

SFM

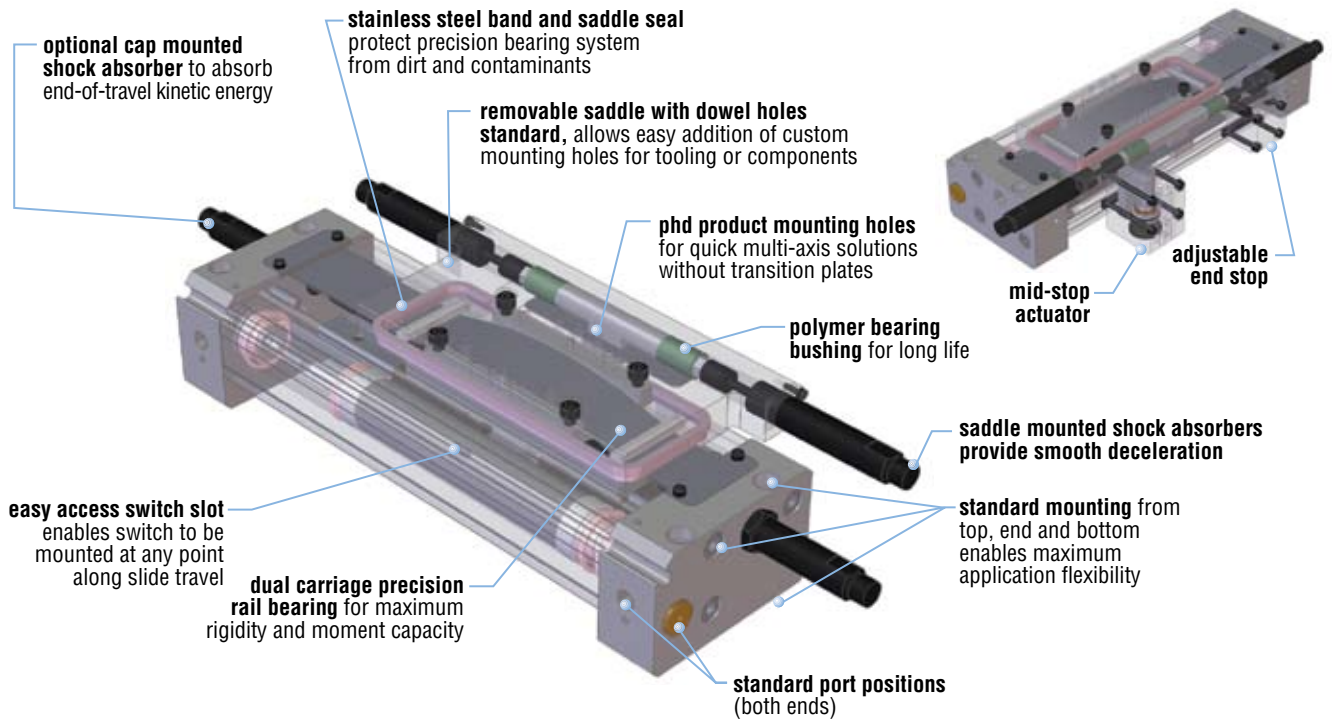


LOW DEFLECTION, HIGH MOMENT RODLESS SLIDE WITH COMPLETE INTERMEDIATE STOPPING CAPABILITY



SFM

U.S. PATENT NOs. 6,857,780,
7,290,478 & 7,290,479
INTERNATIONAL PATENTS PENDING



Major Benefits

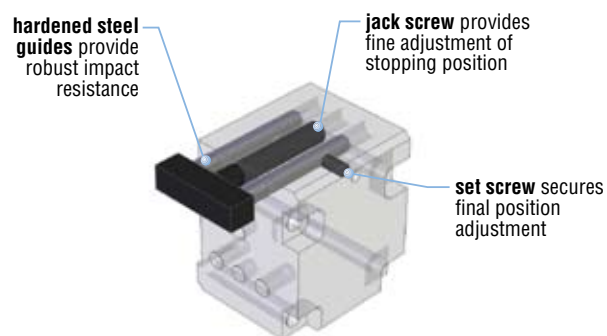
- Modular multi-position stop system includes optional mid-stop actuator and adjustable end stop to support diverse applications.
- Multiple intermediate stopping positions are available, limited only by the length of the Series SFM Slide.

Industry Uses

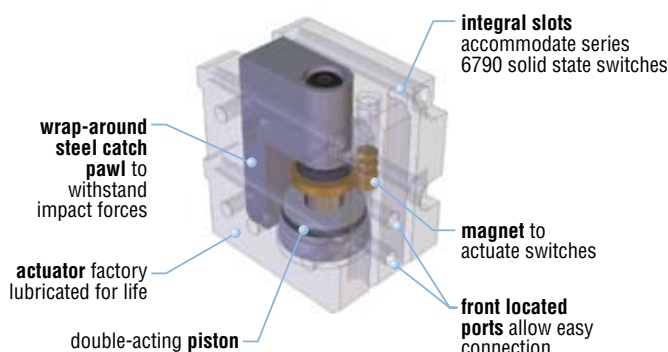
- General automation
- Packaging
- Assembly machine builders
- Medical
- Semiconductor
- Optical
- Plastics
- Automotive



ADJUSTABLE END STOP -NNxx



MID-STOP ACTUATOR -NPxx



Adjustable End Stop

- Adjustable end stop can be used in combination with the saddle assembly shocks, eliminating the need for shocks in the end caps.
- Adjustable end stop can be positioned anywhere along the length of the slide to limit travel.
- Adjustable end stop can be used to provide fine adjustment of mid-stop actuator position.

Mid-Stop Actuator

- Mid-stop actuator stops the saddle assembly at intermediate positions along the length of the slide.
- Mid-stop actuator can be located anywhere along the entire length of the slide travel.
- Location of mid-stop actuator can be easily adjusted at any time.
- Double-acting for maximum flexibility in engaging and disengaging stop.
- Optional switches can be used to sense both engaged and disengaged condition of actuator.

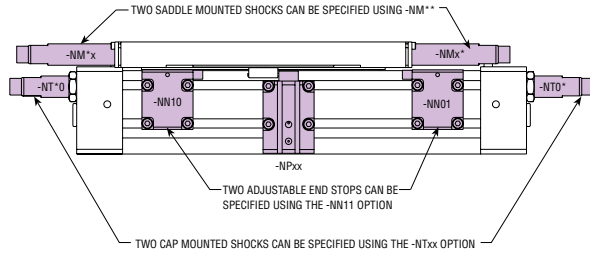
SAFE OPERATION

Proper control valving is essential for safe and reliable operation of the Series SFM Slide! Only center pressurized (pressure center) or equivalent valving should be used to control Series SFM Slides. This product uses back-pressure on the exhaust side of the slide piston to regulate the speed of the saddle. The presence of adequate back-pressure is critical when the saddle stopped by a stop actuator is released. If the air opposite the

pressurized side of the slide piston is exhausted to ambient pressure before the saddle is released, the saddle can rapidly accelerate to high velocity before sufficient back-pressure can build to regulate saddle speed. Use of center pressurized valving ensures that exhaust side air is always at full supply pressure prior to stop release.

