SOLUTIONS FOR INDUSTRIAL AUTOMATION

SLIDES

SERIES SIP, SHP, SJP & STP RAIL BEARING

Compact Precision

NEW!

Series SIP

NEW!

Series SHP

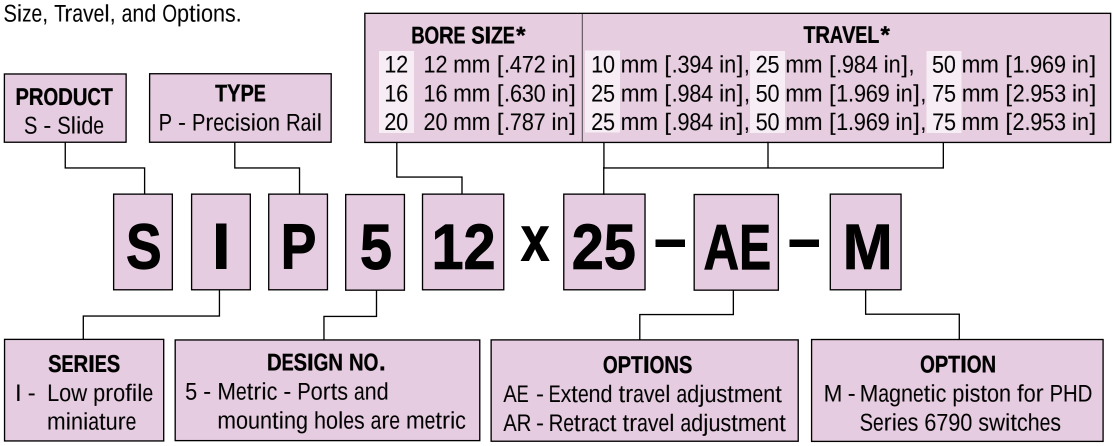
Series SJP

Series STP

INDEX:

ORDERING DATA: SERIES SIP RAIL BEARING SLIDES

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



BORE SIZE*		TRAVEL*
12	12 mm [.472 in]	10 mm [.394 in], 25 mm [.984 in], 50 mm [1.969 in]
16	16 mm [.630 in]	25 mm [.984 in], 50 mm [1.969 in], 75 mm [2.953 in]
20	20 mm [.787 in]	25 mm [.984 in], 50 mm [1.969 in], 75 mm [2.953 in]

PRODUCT
S - Slide

TYPE
P - Precision Rail

S I P 5 12 x 25 – AE – M

SERIES
I - Low profile miniature

DESIGN NO.
5 - Metric - Ports and mounting holes are metric

OPTIONS
AE - Extend travel adjustment
AR - Retract travel adjustment

OPTION
M - Magnetic piston for PHD Series 6790 switches

PART NO.	DESCRIPTION
67902-1-02	NPN (Sink) or PNP (Source) DC Reed, 2 m cable
67902-1-05	NPN (Sink) or PNP (Source) DC Reed, 5 m cable
67903-1-02	NPN (Sink) DC Solid State, 2 m cable
67903-1-05	NPN (Sink) DC Solid State, 5 m cable
67904-1-02	PNP (Source) DC Solid State, 2 m cable
67904-1-05	PNP (Source) DC Solid State, 5 m cable
67922-1	NPN (Sink) or PNP (Source) DC Reed, Quick Connect
67923-1	NPN (Sink) DC Solid State, Quick Connect
67924-1	PNP (Source) DC Solid State, Quick Connect
63549-02	2 m Cordset with Quick Connect
63549-05	5 m Cordset with Quick Connect

NOTE:
*Consult PHD for additional bore sizes and travel increments.

CUSTOM SLIDES ARE AVAILABLE. PLEASE CONSULT PHD.

BENEFITS: SERIES SIP RAIL BEARING SLIDES

BENEFITS

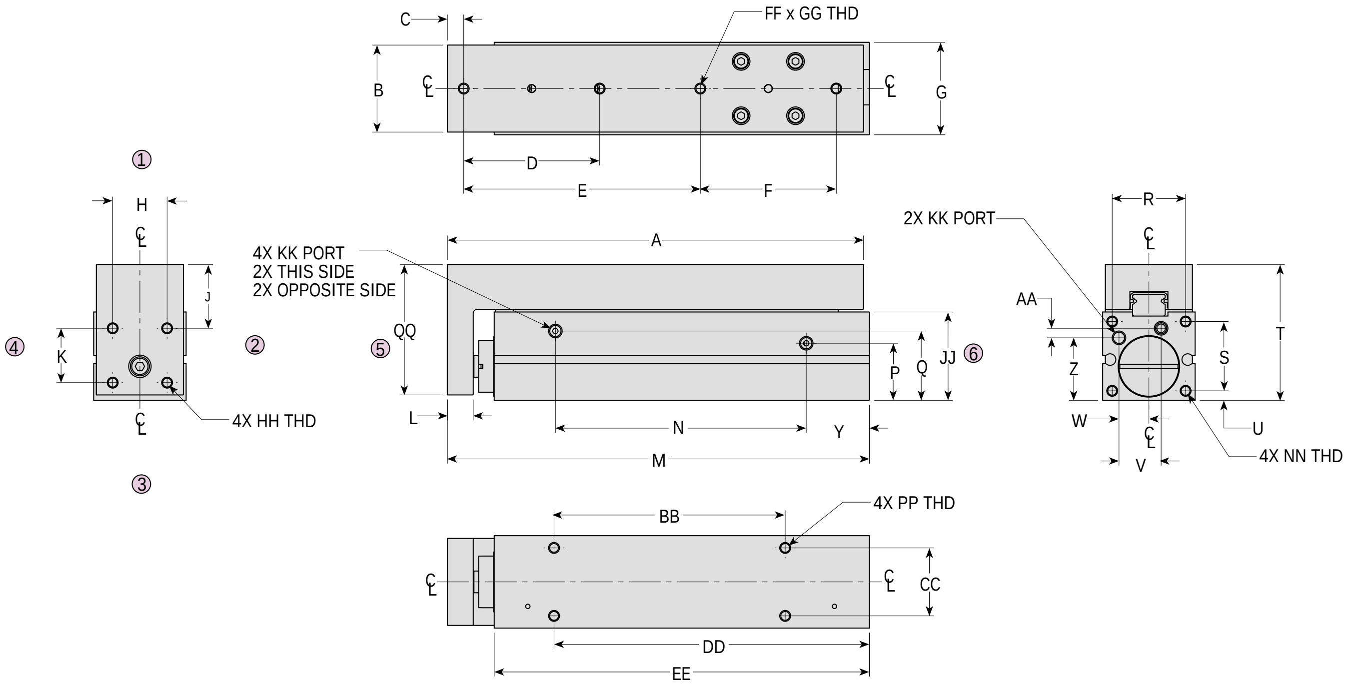
- Series SIP Slides use rail bearing technology to provide smooth, precise movement with high accuracy within confined spaces.
- Available in three bore sizes with a choice of three travel lengths each.
- Standard internal shock pads eliminate metal to metal contact; reducing noise and end-of-travel impact forces.
- Standard Series SIP Slide feature mounting holes on the end and bottom of the body.
- The slide body incorporates switch slots for convenient mounting of PHD's Series 6790 4 mm reed and solid state switches. Magnet option (-M) is required when using Series 6790 Switches.
- Series SIP Slides offer optional 5 mm of travel adjustment on extend (-AE) or retract (-AR). Specify -AE option for extend travel adjustment, -AR for retract travel adjustment, or -AE -AR for both.

SPECIFICATIONS	BORE SIZE					
	12		16		20	
	in	mm	in	mm	in	mm
POWER SOURCE	Integral pneumatic cylinder					
MAX. OPERATING PRESSURE	100 psi [7 bar]					
OPERATING TEMPERATURE RANGE	-20° to 180°F [-29° to 82°C]					
TRAVELS	.394	10	.984	25	.984	25
	.984	25	1.969	50	1.969	50
	1.969	50	2.953	75	2.953	75
STANDARD FEATURES	Multiple port positions, dual mounting positions					
BEARINGS	Stainless steel ground rail bearing system with recirculating ball bearings					
BODY	Anodized aluminum alloy					
TOOL PLATE	Anodized aluminum alloy					

FORCE TABLE

DIRECTION	SIZE 12		SIZE 16		SIZE 20	
	lb/psi	N/bar	lb/psi	N/bar	lb/psi	N/bar
EXTEND	.176	11.4	.314	20.3	.486	31.4
RETRACT	.133	8.6	.270	17.4	.409	26.4

DIMENSIONS: SERIES SIP RAIL BEARING SLIDES



LETTER DIM	SIPx12 TRAVEL, in [mm]			SIPx16 TRAVEL, in [mm]			SIPx20 TRAVEL, in [mm]		
	.394 [10.0]	.984 [25.0]	1.969 [50.0]	.984 [25.0]	1.969 [50.0]	2.953 [75.0]	.984 [25.0]	1.969 [50.0]	2.953 [75.0]
A	2.953 [75.0]	3.543 [90.0]	4.528 [115.0]	4.016 [102.0]	5.000 [127.0]	5.984 [152.0]	4.055 [103.0]	5.039 [128.0]	6.024 [153.0]
B		.827 [21.0]			1.063 [27.0]			1.260 [32.0]	
C		.197 [5.0]			.236 [6.0]			.236 [6.0]	
D	—		.787 [20.0]	—	1.654 [42.0]		—		1.969 [50.0]
E	.827 [21.0]	1.417 [36.0]	2.402 [61.0]	1.614 [41.0]	2.598 [66.0]	3.583 [91.0]	1.457 [37.0]	2.441 [62.0]	3.425 [87.0]
F		1.417 [36.0]			1.654 [42.0]			1.969 [50.0]	
G		.906 [23.0]			1.142 [29.0]			1.339 [34.0]	
H		.551 [14.0]			.709 [18.0]			.787 [20.0]	
J		.591 [15.0]			.748 [19.0]			.925 [23.5]	
K		.551 [14.0]			.709 [18.0]			.787 [20.0]	
L		.276 [7.0]			.295 [7.5]			.374 [9.5]	
M	3.031 [77.0]	3.622 [92.0]	4.606 [117.0]	4.094 [104.0]	5.079 [129.0]	6.063 [154.0]	4.134 [105.0]	5.118 [130.0]	6.102 [155.0]
N	.776 [19.7]	1.366 [34.7]	2.350 [59.7]	1.764 [44.8]	2.748 [69.8]	3.732 [94.8]	1.661 [42.2]	2.646 [67.2]	3.630 [92.2]
P		.256 [6.5]			.197 [5.0]			.827 [21.0]	
Q		.673 [17.1]			.866 [22.0]			1.004 [25.5]	
R		.669 [17.0]			.827 [21.0]			1.063 [27.0]	
S		.591 [15.0]			.827 [21.0]			.984 [25.0]	
T		1.299 [33.0]			1.693 [43.0]			1.969 [50.0]	
U		.138 [3.5]			.157 [4.0]			.157 [4.0]	
V		.276 [7.0]			.413 [10.5]			.610 [15.5]	
W		.098 [2.5]			.256 [6.5]			.433 [11.0]	
Y		.839 [21.3]			.913 [23.2]			.917 [23.3]	
Z		.674 [17.1]			.846 [21.5]			.906 [23.0]	
AA		0.00			.070 [1.8]			.138 [3.5]	
BB	.787 [20.0]	1.378 [35.0]	2.362 [60.0]	1.339 [34.0]	2.323 [59.0]	3.307 [84.0]	1.378 [35.0]	2.362 [60.0]	3.346 [85.0]
CC		.669 [17.0]			.866 [22.0]			.984 [25.0]	
DD	1.890 [48.0]	2.480 [63.0]	3.465 [88.0]	2.677 [68.0]	3.661 [93.0]	4.646 [118.0]	2.598 [66.0]	3.583 [91.0]	4.567 [116.0]
EE	2.461 [62.5]	3.051 [77.5]	4.035 [102.5]	3.504 [89.0]	4.488 [114.0]	5.472 [139.0]	3.465 [88.0]	4.449 [113.0]	5.433 [138.0]
FF	3	3	4	3	4	4	3	3	4
GG		[M3 x 0.5 x 4.6]			[M4 x 0.7 x 6]			[M4 x 0.7 x 6]	
HH		[M3 x 0.5 x 7]			[M4 x 0.7 x 7.5]			[M4 x 0.7 x 9.5]	
JJ		.827 [21.0]			1.102 [28.0]			1.280 [32.5]	
KK		[M3 x 0.5 x 3.5]			[M5 x 0.8 x 4]			[M5 x 0.8 x 4.0]	
NN		[M3 x 0.5 x 5.5]			[M4 x 0.7 x 8]			[M4 x 0.7 x 8]	
PP		[M3 x 0.5 x 5.5]			[M4 x 0.7 x 6]			[M4 x 0.7 x 6]	
QQ		1.260 [32.0]			1.614 [41.0]			1.890 [48.0]	

NOTES:
1) DESIGNATED ℄ IS CENTERLINE OF UNIT
2) METRIC INFORMATION SHOWN IN [ ]
3) CIRCLED NUMBERS INDICATE POSITION CALLOUT

All dimensions are reference only unless specifically toleranced.

ENGINEERING DATA: SERIES SIP RAIL BEARING SLIDES

PRESSURE RATINGS

All Series SIP Slides have an operating pressure range of 20 psi minimum to 100 psi maximum [1.4 to 6.9 bar]. Maximum life will be achieved when pressure and velocity are no greater than necessary for proper operation. External flow controls are recommended. Series SIP Slides feature standard pneumatic ports on the end and both sides of the slide body, and are provided with the end ports ready for use and the side ports plugged with set screws and thread sealant.

OPERATING TEMPERATURE

Series SIP Slides are designed for use in temperatures between -20° to 180° F [-29° to 82° C]. For temperatures outside this range, consult PHD.

SEALS

Series SIP Slides utilize urethane and Nitrile seals which are compatible with standard paraffin-based lubrication oils used for pneumatic cylinders. For compatibility with other fluids, consult PHD.

LUBRICATION

All units are pre-lubricated at the factory for service under normal operating conditions. Slides are designed and tested with non-lubricated air. However, the use of lubricated air will extend life.

MATERIAL SPECIFICATIONS

The slide housing and tool plate are anodized aluminum alloy. Linear rail and bearings are hardened and ground stainless steel.

MAINTENANCE

Common with most PHD products, these slides are fully field repairable. Repair kits and main structural components are available as needed for extended service life.

TOTAL TRAVEL LENGTH AND WEIGHT

For standard units the tolerance of nominal travel lengths is +.039/-.000 [+1 mm/-0 mm]. See Options section of catalog for details regarding units with travel adjustment option (-AE or -AR).

	NOMINAL TRAVEL		UNIT BASE WEIGHT	
SIZE	in	mm	lb	kg
12	(.394)	10	.30	.14
	(.984)	25	.35	.16
	(1.969)	50	.46	.21
16	(.984)	25	.71	.32
	(1.969)	50	.88	.40
	(2.953)	75	1.04	.47
20	(.984)	25	1.04	.47
	(1.969)	50	1.26	.57
	(2.953)	75	1.48	.67

MOUNTING INSTRUCTIONS

PHD recommends mounting load or tooling with tool plate retracted. Support tool plate while tightening fasteners. Maximum mounting torques (for screw thread engagement of one diameter or greater):

SIZE	in-lb	Nm
M2	2.6	0.3
M3	9	1.0
M4	18	2.0

SLIDE SELECTION

There are three major factors to consider when selecting a slide: thrust capacity, dynamic moment capacity, and the allowable velocity.

1 THRUST CAPACITY

Use the theoretical force output table to determine if thrust is sufficient for the applied load.

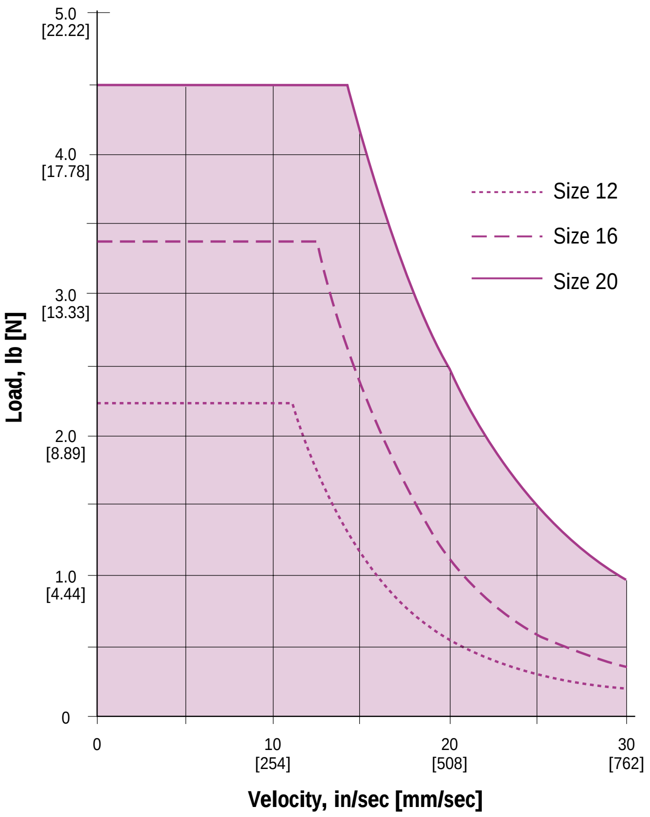
2 DYNAMIC MOMENT CAPACITY

The Dynamic Moment Load graphs (pages 5A-7 to 5A-9) show the allowable load for the three most common mounting positions of the Series SIP Slide. Determine the distance “x” from the edge of the tool plate to the load center of gravity. Use the appropriate graph for the loading condition to determine the allowable load. It is generally best to keep the center of gravity of the load as close to the slide as possible. If the application requires combined loading such as a horizontal pitch load combined with a roll load, if static loads exceed dynamic loads, or if there are other questions concerning the selection of an appropriate slide, please contact PHD’s Customer Service Department.

3 ALLOWABLE VELOCITY

Use the allowable velocity graph to verify that the slide selected can carry the payload at the desired velocity.

ALLOWABLE LOAD VS. VELOCITY

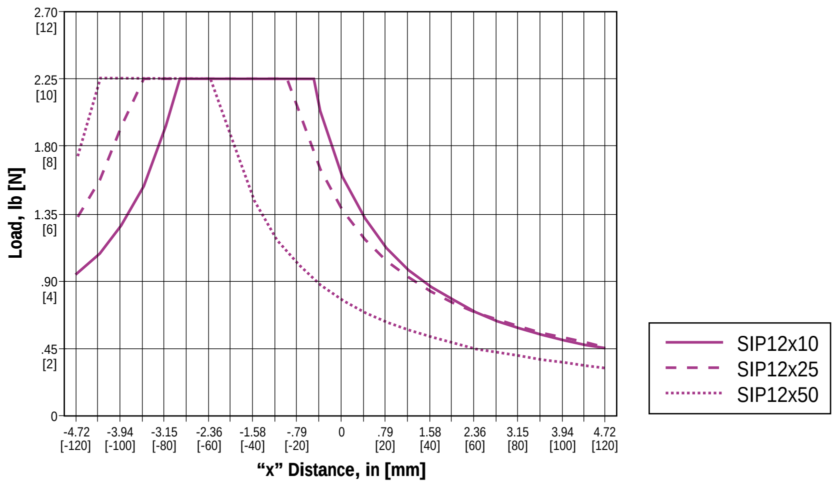


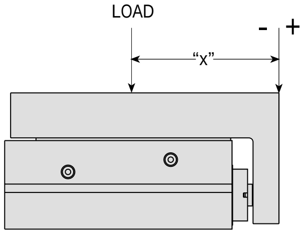
THEORETICAL FORCE OUTPUT TABLE lb [N]

SIZE	DIRECTION	OPERATING PRESSURE 20 psi [1.4 bar]	30 psi [2.1 bar]	40 psi [2.8 bar]	50 psi [3.4 bar]	60 psi [4.1 bar]	70 psi [4.8 bar]	80 psi [5.5 bar]	90 psi [6.2 bar]	100 psi [6.9 bar]
12	RETRACT	2.7 [12.0]	4.0 [17.8]	5.3 [23.6]	6.7 [29.8]	8.0 [35.6]	9.3 [41.3]	10.7 [47.6]	12.0 [53.3]	13.3 [59.1]
	EXTEND	3.5 [15.6]	5.3 [23.6]	7.1 [31.6]	8.8 [39.1]	10.6 [47.1]	12.4 [55.1]	14.1 [62.7]	15.9 [70.7]	17.6 [78.2]
16	RETRACT	5.4 [24.0]	8.1 [36.0]	10.8 [48.0]	13.5 [60.0]	16.2 [72.0]	18.9 [84.0]	21.6 [96.0]	24.3 [108.0]	27.0 [120.0]
	EXTEND	6.3 [28.0]	9.4 [41.8]	12.5 [55.6]	15.7 [69.8]	18.8 [83.6]	22.0 [97.8]	25.1 [111.6]	28.2 [125.3]	31.4 [139.6]
20	RETRACT	8.2 [37.0]	12.3 [55.4]	16.4 [73.9]	20.5 [89.8]	24.5 [108.2]	28.6 [126.7]	32.7 [145.2]	36.8 [163.7]	40.9 [182.2]
	EXTEND	9.7 [44.0]	14.6 [65.9]	19.4 [87.9]	24.3 [106.8]	29.2 [128.7]	34.0 [150.7]	38.9 [172.7]	43.7 [194.7]	48.6 [216.7]

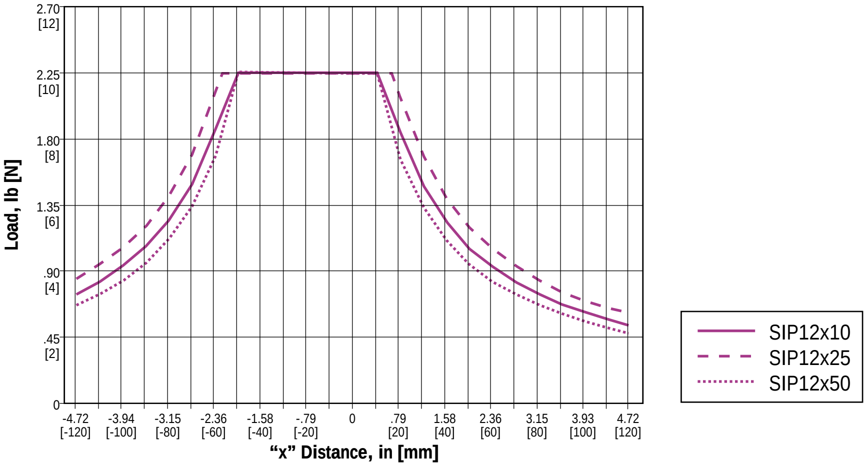
ENGINEERING DATA: SERIES SIP SIZE 12, DYNAMIC MOMENT LOADS

