



MAGNETICALLY COUPLED RODLESS CYLINDERS



C002^A

CYLINDER NOMENCLATURE

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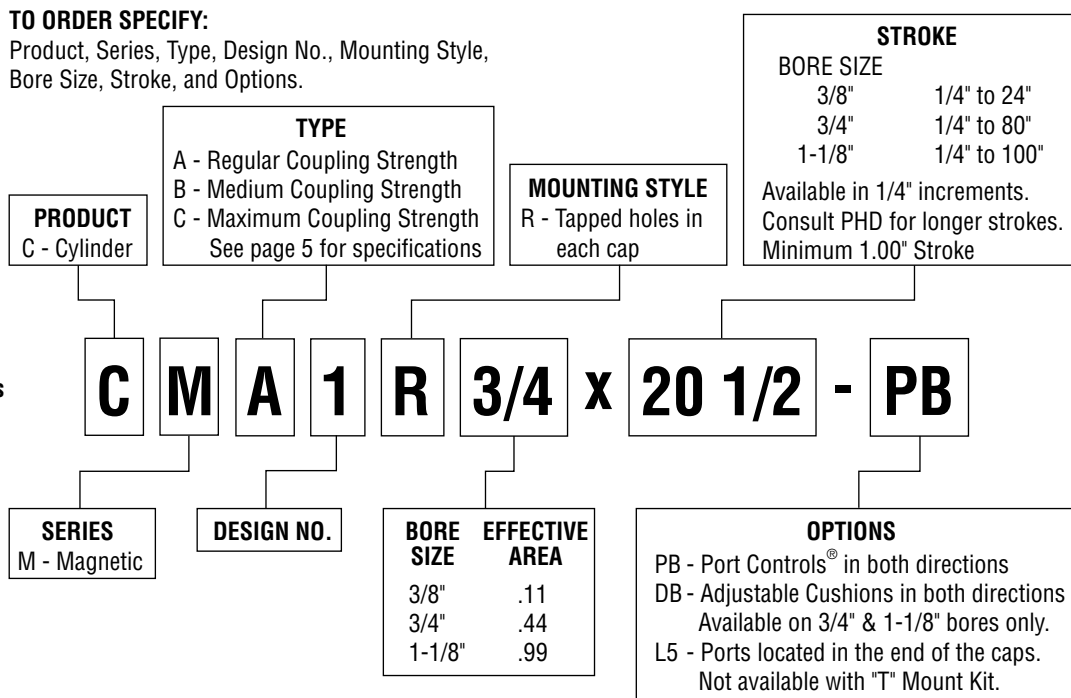
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TO ORDER SPECIFY:
 Product, Series, Type, Design No., Mounting Style,
 Bore Size, Stroke, and Options.



ACCESSORIES

CYLINDER BORE	PROXIMITY SWITCH KIT	SERIES 5360 HALL EFFECT SWITCH MOUNTING KIT	STROKE ADJUSTMENT KIT	SHOCK ABSORBER KIT	SHOCK ABSORBER MOUNTING KIT
3/8"	53836-1	53833-1	53842-1	54007-02-1	53839-1
3/4"	53837-1	53834-1	53843-1	54007-04-1	53840-1
1-1/8"	53838-1	53835-1	53844-1	54007-05-1	53841-1

CYLINDER BORE	FOOT MOUNT BRACKET KIT	"T" MOUNT THREADED LUG MOUNT KIT	FLOATING CARRIAGE BRACKET KIT	BOLT KIT
3/8"	53857-1	53848-1	53851-1	53845-1
3/4"	53858-1	53849-1	53852-1	53846-1
1-1/8"	53859-1	53850-1	53853-1	53847-1

8 mm PROXIMITY SWITCHES See Catalog 93 for switch details.

MODEL	DESCRIPTION
51422-005-02	DC Inductive Proximity Switch - Current Sinking NPN
51422-006-02	DC Inductive Proximity Switch - Current Sourcing PNP

MAGNETIC CYLINDER GREASE CARTRIDGE

MODEL	DESCRIPTION
54622-001	14 oz. Cartridge (Only approved grease for PHD Magnetically Coupled Cylinders.)

SERIES 5360 MINIATURE HALL EFFECT SWITCHES See Catalog 93 for switch details.

PART NO.	COLOR	DESCRIPTION
53603-1-02	Yellow	NPN (Sink) 4.5-24 VDC, 2 Meter Cable
53604-1-02	Red	PNP (Source) 4.5-24 VDC, 2 Meter Cable
53623-1	Yellow	NPN (Sink) 4.5-24 VDC, Quick Connect
53624-1	Red	PNP (Source) 4.5-24 VDC, Quick Connect

CORDSET

17533-00-02 2 meter cordset for all Series 5360 Switches with Quick Connect. Longer cable lengths available, consult PHD.

MAGNETIC RODLESS CYLINDER

BENEFITS

- PHD Magnetically Coupled Rodless Cylinders save up to 50% of the space used by traditional cylinders, making them ideal for applications requiring long stroke lengths and equal piston force in both directions.
- The magnetic cylinder design has no external pneumatic seals. This design eliminates potential leakage to the atmosphere and prevents external contamination from getting into the pneumatic cylinder.
- The cylinder carriage rotates for easy mounting in any quadrant, except as noted for options.
- PHD offers three magnetic coupling strengths per size, to provide the best cylinder efficiency and value.
- Standard shock pads on the carriage eliminate metal-to-metal contact at the end of stroke, reducing shock noise, and providing a more stable end position versus stopping with the piston.
- Optional built-in PHD Port Controls® regulate the cylinder speed and eliminate the need for external flow controls.
- Adjustable cushions are available for smooth end of stroke deceleration. Available on 3/4" and 1-1/8" bores only.
- Shock absorbers with complete mounting hardware are available for decelerating the load in high speed applications.
- Inductive proximity switches or Hall Effect switches and complete mounting hardware allow the rodless cylinder to interface with various electronic controllers and logic systems.