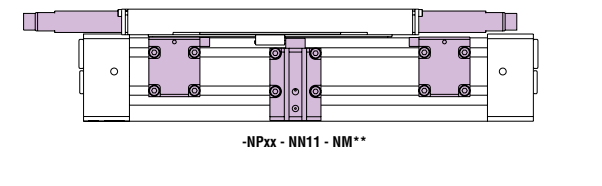
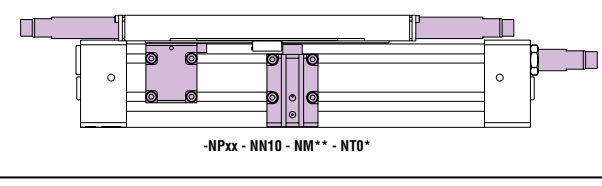
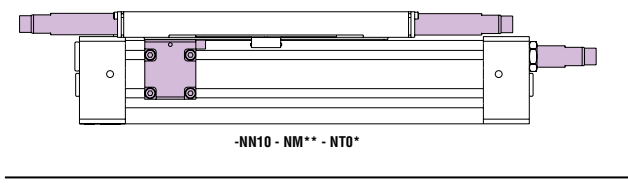
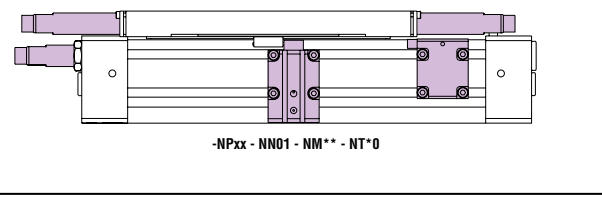
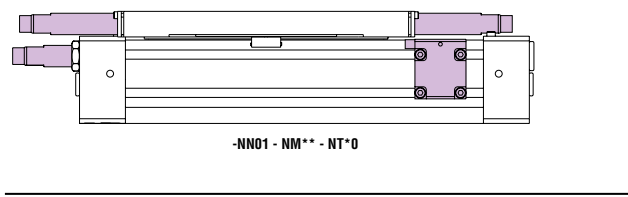
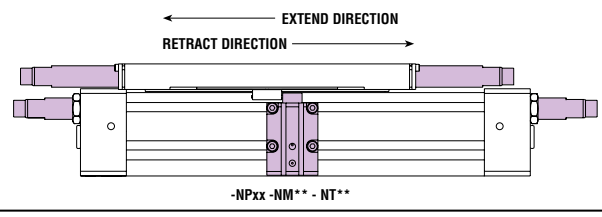
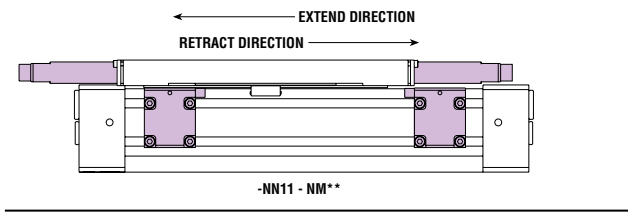
ORDERING DATA: SERIES SFM SLIDES

STOP ACTUATOR, ADJUSTABLE END STOP, & SHOCK LOCATION KEY WHERE * = SHOCK DAMPING CONSTANT



The figures below can be used to determine the proper option ordering sequence for a desired slide configuration. Find the combination of mid-stop actuator and/or adjustable end-stops that fit your application and read the option sequence below the corresponding figure. **Note:** -NMxx option must be ordered. Either -NNxx or -NTxx option must be ordered for each direction of saddle travel.

SFM



ENGINEERING DATA: SERIES SFM SLIDES

SPECIFICATIONS	SERIES SFM
OPERATING PRESSURE	36 psi min to 116 psi max [2.5 bar min to 8 bar max] air
OPERATING TEMPERATURE	41° to 140°F [5° to 60°C]
TRAVEL TOLERANCE	+ .12/- .00 in [+3.0/-0.0 mm]
REPEATABILITY	±0.0016 in [±0.04 mm] of original position
VELOCITY	4 to 60 in/sec [.1 to 1.5 m/sec]
LUBRICATION	Factory lubricated for life
MAINTENANCE	Field repairable

SIZE	MAXIMUM TRAVEL		BORE DIAMETER		EFFECTIVE AREA		BASE WEIGHT		ADDER WEIGHT (per 25 mm)		TYPICAL DYNAMIC LOAD		MOVING SADDLE	
	in	mm	in	mm	in ²	mm ²	lb	kg	lb	kg	lb	N	lb	kg
27	70.8	1800	1.06	27	.88	570	7.9	3.58	0.37	0.17	0 - 100	0 - 440	3.0	1.36
40	133.8	3400	1.57	40	1.95	1260	21.6	9.80	0.71	0.32	20 - 250	89 - 1100	8.0	3.63

NOTE: Thrust capacity, allowable mass and dynamic moment capacity must be considered when selecting a slide.

MAXIMUM BEARING CAPACITY

SIZE	LOAD		PITCH MOMENT		YAW MOMENT		ROLL MOMENT	
	lb	N	in-lb	Nm	in-lb	Nm	in-lb	Nm
27	946	4208	460	52.0	460	52.0	299	33.8
40	1971	3767	1535	173.4	1535	173.4	911	102.9

FORCE TABLE

DIRECTION	SFM527		SFM540	
	lb/psi	N/bar	lb/psi	N/bar
Extend	.887	57.3	1.948	125.7
Retract	.887	57.3	1.948	125.7

CYLINDER FORCE CALCULATIONS

	IMPERIAL	METRIC
	$F = P \times A$	$F = 0.1 \times P \times A$
F = Cylinder Force	lbs	N
P = Operating Pressure	psi	bar
A = Effective Area	in ²	mm ²
(Extend or Retract)		