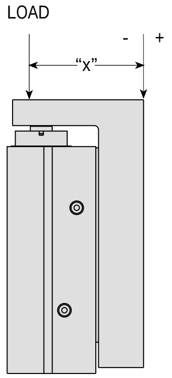
MAXIMUM DYNAMIC HORIZONTAL PITCH MOMENT LOADS



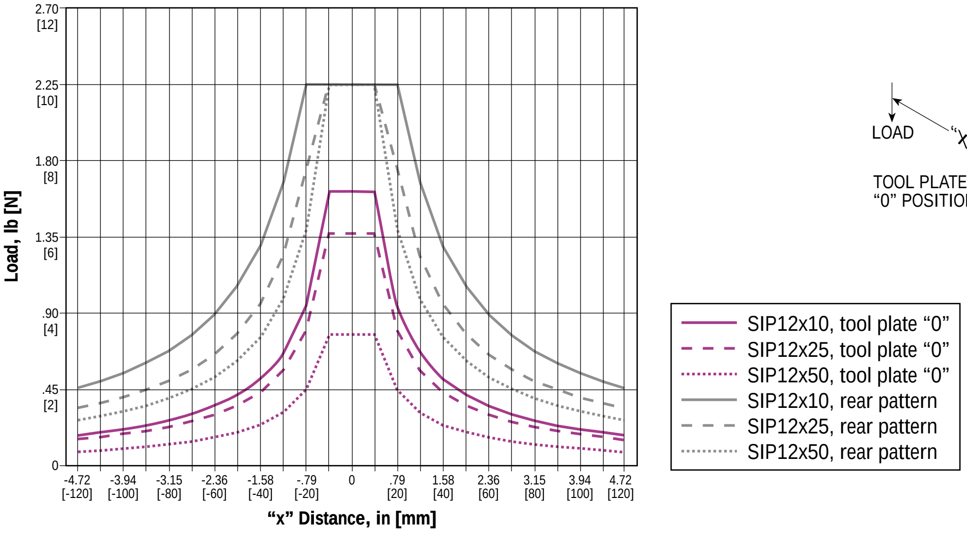


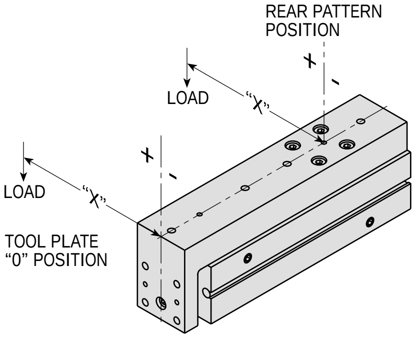
MAXIMUM DYNAMIC VERTICAL PITCH MOMENT LOADS





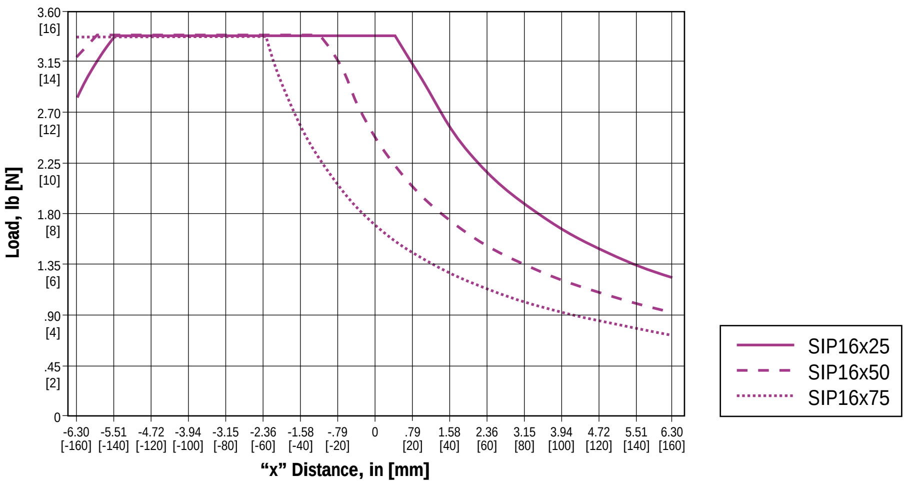
MAXIMUM DYNAMIC ROLL MOMENT LOADS

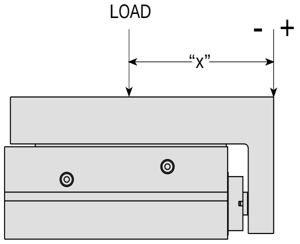


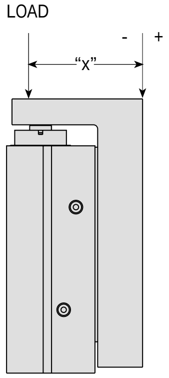


ENGINEERING DATA: *SERIES SIP SIZE 16, DYNAMIC MOMENT LOADS*

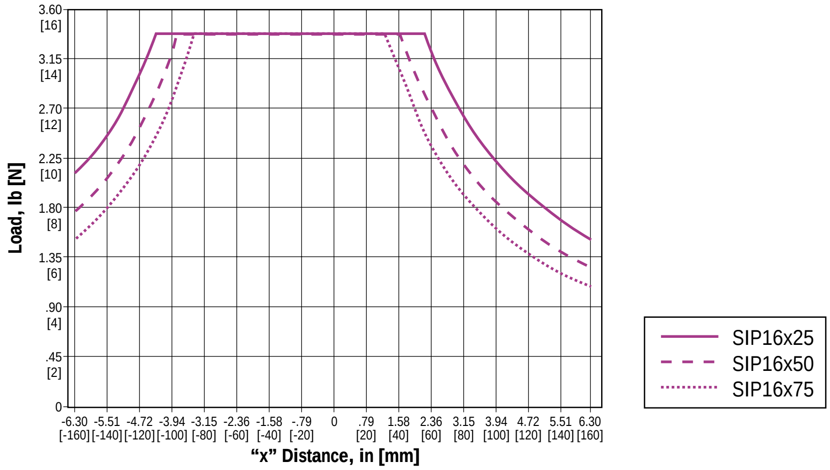
MAXIMUM DYNAMIC HORIZONTAL PITCH MOMENT LOADS



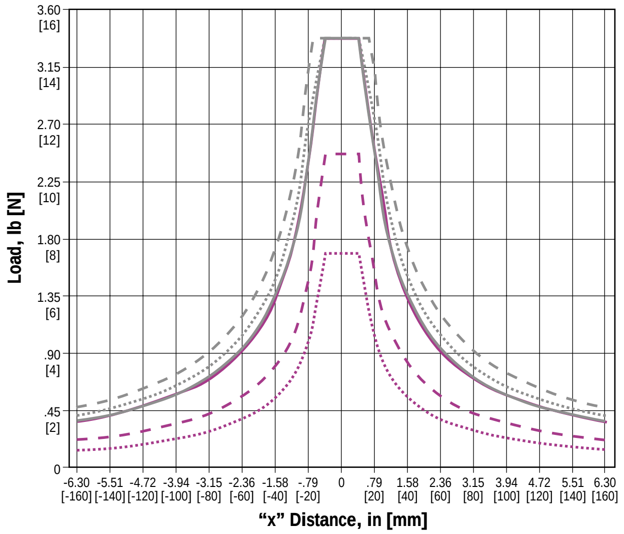


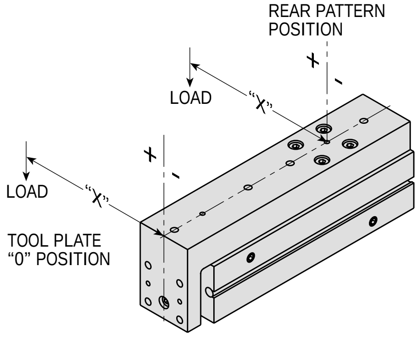


MAXIMUM DYNAMIC VERTICAL PITCH MOMENT LOADS



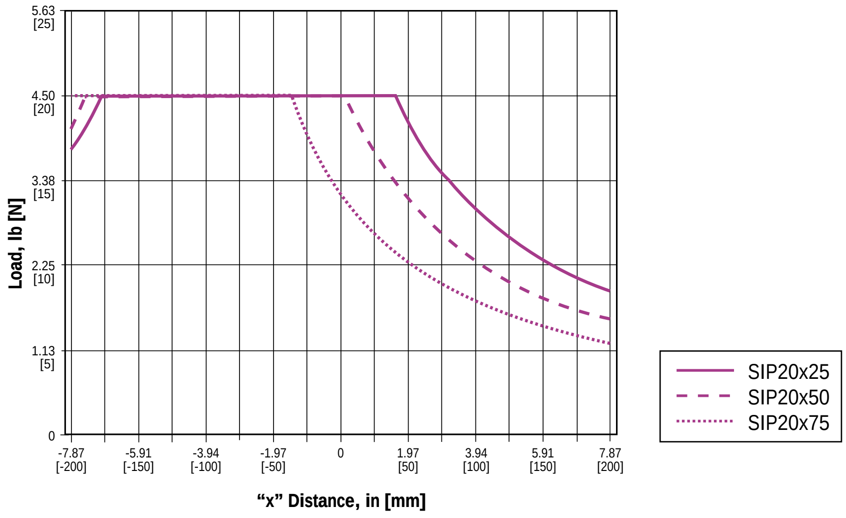
MAXIMUM DYNAMIC ROLL MOMENT LOADS

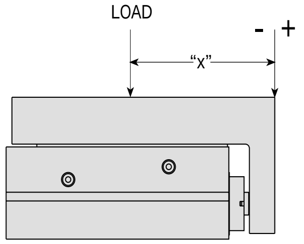


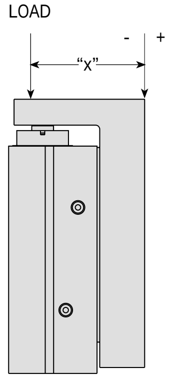


ENGINEERING DATA: *SERIES SIP SIZE 20, DYNAMIC MOMENT LOADS*

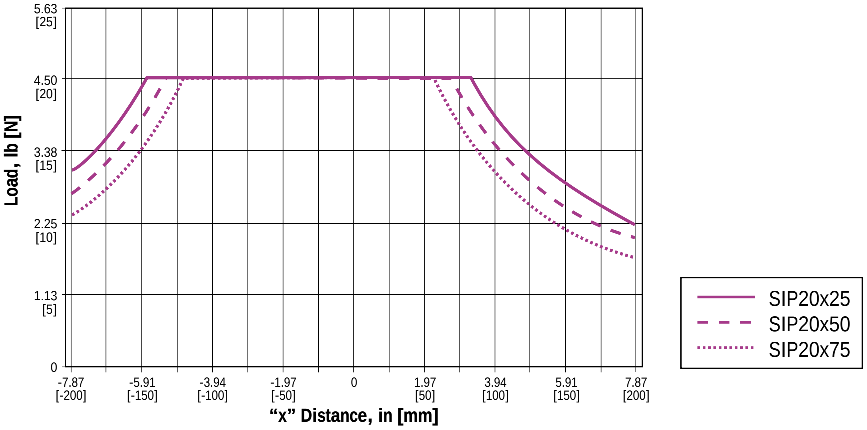
MAXIMUM DYNAMIC HORIZONTAL PITCH MOMENT LOADS

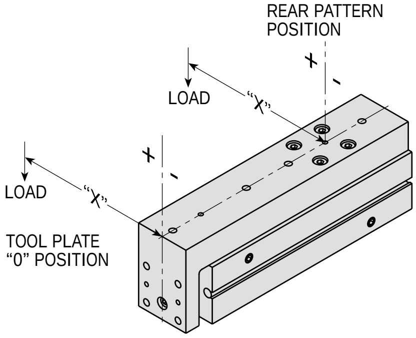




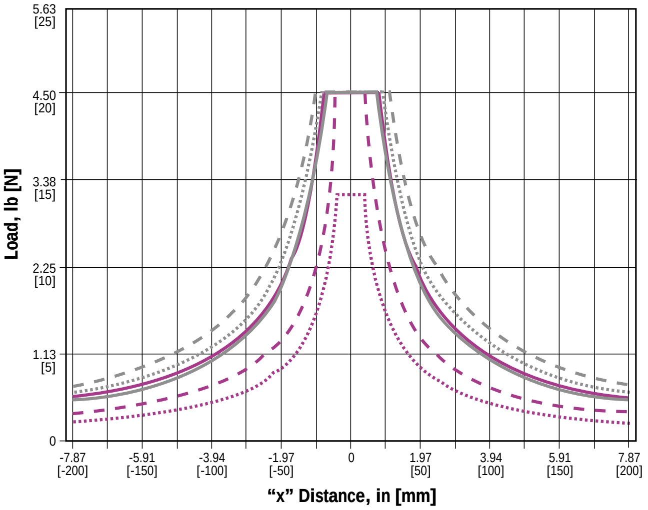


MAXIMUM DYNAMIC VERTICAL PITCH MOMENT LOADS





MAXIMUM DYNAMIC ROLL MOMENT LOADS



SIP20x25, tool plate "0"
SIP20x50, tool plate "0"
SIP20x75, tool plate "0"
SIP20x25, rear pattern
SIP20x50, rear pattern
SIP20x75, rear pattern

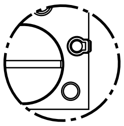
OPTIONS: SERIES SIP RAIL BEARING SLIDES

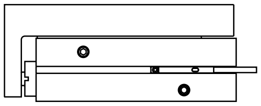
M

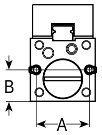
MAGNET FOR PHD SERIES 6790 REED AND SOLID STATE SWITCHES

This option equips the unit with a magnetic piston for use with PHD's Series 6790 Switch. The switch housing is 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 set screw.

LETTER	SIZE 12		SIZE 16		SIZE 20	
DIM	in	mm	in	mm	in	mm
A	0.689	17.5	0.933	23.7	1.122	28.5
B	0.492	12.5	0.551	14	0.591	15


END VIEW





SERIES 6790 REED SWITCHES

	REPEATABILITY		HYSTERESIS MAXIMUM		BANDWIDTH MIN./MAX.	
SIZE	in	mm	in	mm	in	mm
12	+/-.005	+/-.13	0.060	1.5	.380/.400	9.7/10.2
16	+/-.005	+/-.13	0.080	2.0	.220/.350	5.6/8.9
20	+/-.005	+/-.13	0.060	1.5	.335/.750	8.5/19.0

SERIES 6790 SOLID STATE SWITCHES

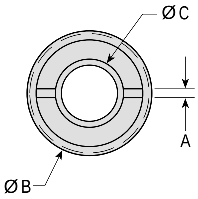
	REPEATABILITY		HYSTERESIS MAXIMUM		BANDWIDTH MIN./MAX.	
SIZE	in	mm	in	mm	in	mm
12	+/-.005	+/-.13	0.060	1.5	.335/.630	8.5/16.0
16	+/-.005	+/-.13	0.080	2.0	.170/.490	4.3/12.4
20	+/-.005	+/-.13	0.060	1.5	.280/.670	7.1/17.0

AE

TRAVEL ADJUSTMENT ON EXTEND

This option provides up to 5 mm of travel on extend. Travel adjustment is made using a spanner wrench or similar tool to engage the slots in the cartridge and rotating the cartridge to the desired position. Rotating the cartridge clockwise reduces the travel. Normal shock pad operation is maintained regardless of cartridge position. Travel adjustment has internal stops, preventing loss of components. The -AE option may be used in conjunction with the -AR option to provide travel adjustment at both ends of travel.

CARTRIDGE SLOT DETAIL



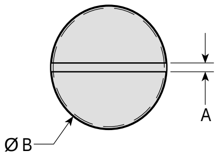
	"A" SLOT WIDTH		"B" MAX TOOL DIA		"C" ROD CLEARANCE DIA		SLOT DEPTH	
SIZE	in	mm	in	mm	in	mm	in	mm
12	.062	1.6	.450	11.4	.215	5.5	.030	.8
16	.062	1.6	.600	15.2	.362	9.2	.060	1.5
20	.062	1.6	.817	20.8	.478	12.1	.060	1.5

AR

TRAVEL ADJUSTMENT ON RETRACT

This option provides up to 5 mm of travel on retract. Travel adjustment is made using a flat-bladed screwdriver or similar tool to engage the slot in the bore plug and rotating the bore plug to the desired position. Rotating the bore plug clockwise reduces the travel. Normal shock pad operation is maintained regardless of bore plug position. Travel adjustment has internal stops, preventing loss of components. The -AR option may be used in conjunction with the -AE option to provide travel adjustment at both ends of travel.

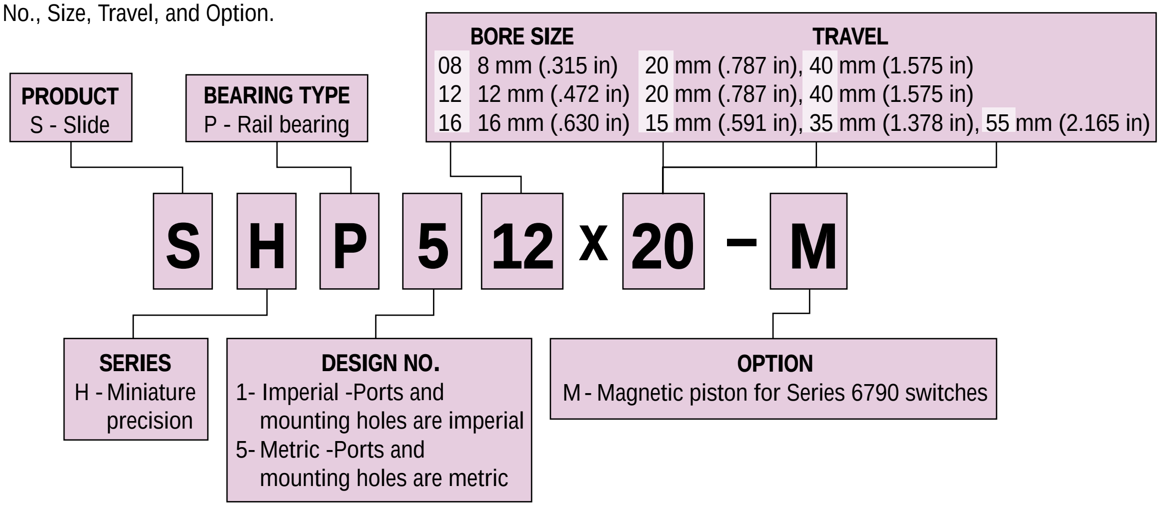
BORE PLUG SLOT DETAIL



	"A" SLOT WIDTH		"B" MAX TOOL DIA		SLOT DEPTH	
SIZE	in	mm	in	mm	in	mm
12	.062	1.6	.450	11.4	.030	.8
16	.062	1.6	.600	15.2	.060	1.5
20	.062	1.6	.817	20.8	.060	1.5

ORDERING DATA: SERIES SHP SLIDES WITH RAIL BEARING

TO ORDER SPECIFY:
Product, Series, Bearing Type, Design No., Size, Travel, and Option.



S H P 5 12 X 20 – M

PRODUCT
S - Slide

SERIES
H - Miniature precision

BEARING TYPE
P - Rail bearing

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

BORE SIZE		**TRAVEL**
08	8 mm (.315 in)	20 mm (.787 in), 40 mm (1.575 in)
12	12 mm (.472 in)	20 mm (.787 in), 40 mm (1.575 in)
16	16 mm (.630 in)	15 mm (.591 in), 35 mm (1.378 in), 55 mm (2.165 in)

OPTION
M - Magnetic piston for Series 6790 switches

PART NO.	DESCRIPTION
67902-1-02	NPN (Sink) or PNP (Source) DC Reed, 2 m cable
67902-1-05	NPN (Sink) or PNP (Source) DC Reed, 5 m cable
67903-1-02	NPN (Sink) DC Solid State, 2 m cable
67903-1-05	NPN (Sink) DC Solid State, 5 m cable
67904-1-02	PNP (Source) DC Solid State, 2 m cable
67904-1-05	PNP (Source) DC Solid State, 5 m cable
67922-1	NPN (Sink) or PNP (Source) DC Reed, Quick Connect
67923-1	NPN (Sink) DC Solid State, Quick Connect
67924-1	PNP (Source) DC Solid State, Quick Connect
63549-02	2 m Cordset with Quick Connect
63549-05	5 m Cordset with Quick Connect

BENEFITS: ***SERIES SHP SLIDES WITH RAIL BEARING***

BENEFITS

- Series SHP Slides use rail bearing technology to provide smooth, precise movement within confined spaces.

- Available in three bore sizes and five travel lengths.

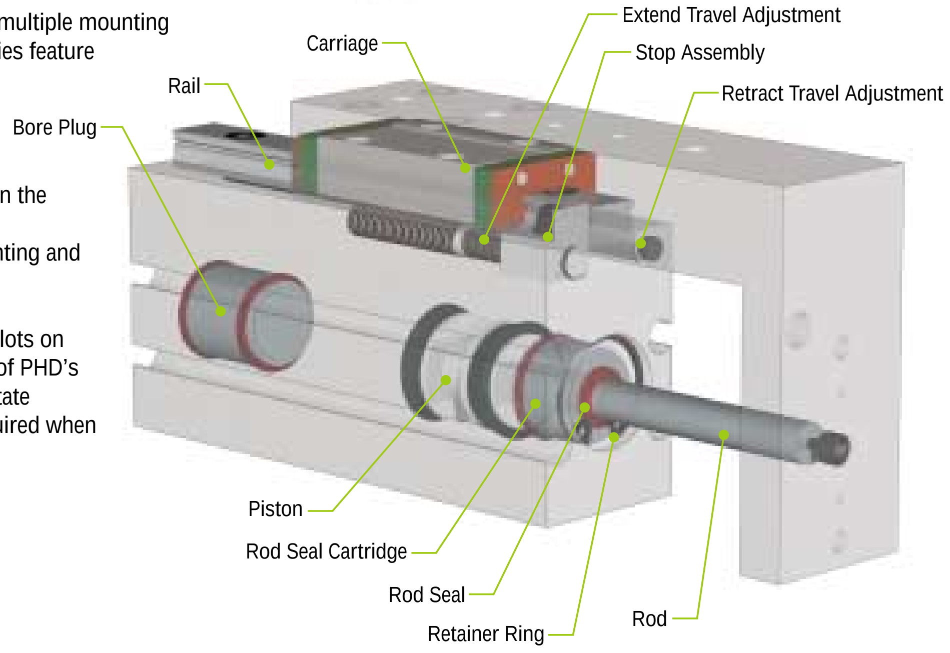
- Standard travel adjustments for both extend and retract positions are conveniently located on the back of the slide. Integrated shock pads provide shock reduction throughout the full range of travel adjustment.

