERPENDICULAR TO SURFACE C (DATUM) WITHIN A 0.0015 DIAMETRAL TOLERANCE ZONE.
2) THE AXIS OF THE DOWEL HOLES ARE LOCATED TO EACH OTHER AND PERPENDICULAR TO SURFACE A (DATUM) WITHIN A 0.0015 [0.038] DIAMETRAL TOLERANCE ZONE.
3) THE AXIS OF THESE HOLES ARE LOCATED TO SURFACE A (DATUM) AND DOWEL HOLE PATTERN B (DATUM) WITHIN 0.008 BILATERAL TOLERANCE ZONE.
4) THE AXIS OF THESE DOWEL HOLES ARE LOCATED TO EACH OTHER AND PERPENDICULAR TO SURFACE A (DATUM) WITHIN A 0.0015 [0.038] DIAMETRAL TOLERANCE ZONE.
5) ⚠CAUTION: DO NOT EXCEED DOWEL HOLE DEPTH WHEN INSTALLING DOWEL PINS. INTERNAL DAMAGE MAY OCCUR.
6) ⌖ = POSITION TOLERANCE, THIS TOLERANCE DETERMINES THE LOCATION OF THE HOLES AND THE PERPENDICULARITY TO THE INDICATED DATUM FEATURES.

All dimensions are reference only unless specifically toleranced.

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 into two small grooves located on the side of the slide housing 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 complete switch information.

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.

NE1x — SHOCK ABSORBER INSTALLED ON EXTEND IN POSITION 1

This option provides shock absorbers and travel adjustment on extend in position 1. Travel on extend can be reduced by a maximum of 'A' shown in the table below. Adjust shock absorber screw to the required position using a large screwdriver and lock into place using 'F' hex wrench.

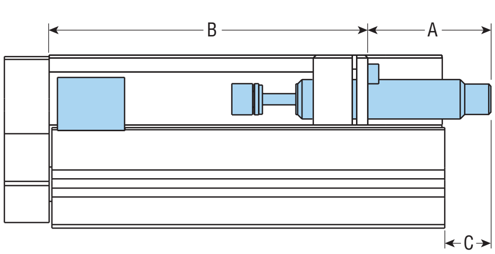
NOTE: The "x" indicates shock absorber damping constant which must be specified by customer. (See page 118 for shock absorber selection requirements.)

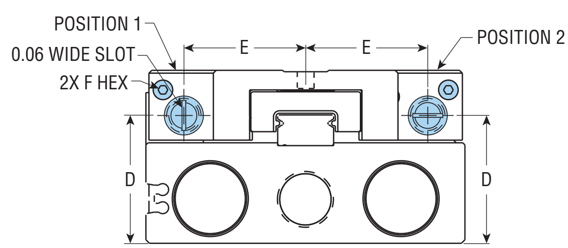
NE2x — SHOCK ABSORBER INSTALLED ON EXTEND IN POSITION 2

This option provides shock absorbers and travel adjustment on extend in position 2. Travel on extend can be reduced by a maximum of 'A' shown in the table below. Adjust shock absorber screw to the required position using a large screwdriver and lock into place using 'F' hex wrench.

NOTE: The "x" indicates shock absorber damping constant which must be specified by customer. (See page 118 for shock absorber selection requirements.)

SIZE	TRAVEL		A		B		C		D		E		F
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	HEX
	1	25	0.650	16.5	2.953	75.0	0.591	15.0					
08	2	50	0.827	21.0	3.779	96.0	–	–	0.752	19.1	0.743	18.8	2 mm
	3	75	0.827	21.0	4.783	121.5	–	–					
	1	25	1.064	27.0	2.755	70.0	0.433	11.0					
12	2-1/2	60	0.828	21.0	4.490	114.0	–	–	1.022	26.0	0.96	24.4	2.5 mm
	4	100	0.866	22.5	6.081	154.5	–	–					
	1-1/2	38	0.945	24.0	3.662	93.0	0.039	1.0					
16	3	75	1.122	28.5	4.981	126.5	–	–	1.181	30.0	1.260	32	2.5 mm
	5	125	1.102	28.0	6.989	177.5	–	–					
	2	50	1.280	32.5	4.152	105.5	–	–					
20	4	100	1.280	32.5	6.576	167.0	–	–	1.447	36.8	1.42	36.1	2.5 mm
	6	150	1.280	32.5	8.896	226.0	–	–					
	2	50	1.772	45.0	4.487	114.0	0.669	17.0					
25	4	100	1.516	38.5	6.732	171.0	–	–	1.810	46.0	1.712	43.4	3 mm
	6	150	1.457	37.0	8.800	223.5	–	–					