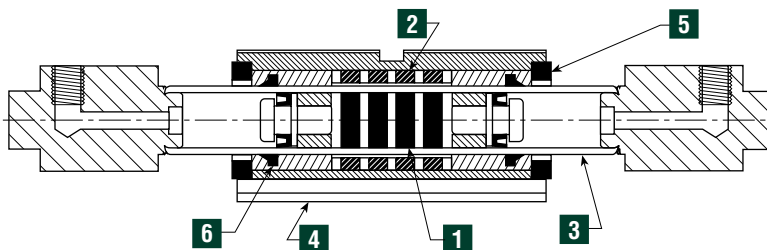


- Mounting is made easy with standard tapped holes in the end caps, foot mounting bracket, or threaded stud bracket.
- A carriage compliance bracket is available for compensating the misalignment between the cylinder and external fixturing.
- PHD Magnetically Coupled Cylinders may be repaired at the factory for extended service.
- Carriage has external grease zerk for adding Magnetic Cylinder Grease (page 2), providing ease of maintenance and long life.

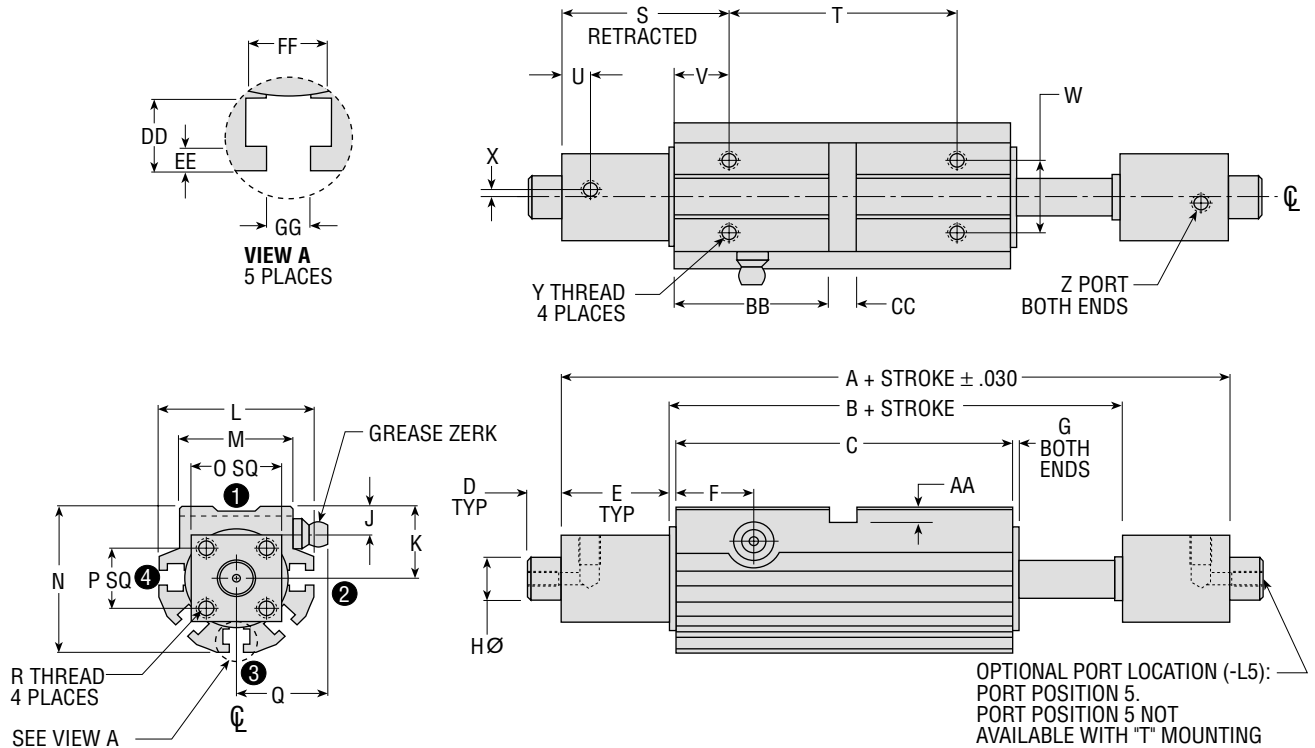
CONSTRUCTION

The piston contains a series of rare earth magnets which are magnetically coupled to a second series of rare earth magnets in the carriage. The carriage is driven back and forth as air pressure within the cylinder tube forces the piston to move. This design provides a rodless cylinder with no external dynamic seals.