- Available in both imperial and metric versions for applications in worldwide markets.

- Standard Series SHP Slides provide multiple mounting options for maximum flexibility. Bodies feature mounting holes on sides, end, and bottom. Tool plates feature mounting on top and end.

- Standard dowel holes are provided on the body and both end and top tool plate mounting positions for precise mounting and attachment of tooling.

- Slide housing provides dual switch slots on either side for convenient mounting of PHD's Series 6790 4 mm Reed and Solid State switches. Magnet option (-M) is required when using switches.

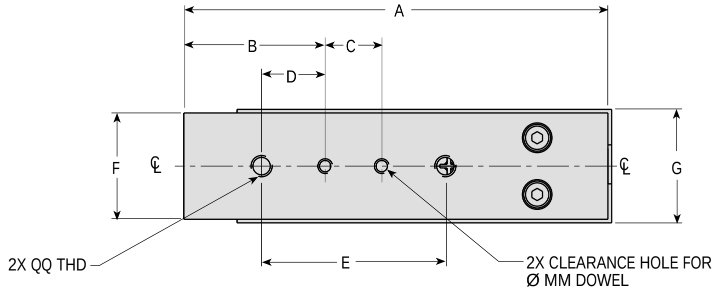


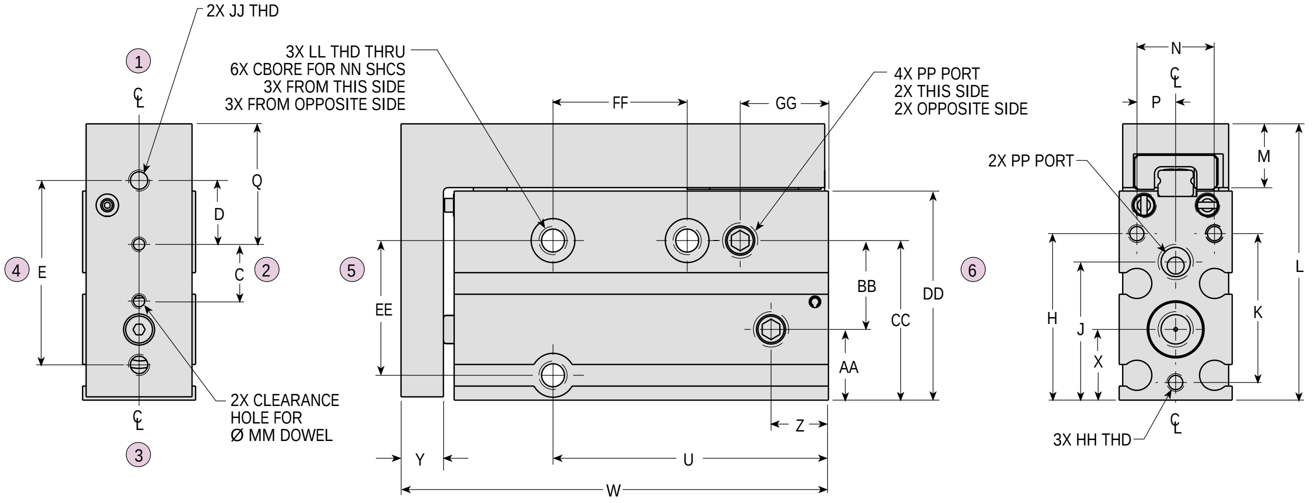
SPECIFICATIONS	BORE SIZE					
	08		12		16	
	in	mm	in	mm	in	mm
POWER SOURCE	Integral pneumatic cylinder					
MAX. OPERATING PRESSURE	100 psi [6.9 bar]					
OPERATING TEMPERATURE RANGE	-20° to 180°F [-29° to 82°C]					
TRAVELS	.79	20	.79	20	.59	15
	1.57	40	1.57	40	1.38	35
					2.17	55
TRAVEL ADJUSTMENTS	Standard on both extend and retract					
STANDARD FEATURES	Multiple port positions, multiple mounting positions, dowel pin holes					
BEARINGS	Stainless steel ground rail bearing system with recirculating ball bearings					
BODY	Anodized aluminum alloy					
TOOL PLATE	Anodized aluminum alloy					

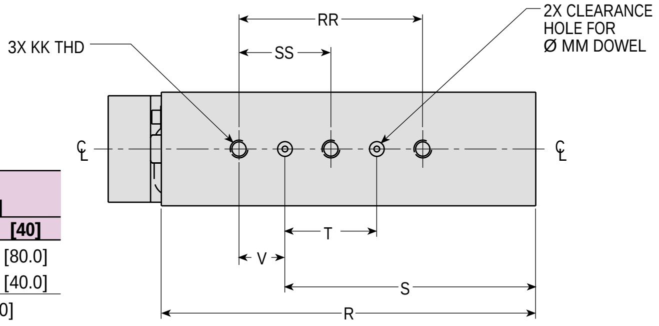
FORCE TABLE

DIRECTION	SIZE 08		SIZE 12		SIZE 16	
	lb/psi	N/B	lb/psi	N/B	lb/psi	N/B
EXTEND	.079	5.1	.176	11.4	.314	20.3
RETRACT	.060	3.9	.133	8.6	.270	17.4

DIMENSIONS: SERIES SHP SLIDES - SIZE 08







LETTER DIM.	SIZE 08 TRAVEL, in [mm]			
	0.79	[20]	1.57	[40]
A	2.362	[60.0]	3.149	[80.0]
B	0.787	[20.0]	1.574	[40.0]
C*	0.315			[8.0]
D	0.354			[9.0]
E	1.024			[26.0]
F	0.591			[15.0]
G	0.630			[16.0]
H	0.925			[23.5]
J	0.767			[19.5]
K	0.827			[21.0]
L	1.534			[39.0]
M	0.354			[9.0]
N	0.433			[11.0]
P	0.217			[5.5]
Q	0.669			[17.0]
R	2.087	[53.0]	2.874	[73.0]
S	1.398	[35.5]	1.791	[45.5]
T*	0.512			[13.0]
U	1.536	[39.0]	2.323	[59.0]
V	0.256			[6.5]
W	2.383	[60.5]	3.17	[80.5]
X	0.393			[10.0]
Y	0.236			[6.0]
Z	0.320			[8.1]

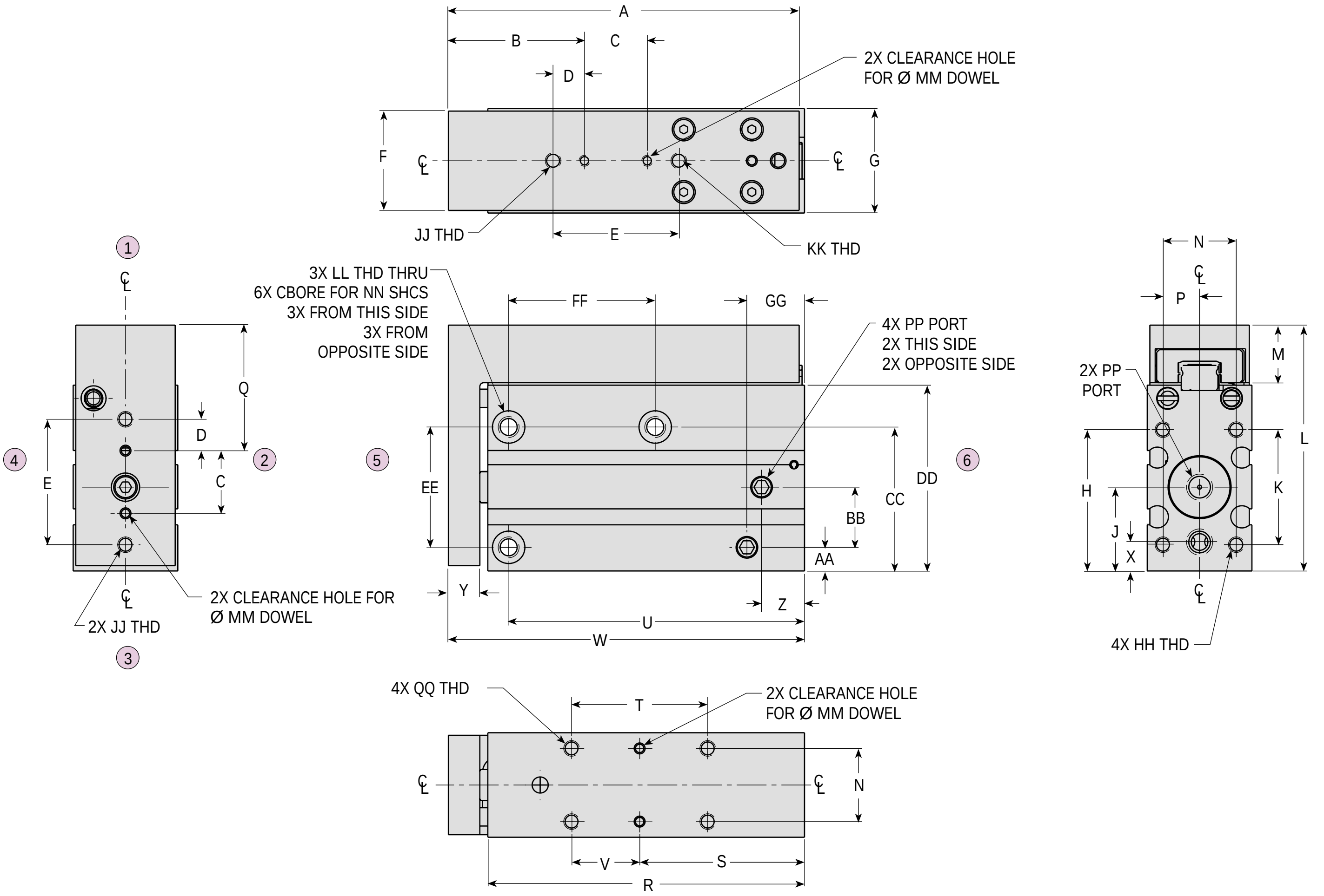
* TOLERANCE IS ± .001 BETWEEN DOWEL PIN HOLES.

LETTER DIM.	SIZE 08 TRAVEL, in [mm]			
	0.79	[20]	1.57	[40]
AA	.393			[10.0]
BB	.493			[12.5]
CC	.886			[22.5]
DD	1.161			[29.5]
EE	.748			[19.0]
FF	0.748	[19.0]	1.535	[39.0]
GG	0.492			[12.5]
HH	#4-40 UNC x .320 DP			[M2.5 x 0.45 x 8.1 mm DP]
JJ	#4-40 UNC THRU			[M3 x 0.5 THRU]
KK	#4-40 UNC x .140 DP			[M2.5 x 0.45 x 3.5 mm DP]
LL	#8-32 UNC THRU			[M4 x 0.7 THRU]
MM	1/16 x .125 DP			[2 mm x 3.1 mm DP]
NN	#5			[M3]
PP	#10-32 PORT			[M5 x 0.8 PORT]
QQ	#4-40 UNC x .157 DP			[M3 x 0.5 x 4.0 mm DP]
RR	1.024			[26.0]
SS	.512			[13.0]

NOTES:
1) DESIGNATED ℄ IS CENTERLINE OF UNIT.
2) METRIC INFORMATION SHOWN IN [ ].
3) CIRCLED NUMBERS INDICATE POSITION CALLOUT.

All dimensions are reference only unless specifically toleranced.

DIMENSIONS: SERIES SHP SLIDES - SIZES 12 & 16



LETTER DIM.	SIZE 12				SIZE 16					
	TRAVEL, in [mm]				TRAVEL, in [mm]					
	0.79	**[20]**	**1.57**	**[40]**	**0.59**	**[15]**	**1.38**	**[35]**	**2.17**	**[55]**
A	2.638	[67.0]	3.425	[87.0]	2.874	[73.0]	3.661	[93.0]	4.449	[113.0]
B	1.024	[26.0]	1.811	[46.0]	1.201	[30.5]	1.988	[50.5]	2.776	[70.5]
C*	0.472	[12.0]			0.472	[12.0]				
D	0.236	[6.0]			0.512	[13.0]				
E	0.945	[24.0]			1.496	[38.0]				
F	0.748	[19.0]			0.945	[24.0]				
G	0.787	[20.0]			0.984	[25.0]				
H	1.064	[27.0]			1.141	[29.0]				
J	0.631	[16.0]			0.669	[17.0]				
K	0.866	[22.0]			0.944	[24.0]				
L	1.851	[47.0]			2.106	[53.5]				
M	0.433	[11.0]			0.551	[14.0]				
N*	0.551	[14.0]			0.630	[16.0]				
P	0.276	[7.0]			0.315	[8.0]				
Q	0.945	[24.0]			.768	[19.5]				
R	2.382	[60.5]	3.169	[80.5]	2.559	[65.0]	3.346	[85.0]	4.134	[105.0]
S	1.240	[31.5]	1.633	[41.5]	1.338	[34.0]	1.731	[44.0]	2.126	[54.0]
T	1.024	[26.0]			1.181	[30.0]				
U	2.225	[56.5]	3.012	[76.5]	2.362	[60.0]	3.149	[80.0]	3.937	[100.0]
V	0.512	[13.0]			0.591	[15.0]				
W	2.678	[68.0]	3.465	[88.0]	2.895	[73.5]	3.682	[93.5]	4.47	[113.5]
X	0.218	[5.5]			0.197	[5.0]				
Y	0.236	[6.0]			0.276	[7.0]				
Z	0.323	[8.2]			0.372	[9.4]				

* TOLERANCE IS ± .001 BETWEEN DOWEL PIN HOLES.

LETTER DIM.	SIZE 12				SIZE 16					
	TRAVEL, in [mm]				TRAVEL, in [mm]					
	0.79	**[20]**	**1.57**	**[40]**	**0.59**	**[15]**	**1.38**	**[35]**	**2.17**	**[55]**
AA	0.178	[4.5]			0.197	[5.0]				
BB	0.453	[11.5]			0.472	[12.0]				
CC	1.084	[27.5]			1.161	[29.5]				
DD	1.399	[35.5]			1.535	[39.0]				
EE	0.906	[23.0]			0.984	[25.0]				
FF	1.102	[28.0]	1.889	[48.0]	1.181	[30.0]	1.968	[50.0]	2.756	[70.0]
GG	0.433	[11.0]			0.591	[15.0]				
HH	#4-40 UNC x .236 DP	[M3 x 0.5 x 6 mm DP]			#8-32 UNC x .276 DP	[M4 x 0.7 x 7 mm DP]				
JJ	#4-40 UNC x .236 DP	[M3 x 0.5 x 6 mm DP]			#8-32 UNC x .295 DP	[M4 x 07 x 7.5 mm DP]				
KK	#4-40 UNC x .167 DP	[M3 x 0.5 x 4.2 mm DP]			#8-32 UNC x .207 DP	[M4 x 0.7 x 5.2 mm DP]				
LL	#8-32 UNC THRU	[M4 X 0.7 THRU]			#10-32 UNF THRU	[M5 x 0.8 THRU]				
MM	1/16 x .125 DP	[2 mm x 3.1 mm DP]			1/8 x .188 DP	[2 mm x 3 mm DP]				
NN	#5	[M3]			#6	[M4]				
PP	#10-32 PORT	[M5 x 0.8 PORT]			#10-32 PORT	[M5 x 0.8 PORT]				
QQ	#4-40 UNC x .177 DP	[M3 x 0.5 x 4.5 mm DP]			#8-32 UNC x .236 DP	[M4 x 0.7 x 6 mm DP]				

NOTES:
1) DESIGNATED ℄ IS CENTERLINE OF UNIT.
2) METRIC INFORMATION SHOWN IN [ ].
3) CIRCLED NUMBERS INDICATE POSITION CALLOUT.

ENGINEERING DATA: SERIES SHP SLIDES

PRESSURE RATINGS

All Series SHP Slides have an operating pressure range of 20 psi minimum to 100 psi maximum [1.4 to 6.9 bar]. For longest slide life it is recommended that pressure and velocity be no greater than necessary for proper operation. Series SHP Slides incorporate internal orifices to help limit velocities. However, external flow controls are recommended at higher pressures or if slide operation results in strong impact loads at ends of travel. Series SHP Slides feature standard pneumatic ports on the end and both sides of the slide body, and are provided with the end ports ready for use and the side ports plugged with set screws and thread sealant.

OPERATING TEMPERATURE

Series SHP Slides are designed for use in temperatures between 20° to 180° F [-6° to 82° C]. For temperatures outside this range, consult PHD.

SEALS

Series SHP Slides utilize urethane and Nitrile seals which are compatible with standard paraffin-based lubrication oils used for pneumatic cylinders. For compatibility with other fluids, consult PHD.

LUBRICATION

All units are pre-lubricated at the factory for service under normal operating conditions. Slides are designed and tested with non-lubricated air. However, the use of lubricated air will extend life.

MATERIAL SPECIFICATIONS

The slide housing and tool plate are anodized aluminum alloy. Linear rail and bearings are hardened and ground stainless steel.

MAINTENANCE

In common with most PHD products, these slides are fully field repairable. Repair kits and main structural components are available as needed for extended service life.

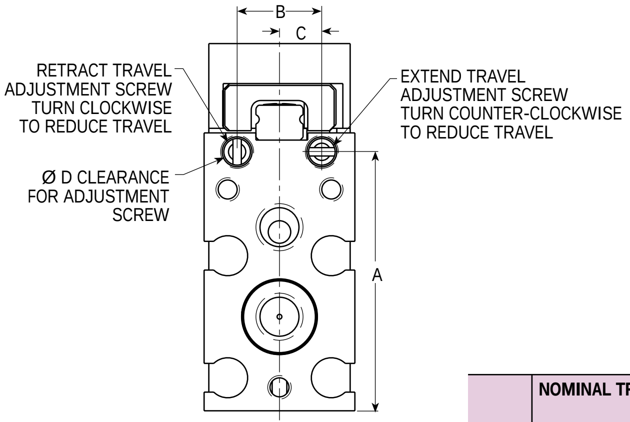
UNIT WEIGHT

SIZE	TRAVEL in	TRAVEL mm	WEIGHT lb	WEIGHT kg
08	.79	20	.20	.09
	1.57	40	.26	.12
12	.79	20	.38	.17
	1.57	40	.48	.22
16	.59	15	.56	.25
	1.38	35	.71	.32
	2.17	55	.85	.39

TRAVEL ADJUSTMENT

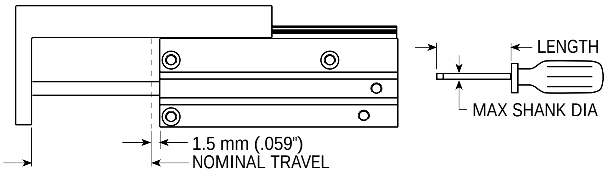
Standard Series SHP Slides provide travel adjustment in both the retract and extend directions. Travel adjustments are made using a small flat bladed or standard screwdriver via the adjustment holes located on the back of the slide. Series SHP Slides are designed to provide nominal travel. Using the travel adjustment screws allows reducing either the extend or retract travel by .394 in [10 mm] (5 mm for SHP08).

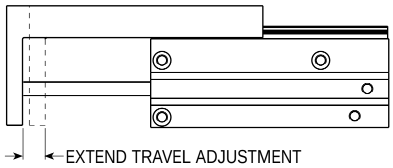
Travel adjustment requires a small flat bladed screwdriver with a minimum shank length and diameter as shown in the table below. Blade thickness should not exceed .030 in [.75 mm]. Travel adjustments should not be adjusted beyond positions shown in illustration. Loss of components or damage to the mechanism may occur if adjusted beyond the recommended limits.

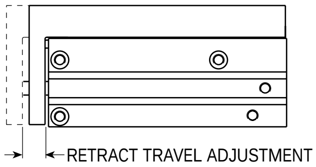


LETTER DIM	08 in	08 mm	12 in	12 mm	16 in	16 mm
A	1.082	27.5	1.300	33.0	1.436	36.5
B	0.354	9.0	0.480	12.2	0.570	14.5
C	0.177	4.5	0.240	6.1	0.285	7.2
D	0.125	3.2	0.165	4.2	0.165	4.2

TRAVEL ADJUSTMENT







SIZE	NOMINAL TRAVEL in	NOMINAL TRAVEL mm	EXTEND TRAVEL ADJUSTMENT in	EXTEND TRAVEL ADJUSTMENT mm	RETRACT TRAVEL ADJUSTMENT in	RETRACT TRAVEL ADJUSTMENT mm	ADJUSTMENT MIN. SHANK LENGTH in	ADJUSTMENT MIN. SHANK LENGTH mm	SCREWDRIVER MAX. SHANK DIAMETER in	SCREWDRIVER MAX. SHANK DIAMETER mm
08	0.79	20	.197	5	.197	5	1.5	38	.083	2.1
	1.57	40	.197	5	.197	5	2.3	58	.083	2.1
12	0.79	20	.394	10	.394	10	1.1	28	.130	3.3
	1.57	40	.394	10	.394	10	1.2	30	.130	3.3
16	0.59	15	.394	10	.394	10	1.3	33	.130	3.3
	1.38	35	.394	10	.394	10	1.3	33	.130	3.3
	2.17	55	.394	10	.394	10	2.2	55	.130	3.3

ENGINEERING DATA: *SERIES SHP SLIDES*

SLIDE SELECTION

There are three major factors to consider when selecting a slide: thrust capacity, allowable mass, and dynamic moment capacity.

1 THRUST CAPACITY

Use the theoretical output table to determine if thrust is sufficient for the applied load.

2 MAXIMUM PAYLOAD CAPACITY

All Series SHP Slides come standard with end of travel shock pads. However, these shock pads are limited in the amount of energy that they can dissipate. Therefore, the slides have a maximum payload limit. Use the allowable velocity graph to verify that the slide can carry the payload at the desired velocity.

3 DYNAMIC MOMENT CAPACITY

The Dynamic Moment Load graphs show the allowable load for the three most common mounting positions of the Series SHP Slide. Determine the distance “x” from the edge of the tool plate to the load center of gravity. Use the graph appropriate for the loading condition to determine the allowable load. It is generally best to keep the load center of gravity as close to the slide as possible. (See next page for graphs.) If the application requires combined loading such as a horizontal pitch load combined with a roll load, if static loads exceed dynamic loads, or if there are other questions concerning the selection of an appropriate slide, please contact PHD’s Customer Service Department.