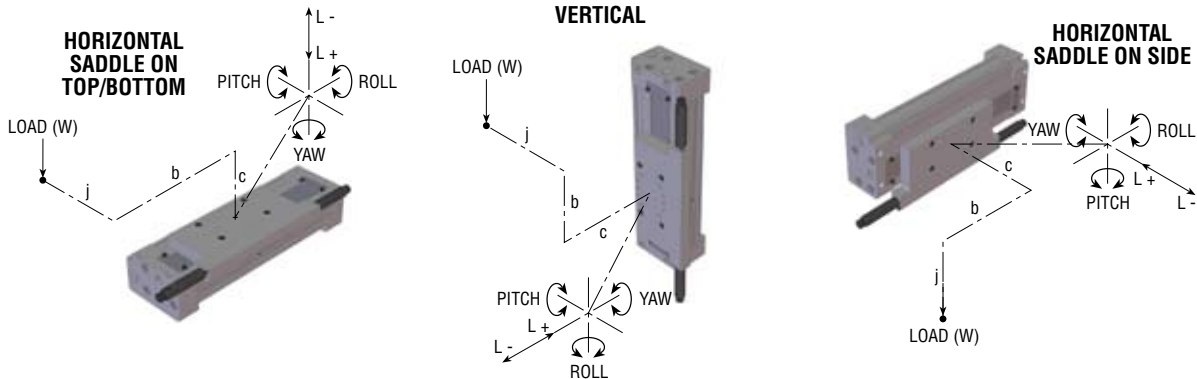
STATIC MOMENT CAPACITY

HORIZONTAL SADDLE TOP OR BOTTOM	VERTICAL	HORIZONTAL SADDLE ON SIDE
M_p (Pitch) = Load x b	M_p = Load x e	M_p = 0
M_y (Yaw) = 0	M_y = Load x j	M_y = Load x b
M_r (Roll) = Load x j	M_r = 0	M_r = Load x e

SIZE	"d" CONSTANT	
	in	mm
27	1.448	36.8
40	1.713	43.5

NOTE: $e = c + d$

NOTE: Values apply when stopping with cap mounted shock absorbers. See PHD product sizing catalog for detailed information on calculating static moments at all stopping positions.

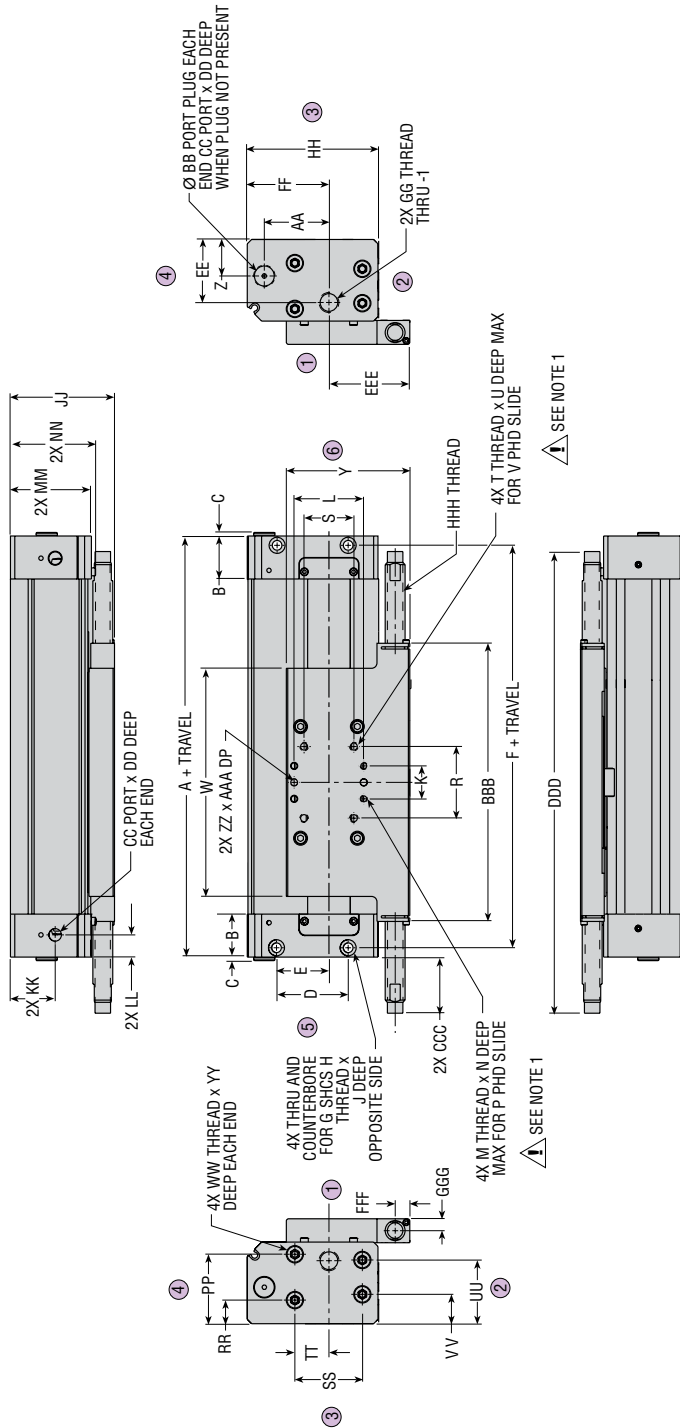


SIZING AND APPLICATION ASSISTANCE

See PHD Product Sizing Catalog for specific and complete sizing information. Online sizing assistance is available at: www.phdinc.com/apps/sizing

DIMENSIONS: SERIES SFM SLIDES

SFM



OPTIONS: SERIES SFM SLIDES

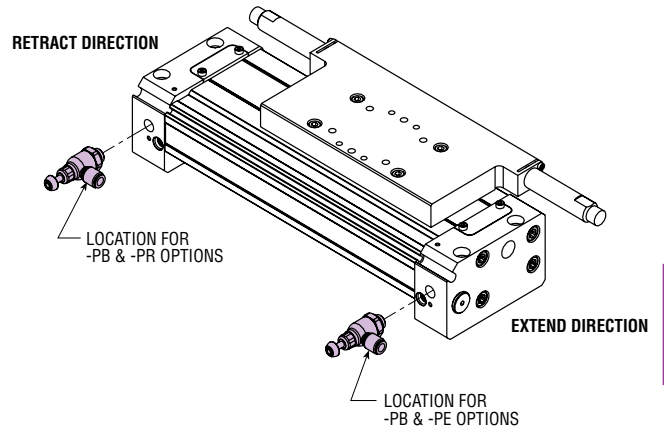
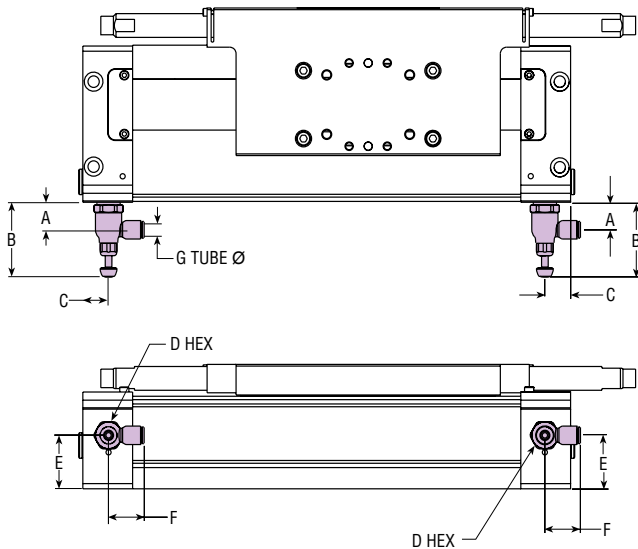
PB FLOW CONTROLS ON EXTEND AND RETRACT

PR FLOW CONTROLS ON RETRACT

PE FLOW CONTROLS ON EXTEND

The PHD Series SFM Slide utilizes external compact banjo flow control fittings to adjust the saddle velocity. The control fittings are unidirectional flow control valves where intake air flows freely through the flow control and exhaust air is metered out through an adjustment screw. Intake capacity is slightly greater than the full open exhaust capacity, enabling maximum variation of saddle speeds.