- 1 Rare earth piston magnet
- 2 Rare earth carriage magnet
- 3 Stainless steel tube
- 4 360° rotatable aluminum carriage
- 5 Shock pad
- 6 Tube wiper



DIMENSIONS



LETTER DIMENSION

SIZE	A	B	C	D	E	F	G	H Ø	J	K	L
3/8	5.355	3.305	3.205	.315	1.025	.810	.050	.4330	.300	.730	1.420
3/4	7.515	4.275	4.175	.395	1.620	.790	.050	.6670	.290	.905	2.130
1-1/8	8.740	5.200	5.100	.475	1.770	.950	.050	.9840	.321	1.220	2.880

SIZE	M	N	O	P	Q	R	S	T	U	V
3/8	1.100	1.440	.875	.590	.862	8-32 x .375	1.595	2.165	.260	.520
3/4	1.730	1.970	1.375	.985	1.107	10-24 x .440	2.223	3.070	.890	.553
1-1/8	2.200	2.660	1.750	1.180	1.342	1/4-20 x .550	2.495	3.750	.995	.675

SIZE	W	X	Y	Z	AA	BB	CC	DD	EE	FF	GG
3/8	.750	.063	8-32 x .330	10-32 x .300	.130	1.477	.2505	.200	.075	.280	.140
3/4	1.260	.402	10-24 x .350	1/8 NPT	.162	1.931	.3130	.306	.122	.460	.220
1-1/8	1.650	.400	1/4-20 x .455	1/8 NPT	.193	2.362	.3755	.380	.157	.540	.270

ENGINEERING DATA

SPECIFICATIONS

MODEL	BORE	EFFECTIVE PISTON AREA (IN ²)	UNIT WEIGHT LBS	STATIC MAGNETIC COUPLING STRENGTH (LBS)	MAX. AIR PRESSURE BEFORE UNCOUPLING (PSI)
CMA	3/8"	.110	.61 + (.01 • STROKE)	9	81
CMB	3/8"	.110	.63 + (.01 • STROKE)	13	118
CMC	3/8"	.110	.65 + (.01 • STROKE)	18	163
CMA	3/4"	.442	1.87 + (.02 • STROKE)	36	81
CMB	3/4"	.442	1.95 + (.02 • STROKE)	60	135
CMC	3/4"	.442	2.02 + (.02 • STROKE)	83	187
CMA	1-1/8"	.994	4.35 + (.03 • STROKE)	89	89
CMB	1-1/8"	.994	4.57 + (.03 • STROKE)	142	142
CMC	1-1/8"	.994	4.78 + (.03 • STROKE)	195	196

LUBRICATION

The internal air cylinder and carriage are lubricated at the factory. It is recommended that lubricated air be used for maximum life and performance of the internal cylinder. The cylinder carriage should be lubricated every 750 miles of linear travel using Magnetic Cylinder Grease in the carriage lubrication fitting. Consult PHD for alternative lubrication products.

TEMPERATURE LIMITS AND SEALS

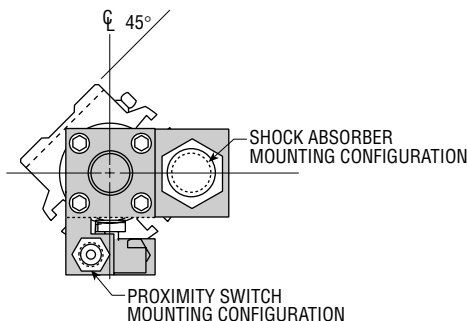
Operating temperatures are between -20° and 140°F. The Buna-N piston seals are compatible with standard petroleum-based oil used for lubrication of air cylinders.

MAXIMUM VELOCITY

Maximum velocity will vary greatly based on load, operating pressure, stroke length, and type of deceleration used. Consult PHD for high speed applications.

CARRIAGE ROTATION

The unique design of the carriage with multiple "T" slots at 45° allows for its rotation in 45° increments and use of the available options.



Design allows use of options at 45° angles.

PRESSURE RATINGS

The minimum operating pressure is 35 psi. Maximum pressure ratings are shown in the Specifications table and are based on the amount of pressure required to uncouple the piston from the carriage.

MAGNETIC COUPLING STRENGTH

Values shown indicate how much external force can be applied to the carriage and how much air pressure can be applied to the cylinder before the piston uncouples from the carriage.

REPAIR

Magnetic cylinders may be sent to PHD for repair and rebuild. Consult your local distributor to acquire return authorization prior to shipping.

ENVIRONMENT

These cylinders are not recommended for harsh environments where grit, metal fines, or other small abrasive contaminants are concentrated. Internal magnets may attract ferric particles causing damage to the cylinder tube. Tube wipers on the carriage will prevent dirt from most industrial environments from damaging the unit.