THEORETICAL OUTPUT TABLE lb [N]

		OPERATING PRESSURE								
SIZE	DIRECTION	20 psi [1.4 bar]	30 psi [2.1 bar]	40 psi [2.8 bar]	50 psi [3.4 bar]	60 psi [4.1 bar]	70 psi [4.8 bar]	80 psi [5.5 bar]	90 psi [6.2 bar]	100 psi [6.9 bar]
08	RETRACT	1.2 [5.3]	1.8 [8.0]	2.4 [10.7]	3.0 [13.3]	3.6 [16.0]	4.2 [18.7]	4.8 [21.3]	5.4 [24.0]	6.0 [26.7]
	EXTEND	1.6 [7.1]	2.4 [10.7]	3.1 [13.8]	3.9 [17.3]	4.7 [20.9]	5.5 [24.4]	6.3 [28.0]	7.1 [31.6]	7.9 [35.1]
12	RETRACT	2.7 [12.0]	4.0 [17.8]	5.3 [23.6]	6.7 [29.8]	8.0 [35.6]	9.3 [41.3]	10.7 [47.6]	12.0 [53.3]	13.3 [59.1]
	EXTEND	3.5 [15.6]	5.3 [23.6]	7.1 [31.6]	8.8 [39.1]	10.6 [47.1]	12.4 [55.1]	14.1 [62.7]	15.9 [70.7]	17.6 [78.2]
16	RETRACT	5.4 [24.0]	8.1 [36.0]	10.8 [48.0]	13.5 [60.0]	16.2 [72.0]	18.9 [84.0]	21.6 [96.0]	24.3 [108.0]	27.0 [120.0]
	EXTEND	6.3 [28.0]	9.4 [41.8]	12.5 [55.6]	15.7 [69.8]	18.8 [83.6]	22.0 [97.8]	25.1 [111.6]	28.2 [125.3]	31.4 [139.6]

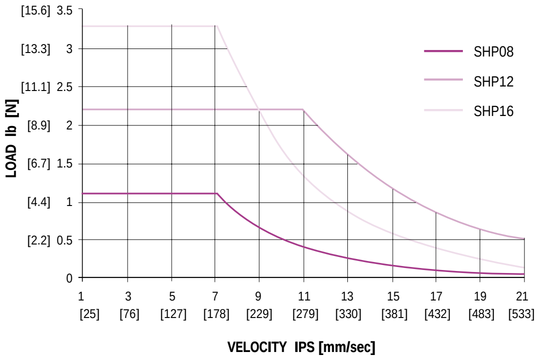
UNIT	TRAVEL TIME
SHP08x20	0.1
SHP08x40	0.18
SHP12x20	0.18
SHP12x40	0.22
SHP 16x15	0.15
SHP16x35	0.2
SHP16x55	0.25

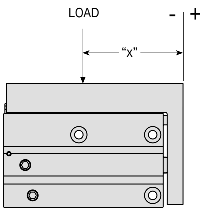
NOTES:

1) Travel time is in seconds from application of pressure.

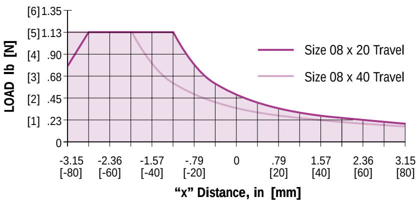
2) Travel times relatively independent of pressure between 60 and 100 psi.

ALLOWABLE LOAD VS. VELOCITY



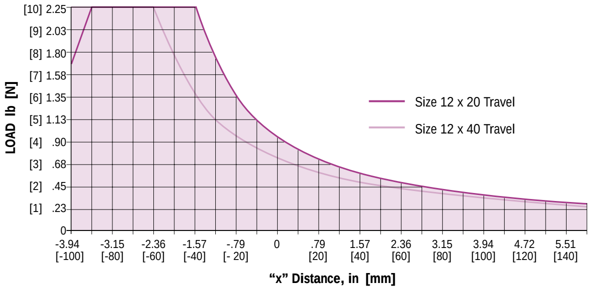


SIZE 08

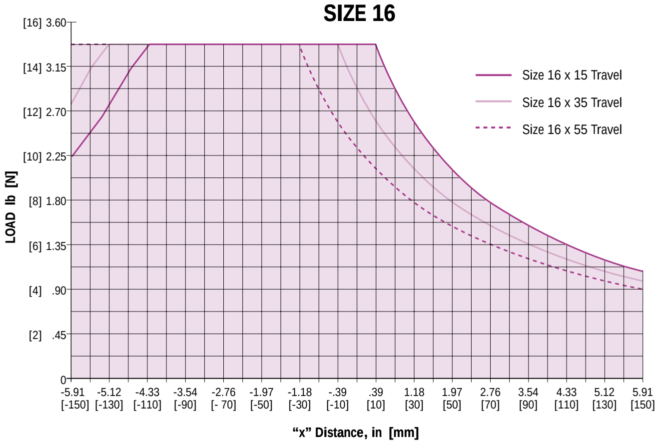


MAXIMUM DYNAMIC HORIZONTAL PITCH MOMENT LOADS

SIZE 12

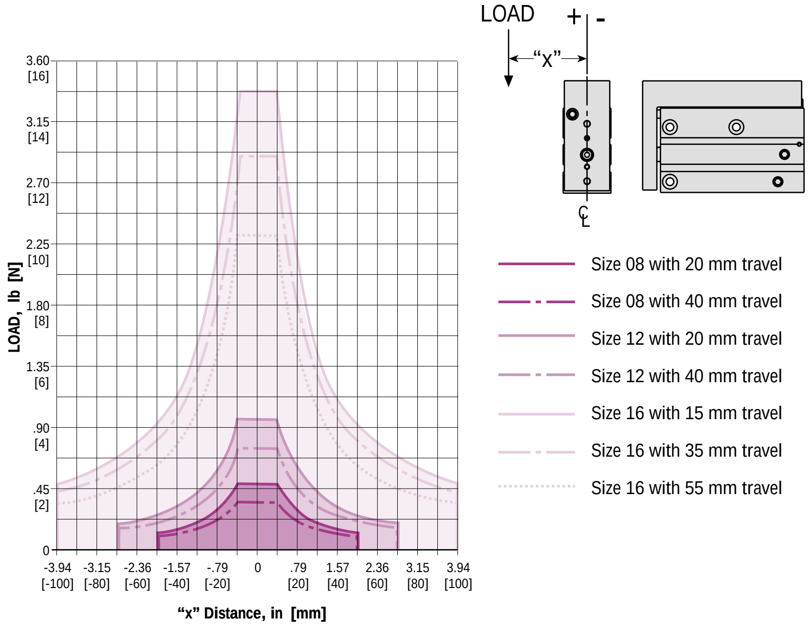


SIZE 16

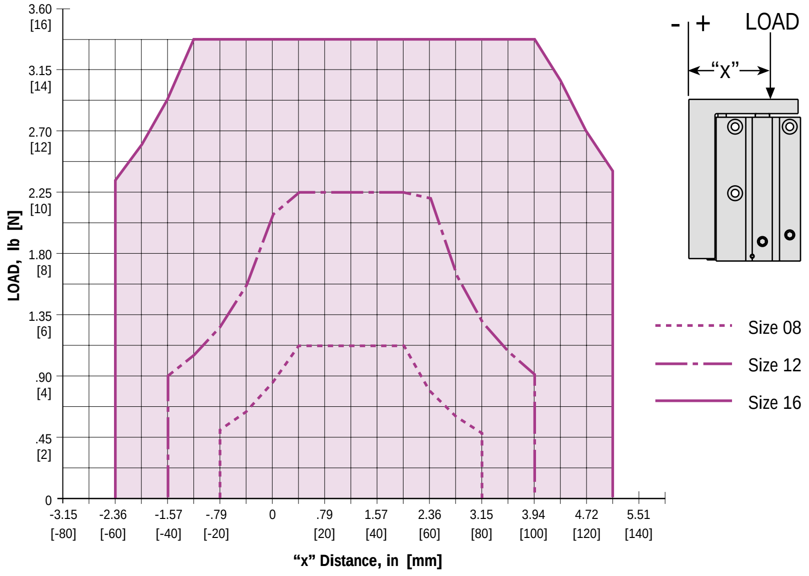


ENGINEERING DATA: *SERIES SHP SLIDES*

MAXIMUM DYNAMIC ROLL MOMENT LOADS



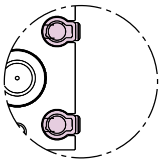
MAXIMUM DYNAMIC VERTICAL PITCH MOMENT LOADS



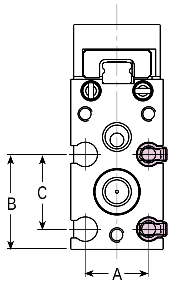
M MAGNET FOR PHD SERIES 6790 MINIATURE REED AND SOLID STATE SWITCHES

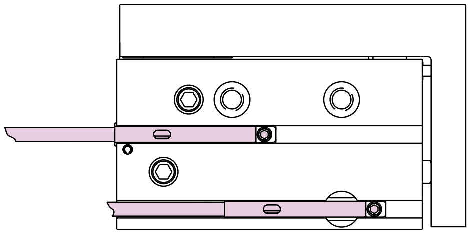
This option equips the unit with a magnetic piston for use with PHD's Series 6790 Switch. The switch housing is contained by the slide housing and provides a very compact switch design. The switches mount easily into two small grooves located on the side of the slide housing and are locked into place with a set screw.

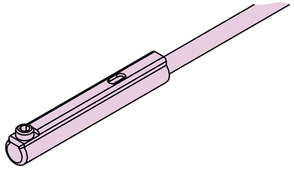
PART NO.	DESCRIPTION
67902-1-02	NPN (Sink) or PNP (Source) DC Reed, 2 m cable
67902-1-05	NPN (Sink) or PNP (Source) DC Reed, 5 m cable
67903-1-02	NPN (Sink) DC Solid State, 2 m cable
67903-1-05	NPN (Sink) DC Solid State, 5 m cable
67904-1-02	PNP (Source) DC Solid State, 2 m cable
67904-1-05	PNP (Source) DC Solid State, 5 m cable
67922-1	NPN (Sink) or PNP (Source) DC Reed, Quick Connect
67923-1	NPN (Sink) DC Solid State, Quick Connect
67924-1	PNP (Source) DC Solid State, Quick Connect
63549-02	2 m Cordset with Quick Connect
63549-05	5 m Cordset with Quick Connect



END VIEW







LETTER DIM	SIZE 08		SIZE 12		SIZE 16	
	in	mm	in	mm	in	mm
A	0.433	11.0	0.636	16.2	0.786	20.0
B	0.648	16.5	0.854	21.7	0.892	22.7
C	0.510	13.0	0.446	11.3	0.447	11.4

REED BENEFITS

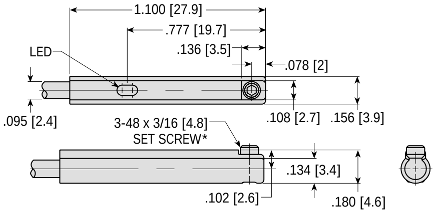
- Available as 4.5 - 30 VDC model for simple interfacing to sequencers and programmable controllers.
- Can be used to directly drive some types of relays or valve solenoids within the switch specifications stated.

SPECIFICATIONS	67902 & 67922
OPERATING PRINCIPLE	Magnetic Reed
ACTUATED BY	Piston Magnet
INPUT VOLTAGE	4.5 - 30 VDC
OUTPUT TYPE	Contact Closure
CURRENT RATING	50 mA Max.
CONTACT RESISTANCE	.115 Ohm Max.
ENVIRONMENTAL	IP67
OPERATING TEMP.	-20° to 85°C

SOLID STATE BENEFITS

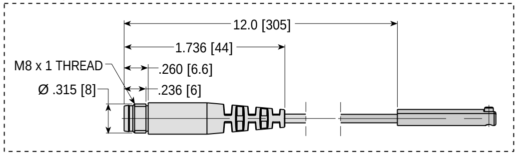
- Solid state switches afford long life. Constant amplitude output allows use with most digital logic systems.
- Switch circuitry protects against voltage surges and other electrical anomalies associated with operating systems.
- Excellent switch hysteresis characteristics and symmetry.
- Offered in 4.5 - 30 VDC current sinking and current sourcing versions for simple interfacing to electronic system controllers.

SPECIFICATIONS	67903 & 67923	67904 & 67924
OPERATING PRINCIPLE	Solid State	
ACTUATED BY	Piston Magnet	
INPUT VOLTAGE	4.5 - 30 VDC	
OUTPUT TYPE	NPN (Sink)	PNP (Source)
CURRENT RATING	50 mA. Max	
VOLTAGE DROP	.5 VDC	
SWITCH BURDEN	10 mA. Max.	
ENVIRONMENTAL	IP67	
OPERATING TEMP.	-20° to 85°C	



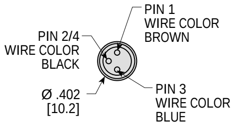
*MAX. SCREW TORQUE 1.0 in-lb [.110 Nm]

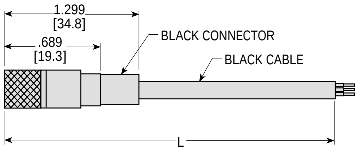
MALE QUICK CONNECT DETAIL



METRIC INFORMATION SHOWN IN [ ]

63549-xx CORDSET WITH FEMALE QUICK CONNECT

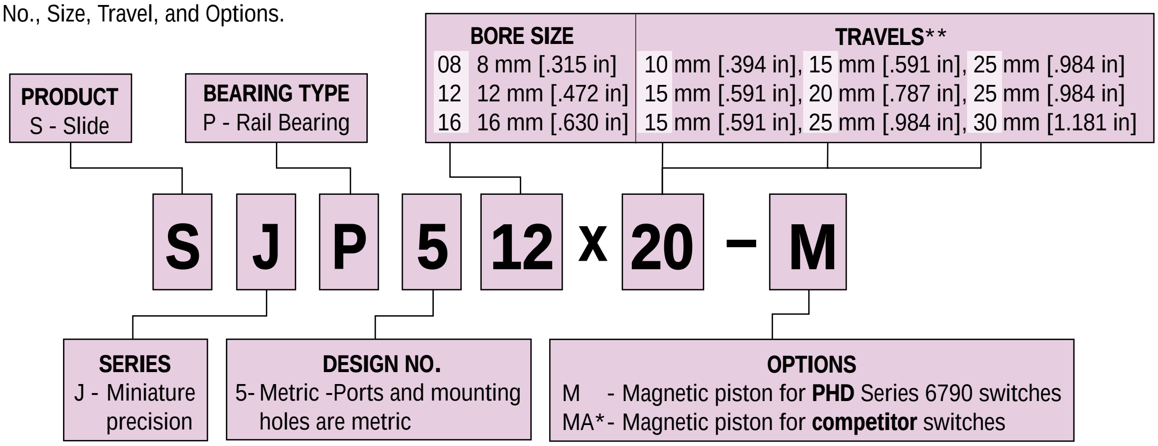




MODEL NO.	LETTER DIM.
	L
63549-02	78.74 [2 m]
63549-05	196.85 [5 m]

ORDERING DATA: SERIES SJP RAIL BEARING SLIDES

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



PRODUCT
S - Slide

BEARING TYPE
P - Rail Bearing

BORE SIZE		TRAVELS**
08	8 mm [.315 in]	10 mm [.394 in], 15 mm [.591 in], 25 mm [.984 in]
12	12 mm [.472 in]	15 mm [.591 in], 20 mm [.787 in], 25 mm [.984 in]
16	16 mm [.630 in]	15 mm [.591 in], 25 mm [.984 in], 30 mm [1.181 in]

S J P 5 12 x 20 – M

SERIES
J - Miniature precision

DESIGN NO.
5- Metric -Ports and mounting holes are metric

OPTIONS
M - Magnetic piston for **PHD** Series 6790 switches
MA*- Magnetic piston for **competitor** switches

PART NO.	DESCRIPTION
67902-1-02	NPN (Sink) or PNP (Source) DC Reed, 2 m cable
67902-1-05	NPN (Sink) or PNP (Source) DC Reed, 5 m cable
67903-1-02	NPN (Sink) DC Solid State, 2 m cable
67903-1-05	NPN (Sink) DC Solid State, 5 m cable
67904-1-02	PNP (Source) DC Solid State, 2 m cable
67904-1-05	PNP (Source) DC Solid State, 5 m cable
67922-1	NPN (Sink) or PNP (Source) DC Reed, Quick Connect
67923-1	NPN (Sink) DC Solid State, Quick Connect
67924-1	PNP (Source) DC Solid State, Quick Connect
63549-02	2 m Cordset with Quick Connect
63549-05	5 m Cordset with Quick Connect

NOTES:
*See page 5A-7 for use of the -MA option.
**Consult PHD for additional travel increments.

BENEFITS: SERIES SJP RAIL BEARING SLIDES

BENEFITS

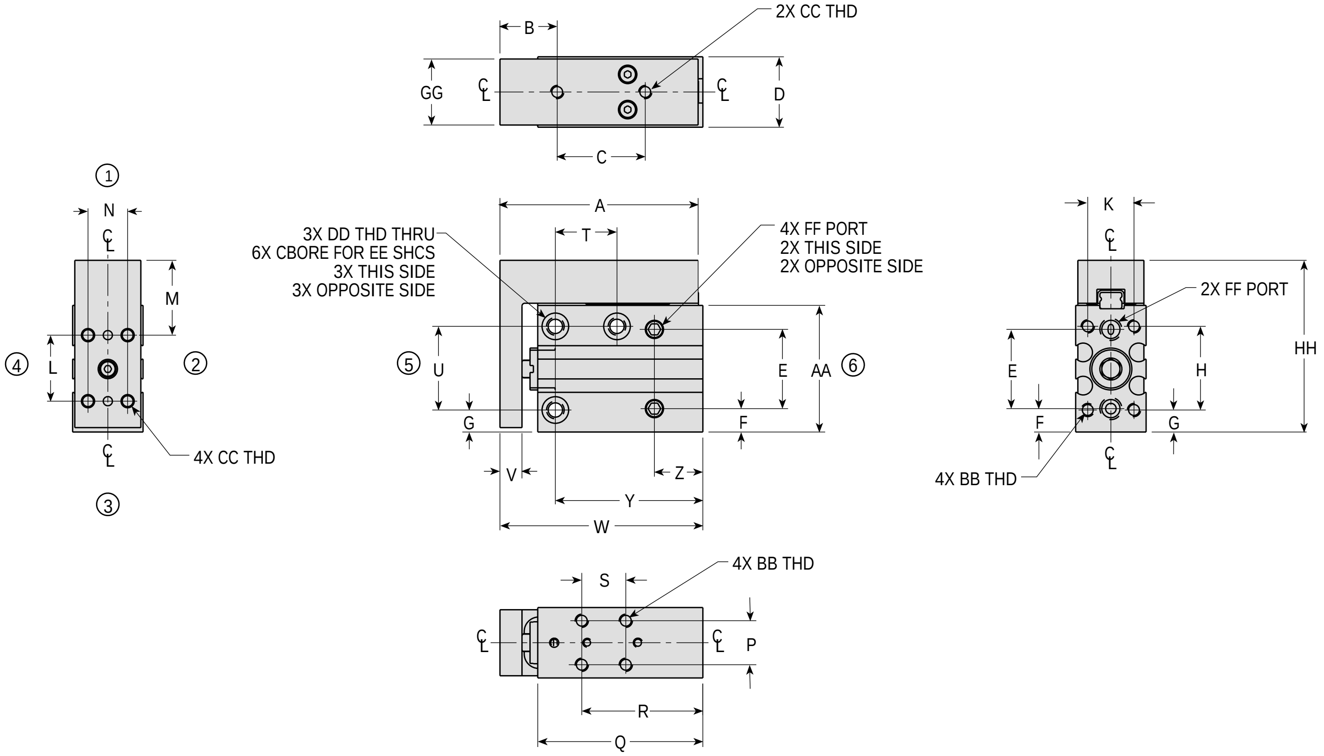
- This slide is designed to be an MRO drop-in. Consult PHD or your local distributor for unit compatibility.
- Series SJP Slides use rail bearing technology to provide smooth, precise movement with high accuracy within confined spaces.
- Available in three bore sizes with three travel lengths each.
- Standard internal shock pads eliminate metal to metal contact reducing noise and end-of-travel impact forces.
- Standard Series SJP Slides provide multiple mounting options for maximum flexibility. Bodies feature mounting holes on sides, end, and bottom.
- Slide body incorporates twin switch slots on both sides for convenient mounting of PHD's Series 6790 4 mm Reed and solid state switches. Magnet option -M is required when using Series 6790 Switches.
- Series SJP Slides can be fitted with certain competitor's switches. Magnet option -MA is required when using these switches.