The PHD Series SFM flow control fittings are supplied for direct mounting to the caps and provide integral tube fitting connection. They also swivel 360 degrees around the ports, easing tube routing



installation. Saddle velocities are adjusted and maintained by the captivated fine adjustment screw with a locking nut, which ensures precise velocity control and repeatability.

Note: Flow control fitting is effective throughout the Series SFM temperature and pressure range.

SIZE	SPEED CONTROL REPLACEMENT KIT NO.	
	METRIC	IMPERIAL
27	70696-03	70695-03
40	70696-06	70695-05

Kit includes flow control for one end.

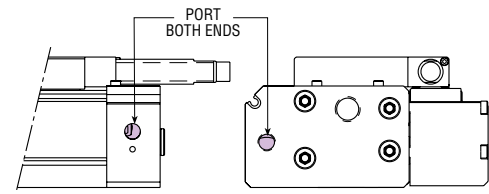
SIZE	LETTER DIMENSIONS			
	A	B MAX	C	D HEX
27	.630 [16.0]	1.730 [44.0]	.610 [15.5]	.630 [16.0]
40	.730 [18.5]	1.890 [48]	.945 [24.0]	.750 [19.0]

SIZE	STANDARD -L9 OPTION			
	E	F	G	G
27	1.240 [31.5]	.870 [22.0]	[6.0]	1/4
40	1.535 [39.0]	1.100 [28.0]	[8.0]	3/8

Numbers in [] are metric.

L9 NPT PORTS

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



SIZE	PORT SIZE
27	1/8-27 NPT
40	1/4-18 NPT

NOTE: Port locations are the same as BSPP ports on page 7.

Z1 CORROSION RESISTANT PLATING

This option provides corrosion resistant plating on all externally exposed ferrous parts. This optional plating can be used to protect the slide from severe or corrosive environments.

NOTE: Shock Absorbers are not plated with -Z1 option.

All dimensions are reference only unless specifically toleranced.

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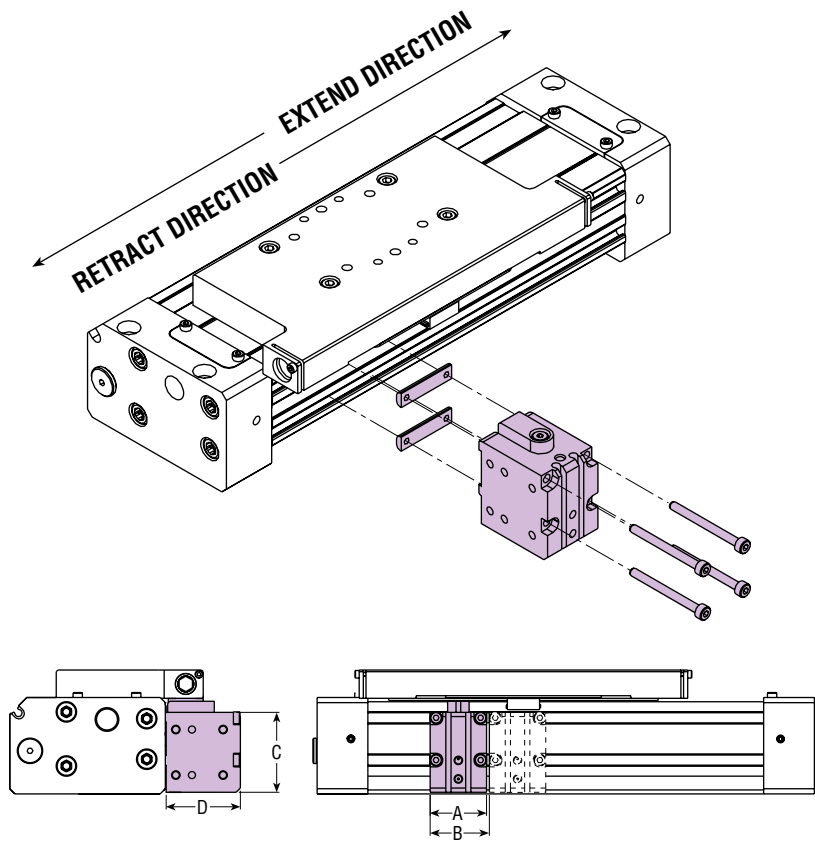
OPTIONS: SERIES SFM SLIDES

NP1x PORTED MID-STOP ACTUATOR

NP3x VALVE READY MID-STOP ACTUATOR

This option provides mid-stop actuators to stop the saddle at intermediate positions of travel. Actuators are double-acting for flexible system configuration and can stop the saddle in both directions of travel. Actuators can be positioned anywhere along

the length of travel. Ported version (-NP1x) accepts standard 10-32 [M5] threaded fittings. Valve-ready version (-NP3x) directly interfaces to MAC 43A-AAA-Rxxx-xxx valve with included valve mounting kit. (Valves must be ordered separately from your MDN Distributor.) Mid-stop actuators are switch ready with internal magnet to actuate PHD Series 6790 Solid State Switches. (Series 6790 Reed Switches are not compatible with Series SFM Slide.) Actuators with associated mounting hardware are packed with the slide, ready for installation onto the slide at desired intermediate stopping positions.



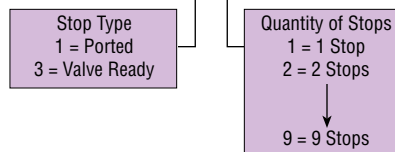
SIZE	LETTER DIMENSIONS			
	A	B (min)	C	D
27	1.313 [33.4]	1.378 [35.0]	1.860 [47.2]	1.727 [43.9]
40	1.500 [38.1]	1.575 [40.0]	2.050 [52.1]	1.727 [43.9]

NOTES:

- 1) Numbers in [] are in mm.
- 2) Dimension B refers to spacing between adjacent stops.