All dimensions are reference only unless specifically toleranced.

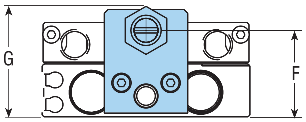
FOR SIZE 08 ONLY

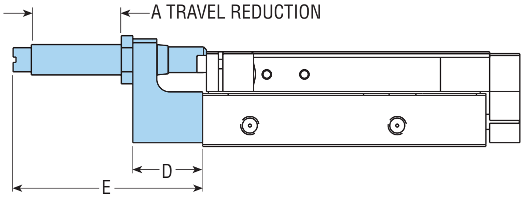
NRx SHOCK ABSORBER INSTALLED ON RETRACT

This option provides shock absorbers and travel adjustment on retract. Travel on retract can be reduced by a maximum of ‘A’ shown in the table at right. Adjust travel to the required position using a large screwdriver and lock into place using 11 mm hex wrench.

NOTE: The “x” indicates shock absorber damping constant which must be specified by customer. (See page 118 for shock absorber selection requirements.)

A		D		E		F		G	
in	mm	in	mm	in	mm	in	mm	in	mm
0.905	23.0	0.728	18.5	2.008	51.0	0.901	22.9	1.151	29.2





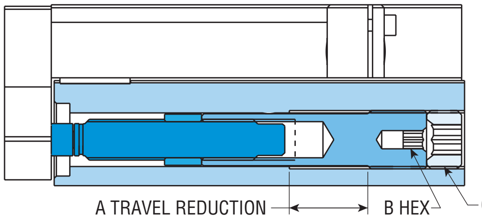
FOR SIZES 12, 16, 20, AND 25

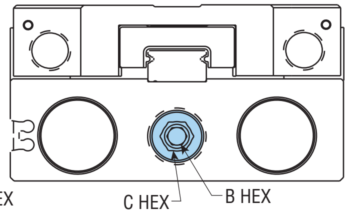
NRx SHOCK ABSORBER INSTALLED ON RETRACT

This option provides shock absorbers and travel adjustment on retract. Travel on retract can be reduced by a maximum of ‘A’ shown in the table. Adjust travel to the required position using ‘B’ hex wrench and lock into place using ‘C’ hex wrench.

NOTE: The “x” indicates shock absorber damping constant which must be specified by customer. (See page 118 for shock absorber selection requirements.)

MODEL	A		B HEX	C HEX
	in	mm		
STPxx12	0.512	13.0	4 mm	5 mm
STPxx16	0.984	25.0	5 mm	6 mm
STPxx20	1.063	27.0	6 mm	8 mm
STPxx25	1.063	27.0	6 mm	10 mm





ACCESSORIES: Series STP Slides

MODULAR MOUNTING KITS

Modular design of the Series STP housings and tool plates allow slide units to bolt and dowel together without the need for a transition plate. See chart for slide compatibility and hardware kits required. Each kit contains 2 dowel pins and 2 SHCS to mount the units together. PHD recommends that a -J3 option (transitional fit) be specified with the slide ordering data to allow the units to dowel together properly. Both units have -J3 dowel hole option as shown.

PRIMARY	SECONDARY	KIT NUMBERS	
		IMPERIAL	METRIC
STPDx08	STPDx08	68125-01	68125-02
STPDx12	STPDx12	70770-01	70770-02
STPDx16	STPDx16	68053-01	68053-02
STPDx20	STPDx20	70870-01	70870-02
STPDx25	STPDx25	68043-01	68043-02