	BORE SIZE					
SPECIFICATIONS	08		12		16	
	in	mm	in	mm	in	mm
POWER SOURCE	Integral pneumatic cylinder					
MAX. OPERATING PRESSURE	100 psi [6.9 bar]					
OPERATING TEMPERATURE RANGE	-20° to 180°F [-29° to 82°C]					
TRAVELS	.394	10	.591	15	.591	15
	.591	15	.787	20	.984	25
	.984	25	.984	25	1.181	30
STANDARD FEATURES	Multiple port positions, multiple mounting positions					
BEARINGS	Stainless steel ground rail bearing system with recirculating ball bearings					
BODY	Anodized aluminum alloy					
TOOL PLATE	Anodized aluminum alloy					

FORCE TABLE

DIRECTION	SIZE 08		SIZE 12		SIZE 16	
	lb/psi	N/bar	lb/psi	N/bar	lb/psi	N/bar
EXTEND	.079	5.1	.175	11.3	.314	20.3
RETRACT	.060	3.9	.132	8.5	.270	17.4

DIMENSIONS: SERIES SJP RAIL BEARING SLIDES



LETTER DIM.	SIZE 08 TRAVEL, in [mm]						SIZE 12 TRAVEL, in [mm]						SIZE 16 TRAVEL, in [mm]					
	.394	**[10]**	**.591**	**[15]**	**.984**	**[25]**	**.591**	**[15]**	**.787**	**[20]**	**.984**	**[25]**	**.591**	**[15]**	**.984**	**[25]**	**1.181**	**[30]**
A	1.969	[50.0]	2.165	[55.0]	2.559	[65.0]	2.441	[62.0]	2.638	[67.0]	2.953	[75.0]	2.953	[75.0]	3.346	[85.0]	3.543	[90.0]
B			0.512	[13.0]					0.591	[15.0]					0.709	[18.0]		
C	.787	[20.0]	0.984	[25.0]	1.575	[40.0]	.984	[25.0]	1.181	[30.0]	1.575	[40.0]	1.378	[35.0]	1.772	[45.0]	1.969	[50.0]
D			.630	[16.0]					.787	[20.0]					.984	[25.0]		
E			.709	[18.0]					.866	[22.0]					.984	[25.0]		
F			.209	[5.3]					.217	[5.5]					.256	[6.5]		
G			.197	[5.0]					.197	[5.0]					.217	[5.5]		
H			.748	[19.0]					.906	[23.0]					1.063	[27.0]		
K			.413	[10.5]					.512	[13.0]					.669	[17.0]		
L			.591	[15.0]					.709	[18.0]					1.024	[26.0]		
M			.669	[17.0]					.846	[21.5]					.846	[21.5]		
N			.354	[9.0]					.433	[11.0]					.630	[16.0]		
P			.394	[10.0]					.512	[13.0]					.669	[17.0]		
Q	1.673	[42.5]	1.870	[47.5]	2.264	[57.5]	2.028	[51.5]	2.224	[56.5]	2.539	[64.5]	2.441	[62.0]	2.835	[72.0]	3.031	[77.0]
R	1.279	[32.5]	1.476	[37.5]	1.870	[47.5]	1.555	[39.5]	1.752	[44.5]	2.067	[52.5]	1.969	[50.0]	2.362	[60.0]	2.559	[65.0]
S	.591	[15.0]	.787	[20.0]	1.181	[30.0]	.709	[18.0]	.945	[24.0]	1.260	[32.0]	1.181	[30.0]	1.575	[40.0]	1.772	[45.0]
T	.551	[14.0]	.945	[24.0]	1.339	[34.0]	.945	[24.0]	.945	[24.0]	1.339	[34.0]	1.339	[34.0]	1.575	[40.0]	1.575	[40.0]
U			.748	[19.0]					.906	[23.0]					1.063	[27.0]		
V			.197	[5.0]					.276	[7.0]					.374	[9.5]		
W	2.008	[51.0]	2.205	[56.0]	2.598	[66.0]	2.480	[63.0]	2.677	[68.0]	2.992	[76.0]	2.993	[76.0]	3.386	[86.0]	3.583	[91.0]
Y	1.516	[38.5]	1.713	[43.5]	2.107	[53.5]	1.831	[46.5]	2.028	[51.5]	2.343	[59.5]	2.244	[57.0]	2.638	[67.0]	2.835	[72.0]
Z			.433	[11.0]					.492	[12.5]					.512	[13.0]		
AA			1.132	[28.8]					1.319	[33.5]					1.516	[38.5]		
BB			[M3 x 0.5 x 4.8]						[M4 x 0.7 x 6.0]						[M4 x 0.7 x 6.0]			
CC			[M3 x 0.5 x 5]						[M4 x 0.7 x 6 MIN]						[M4 x 0.7 x 6 MIN]			
DD			[M4 x 0.7]						[M5 x 0.8]						[M5 x 0.8]			
EE			[M3]						[M4]						[M4]			
FF			[M5 x 0.8 PORT]						[M5 x 0.8 PORT]						[M5 x 0.8 PORT]			
GG			.591	[15.0]					.748	[19.0]					.945	[24.0]		
HH			1.536	[39.0]					1.850	[47.0]					2.106	[53.5]		

NOTES:
1) DESIGNATED ℄ IS CENTERLINE OF UNIT.
2) METRIC INFORMATION SHOWN IN [ ].
3) CIRCLED NUMBERS INDICATE POSITION CALLOUT.

ENGINEERING DATA: SERIES SJP RAIL BEARING SLIDES

PRESSURE RATINGS

All Series SJP Slides have an operating pressure range of 20 psi minimum to 100 psi maximum [1.4 to 6.9 bar]. Maximum life will be achieved when pressure and velocity are no greater than necessary for proper operation. External flow controls are recommended. Series SJP Slides feature standard pneumatic ports on the end and both sides of the slide body, and are provided with the end ports ready for use and the side ports plugged with set screws and thread sealant.

OPERATING TEMPERATURE

Series SJP Slides are designed for use in temperatures between -20° to 180° F [-29° to 82° C]. For temperatures outside this range, consult PHD.

SEALS

Series SJP Slides utilize urethane and Nitrile seals which are compatible with standard paraffin-based lubrication oils used for pneumatic cylinders. For compatibility with other fluids, consult PHD.

LUBRICATION

All units are pre-lubricated at the factory for service under normal operating conditions. Slides are designed and tested with non-lubricated air. However, the use of lubricated air will extend life.

TOTAL TRAVEL LENGTH AND WEIGHT

Tolerance of minimum travel length is +.039/-.000 [+1 mm/-0 mm].

SIZE	MINIMUM TRAVEL in	mm	UNIT BASE WEIGHT lb	kg
08	(.394)	10	.16	.07
	(.591)	15	.18	.08
	(.984)	25	.21	.10
12	(.591)	15	.32	.15
	(.787)	20	.35	.16
	(.984)	25	.39	.18
16	(.591)	15	.57	.26
	(.984)	25	.65	.29
	(1.181)	30	.68	.31

MATERIAL SPECIFICATIONS

The slide housing and tool plate are anodized aluminum alloy. Linear rail and bearings are hardened and ground stainless steel.

MAINTENANCE

In common with most PHD products, these slides are fully field repairable. Repair kits and main structural components are available as needed for extended service life.

MOUNTING INSTRUCTIONS

PHD recommends to mount load or tooling with tool plate retracted. Support tool plate while tightening fasteners. Maximum mounting torques (for screw thread engagement of one diameter or greater):

FASTENER SIZE	in-lb	Nm
M3	9	1
M4	18	2
M5*	35	4

*Mounting holes only, port fittings require less.

SLIDE SELECTION

There are three major factors to consider when selecting a slide: thrust capacity, dynamic moment capacity, and the allowable velocity.

1 THRUST CAPACITY

Use the theoretical force output table to determine if thrust is sufficient for the applied load.

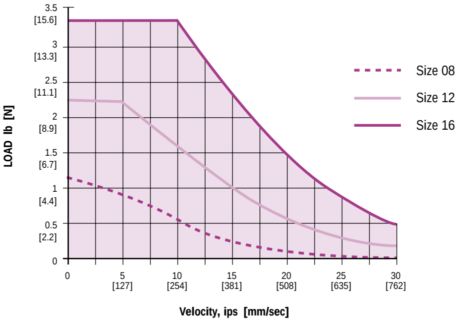
THEORETICAL FORCE OUTPUT TABLE lb [N]

SIZE	DIRECTION	OPERATING PRESSURE 20 psi [1.4 bar]	30 psi [2.1 bar]	40 psi [2.8 bar]	50 psi [3.4 bar]	60 psi [4.1 bar]	70 psi [4.8 bar]	80 psi [5.5 bar]	90 psi [6.2 bar]	100 psi [6.9 bar]
08	RETRACT	1.2 [5.3]	1.8 [8.0]	2.4 [10.7]	3.0 [13.3]	3.6 [16.0]	4.2 [18.7]	4.8 [21.3]	5.4 [24.0]	6.0 [26.7]
	EXTEND	1.6 [7.1]	2.4 [10.7]	3.1 [13.8]	3.9 [17.3]	4.7 [20.9]	5.5 [24.4]	6.3 [28.0]	7.1 [31.6]	7.9 [35.1]
12	RETRACT	2.7 [12.0]	4.0 [17.8]	5.3 [23.6]	6.7 [29.8]	8.0 [35.6]	9.3 [41.3]	10.7 [47.6]	12.0 [53.3]	13.3 [59.1]
	EXTEND	3.5 [15.6]	5.3 [23.6]	7.1 [31.6]	8.8 [39.1]	10.6 [47.1]	12.4 [55.1]	14.1 [62.7]	15.9 [70.7]	17.6 [78.2]
16	RETRACT	5.4 [24.0]	8.1 [36.0]	10.8 [48.0]	13.5 [60.0]	16.2 [72.0]	18.9 [84.0]	21.6 [96.0]	24.3 [108.0]	27.0 [120.0]
	EXTEND	6.3 [28.0]	9.4 [41.8]	12.5 [55.6]	15.7 [69.8]	18.8 [83.6]	22.0 [97.8]	25.1 [111.6]	28.2 [125.3]	31.4 [139.6]

2 DYNAMIC MOMENT CAPACITY

The Dynamic Moment Load graphs show the allowable load for the three most common mounting positions of the Series SJP Slide. Determine the distance “x” from the edge of the tool plate to the load center of gravity. Use the appropriate graph for the loading condition to determine the allowable load. It is generally best to keep the center of gravity of the load as close to the slide as possible. (See next page for graphs.) If the application requires combined loading such as a horizontal pitch load combined with a roll load, if static loads exceed dynamic loads, or if there are other questions concerning the selection of an appropriate slide, please contact PHD’s Customer Service Department.

ALLOWABLE LOAD VS. VELOCITY

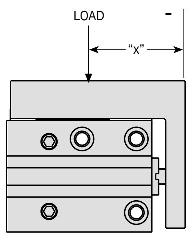


3 ALLOWABLE VELOCITY

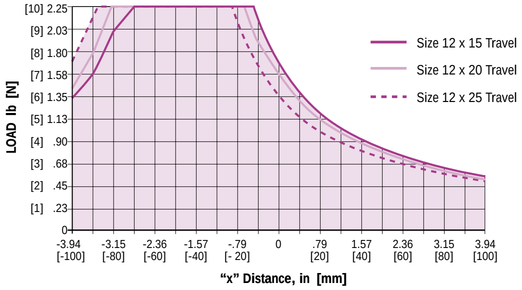
Use the allowable velocity graph at left to verify that the slide selected can carry the payload at the desired velocity.

ENGINEERING DATA: SERIES SJP RAIL BEARING SLIDES

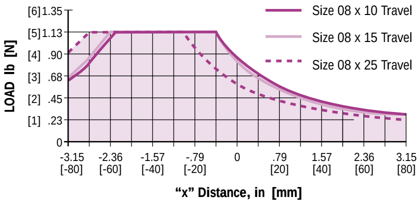
MAXIMUM DYNAMIC HORIZONTAL PITCH MOMENT LOADS



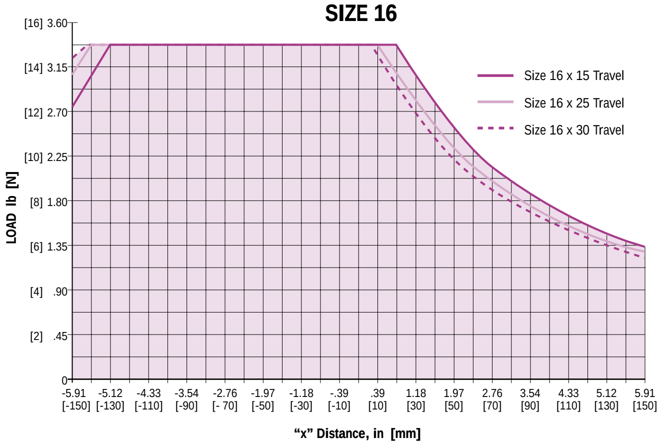
SIZE 12



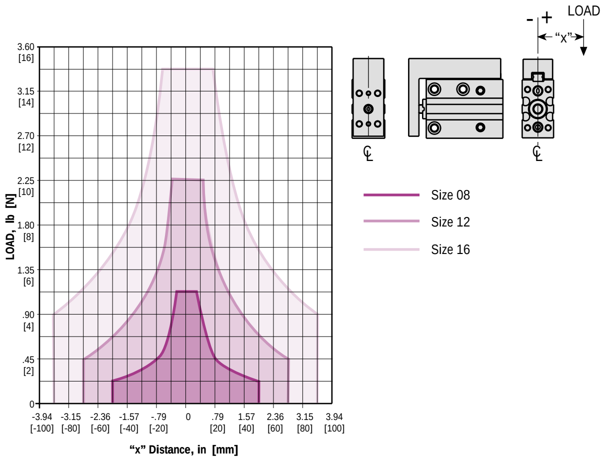
SIZE 08



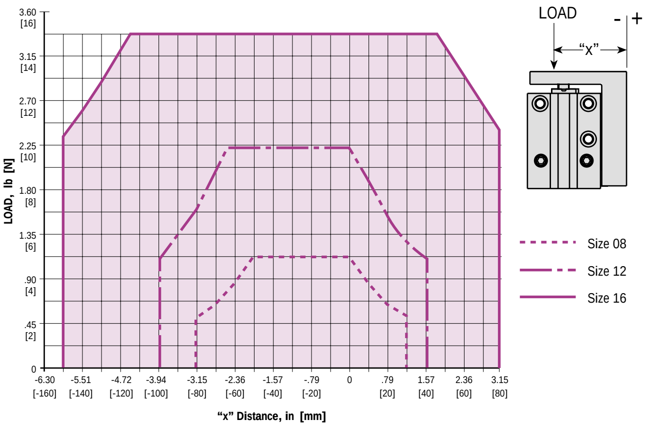
SIZE 16



MAXIMUM DYNAMIC ROLL MOMENT LOADS



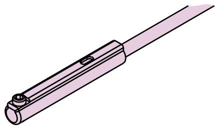
MAXIMUM DYNAMIC VERTICAL PITCH MOMENT LOADS



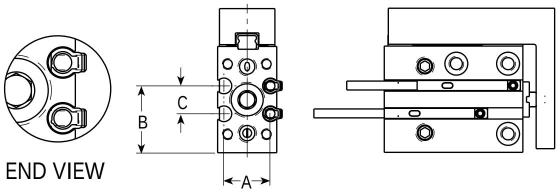
OPTIONS: SERIES SJP RAIL BEARING SLIDES

M MAGNET FOR PHD SERIES 6790 REED AND SOLID STATE SWITCHES

This option equips the unit with a magnetic piston for use with PHD's Series 6790 Switch. The switch housing is 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 set screw.



LETTER DIM	SIZE 08		SIZE 12		SIZE 16	
	in	mm	in	mm	in	mm
A	0.496	12.6	0.645	16.4	0.786	20.0
B	0.712	18.1	0.844	21.4	0.972	24.7
C	0.297	7.5	0.388	9.9	0.447	11.4



REED BENEFITS

- Available as 4.5 - 30 VDC model for simple interfacing to sequencers and programmable controllers.
- Can be used to directly drive some types of relays or valve solenoids within the switch specifications stated.

SPECIFICATIONS	67902 & 67922
OPERATING PRINCIPLE	Magnetic Reed
ACTUATED BY	Piston Magnet
INPUT VOLTAGE	4.5 - 30 VDC
OUTPUT TYPE	Contact Closure
CURRENT RATING	50 mA Max.
CONTACT RESISTANCE	.115 Ohm Max.
ENVIRONMENTAL	IP67
OPERATING TEMP.	-20° to 85°C

MA MAGNET FOR COMPETITOR'S REED AND SOLID STATE SWITCHES

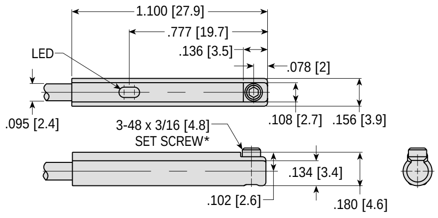
The Series SJP can be used as an exact drop-in replacement for a competitor's commercially available rail slide. If the Series SJP is being used to replace the competitor's slide, and you wish to continue using their switches, the MA option must be specified. For additional information and switch compatibility, contact your local PHD distributor or PHD customer service.

PART NO.	DESCRIPTION
67902-1-02	NPN (Sink) or PNP (Source) DC Reed, 2 m cable
67902-1-05	NPN (Sink) or PNP (Source) DC Reed, 5 m cable
67903-1-02	NPN (Sink) DC Solid State, 2 m cable
67903-1-05	NPN (Sink) DC Solid State, 5 m cable
67904-1-02	PNP (Source) DC Solid State, 2 m cable
67904-1-05	PNP (Source) DC Solid State, 5 m cable
67922-1	NPN (Sink) or PNP (Source) DC Reed, Quick Connect
67923-1	NPN (Sink) DC Solid State, Quick Connect
67924-1	PNP (Source) DC Solid State, Quick Connect
63549-02	2 m Cordset with Quick Connect
63549-05	5 m Cordset with Quick Connect

SOLID STATE BENEFITS

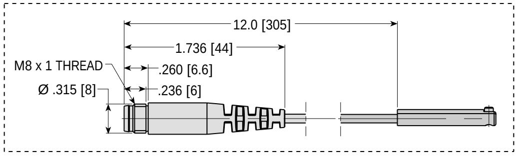
- Solid state switches afford long life. Constant amplitude output allows use with most digital logic systems.
- Switch circuitry protects against voltage surges and other electrical anomalies associated with operating systems.
- Excellent switch hysteresis characteristics and symmetry.
- Offered in 4.5 - 30 VDC current sinking and current sourcing versions for simple interfacing to electronic system controllers.

SPECIFICATIONS	67903 & 67923	67904 & 67924
OPERATING PRINCIPLE	Solid State	
ACTUATED BY	Piston Magnet	
INPUT VOLTAGE	4.5 - 30 VDC	
OUTPUT TYPE	NPN (Sink)	PNP (Source)
CURRENT RATING	50 mA. Max	
VOLTAGE DROP	.5 VDC	
SWITCH BURDEN	10 mA. Max.	
ENVIRONMENTAL	IP67	
OPERATING TEMP.	-20° to 85°C	



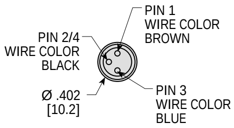
*MAX. SCREW TORQUE 1.0 in-lb [.110 Nm]

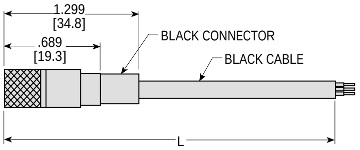
MALE QUICK CONNECT DETAIL



METRIC INFORMATION SHOWN IN [ ]

63549-xx CORDSET WITH FEMALE QUICK CONNECT





MODEL NO.	LETTER DIM. L
63549-02	78.74 [2 m]
63549-05	196.85 [5 m]

ORDERING DATA: SERIES STP SLIDES WITH RAIL BEARING

TO ORDER SPECIFY:
Product, Series, Bearing Type, Carriage Style, Design No., Size, Travel, Travel Adjustment, Shock Absorber Installed, and Miscellaneous 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 - Magnetic piston for use with PHD Series 6790 Switches
Q6 - Complete corrosion resistant guide shafts

SERIES 6790 SWITCHES

PART NO.	DESCRIPTION
67902-1-02	NPN (Sink) or PNP (Source) DC Reed, 2 m cable
67902-1-05	NPN (Sink) or PNP (Source) DC Reed, 5 m cable
67903-1-02	NPN (Sink) DC Solid State, 2 m cable
67903-1-05	NPN (Sink) DC Solid State, 5 m cable
67904-1-02	PNP (Source) DC Solid State, 2 m cable
67904-1-05	PNP (Source) DC Solid State, 5 m cable
67922-1	NPN (Sink) or PNP (Source) DC Reed, Quick Connect
67923-1	NPN (Sink) DC Solid State, Quick Connect
67924-1	PNP (Source) DC Solid State, Quick Connect
63549-02	2 meter Cordset with Quick Connect
63549-05	5 meter Cordset with Quick Connect

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

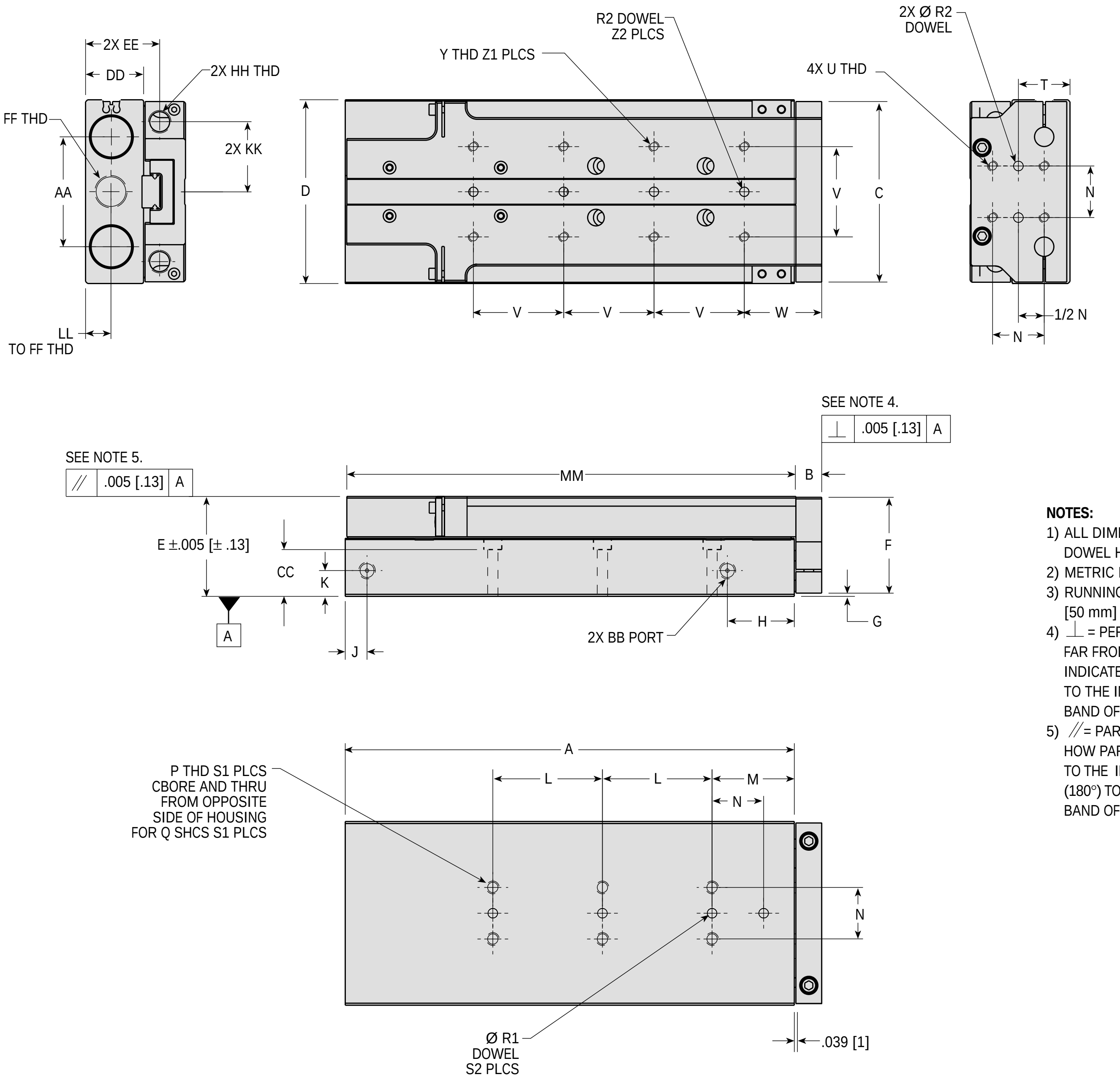
BENEFITS: *SERIES STP SLIDES WITH RAIL BEARING*

BENEFITS

- Series STP Slides provide smooth precise linear motion with high accuracy at twice the thrust of a single bore cylinder.
- Available in five bore sizes with a choice of three travel lengths to fit a wide range of applications. Optional travel adjustments allow precise adjustment of travel.
- Available in both imperial and metric versions for applications in worldwide markets.
- Standard internal and external shock pads eliminate metal to metal contact reducing noise and end-of-travel impact forces.
- Fully integrated shock absorbers and travel adjustments with shock pads allow easy adjustment from back of slide while not increasing overall package width.
- Shock absorbers and travel adjustments on retract eliminate pitch and yaw moments usually associated with externally mounted shocks and travel adjustments.
- Series STP units have increased stopping capacity and minimal deflection when travel adjustment and/or shock absorbers are used in both positions.
- Slide housing incorporates twin switch slots for flush installation of PHD's new Series 6790 reed and solid state switches.
- Consult PHD for 4 mm and 8 mm proximity switch ready units.
- All units have customer mounting and dowel holes in the housing, carriage, and tool plate.
- Modular mounting kits allow quick connect of same size Series STP Slides without the need for transition plates. See page 5A-34 for details.
- Standard stainless steel fasteners eliminate the need for costly corrosion resistant options. Combining this with -Q6 shaft option provides a completely corrosion resistant unit.