OPTION CODE

-NP x x



OPTIONS: SERIES SFM SLIDES

NN10 ADJUSTABLE END STOP
IN EXTEND DIRECTION

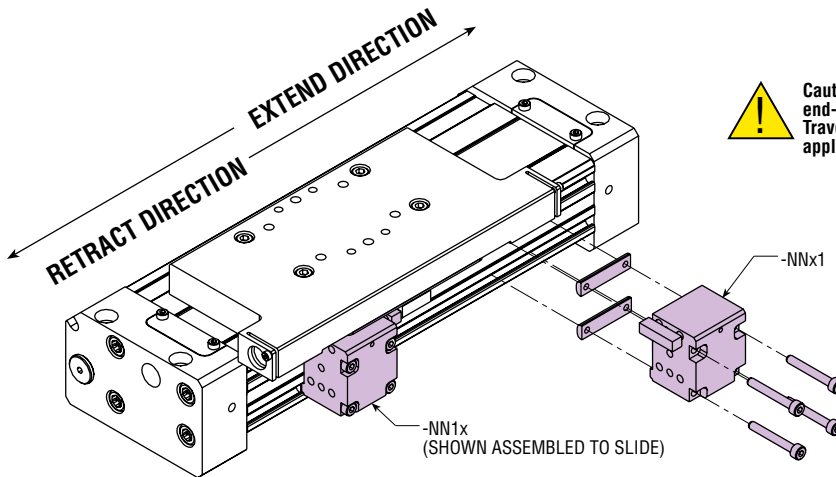
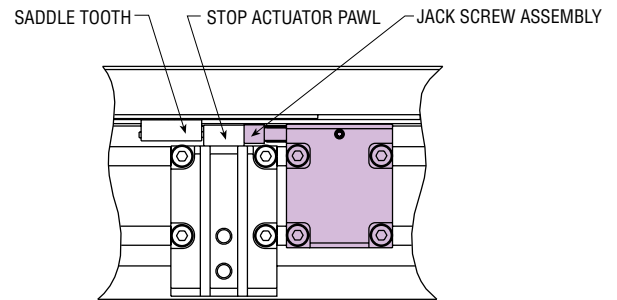
NN01 ADJUSTABLE END STOP
IN RETRACT DIRECTION

NN11 ADJUSTABLE END STOP
IN BOTH DIRECTIONS

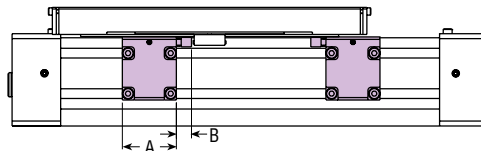
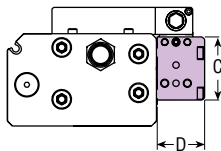
This option provides adjustable end stops to control the end-of-travel stopping position. The end stop can be positioned anywhere along the length of travel and features an additional ± 0.118 in [3 mm] of fine position adjustment once the stop has been mounted to the slide. A single adjustable end stop can also be used to provide ± 0.118 in [3 mm] of fine position adjustment for multiple mid-stop actuators. End stops with associated mounting hardware are packed with the slide, ready for installation onto the slide at desired end-of-travel stopping positions.

FINE POSITIONING STOP ACTUATOR WITH ADJUSTABLE END STOP

- Locate stop actuator at approximate desired mounting location
- Snug stop actuator fasteners leaving stop actuator free to slide
- Firmly mount adjustable end stop next to stop actuator
- Pressurize slide to push saddle against stop actuator pawl
- Adjust jack screw of end stop to fine position stop actuator pawl
- Tighten stop actuator fasteners to secure and remove end stop



Caution: Care should be taken to ensure that stopping at end-of-travel position is always accomplished with either Travel Adjustment Screws, Shock Absorbers, or customer applied tooling or fixturing.



SIZE	LETTER DIMENSIONS			
	A	B (RANGE)	C	D
27	1.313	.250 - .485	1.533	1.152
	[33.4]	[6.4 - 12.3]	[38.9]	[29.3]
40	1.500	.375 - .611	1.920	1.288
	[38.1]	[9.5 - 15.5]	[48.8]	[32.7]

Numbers in [] are in mm.

OPTION CODE

-NN X X

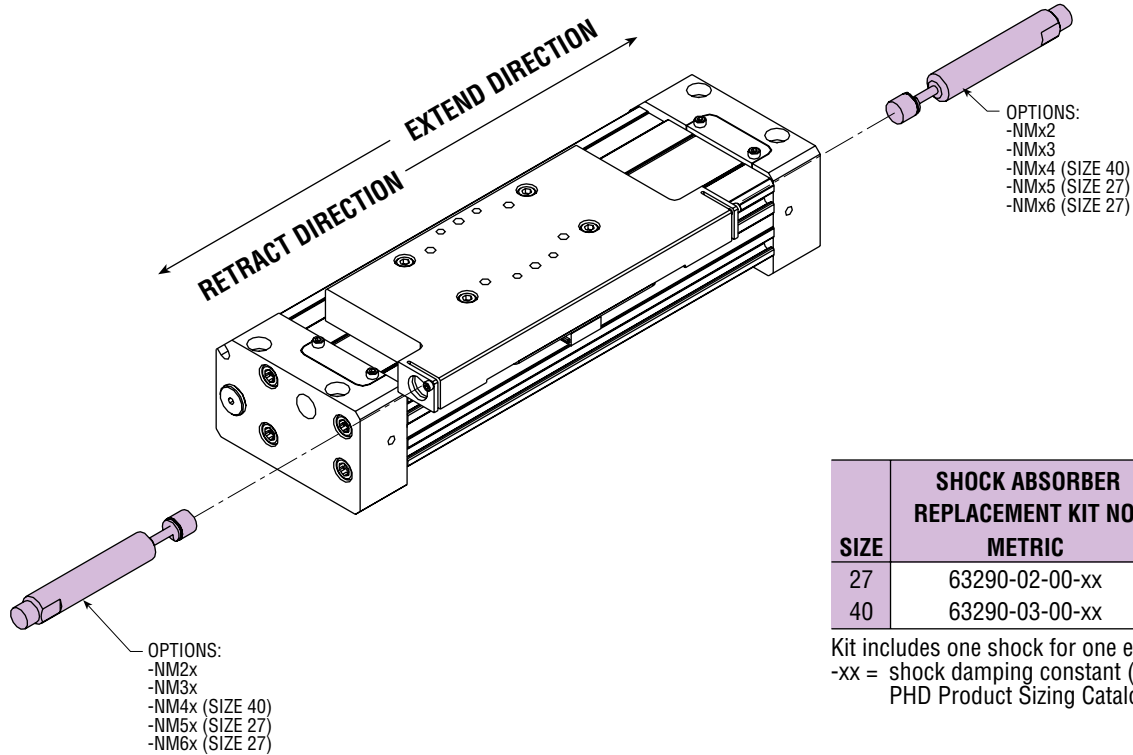
Extend Direction of Travel
0 = No end stop provided
1 = End stop provided

Retract Direction of Travel
0 = No end stop provided
1 = End stop provided

OPTIONS: SERIES SFM SLIDES

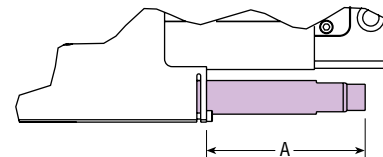
NMxx SADDLE MOUNTED SHOCK ABSORBER

This option must be ordered. See Ordering Data section for additional information on how to specify -NMxx option. See PHD Product Sizing Catalog or product sizing software for details on shock absorber stopping capacity and to determine the proper damping constant value.