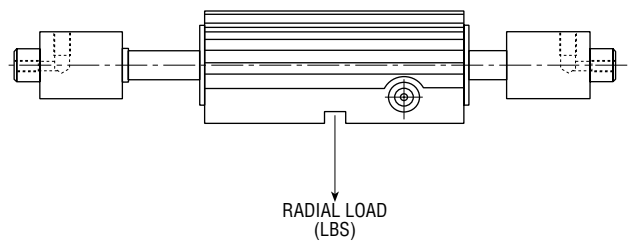
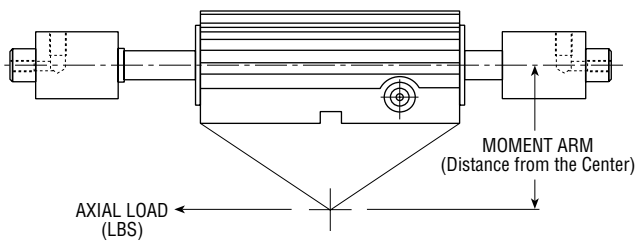
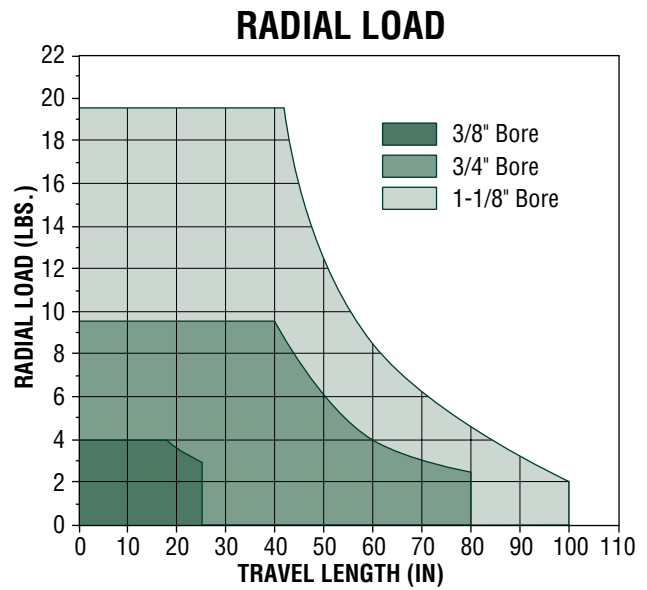
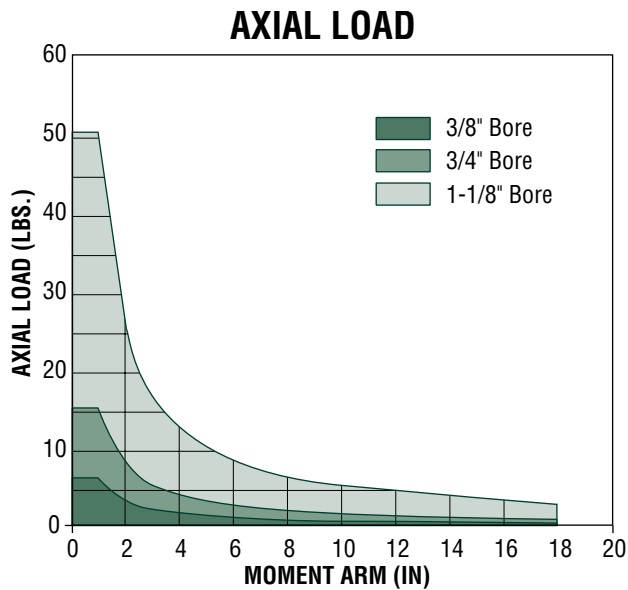
MATERIALS

The cylinder is constructed of anodized aluminum caps and carriage, stainless steel tube, and permanent rare earth magnets in the piston and carriage.

ENGINEERING DATA

TYPICAL LOADS

PHD Magnetically Coupled Rodless Cylinders are designed as a power source for linear motion. Loads should be guided or supported by an external means (guide shafts, etc.) whenever possible. The following charts indicate the maximum weight capability for each slide size for both axial and radial loads.



APPLICATION CONSIDERATIONS

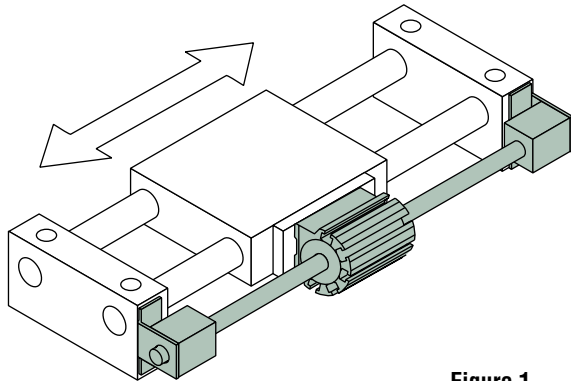


Figure 1

The carriage of the magnetically coupled rodless cylinder rotates freely around the tube. If this rotational tolerance is critical, guide the load externally. Magnetically coupled rodless cylinders may be mounted directly to linear slide assemblies (Figure 1). Consider compensation for misalignment and tube deflection.

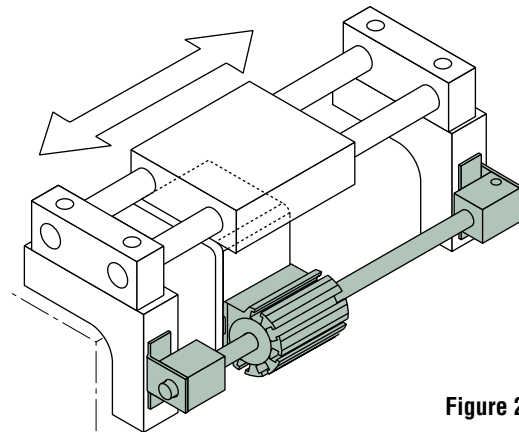


Figure 2

These cylinders can be mounted remotely and attached via a bracket or fixture (Figure 2). It is important to compensate for any misalignment and deflection. It is also important to consider the amount of axial load applied to the cylinder carriage. See page 6 for axial load ratings.

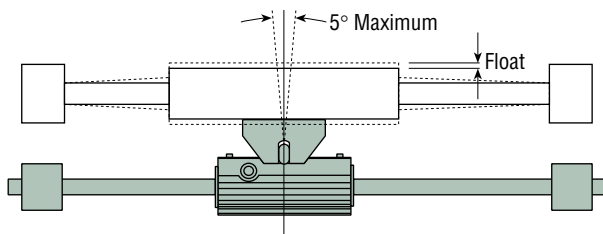


Figure 3

See page 8 for floating mount dimensions.

The PHD Floating Carriage Mounting Bracket is recommended to eliminate alignment problems between the cylinder carriage and external loads (See page 8). This bracket compensates for lack of parallelism and ensures that the cylinder is not damaged by stress and friction caused by misalignment.