	BORE SIZE	
SPECIFICATIONS	**08**	**12, 16, 20, & 25**
POWER SOURCE	Two cylinders built into the Slide Body	
WORKING PRESSURE	20 psi min - 150 psi max at zero load	
TEMPERATURE RANGE	-20° to +180°F [-29° to 82°C]	
LUBRICATION	Permanent for Non-Lubricated or Lubricated Air	
GUIDE SHAFTS	Stainless Steel	Hard Chrome Plated Steel
BEARINGS	Stainless Steel Ground Rail System with Recirculating Ball Bearings	
CARRIAGE	Anodized Aluminum Alloy	
TOOL PLATE	Anodized Aluminum Alloy	
BODY	Anodized Aluminum Alloy	

DIMENSIONS: SERIES STP SLIDES WITH RAIL BEARING



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 .002 in [.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 .005 [.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 .005 [.13].

All dimensions are reference only unless specifically toleranced.

DIMENSIONS: SERIES STP SLIDES WITH RAIL BEARING

LETTER DIM.	BORE SIZE 08					
	in	mm	in	mm	in	mm
TRAVEL	1	25	2	50	3	75
A	2.953	75.0	4.587	116.5	5.866	149.0
B	0.315	8.0				
C	2.087	53.0				
D	2.165	55.0				
E	0.983	25.0				
F	0.924	23.5				
G	0.039	1.0				
H	0.924	23.5				
J	0.492	12.5				
K	0.217	5.5				
L	1.102	28.0				
M	1.142	29.0				
N	0.551	14.0				
P	8-32 x .394 [M4 x 0.7 x 10]					
Q	#5 [M3]					
R1	3 mm x 2.5 mm DP					
R2	3 mm x 3 mm DP					
S1	4		4		6	
S2	3		3		4	
T	0.5315	13.5				
U	5-40 x .315 DP [M3 x 8 DP]					
V	0.868	22.0				
W	1.102	28.0				
Y	5-40 x .275 DP [M3 x 7 DP]					
Z1	4		6		8	
Z2	2		3		4	
AA	1.142	29.0				
BB	10-32 PORT [M5 x 0.8 PORT]					
CC	0.401	10.2				
DD	0.551	14.0				
EE	0.752	19.1				
FF	M6 x 1.0 x 32 DP					
HH	M8 x 1.0 x 12.5 DP					
KK	0.743	18.9				
LL	0.217	5.5				
MM	2.953	75.0	4.587	116.5	5.866	149.0

LETTER DIM.	BORE SIZE 12					
	in	mm	in	mm	in	mm
TRAVEL	1	25	2.5	60	4	100
A	3.544	90.0	5.671	144.0	7.795	198.0
B	0.394	10.0				
C	2.559	65.0				
D	2.638	67.0				
E	1.37	34.8				
F	1.271	32.3				
G	0.079	2.0				
H	0.797	20.2				
J	0.797	20.2				
K	0.378	9.6				
L	1.496	38.0				
M	1.024	26.0				
N	0.67	17.0				
P	10-24 x .632 [M5 x 0.8 x 16]					
Q	#6 [M4]					
R1	4 mm x 2.5 mm DP					
R2	4 mm x 4 mm DP					
S1	4		4		6	
S2	3		3		4	
T	0.713	18.1				
U	6-32 x .394 DP [M4 x 10 DP]					
V	1.102	28.0				
W	1.300	33.0				
Y	8-32 x .375 DP [M4 x 9.5 DP]					
Z1	4		6		8	
Z2	2		3		4	
AA	1.496	38.0				
BB	10-32 PORT [M5 x 0.8 PORT]					
CC	0.612	15.5				
DD	0.795	20.2				
EE	1.022	26.0				
FF	7/16-20 x 1.800 DP					
HH	M8 x 1.0 x 12.5 DP					
KK	0.955	24.3				
LL	0.319	8.1				
MM	3.377	85.8	5.671	144.0	7.795	198.0

LETTER DIM.	BORE SIZE 16					
	in	mm	in	mm	in	mm
TRAVEL	1-1/2	38	3	75	5	125
A	4.528	115.0	6.024	153.0	8.544	217.0
B	0.433	11.0				
C	3.425	87.0				
D	3.504	89.0				
E	1.574	40.0				
F	1.476	37.5				
G	0.079	2.0				
H	1.437	36.5				
J	0.531	13.5				
K	0.453	11.5				
L	1.929	49.0				
M	1.713	43.5				
N	0.905	23.0				
P	1/4-20 x .689 [M6 x 1.0 x 17.5]					
Q	#10 [M5]					
R1	5 mm x 3 mm DP					
R2	5 mm x 5 mm DP					
S1	4		4		6	
S2	3		3		4	
T	0.9055	23.0				
U	10-24 x .433 DP [M5 x 11 DP]					
V	1.496	38.0				
W	1.378	35.0				
Y	10-24 x .375 DP [M5 x 9.5 DP]					
Z1	4		6		8	
Z2	2		3		4	
AA	1.969	50.0				
BB	10-32 PORT [M5 x 0.8 PORT]					
CC	0.684	17.4				
DD	0.906	23.0				
EE	1.181	30.0				
FF	M14 x 1.5 x 55 DP					
HH	M10 x 1.0 x 18.5 DP					
KK	1.26	32.0				
LL	0.394	10.0				
MM	4.528	115.0	6.024	153.0	8.544	217.0

LETTER DIM.	BORE SIZE 20					
	in	mm	in	mm	in	mm
TRAVEL	2	50	4	100	6	150
A	5.433	138.0	8.327	211.5	10.965	278.5
B	0.512	13.0				
C	3.7	94.0				
D	3.779	96.0				
E	1.969	50.0				
F	1.87	47.5				
G	0.079	2.0				
H	1.2	30.5				
J	1.2	30.5				
K	0.566	14.4				
L	2.205	56.0				
M	1.613	41.0				
N	1.024	26.0				
P	1/4-20 x .910 [M6 x 1.0 x 23]					
Q	#10 [M5]					
R1	5 mm x 3 mm DP					
R2	5 mm x 5 mm DP					
S1	4		4		6	
S2	3		3		4	
T	1.078	27.4				
U	10-24 x .512 DP [M5 x 13 DP]					
V	1.654	42.0				
W	1.85	47.0				
Y	10-24 x .375 DP [M5 x 9.5 DP]					
Z1	4		6		8	
Z2	2		3		4	
AA	2.264	57.5				
BB	1/8 NPT PORT [1/8 BSPP PORT]					
CC	0.91	23.1				
DD	1.132	28.8				
EE	1.447	36.8				
FF	M16 x 1.5 x 57 DP					
HH	M12 x 1.0 x 19 DP					
KK	1.417	36.0				
LL	0.566	14.4				
MM	5.433	138.0	8.327	211.5	10.965	278.5

LETTER DIM.	BORE SIZE 25					
	in	mm	in	mm	in	mm
TRAVEL	2	50	4	100	6	150
A	5.531	140.5	8.327	211.5	10.965	278.5
B	0.630	16.0				
C	4.409	112.0				
D	4.488	114.0				
E	2.440	62.0				
F	2.341	59.5				
G	0.079	2.0				
H	1.634	41.5				
J	0.532	13.5				
K	0.630	16.0				
L	2.677	68.0				
M	2.008	51.0				
N	1.260	32.0				
P	5/16-18 x 1.142 [M8 x 1.25 x 29]					
Q	1/4 [M6]					
R1	6 mm x 5.5 mm DP					
R2	6 mm x 6 mm DP					
S1	4		4		6	
S2	3		3		4	
T	1.260	32.0				
U	1/4-20 x .630 DP [M6 x 16 DP]					
V	2.205	56.0				
W	1.890	48.0				
Y	1/4-20 x .500 DP [M6 x 13 DP]					
Z1	4		6		8	
Z2	2		3		4	
AA	2.684	68.2				
BB	1/8 NPT PORT [1/8 BSPP PORT]					
CC	1.143	29.0				
DD	1.418	36.0				
EE	1.810	46.0				
FF	M20 x 1.5 x 60 DP					
HH	M14 x 1.5 x 19.5 DP					
KK	1.712	43.5				
LL	0.620	15.7				
MM	5.531	140.5	8.327	211.5	10.965	278.5

METRIC INFORMATION SHOWN IN [ ].

All dimensions are reference only unless specifically toleranced.

ENGINEERING DATA: *SERIES STP SLIDES WITH RAIL BEARING*

PRESSURE RATINGS

All Series STP Slides have an operating pressure range of 20 psi minimum to 150 psi maximum [1.4 to 10 bar].

BREAKAWAY

Units have less than 20 psi [1.4 bar] breakaway with zero load.

OPERATING TEMPERATURE

Series STP Slides are designed for use in temperatures between 20° to 180° F [-6° to 82° C]. For temperatures outside this range, consult PHD.

SEALS

Series STP Slides utilize urethane and Nitrile seals which are compatible with standard paraffin-based lubrication oils used for pneumatic cylinders. For compatibility with other fluids, consult PHD.

LUBRICATION

All units are pre-lubricated at the factory for service under normal operating conditions. Slides are designed and tested with non-lubricated air. However, the use of lubricated air will extend life.

OPERATING SLIDE VELOCITY

For sizes 08 and 12, slide velocity is 36 in/sec [914 mm/sec] for extend and 24 in/sec [610 mm/sec] on retract. For sizes 16, 20, and 25, slide velocity is 30 in/sec [962 mm/sec] for extend and 24 in/sec [610 mm/sec] on retract.These values are based on an unloaded slide at 87 psi [6 bar] operating pressure.

MATERIAL SPECIFICATIONS

The slide housing, tool plate, and carriage are anodized aluminum alloy. Linear rails and bearings are hardened and ground stainless steel. On standard sizes 12, 16, 20, and 25 slides, the shafts are hard chrome plated steel. Size 08 slides have stainless steel shafts. The corrosion resistant option on sizes 12, 16, 20, and 25 provides hard chrome plated stainless steel shafts.

MAINTENANCE

In common with most PHD products, these slides are fully field repairable. Repair kits and main structural components are available as needed for extended service life.

TOTAL TRAVEL LENGTH

Tolerance on specified minimum travel length is +.098/-.000 [+2.5mm/-0mm].

SIZE	MINIMUM TRAVEL in	mm
08	1	25
	2	51
	3	76
12	1	25
	2.5	64
	4	102
16	1-1/2	38
	3	76
	5	127
20	2	51
	4	102
	6	152
25	2	51
	4	102
	6	152

UNIT WEIGHT

					OPTION ADDERS					
	TRAVEL		BASE WEIGHT		-AR		-NRx		-AEx OR NEx	
SIZE	in	mm	lb	kg	lb	kg	lb	kg	lb	kg
08	1	25	0.55	0.25	0.03	0.014	0.11	0.05	0.06	0.03
	2	50	0.81	0.37	0.04	0.018	0.11	0.05		
	3	75	1.01	0.46	0.05	0.023	0.11	0.05		
12	1	25	1.12	0.51	0.10	0.05	0.09	0.04	0.09	0.04
	2-1/2	60	1.71	0.78	0.15	0.07	0.178	0.08		
	4	100	2.26	1.03	0.20	0.09	0.298	0.14		
16	1-1/2	38	2.10	0.95	0.22	0.10	0.19	0.09	0.13	0.06
	3	75	2.68	1.22	0.29	0.13	0.26	0.12		
	5	125	3.63	1.65	0.40	0.18	0.37	0.17		
20	2	50	3.62	1.64	0.65	0.30	0.32	0.15	0.27	0.12
	4	100	5.24	2.38	0.85	0.39	0.512	0.23		
	6	150	6.64	3.01	1.03	0.47	0.687	0.31		
25	2	50	5.46	2.48	0.57	0.26	0.42	0.19	0.29	0.13
	4	100	7.55	3.43	0.87	0.39	0.73	0.33		
	6	150	9.55	4.34	1.16	0.53	1.02	0.46		

ENGINEERING DATA: SERIES STP SLIDES WITH RAIL BEARING

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 thrust specifications) 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 next six pages)

THRUST SPECIFICATIONS

SIZE	SHAFT DIAMETER		BORE DIAMETER		SHAFT DIRECTION	EFFECTIVE PISTON AREA	
	in	mm	in	mm		in^2	mm^2
08	0.157	4	0.315	8	EXTEND	0.16	101
					RETRACT	0.12	75
12	0.236	6	0.475	12	EXTEND	0.35	229
					RETRACT	0.27	172
16	0.315	8	0.630	16	EXTEND	0.62	402
					RETRACT	0.47	302
20	0.394	10	0.787	20	EXTEND	0.97	628
					RETRACT	0.73	470
25	0.472	12	0.984	25	EXTEND	1.52	982
					RETRACT	1.17	756

CYLINDER THRUST CALCULATION

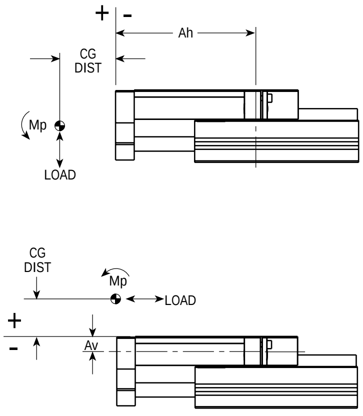
	IMPERIAL	**METRIC**
	F = P x A	F = 0.1 x P x A
F = Cylinder Force	lb	N
P = Operating Pressure	psi	bar
A = Effective Area	in^2	mm^2

STATIC MOMENT CHART

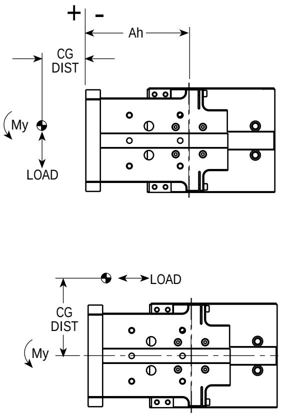
SIZE	TRAVEL		MAX PITCH MOMENT (Mp)		MAX YAW MOMENT (My)		MAX ROLL MOMENT (Mr)		MOMENT ARM Ah		MOMENT ARM Av	
	in	mm	in-lb	Nm	in-lb	Nm	in-lb	Nm	in	mm	in	mm
08	1	25	42.4	4.8	42.4	4.8	67	7.6	2.442	62.0	0.335	8.5
	2	50	168	19.0	141	15.9	76	8.6	3.830	97.3		
	3	75	227	25.6	190	21.5	76	8.6	4.914	124.8		
12	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 page 5A-22 for pitch, page 5A-24 for yaw, and page 5A-26 for roll.

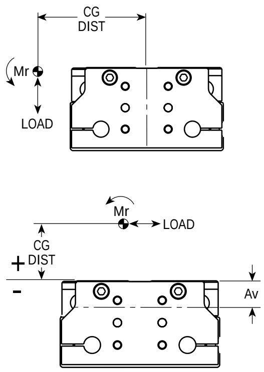
PITCH



YAW

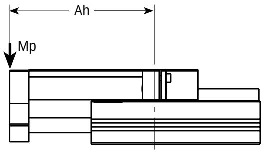


ROLL



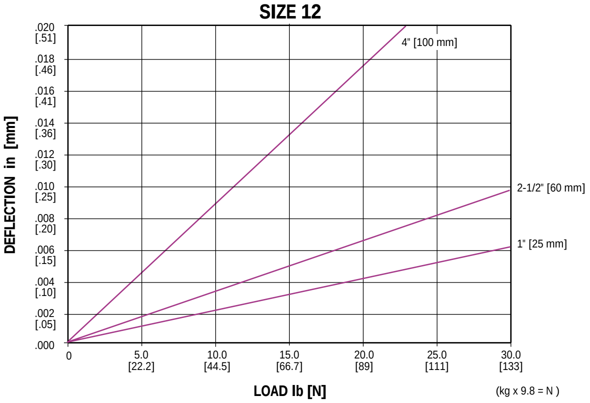
3 STATIC DEFLECTIONS IN PITCH

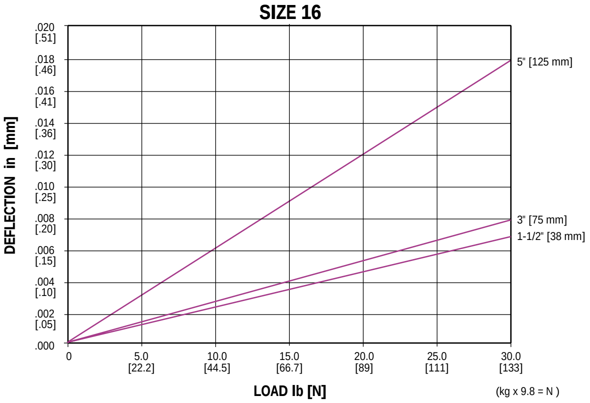
The graphs on this page show table pitch deflection due to static moment loads applied at distance Ah from bearing center while the unit is extended.

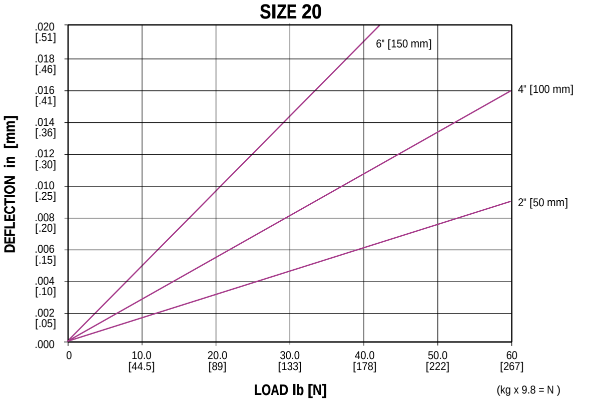


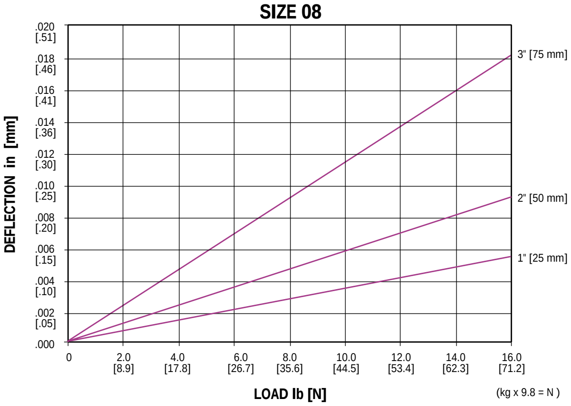
SIZE	TRAVEL in	TRAVEL mm	MOMENT ARM Ah in	MOMENT ARM Ah mm
08	1	25	2.442	62.0
	2	50	3.830	97.3
	3	75	4.914	124.8
12	1	25	2.717	69.0
	2-1/2	60	4.557	115.7
	4	100	6.308	160.2
16	1-1/2	38	3.711	94.3
	3	75	5.049	128.2
	5	125	7.292	185.2
20	2	50	4.286	108.9
	4	100	6.721	170.7
	6	150	9.034	229.5
25	2	50	4.488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

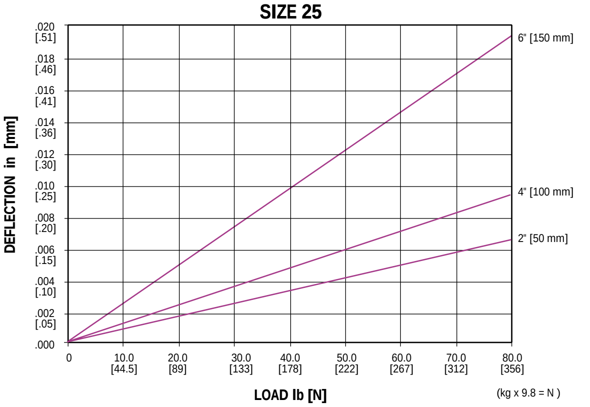
All tabulated and plotted values are typical and were determined empirically.











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 .003".

Deflection Ratio = Deflection at tool plate / Ah distance
= .003 / 9.194 = 3.26 x 10^{-4}

Deflection at load = Deflection Ratio x (Ah + CG)
= 3.26 x 10^{-4} x (9.194 + 2) = .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

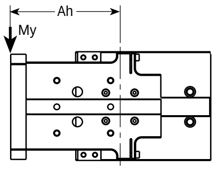
Read the graph for a 55 N load, deflection is approximately .08 mm.