SHOCK ABSORBER REPLACEMENT KIT NO.	
SIZE	METRIC
27	63290-02-00-xx
40	63290-03-00-xx

Kit includes one shock for one end.
-xx = shock damping constant (see PHD Product Sizing Catalog)



OPTION CODE

-NM x x

Extend Direction of Travel 2 = Damping constant 3 = Damping constant 4 = Damping constant (size 40 only) 5 = Damping constant (size 27 only) 6 = Damping constant (size 27 only)	Retract Direction of Travel 2 = Damping constant 3 = Damping constant 4 = Damping constant (size 40 only) 5 = Damping constant (size 27 only) 6 = Damping constant (size 27 only)
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SIZE	SHOCK DAMPING CONSTANT	LETTER DIMENSION	
		A	
27	2	2.60	[66.0]
	3	2.60	[66.0]
	5	2.83	[71.9]
	6	2.83	[71.9]
40	2	2.39	[60.7]
	3	2.39	[60.7]
	4	2.39	[60.7]

Numbers in [] are in mm.

OPTIONS: SERIES SFM SLIDES

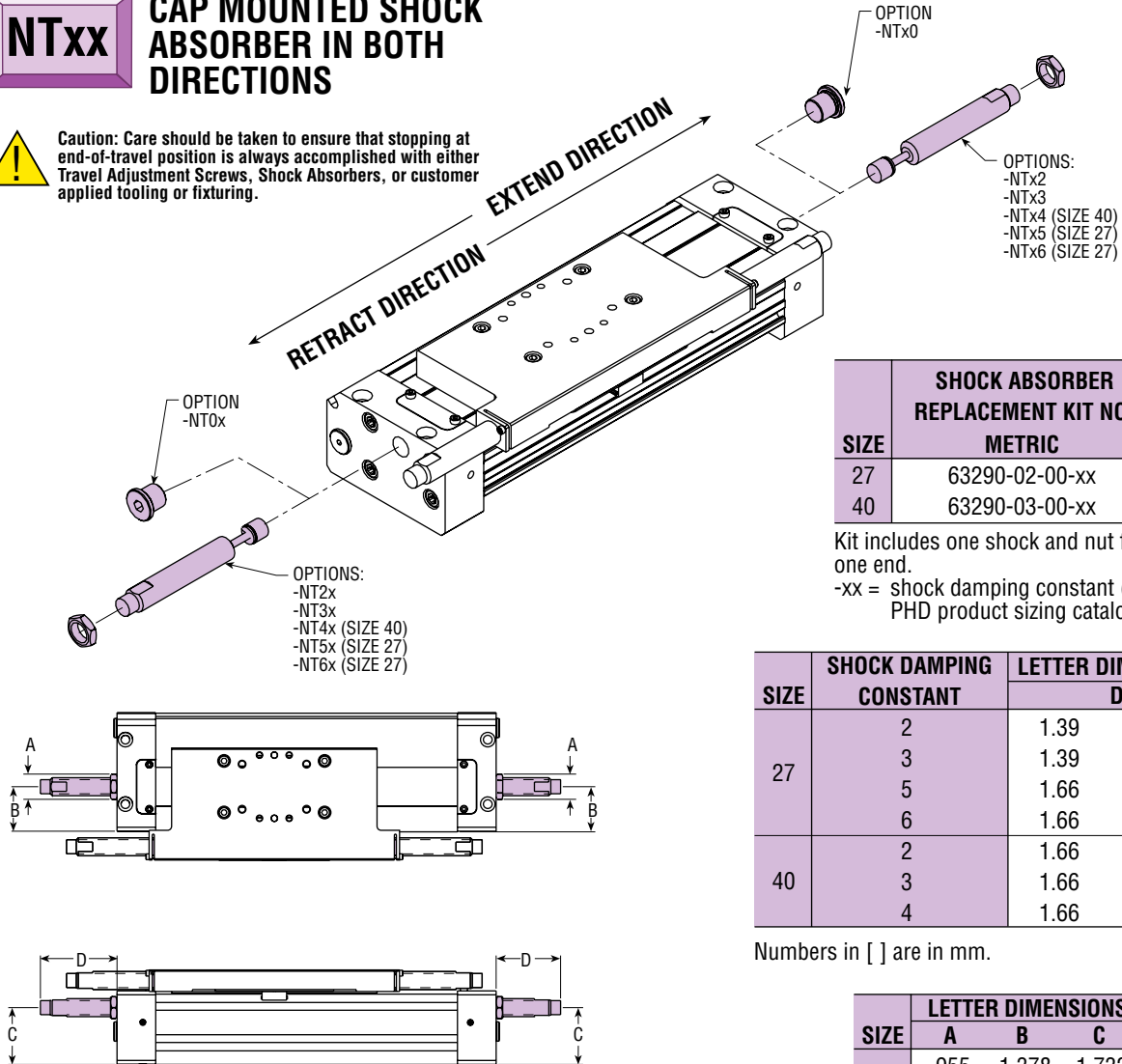
NTx0 CAP MOUNTED SHOCK ABSORBER IN EXTEND DIRECTION

NT0x CAP MOUNTED SHOCK ABSORBER IN RETRACT DIRECTION

NTxx CAP MOUNTED SHOCK ABSORBER IN BOTH DIRECTIONS

This option provides end cap mounted shock absorbers. This option or adjustable end stop (-NNxx option) must be ordered for each direction of travel. End cap mounted shock absorbers can also be ordered in addition to adjustable end stops to provide redundant end-of-travel stopping. Shock absorbers provide an adjustment range of .55 [14 mm] from each end of travel. See PHD Product Sizing Catalog or product sizing software for details on shock absorber stopping capacity and to determine the proper damping constant value.

Caution: Care should be taken to ensure that stopping at end-of-travel position is always accomplished with either Travel Adjustment Screws, Shock Absorbers, or customer applied tooling or fixturing.