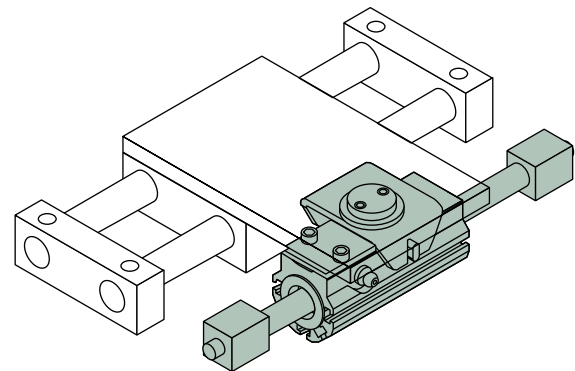


Figure 4

Figure 3 shows a typical arrangement using the floating bracket and attaching directly to an external mechanism. Figure 4 illustrates the floating bracket used with a connecting plate.

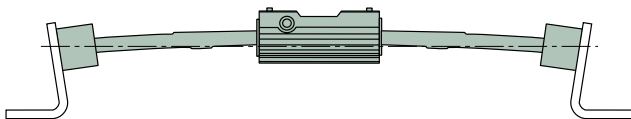


Figure 5

Care should be taken so that the mounting brackets are perpendicular to the centerline of the cylinder. The tube may be bent causing decreased life or sticking.

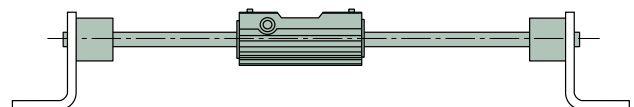


Figure 6

Care should be taken so that the mounting brackets will be flush against the caps prior to attachments to prevent the cylinder tube from being stretched or compressed.

OPTIONS



PORT CONTROLS®

The built-in PHD Port Control® is based on the "meter-out" principle flow control and is used to control the speed of the carriage. An adjustable needle in each cap provides independent speed control in each direction while a check seal provides free flow in for maximum cylinder speed. The self-locking

needle has micrometer threads for precise control and is adjustable under pressure. Port Controls® save space and eliminate the cost of external flow controls, related fittings, and the labor to install them. Maximum carriage speed with flow controls is 2 feet per second at 100 psi.



PORT POSITIONS

The CMA, CMB, and CMC basic cylinder models can have the ports in the ends of the caps (L5) as opposed to the standard ports in the sides of the caps (see page 4). Air lines out each end of the cylinder provide a streamlined unit for applica-

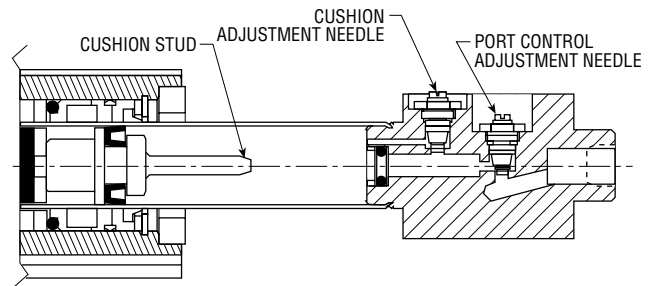
tions where space around the diameter of the cylinder is critical.

Port position 5 is not available with the "T" mount or cushions.



ADJUSTABLE CUSHIONS

PHD Cushions are designed for smooth deceleration of the cylinder carriage. The cushion is activated by a stud on the piston closing off the primary flow of exhausting air. The remaining air volume in the cylinder must pass through an orifice controlled by an adjustable needle. This accurately controls the desired amount of deceleration. The effective cushion length is 5/8". (Available on 3/4" and 1-1/8" bores only.)



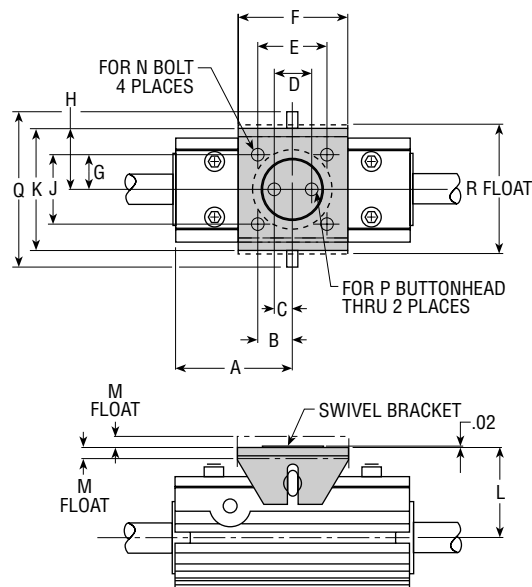
ACCESSORIES

FLOATING CARRIAGE BRACKET KIT

- Eliminates binding between cylinder and external assembly.
- Extends cylinder life and reduces friction due to misalignment.

CYLINDER BORE	KIT NUMBER
3/8"	53851-1
3/4"	53852-1
1-1/8"	53853-1

LETTER DIM.	3/8	3/4	1-1/8
A	1.603	2.088	2.550
B	.470	.886	.875
C	.275	.512	.630
D	.550	1.024	1.260
E	.940	1.770	1.750
F	1.500	2.360	2.380
G	.470	.630	.875
H	.932	1.322	1.544
J	.940	1.260	1.750
K	1.864	2.645	3.088
L	1.280	1.655	2.095
M	.090	.175	.175
N	#8	#10	1/4"
P	#8	#10	1/4"
Q	2.120	2.910	3.490
R	.050	.050	.050