Deflection Ratio = Deflection at tool plate / Ah distance
= .08 / 233.5 = 3.4 x 10^{-4}

Deflection at load = Deflection Ratio x (Ah + CG)
= 3.4 x 10^{-4} x (233.5 + 50) = .096 mm

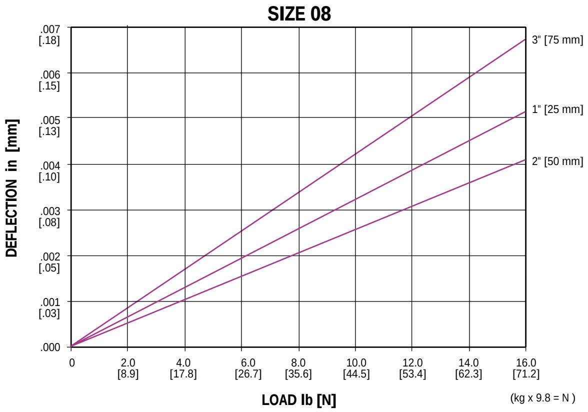
3 STATIC DEFLECTIONS IN YAW

The graph below shows 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.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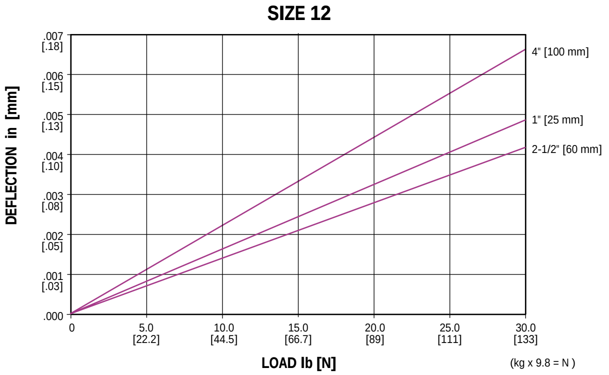
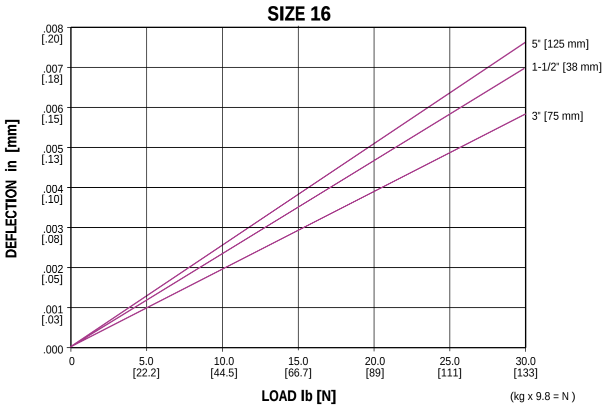
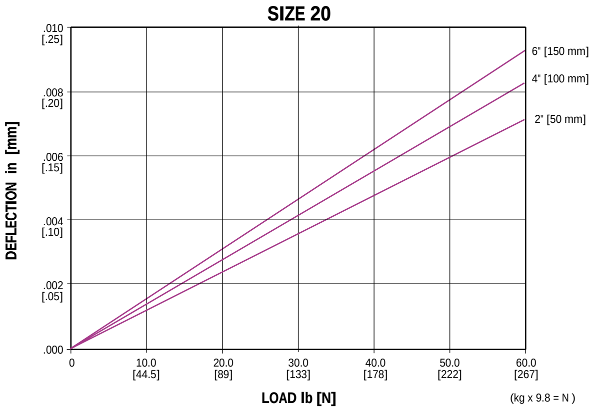
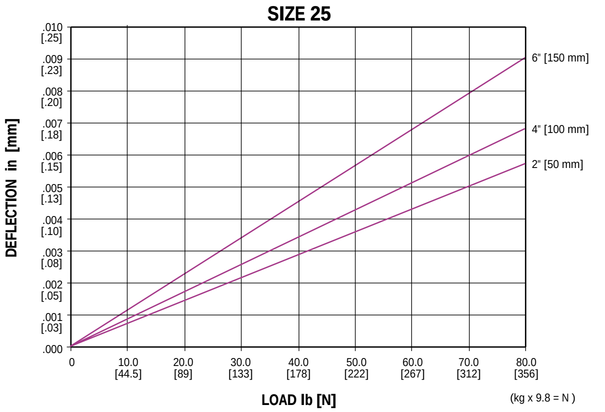

SIZE 12


SIZE 16


SIZE 20


SIZE 25

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 .0015".

Deflection Ratio = Deflection at tool plate / Ah distance
= .0015 / 9.194 = 1.63 x 10^{-4}

Deflection at load = Deflection Ratio x (Ah + CG)
= 1.63 x 10^{-4} x (9.194 + 2) = .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 .04 mm.

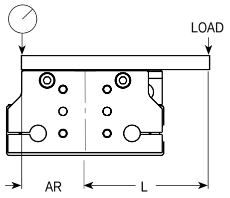
Deflection Ratio = Deflection at tool plate / Ah distance
= .04 / 233.5 = 1.71 x 10^{-4}

Deflection at load = Deflection Ratio x (Ah + CG)
= 1.71 x 10^{-4} x (233.5 + 50) = .048 mm

ENGINEERING DATA: SERIES STP SLIDES WITH RAIL BEARING

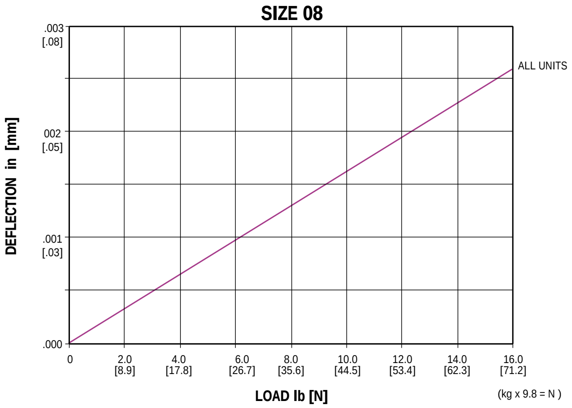
3 STATIC DEFLECTION IN ROLL

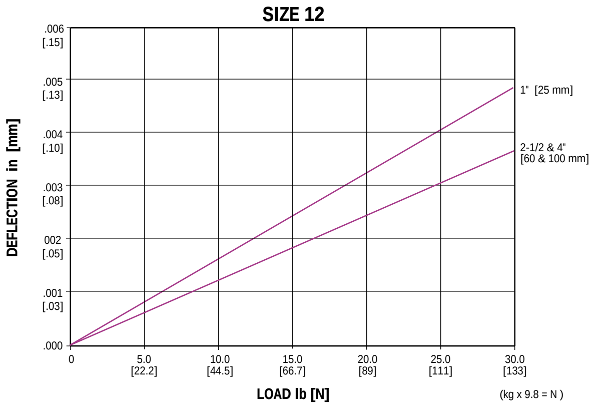
The graph on this page shows table roll deflection due to static moment loads applied at distance L from the center of the bearing. Values plotted in graphs were measured at point indicated.

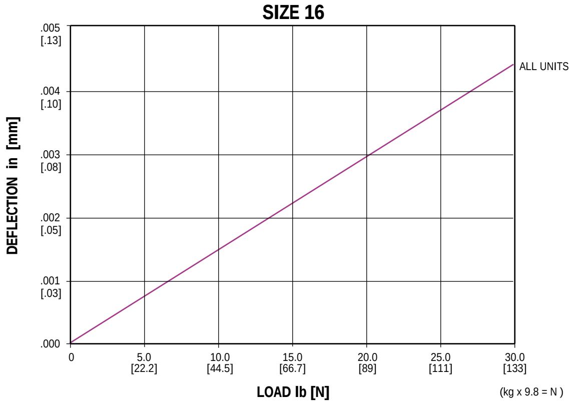


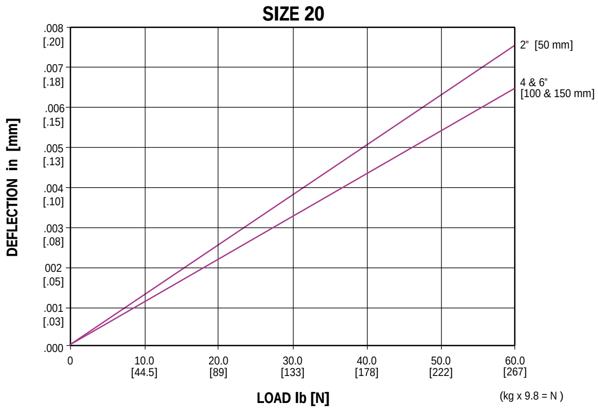
SIZE	TRAVEL in	TRAVEL mm	DISTANCE L in	DISTANCE L mm	DISTANCE AR in	DISTANCE AR mm
08	1	25	2	51	0.827	21.0
	2	50				
	3	75				
12	1	25	2.5	64	1.042	26.5
	2-1/2	60				
	4	100				
16	1-1/2	38	3.5	89	1.418	36.0
	3	75				
	5	125				
20	2	50	4.5	114	1.515	38.5
	4	100				
	6	150				
25	2	50	6	152	1.811	46.0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

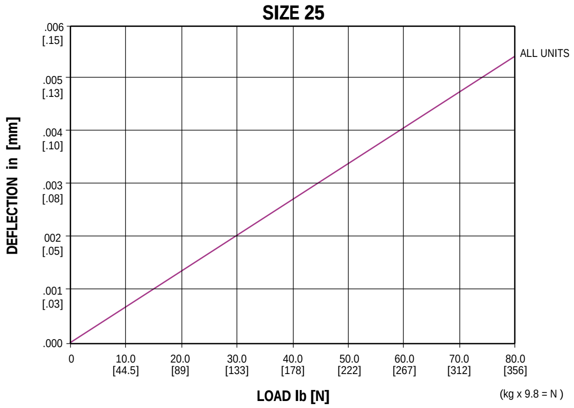
All tabulated and plotted values are typical and were determined empirically.











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 .0005". (This is at AR distance of 1.811)

Deflection Ratio = Deflection at AR / AR distance
= .0005/1.811= 2.76 x 10^{-4}

Deflection at load = Deflection Ratio x (CG distance)
= 2.76 x 10^{-4} x 4 = .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

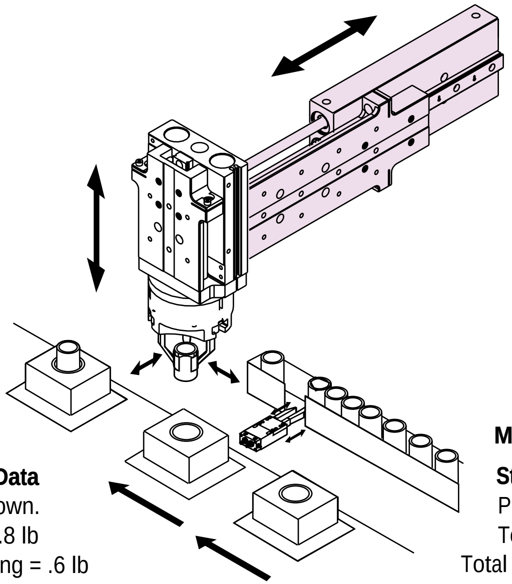
Equivalent load at L= (Mr / L) x 1000 = (4.59 / 152) x 1000 = 30.2 N

Read the graph for a 30.2 N load, deflection is approximately .013 mm. (This is at AR distance of 46 mm.)

Deflection Ratio = Deflection at AR / AR distance
= .013 / 46 = 2.82 x 10^{-4}

Deflection at load = Deflection Ratio x (CG distance)
= 2.82 x 10^{-4} x 102 = .029 mm

SLIDE SIZING EXAMPLE: SERIES STP SLIDES WITH RAIL BEARING



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 = .6 lb
Total Weight of gripped object = .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 = .6
Weight of gripped object = .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 .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 page 5A-35

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 = .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 = .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 = (.1852 + .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 .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 page 5A-35

OPTIONS: SERIES STP SLIDES WITH RAIL BEARING

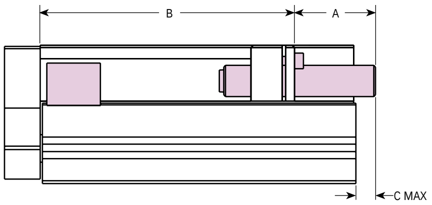
AE1 TRAVEL ADJUSTMENT AND SHOCK PAD ON EXTEND IN POSITION 1

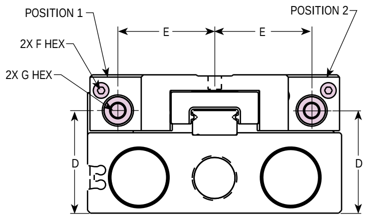
This option provides travel adjustment with a shock pad on extend in position 1. Shock pads provide excellent noise reduction and energy absorption capability. Travel on extend can be reduced by a maximum of ‘A’ shown in the table below. Adjust travel adjustment screw to the required position using ‘G’ hex wrench and lock into place using ‘F’ hex wrench. Refer to page 5A-35 for stopping capacity of the shock pad.

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. Refer to page 5A-35 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	.650	16.5	2.953	75.0	.591	15.0	.752	19.1	0.74	18.9	2 mm	3 mm
	2	50	.827	21.0	3.779	96.0	–	–						
	3	75	.827	21.0	4.783	121.5	–	–						
12	1	25	.749	19.0	2.755	70.0	.120	3.0	1.022	26.0	0.96	24.3	2.5 mm	3 mm
	2-1/2	60	.944	24.0	4.490	114.0	–	–						
	4	100	1.122	28.5	6.081	154.5	–	–						
16	1-1/2	38	.945	24.0	3.662	93.0	.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	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	.354	9.0	1.810	46.0	1.71	43.5	3 mm	6 mm
	4	100	1.181	30.0	6.732	171.0	–	–						
	6	150	1.122	28.5	8.800	223.5	–	–						

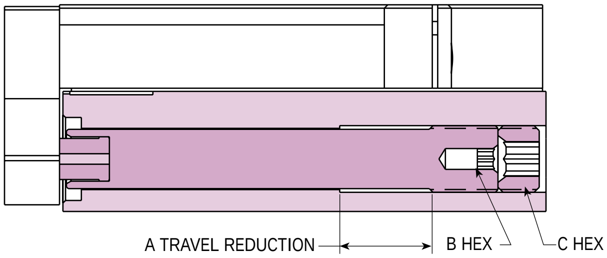


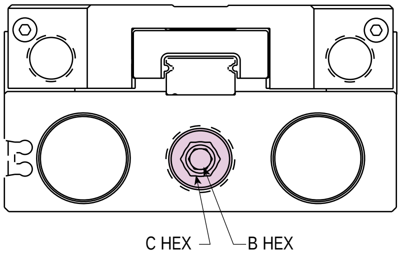


AR TRAVEL ADJUSTMENT AND SHOCK PAD ON RETRACT

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. Refer to page 5A-35 for stopping capacity of the shock pad.

	A		B	C
SIZE	in	mm	HEX	HEX
08	.512	13.0	2 mm	3 mm
12	.669	17.0	4 mm	5 mm
16	.984	25.0	5 mm	6 mm
20	1.063	27.0	6 mm	8 mm
25	1.063	27.0	6 mm	10 mm





All dimensions are reference only unless specifically toleranced.

OPTIONS: SERIES STP SLIDES WITH RAIL BEARING

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 a 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					
	in	mm	in	mm	in	mm
TRAVEL	1	25	2	50	3	75
L	1.102	28.0				
N	.551	14.0				
R1	3 mm x 2.5 mm DP					
R2	3 mm x 3 mm DP					
S2	3		3		4	
T	.532	13.5				
V	.868	22.0				
W	1.102	28.0				
Z2	2		3		4	

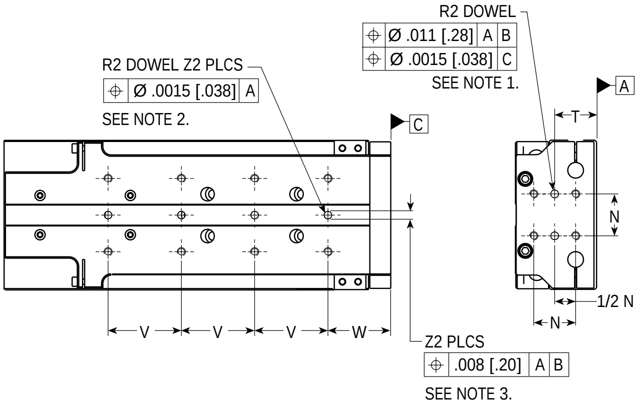
LETTER DIM	SIZE 12					
	in	mm	in	mm	in	mm
TRAVEL	1	25	2.5	60	4	100
L	1.496	38.0				
N	.670	17.0				
R1	4 mm x 2.5 mm DP					
R2	4 mm x 4 mm DP					
S2	3		3		4	
T	.713	18.1				
V	1.102	28.0				
W	1.300	33.0				
Z2	2		3		4	

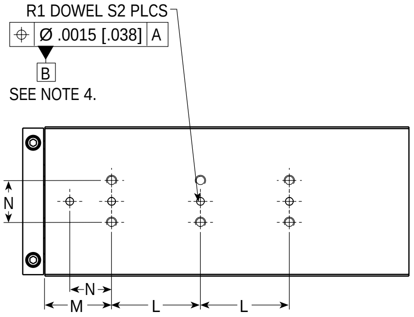
LETTER DIM	SIZE 16					
	in	mm	in	mm	in	mm
TRAVEL	1-1/2	38	3	75	5	125
L	1.929	49.0				
N	.905	23.0				
R1	5 mm x 3 mm DP					
R2	5 mm x 5 mm DP					
S2	3		3		4	
T	.906	23.0				
V	1.496	38.0				
W	1.378	35.0				
Z2	2		3		4	

LETTER DIM	SIZE 20					
	in	mm	in	mm	in	mm
TRAVEL	2	50	4	100	6	150
L	2.205	56.0				
N	1.024	26.0				
R1	5 mm x 3 mm DP					
R2	5 mm x 5 mm DP					
S2	3		3		4	
T	1.078	27.4				
V	1.654	42.0				
W	1.851	47.0				
Z2	2		3		4	

LETTER DIM	SIZE 25					
	in	mm	in	mm	in	mm
TRAVEL	2	50	4	100	6	150
L	2.677	68.0				
N	1.260	32.0				
R1	6 mm x 5.5 mm DP					
R2	6 mm x 6 mm DP					
S2	3		3		4	
T	1.260	32.0				
V	2.205	56.0				
W	1.890	48.0				
Z2	2		3		4	

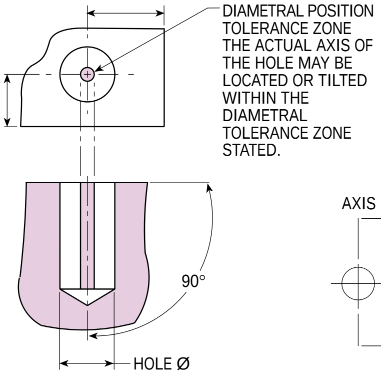
Ø R DOWEL HOLE	TOLERANCE		
	STANDARD	J3 OPTION	J8 OPTION
3 mm	+.0004/-.0009 [+.010/-.024]	+.0013/+.0003 [+.033/+.008]	+.0004/-.0000 [+.010/-.000]
4 mm	+.0004/-.0009 [+.010/-.024]	+.0015/+.0005] [+.033/+.008]	+.0005/-.0000 [+.010/-.000]
5 mm	+.0004/-.0009 [+.010/-.024]	+.0015/+.0004] [+.038/+.010]	+.0005/-.0000 [+.012/-.000]
6 mm	+.0004/-.0009 [+.010/-.024]	+.0015/+.0005] [+.038/+.013]	+.0005/-.0000 [+.012/-.000]



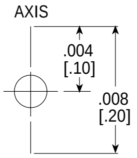


NOTES:
⌖ = POSITION TOLERANCE, THIS TOLERANCE DETERMINES THE LOCATION OF THE HOLES AND THE PERPENDICULARITY TO THE INDICATED DATUM FEATURES.

1) THE AXIS OF THESE DOWEL HOLES ARE LOCATED TO SURFACE A (DATUM) AND DOWEL HOLE PATTERN B (DATUM) WITHIN A .011 DIAMETRAL TOLERANCE ZONE. ADDITIONALLY THE AXIS OF THE HOLES ARE LOCATED TO EACH OTHER AND PERPENDICULAR TO SURFACE C (DATUM) WITHIN A.0015 DIAMETRAL TOLERANCE ZONE.
2) THE AXIS OF THE DOWEL HOLES ARE LOCATED TO EACH OTHER AND PERPENDICULAR TO SURFACE A (DATUM) WITHIN A .0015 [.038] DIAMETRAL TOLERANCE ZONE.
3) THE AXIS OF THESE HOLES ARE LOCATED TO SURFACE A (DATUM) AND DOWEL HOLE PATTERN B (DATUM) WITHIN .008 BILATERAL TOLERANCE ZONE.
4) THE AXIS OF THESE DOWEL HOLES ARE LOCATED TO EACH OTHER AND PERPENDICULAR TO SURFACE A (DATUM) WITHIN A .0015 [.038] DIAMETRAL TOLERANCE ZONE.



DIAMETRAL ZONE



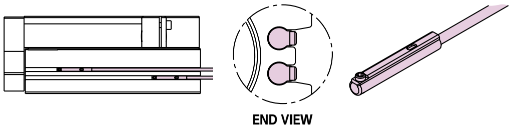
BILATERAL ZONE

OPTIONS: SERIES STP SLIDES WITH RAIL BEARING

M MAGNET FOR PHD SERIES 6790 MINIATURE REED AND SOLID STATE SWITCHES

This option equips the unit with a magnetic piston for use with PHD's Series 6790 Switch. 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 set screw.

PART NO.	DESCRIPTION
67902-1-02	NPN (Sink) or PNP (Source) DC Reed, 2 m cable
67902-1-05	NPN (Sink) or PNP (Source) DC Reed, 5 m cable
67903-1-02	NPN (Sink) DC Solid State, 2 m cable
67903-1-05	NPN (Sink) DC Solid State, 5 m cable
67904-1-02	PNP (Source) DC Solid State, 2 m cable
67904-1-05	PNP (Source) DC Solid State, 5 m cable
67922-1	NPN (Sink) or PNP (Source) DC Reed, Quick Connect
67923-1	NPN (Sink) DC Solid State, Quick Connect
67924-1	PNP (Source) DC Solid State, Quick Connect
63549-02	2 m Cordset with Quick Connect
63549-05	5 m Cordset with Quick Connect



REED BENEFITS

- Available as 4.5 - 30 VDC model for simple interfacing to sequencers and programmable controllers.
- Can be used to directly drive some types of relays or valve solenoids within the switch specifications stated.

SPECIFICATIONS	67902 & 67922
OPERATING PRINCIPLE	Magnetic Reed
ACTUATED BY	Piston Magnet
INPUT VOLTAGE	4.5 - 30 VDC
OUTPUT TYPE	Contact Closure
CURRENT RATING	50 mA Max.
CONTACT RESISTANCE	.115 Ohm Max.
ENVIRONMENTAL	IP67
OPERATING TEMP.	-20° to 85°C

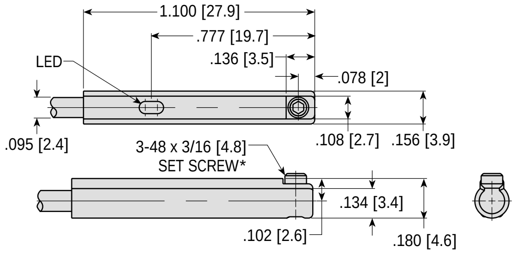
SIZE	REPEATABILITY	HYSTERESIS MAXIMUM	BAND WIDTH MINIMUM/MAXIMUM
08	± .005 [± .13]	.060 [1.5]	.360 / .690 [9.1 / 17.5]
12	± .005 [± .13]	.080 [2.0]	.230 / .340 [5.8 / 8.6]
16	± .005 [± .13]	.075 [1.9]	.340 / .440 [8.6 / 11.2]
20	± .005 [± .13]	.085 [2.2]	.130 / .360 [3.3 / 9.1]
25	± .004 [± .10]	.070 [1.8]	.300 / .425 [7.6 / 10.8]

SOLID STATE BENEFITS

- Solid state switches afford long life. Constant amplitude output allows use with most digital logic systems.
- Switch circuitry protects against voltage surges and other electrical anomalies associated with operating systems.
- Excellent switch hysteresis characteristics and symmetry.
- Offered in 4.5 - 30 VDC current sinking and current sourcing versions for simple interfacing to electronic system controllers.