SHOCK ABSORBER REPLACEMENT KIT NO. METRIC	
SIZE	METRIC
27	63290-02-00-xx
40	63290-03-00-xx

Kit includes one shock and nut for one end.
-xx = shock damping constant (see PHD product sizing catalog)

SIZE	SHOCK DAMPING CONSTANT	LETTER DIMENSION	
		D	
27	2	1.39	[35.3]
	3	1.39	[35.3]
	5	1.66	[42.2]
	6	1.66	[42.2]
40	2	1.66	[42.2]
	3	1.66	[42.2]
	4	1.66	[42.2]

Numbers in [] are in mm.

SIZE	LETTER DIMENSIONS		
	A	B	C
27	.955	1.378	1.732
	[24.3]	[35.0]	[44.0]
40	1.364	1.909	2.441
	[34.6]	[48.5]	[62.0]

Numbers in [] are in mm.

OPTION CODE

-NT x x

Extend Direction Cap Shock 0 = Plug installed no shock 2 = Damping constant 3 = Damping constant 4 = Damping constant (size 40 only) 5 = Damping constant (size 27 only) 6 = Damping constant (size 27 only)	Retract Direction Cap Shock 0 = Plug installed no shock 2 = Damping constant 3 = Damping constant 4 = Damping constant (size 40 only) 5 = Damping constant (size 27 only) 6 = Damping constant (size 27 only)
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All dimensions are reference only unless specifically toleranced.

ACCESSORIES: SERIES SFM SLIDES

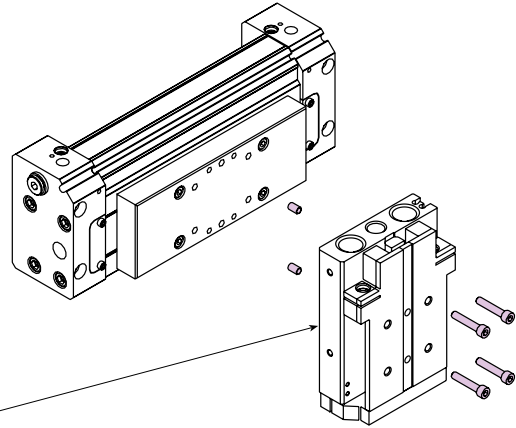
MODULAR MOUNTING KITS

Modular design of the Series SFM saddle allows units to bolt and dowel together without the need for a transition plate. See chart below for slide compatibility and hardware kits required. Each kit contains two dowel pins and four SHCS to mount the units together.

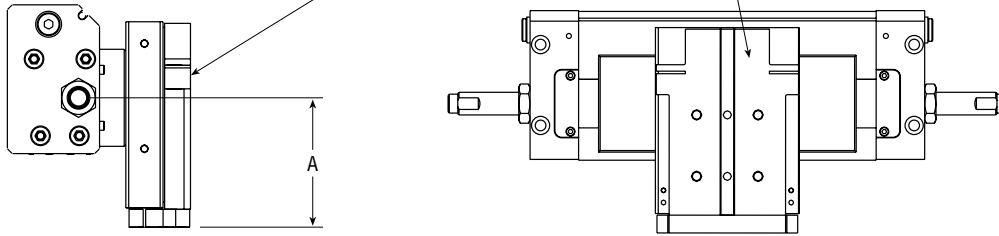
SFM

PRIMARY UNIT	SECONDARY UNIT	DOWEL PIN READY	FASTENER KIT	DIMENSION A (WITHOUT ADJUSTMENT)	
SFM627	STPD516	YES	73234-xx	3.111	[79]
SFM640	STPD525	YES	73235-xx	3.977	[101]

Numbers in [] are in mm.
 -xx = -00 =Standard Plating
 -03 = Z1 Electroless Nickel Plating

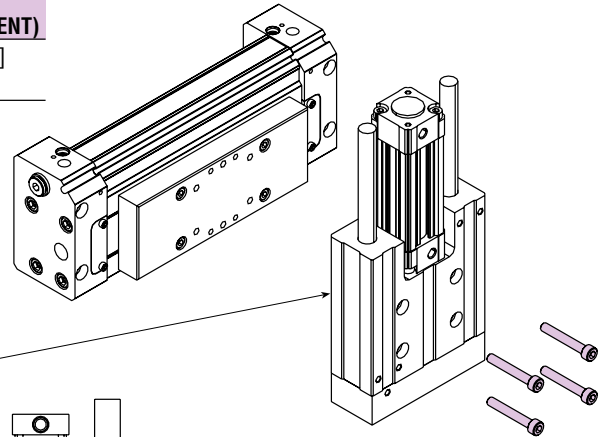


PHD Series STP Slide

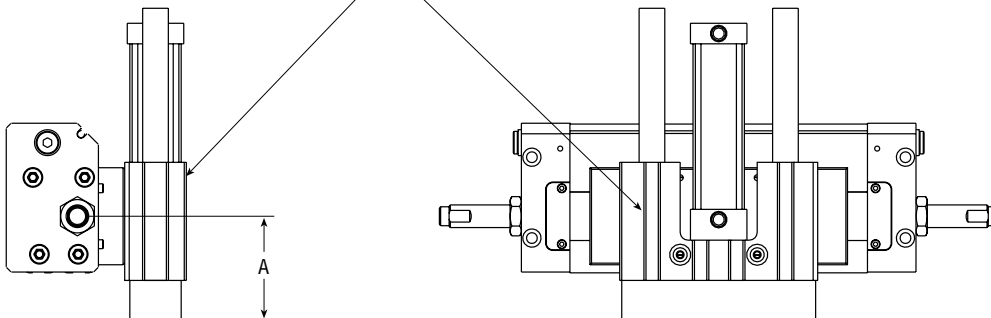


PRIMARY UNIT	SECONDARY UNIT	DOWEL PIN READY	FASTENER KIT	DIMENSION A (WITHOUT ADJUSTMENT)	
SFM627	SK/SLxxx2	NO	73230-xx	2.539	[64.5]
SFM640	SK/SLxxx4	NO	73231-xx	2.559	[65]

Numbers in [] are in mm.
 -xx = -00 =Standard Plating
 -03 = Z1 Electroless Nickel Plating



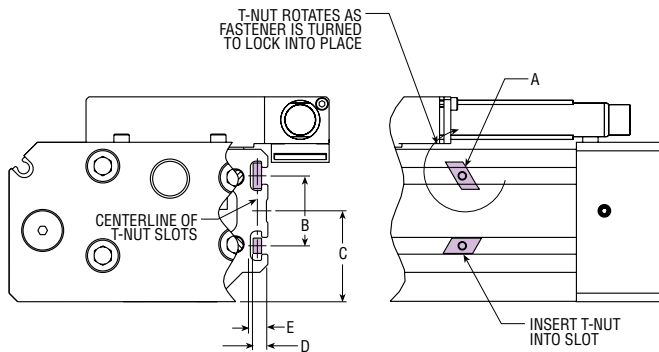
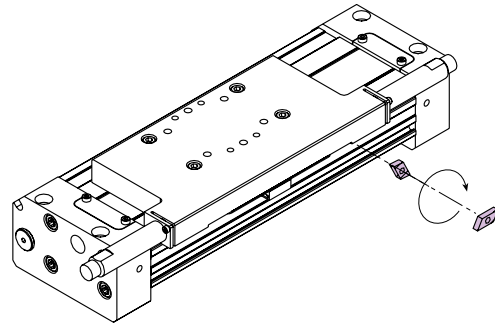
PHD Series SK/SL Slide



ACCESSORIES: SERIES SFM SLIDES

T-NUTS

T-nuts allow attachment of switches, cable carriers, or other accessories to be easily mounted to the slide. T-nuts can be positioned at any point along the T-slot grooves. The swiveling T-nut design allows insertion from the top of the slot. When the nut is tightened, it rotates into the locking position and securely clamps the bolted part.