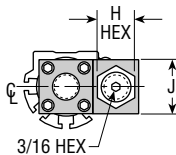


ACCESSORIES

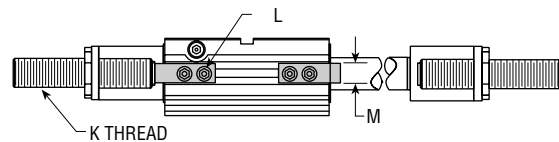
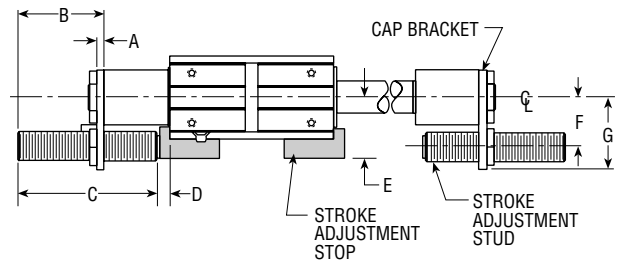
STROKE ADJUSTMENT KITS

- Provides up to 1" adjustment on either or both cylinder ends.
- Provides 1/2" adjustment if Proximity or Hall Effect switches are used with the stroke adjustment kits.
- Can be stacked with other accessory hardware.
- The stop block mounts in carriage "T" slot.
- The carriage must maintain a consistent orientation for the stroke adjustment to function properly.

LETTER DIM.	BORE		
	3/8	3/4	1-1/8
A	.120	.194	.250
B	1.025	1.945	2.195
C	2.537	3.290	3.665
D	.200	.275	.300
E	1.135	1.565	2.190
F	.900	1.260	1.690
G	1.400	1.850	2.375
H	.690	.940	1.130
J	1.000	1.380	1.750
K	1/2-20 UNF	3/4-16 UNF	1-12 UNF
L	3/32	5/32	3/16
M	.375	.500	.750



CYLINDER BORE	KIT NUMBER	DESCRIPTION
3/8"	53842-1	Each kit contains a cap bracket, stroke adjustment stud, stop block, and option retainer locking nut. 1 kit required per end.
3/4"	53843-1	
1-1/8"	53844-1	



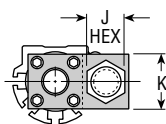
Bolt Kits must be ordered separately, see page 12.

NOTE: PHD Magnetically Coupled Rodless Cylinders are designed as a power source for linear motion. Loads should be guided or supported by an external means (guide shafts, etc.).

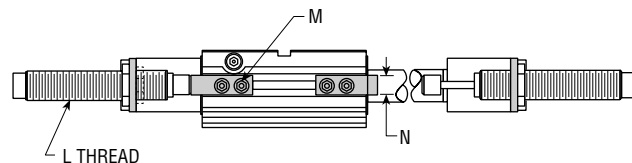
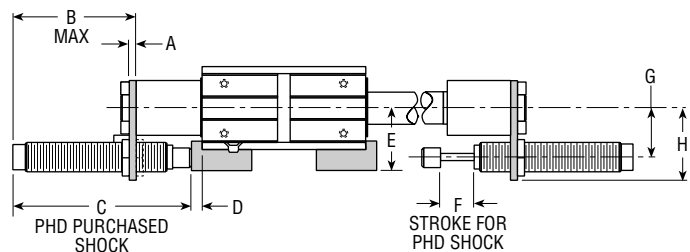
COMBINATION STROKE ADJUSTMENT/ SHOCK ABSORBER MOUNTING KITS

- Easy mounting of shock absorbers for end of stroke deceleration.
- Can be stacked with other accessory hardware.
- PHD supplied shock includes stroke adjustment pad.
- (Must be ordered separately, see page 12.)
- The stop block mounts in carriage "T" slots.
- The carriage must maintain a consistent orientation for the stroke adjustment to function properly.

LETTER DIM.	BORE		
	3/8	3/4	1-1/8
A	.120	.194	.250
B	1.495	2.585	3.230
C	2.370	3.980	4.750
D	.200	.275	.300
E	1.135	1.565	2.190
F	.390	.690	.940
G	.900	1.260	1.690
H	1.400	1.850	2.375
J	.690	.940	1.130
K	1.000	1.380	1.750
L	1/2-20 UNF	3/4-16 UNF	1-12 UNF
M	3/32	5/32	3/16
N	.375	.500	.750



CYLINDER BORE	KIT NUMBER	DESCRIPTION
3/8"	53839-1	Each kit contains a cap bracket, locking nut, stop block, and option retaining nut for mounting a shock absorber on one end of the cylinder. 1 kit required per end.
3/4"	53840-1	
1-1/8"	53841-1	



Bolt Kits and Shock Absorbers must be ordered separately, see page 12.

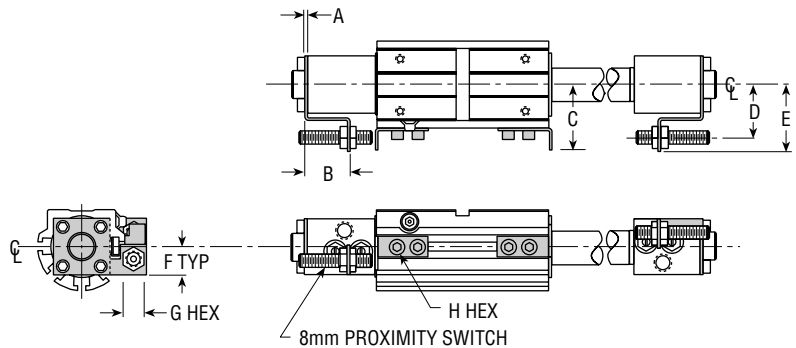
ACCESSORIES

PROXIMITY SWITCH KITS

- 8 mm proximity switches mount on the ends of the cylinder.
- Contains bracket and target.
- Can be stacked with other accessory hardware.
- Target mounts in carriage "T" slot.
- The carriage must maintain a consistent orientation for the Switches to function properly.