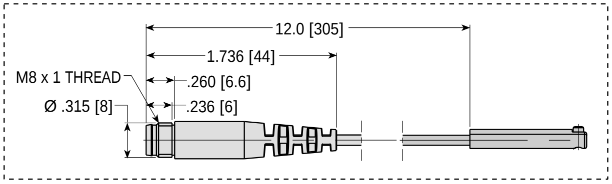
SPECIFICATIONS	67903 & 67923	67904 & 67924
OPERATING PRINCIPLE	Solid State	
ACTUATED BY	Piston Magnet	
INPUT VOLTAGE	4.5 - 30 VDC	
OUTPUT TYPE	NPN (Sink)	PNP (Source)
CURRENT RATING	50 mA. Max	
VOLTAGE DROP	.5 VDC	
SWITCH BURDEN	10 mA. Max.	
ENVIRONMENTAL	IP67	
OPERATING TEMP.	-20° to 85°C	

SIZE	REPEATABILITY	HYSTERESIS MAXIMUM	BAND WIDTH MINIMUM/MAXIMUM
08	± .007 [± .18]	.065 [1.7]	.320 / .580 [8.1 / 14.7]
12	± .007 [± .18]	.095 [2.4]	.300 / .450 [7.8 / 11.5]
16	± .007 [± .18]	.095 [2.4]	.330 / .510 [8.4 / 13.0]
20	± .005 [± .13]	.110 [2.8]	.190 / .380 [4.8 / 9.6]
25	± .005 [± .13]	.080 [2.0]	.320 / .470 [8.1 / 11.9]



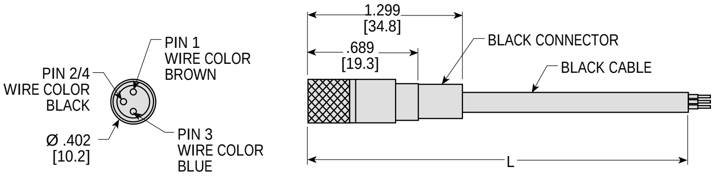
*MAX. SCREW TORQUE 1.0 in-lb [.110 Nm]

MALE QUICK CONNECT DETAIL



METRIC INFORMATION SHOWN IN [ ]

63549-xx CORDSET WITH FEMALE QUICK CONNECT



MODEL NO.	LETTER DIM. L
63549-02	78.74 [2 m]
63549-05	196.85 [5 m]

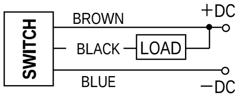
All dimensions are reference only unless specifically toleranced.

OPTIONS: SERIES STP SLIDES WITH RAIL BEARING

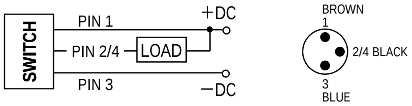
SOLID STATE WIRING SCHEMATICS

MODEL NO. 67903-1 & 67923-1 - NPN (SINK)
INPUT: 4.5 - 30 VDC
LOAD CURRENT: 50 mA. MAX.
SWITCH HOUSING COLOR: BLACK
(Bi-polar LED emits a yellow light)

CABLED MODEL 67903

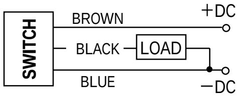


QUICK CONNECT MODEL 67923

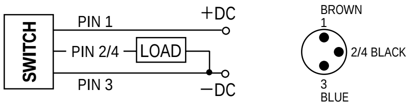


MODEL NO. 67904-1 & 67924-1 - PNP (SOURCE)
INPUT: 4.5-30 VDC
LOAD CURRENT: 50 mA. MAX.
SWITCH HOUSING COLOR: BLACK
(Bi-polar LED emits a red light.)

CABLED MODEL 67904



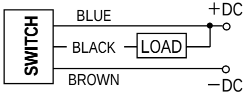
QUICK CONNECT MODEL 67924



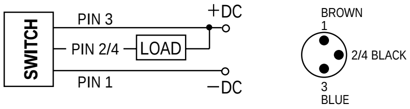
REED WIRING SCHEMATICS

MODEL NO. 67902-1 & 67922-1 - NPN (SINK) OR PNP (SOURCE)
INPUT: 4.5 - 30 VDC
LOAD CURRENT: 50 mA. MAX.
SWITCH HOUSING COLOR: BLACK
(LED emits a red light)

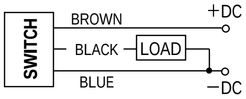
CABLED MODEL 67902 - NPN (SINK)



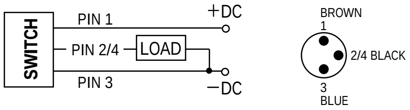
QUICK CONNECT MODEL 67922 - NPN (SINK)



CABLED MODEL 67902 - PNP (SOURCE)



QUICK CONNECT MODEL 67922 - PNP (SOURCE)



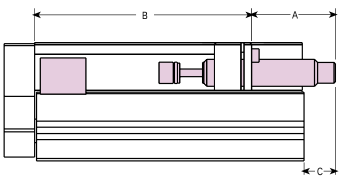
NE1x SHOCK ABSORBER INSTALLED ON EXTEND IN POSITION 1

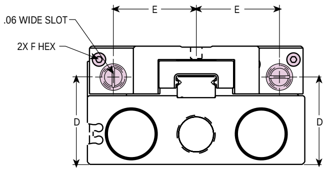
This option provides shock absorbers and travel adjustment on extend in position 1. Travel on extend can be reduced by a maximum of ‘A’ shown in the table below. Adjust shock absorber screw to the required position using a large screwdriver and lock into place using ‘F’ hex wrench. Refer to page 5A-36 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. Refer to page 5A-36 for shock absorber selection requirements.

	TRAVEL		A		B		C		D		E		F
SIZE	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	HEX
08	1	25	.650	16.5	2.953	75.0	.591	15.0	.752	19.1	0.743	18.9	2 mm
	2	50	.827	21.0	3.779	96.0	–	–					
	3	75	.827	21.0	4.783	121.5	–	–					
12	1	25	1.064	27.0	2.755	70.0	.433	11.0	1.022	26.0	0.96	24.4	2.5 mm
	2-1/2	60	0.828	21.0	4.490	114.0	–	–					
	4	100	0.866	22.5	6.081	154.5	–	–					
16	1-1/2	38	.945	24.0	3.662	93.0	.039	1.0	1.181	30.0	1.260	32	2.5 mm
	3	75	1.122	28.5	4.981	126.5	–	–					
	5	125	1.102	28.0	6.989	177.5	–	–					
20	2	50	1.280	32.5	4.152	105.5	–	–	1.447	36.8	1.42	36	2.5 mm
	4	100	1.280	32.5	6.576	167.0	–	–					
	6	150	1.280	32.5	8.896	226.0	–	–					
25	2	50	1.772	45.0	4.487	114.0	.669	17.0	1.810	46.0	1.712	43.5	3 mm
	4	100	1.516	38.5	6.732	171.0	–	–					
	6	150	1.457	37.0	8.800	223.5	–	–					





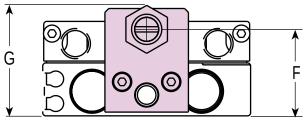
OPTIONS: SERIES STP SLIDES WITH RAIL BEARING

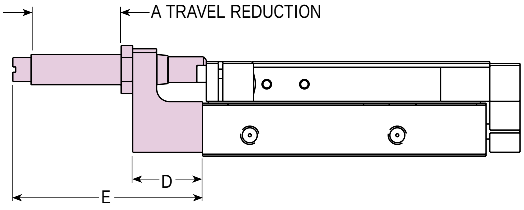
FOR SIZE 08 ONLY

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. Refer to page 5A-36 for shock absorber selection requirements.

A		D		E		F		G	
in	mm	in	mm	in	mm	in	mm	in	mm
.905	23.0	.728	18.5	2.008	51.0	.901	22.9	1.151	29.2



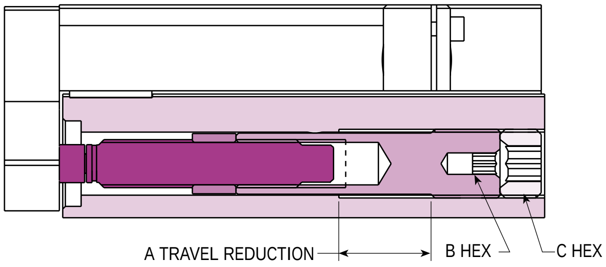


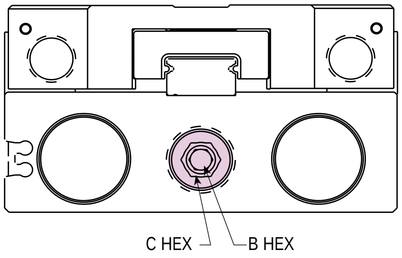
FOR SIZES 12, 16, 20, & 25

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 below. Adjust travel to the required position using ‘B’ hex wrench and lock into place using ‘C’ hex wrench. Refer to page 5A-36 for shock absorber selection requirements.

MODEL	A		B HEX	C HEX
	in	mm		
STPxx12	.512	13.0	4 mm	5 mm
STPxx16	.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





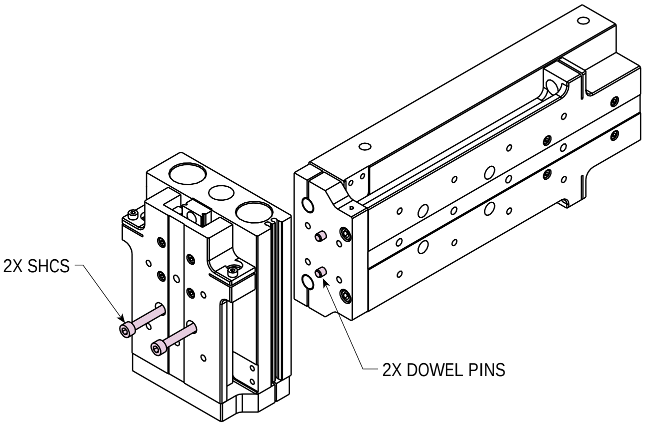
Q6 CORROSION RESISTANT GUIDE SHAFTS

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

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. Series STP units can also be bolted directly together as shown. PHD recommends that a -J3 option (transitional fit) be specified with the slide ordering data to allow the units to dowel together properly.

		KIT NUMBERS	
PRIMARY	SECONDARY	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



STOPPING CAPACITY: SERIES STP SLIDES WITH RAIL BEARING

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 + .29 lb + .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.

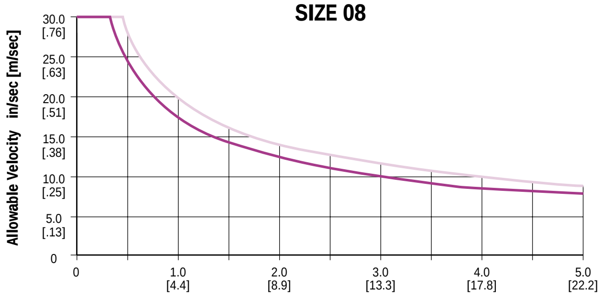
TABLE 1

SIZE	TRAVEL in	TRAVEL mm	STP MOVING WEIGHT lb	STP MOVING WEIGHT N	WEIGHT ADDERS -AE1, -AE2, -NE1x, -NE2x lb	WEIGHT ADDERS -AE1, -AE2, -NE1x, -NE2x N	PISTON AREA EXTEND in^2	PISTON AREA EXTEND mm^2	PISTON AREA RETRACT in^2	PISTON AREA RETRACT mm^2
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						

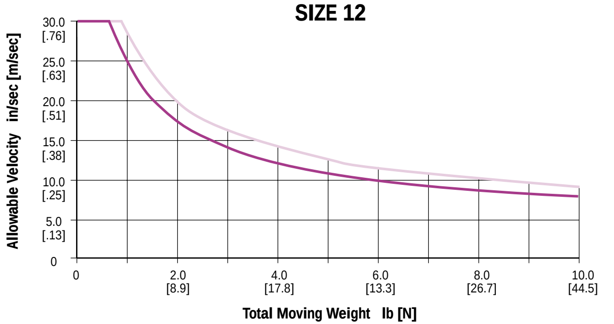
MAXIMUM ALLOWABLE KINETIC ENERGY GRAPHS FOR SHOCK PADS

▨ OPTIONS -AE1 & AE2, AR

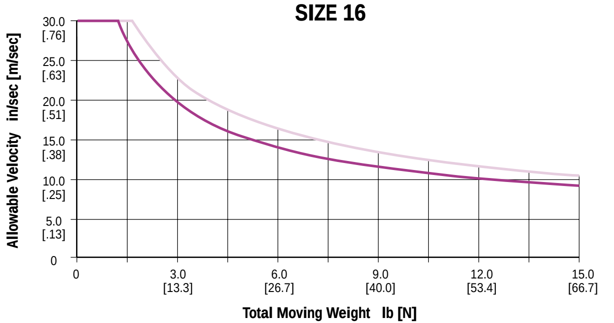
■ OPTION -AE1 ONLY



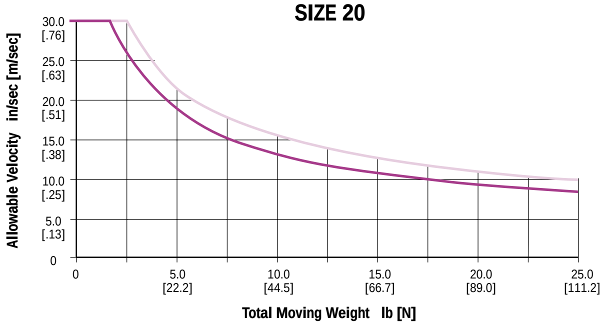
(kg x 9.8 = N)



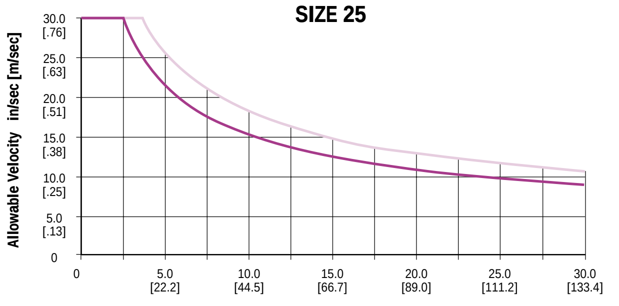
(kg x 9.8 = N)



(kg x 9.8 = N)



(kg x 9.8 = N)



(kg x 9.8 = N)

SHOCK ABSORBER SELECTION GUIDE: SERIES STP

PHD SHOCK ABSORBER SPECIFICATIONS CHART

		STROKE			E_T TOTAL ENERGY PER CYCLE		E_TC TOTAL ENERGY PER HOUR		F_G MAX PROPELLING FORCE	
SIZE	PHD SHOCK ABSORBER NO.	in	m	THREAD TYPE	in-lb	Nm	in-lb	Nm	lb	N
08 &12	68149-01-x	.210	.0053	M8 x1	20	2.26	50,000	5654	45	200
16	68015-01-x	.240	.0061	M10 x 1	40	4.52	110,000	12439	80	356
20	70861-01-x	.400	.0102	M12 x 1	65	7.35	250,000	28269	120	534
25	67127-01-x	.448	.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.

E_K (in-lb) $= .5 \text{ x } \frac{W_{TM}}{386} \text{ x } V^2$ E_K (Nm) $= .5 \text{ x } \frac{W_{TM}}{9.8} \text{ x } V^2$

or

Note: W_{TM} in kg mass may be substituted for $\frac{W_{TM}}{9.8}$ E_K (Nm) $= .5 \text{ x } W_{TM} \text{ x } V^2$

STEP 3: Calculate the propelling force (F_D) 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 .1 to obtain the correct unit of measure.

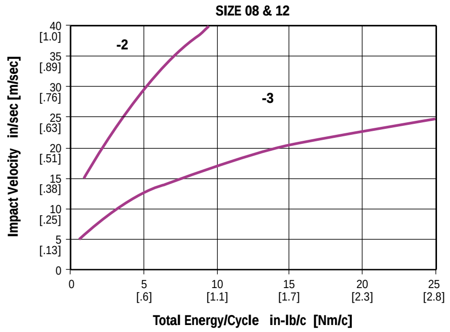
Use Shock Absorber Specification Chart to verify that the selected unit has an F_G capacity greater than the value just calculated. If not, select a larger shock absorber or slide.

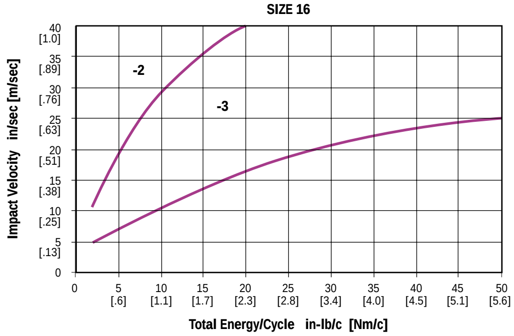
Calculate the work energy input ($E_W = F_D$ x S) using the travel of the shock absorber selected.

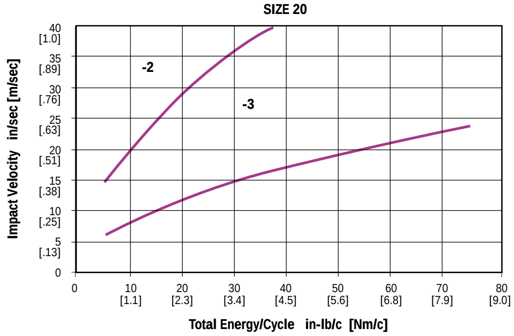
STEP 4: Calculate the total energy. $E_T = E_K + E_W$
Use Shock Absorber Specification Chart to verify that the selected unit has an E_T capacity greater than the value just calculated. If not, select a larger shock absorber or slide.

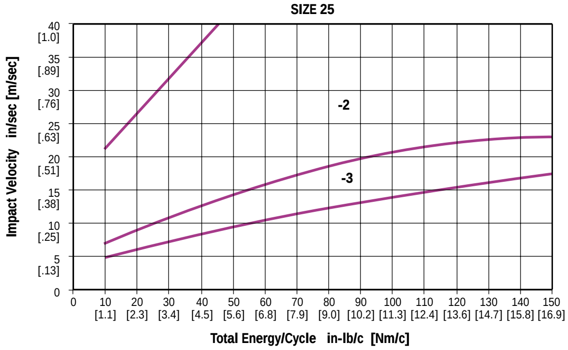
STEP 5: Calculate the total energy that must be absorbed per hour (E_TC). $E_TC = E_T$ x C
Use Shock Absorber Specification Chart to verify that the selected unit has an E_TC capacity greater than the value just calculated. If not, select a larger shock absorber or slide.

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.

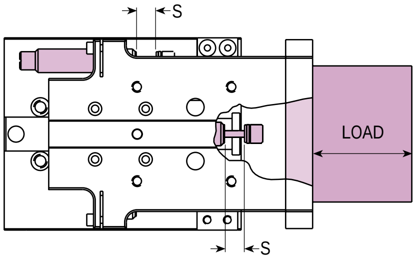








SIZING EXAMPLE: HORIZONTAL APPLICATION



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 + .29 lb + 20 lb = 22.89 lb
Retract = 2.6 lb + .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

$E_K = .5 \times W_{TM} \times V^2 / 386$
Extend = $.5 \times 22.89 \times 15^2 / 386 = 6.67$ in-lb
Retract = $.5 \times 3.89 \times 20^2 / 386 = 2.02$ 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 Specification 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 .448 = 54.5 in-lb
Retract = 93.6 x .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 Specification 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 Specification Chart to verify that the selected unit has and 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 = .381 m/sec (extend), V_R =.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

$E_K = .5 \times W_{TM} \times V^2 / 9.8$
Extend = $.5 \times 101.89 \times .381^2 / 9.8 = .75$ Nm
Retract = $.5 \times 17.29 \times .51^2 / 9.8 = .23$ Nm

STEP 3: Calculate the propelling force and work energy

F_D = Effective Piston Area x Operating Pressure x .1
Extend = 982 x 5.5 x .1 = 540 N
Retract = 756 x 5.5 x .1 = 416 N

Use the Shock Absorber Specification 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 .0114 = 6.16 Nm
Retract = 416 x .0114 = 4.74 Nm

STEP 4: Calculate the total energy: $E_T = E_K + E_W$

Extend = .75 + 6.16 = 6.91 Nm
Retract = .23 + 4.74 = 4.97 Nm

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

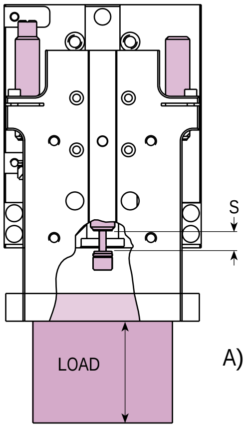
STEP 6: Determine the damping constant required

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.

SHOCK ABSORBER SELECTION GUIDE: SERIES STP

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 + .29 lb + .29 lb + 30 lb = 33.18 lb
Retract = 2.6 lb + .29 lb + .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 = .5 x W_{TM} x V^2 / 386
Extend = .5 x 33.18 x 25^2 / 386 = 26.9 in-lb
Retract = .5 x -4.18 x 20^2 / 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 Specification Chart to verify that the selected unit has an F_G capacity greater than the value just calculated.

E_W = F_D x S
Extend = 151.6 x .448 = 67.9 in-lb
Retract = 89.42 x .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 Specification 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 x 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 Specification Chart to verify that the selected unit has and 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 = .64 m/sec (extend), V_R =.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

EK = .5 x W_{TM} x V^2 / 9.8
Extend = .5 x 147.18 x $.64^2$ / 9.8 = 3.08 Nm
Retract = .5 x -18.58 x $.51^2$ / 9.8 = -.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 .1) ± W_{TM}
Extend = (982 x 5.5 x .1) + 147.18 N = 673 N (working with gravity)
Retract = (756 x 5.5 x .1) - 18.58 N = 397 N (working against gravity)

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

E_W = F_D x S
Extend = 673 x .0114 = 7.67 Nm
Retract = 397 x .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 = -.25 + 4.53 = 4.28 Nm

Use the Shock Absorber Specification 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 x C

Extend = 10.75 x 800 = 8600 Nm/hr
Retract = 4.28 x 800 = 3424 Nm/hr

Use the Shock Absorber Specification Chart to verify that the selected unit has and 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.