SIZE	LETTER DIMENSIONS				
	A	B	C	D	E
27	M3 x 0.5	.984	1.280	.195	.246
	M3 x 0.5	[25.0]	[32.5]	[5.0]	[6.2]
40	M5 x 0.8	1.181	1.732	.303	.386
	M5 x 0.8	[30.0]	[44.0]	[7.7]	[9.8]

NOTE: Dimensions D and E are for minimum (D) and maximum (E) thread engagement.

SIZE	SWIVEL T-NUT	
	-STD	-Z1
27	72128-00	72128-03
40	72129-00	72129-03

NOTE: Each number represents one T-Nut.

SIZE	TORQUE	
	in-lb	Kgf-m
27	20	9.1
40	80	36.3

NOTE: Over torquing fastener may damage tube, T-nut, and/or fastener.

M MAGNET FOR PHD SERIES 6790 SOLID STATE SWITCHES

Series SFM Slides are optionally internally equipped with a magnet for use with PHD Series 6790 Solid State Switches. These switches mount easily to the unit using the switch slot on the side of the tube.

PHD Series 6790 Solid State Switches are designed specifically to provide an input signal to various types of programmable controllers or logic systems. See the Switches and Sensors section for complete switch specifications.

SERIES 6790 SWITCHES

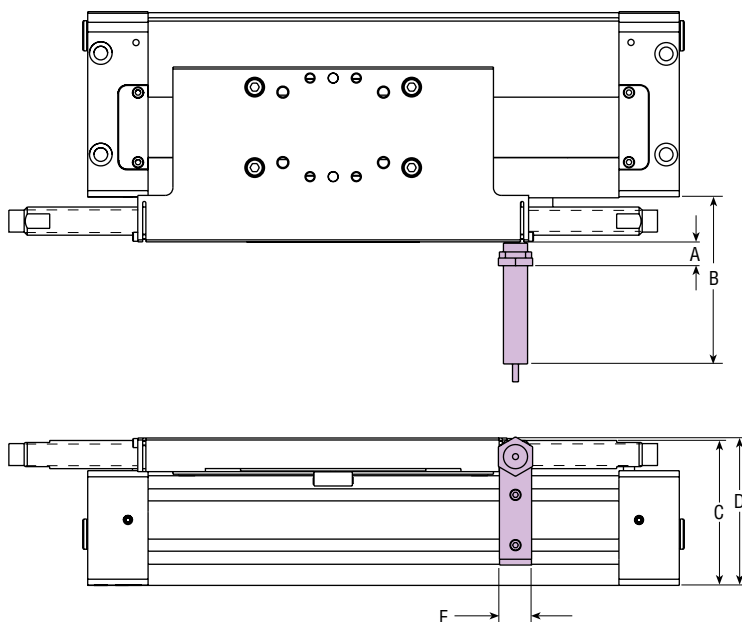
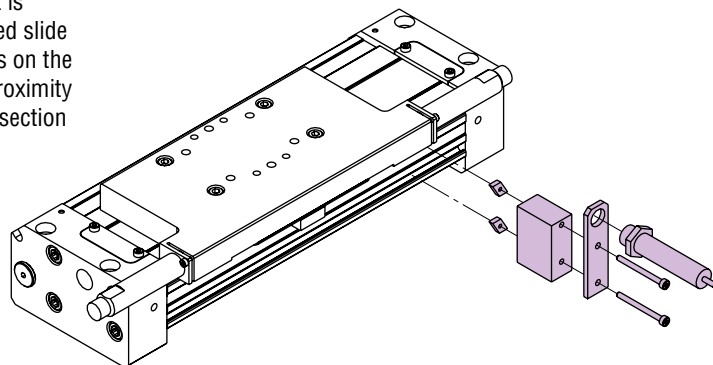
PART NO.	DESCRIPTION
67902-1-02	NPN (Sink) or PNP (Source) DC Reed, 2 m cable
67902-1-05	NPN (Sink) or PNP (Source) DC Reed, 5 m cable
67903-1-02	NPN (Sink) DC Solid State, 2 m cable
67903-1-05	NPN (Sink) DC Solid State, 5 m cable
67904-1-02	PNP (Source) DC Solid State, 2 m cable
67904-1-05	PNP (Source) DC Solid State, 5 m cable
67922-1	NPN (Sink) or PNP (Source) DC Reed, Quick Connect
67929-2	AC Reed, Current Limited, 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:

- 1) Switch set screw torque to 16 in-oz [.11 Nm] max.
- 2) See Switches and Sensors section for additional switch information and complete specification.

EXTERNAL PROXIMITY SWITCH READY BRACKETS

This accessory provides for external mounting of a 12 mm round metal sensing proximity switch. One switch mount kit is required per switch and includes the bracket with the required slide mounting hardware. The Series SFM Slide utilizes the T-slots on the side of the tube to attach the proximity mounting bracket. Proximity switches are ordered separately. See Switches and Sensors section for complete switch specifications.



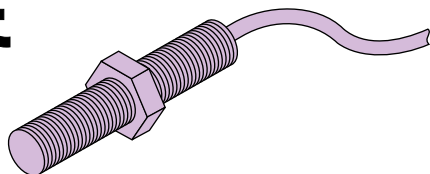
SIZE	LETTER DIMENSIONS				
	A	B	C	D	E
27	.396 [10.1]	3.251 [82.6]	2.835 [72.0]	2.884 [73.3]	.630 [16.0]
40	.376 [9.6]	3.352 [85.1]	3.777 [95.9]	3.835 [97.4]	.787 [20.0]

Numbers in [] are in mm.

SIZE	PROXIMITY MOUNTING KIT (METRIC)	
	-STD	-Z1 PLATING
27	78422-011	78422-012
40	78422-021	78422-022

Kit includes hardware for one switch.
Switches ordered separately.

12 mm THREADED PROXIMITY SWITCH



PART NO.	DESCRIPTION
15561-001	NPN (Sink) 3 meter cable
15561-002	PNP (Source) 3 meter cable
15561-003	VAC Solid State, 3 meter cable