CYLINDER BORE	KIT NUMBER	DESCRIPTION
3/8"	53836-1	Each kit contains a mounting bracket and target for one 8 mm switch. 1 kit required per end.
3/4"	53837-1	
1-1/8"	53838-1	

LETTER DIM.	3/8	3/4	1-1/8
A	.120	.075	.075
B	N/A	1.100	1.230
C	1.085	1.585	1.945
D	.895	1.290	1.740
E	1.145	1.620	2.070
F	.550	.690	.880
G	.510	.510	.510
H	3/32	5/32	3/16

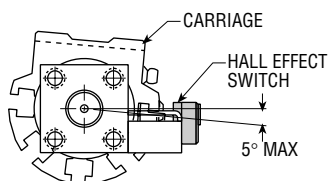


Bolt Kit must be ordered separately, see page 12. Switches must be ordered separately. See Catalog 93 for details.

HALL EFFECT SWITCH MOUNTING KIT

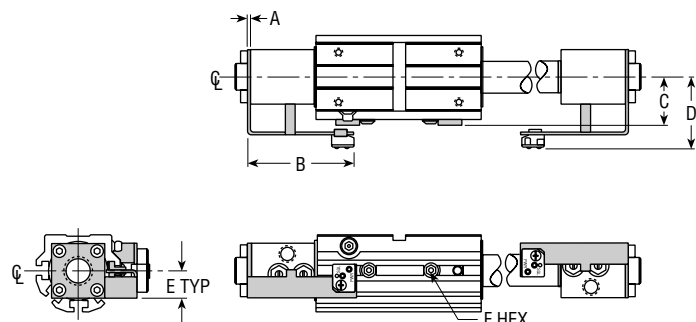
- Easy mounting of PHD Miniature Hall Effect Switches on the ends of the cylinder.
- Contains bracket and target.
- Can be stacked with other accessory hardware.
- Target mounts easily in carriage "T" slot.
- The carriage must maintain a consistent orientation for the Switches to function properly.

CYLINDER BORE	KIT NUMBER	DESCRIPTION
3/8"	53833-1	Each kit contains a mounting bracket and target for one PHD Miniature Hall Effect Switch. 1 kit required per end.
3/4"	53834-1	
1-1/8"	53835-1	



Carriage can be rotated a maximum of 5° and maintain proper switch operation.

LETTER DIM.	3/8	3/4	1-1/8
A	.075	.075	.075
B	2.135	2.725	2.875
C	.840	1.215	1.595
D	1.385	1.830	2.178
E	.520	.690	.880
F	5/64	1/8	5/32



Bolt Kits must be ordered separately, see page 12. Switches must be ordered separately. See Catalog 93 for details.

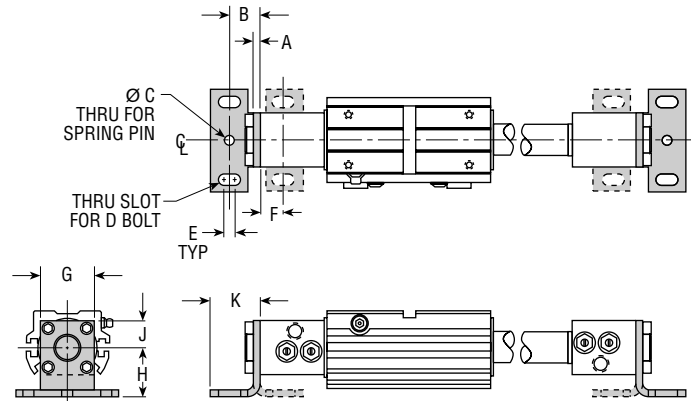
ACCESSORIES

FOOT MOUNT BRACKET KITS

- Permit easy mounting of cylinder to a flat surface.
- Brackets are reversible allowing the mounting holes to be tucked underneath the cylinder.
- Can be stacked with other accessory hardware.

CYLINDER BORE	KIT NUMBER	DESCRIPTION
3/8"	53857-1	Foot brackets for both ends of the cylinder. 2 bolt kits required.
3/4"	53858-1	
1-1/8"	53859-1	

LETTER DIM.	BORE		
	3/8	3/4	1-1/8
A	.120	.194	.250
B	.580	.784	1.170
C	.193	.257	.257
D	#10	1/4	5/16
E	.280	.280	.355
F	.460	.590	.920
G	1.000	1.380	1.750
H	.875	1.266	1.575
J	.500	.688	.875
K	1.020	1.274	1.750

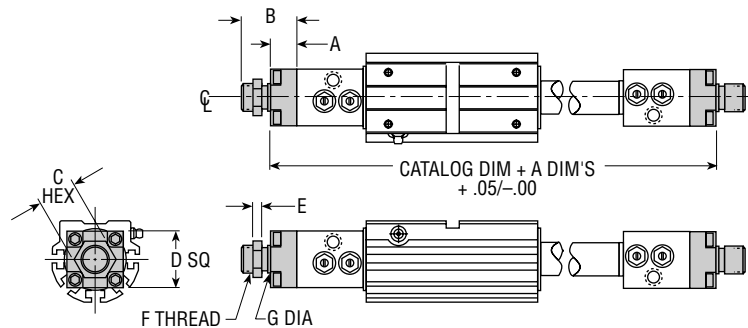


THREADED LUG MOUNTING KITS

- Provides traditional magnetic cylinder mounting.
- Includes jam nut.
- Not available with -L5 option.

CYLINDER BORE	KIT NUMBER	DESCRIPTION
3/8"	53848-1	Threaded lug bracket and jam nut for one end of the cylinder.
3/4"	53849-1	
1-1/8"	53850-1	1 kit required per end.

LETTER DIM.	BORE		
	3/8	3/4	1-1/8
A	.500	.630	.880
B	1.000	1.350	1.880
C	.562	.937	1.120
D	.875	1.375	1.750
E	.227	.387	.446
F	3/8-24	5/8-18	3/4-16
G	.4330	.6670	.9840

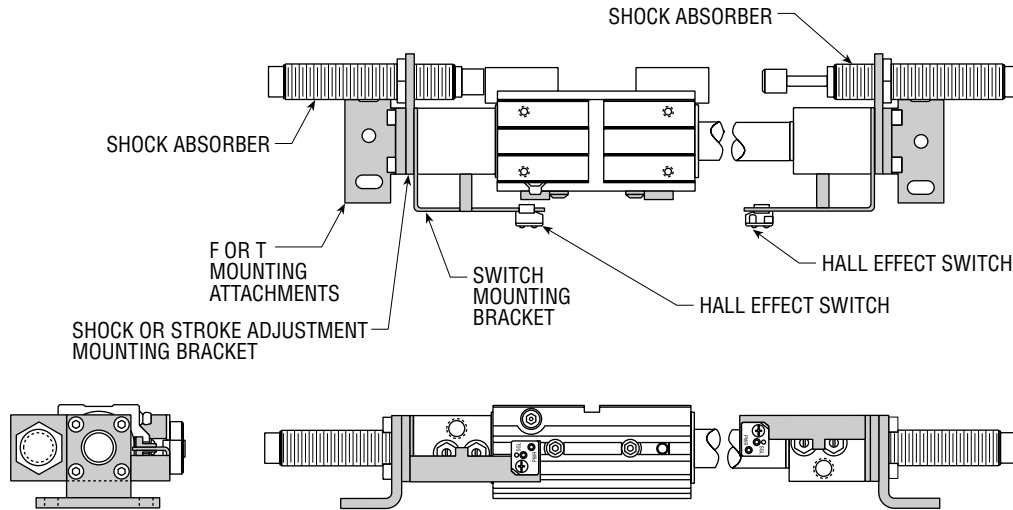


ACCESSORIES

RECOMMENDED OPTION ATTACHMENT ORDER

Install brackets in this order:

- 1) Switch Bracket
- 2) Shock Absorber Brackets
- 3) Stroke Adjustment Bracket
- 4) Mounting Brackets (F or T)



BOLT KITS

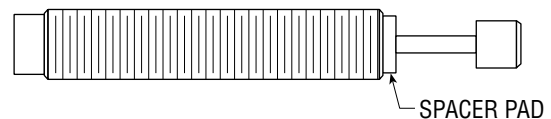
Accessories for the magnetic rodless cylinder are modular and can be combined by stacking the various brackets and plates on the cap. PHD offers a universal bolt kit containing various lengths of cap screws, covering any accessory combination.

OPTIONS	BORE	MOUNTINGS		
		NONE	F MOUNT	T MOUNT
No Options	3/8	N/A	8-32 x 1/2	8-32 x 5/8
	3/4	N/A	10-24 x 5/8	10-24 x 3/4
	1-1/8	N/A	1/4-20 x 3/4	1/4-20 x 1
Proximity Switch or Hall Switch	3/8	8-32 x 3/8	8-32 x 1/2	8-32 x 5/8
	3/4	10-24 x 3/8	10-24 x 5/8	10-24 x 1
	1-1/8	1/4-20 x 3/4	1/4-20 x 3/4	1/4-20 x 1
Stroke Adjustment or Shock Bracket	3/8	8-32 x 1/2	8-32 x 5/8	8-32 x 3/4
	3/4	10-24 x 5/8	10-24 x 3/4	10-24 x 1
	1-1/8	1/4-20 x 3/4	1/4-20 x 1	1/4-20 x 1-1/4
Proximity or Hall Switch with Shock or Stroke Adjustment	3/8	8-32 x 1/2	8-32 x 5/8	8-32 x 3/4
	3/4	10-24 x 5/8	10-24 x 3/4	10-24 x 1
	1-1/8	1/4-20 x 3/4	1/4-20 x 1	1/4-20 x 1-1/4

CYLINDER BORE	KIT NUMBER	DESCRIPTION
3/8"	53845-1	Each kit contains cap screws for mounting any accessory combination on one end of the cylinder.
3/4"	53846-1	
1-1/8"	53847-1	

SHOCK ABSORBER/STROKE ADJUSTER COMBINATION

- Smooth deceleration of cylinder and external loads.
- Spacer pad allows the shock absorber to double as a stroke adjustment screw.
- Complete mounting hardware is available in PHD's Shock Absorber Mounting Kits.



SHOCK BRAND	BORE		
	3/8	3/4	1-1/8
PHD SHOCK ABSORBER KIT	54007-02-1	54007-04-1	54007-05-1
ACE CONTROLS NUMBER	MC-75-1776	MS-200-1777	MS-500-1778
ENIDINE SHOCK ABSORBER NUMBER	PRO 25-IF-2B	PRO 50-IF-2B	PRO 100-IF-2B
PHD SPACER PAD	54094-001	54094-002	54094-003
ENIDINE LOCK NUT	PRO25IF	PRO50IF	PRO100IF

NOTE: PHD Shock Absorber Kit includes one shock with button and one spacer pad. The spacer pad allows the shock to also be used as a stroke adjustment screw. Enidine shocks must have the spacer pad to be used as a stroke adjustment. Shock absorbers other than those shown above may not function as a stroke adjustment.

See page 9 for Shock Mounting Kits and dimensional information.