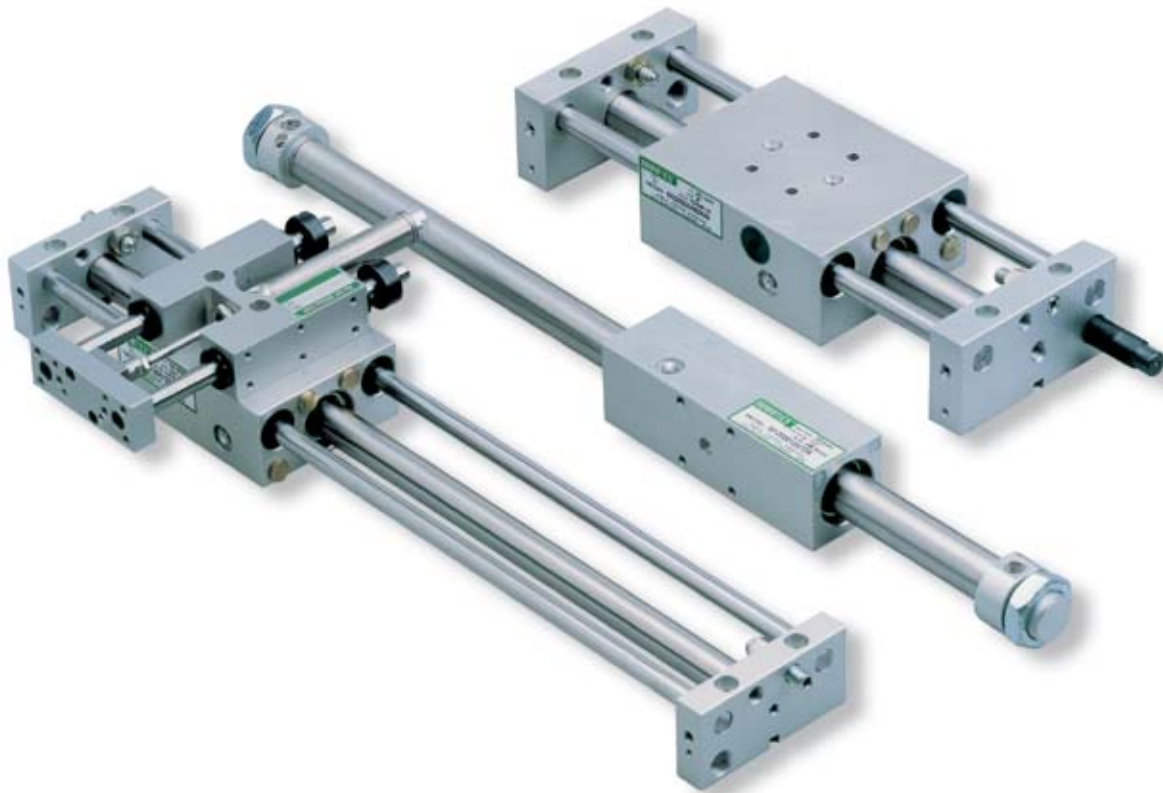


numatics®

MCR Series

Magnetically Coupled Rodless Cylinders



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MCR Series

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Magnetically Coupled Rodless Cylinders

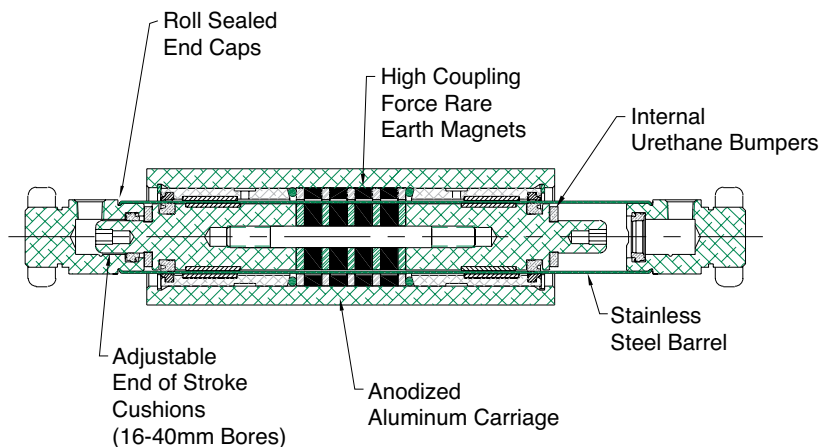
MC1 & MC2 Standard Carriage Series

- 50% Space Savings Over Conventional Cylinders
- Two Magnet Coupling Strength Options
- 6 Bore Sizes
- 304 Stainless Steel Barrel
- Compressed Air or Low Pressure Hydraulic Service
- Rare Earth Magnets for Greater Coupling Forces



MC3, MC4 & MC5 Externally Guided Series

- Higher Load Capacity
- Non-Rotating Linear Travel
- NuMate™ Interface Capabilities for Multi Axis Motions
- Stroke Adjustment Kits
- Precision Linear Ball Bearings
- Position Sensing Switches



Magnetically Coupled Rodless Cylinders

Specifications	
Bore	12 16 20 25 32 40
Series	Standard and Guided Carriages
Working Pressure:	Up to 7 Bar / 100 PSIG
Ambient Temperature Range:	-20° to +60° C (-4° to +140° F)
Medium:	Filtered Compressed Air With or Without Lubrication and Low Pressure Hydraulic*
Standard Stroke Lengths:	Non-Guided up to 2540 mm (100 inches) Guided up to 1524 mm (60 inches)
Velocity:	Up to 1 Meter / Second (3.28 Feet / Second)

* Consult Factory for Cylinder Rating

How To Order

MC1 12 0024 A 6 D A 2

Series Identifier

- MC1 = Magnetically Coupled Rodless Cylinder Standard Coupling Strength
- MC2 = Magnetically Coupled Rodless Cylinder Lower Coupling Strength
- MC3 = Magnetically Coupled Rodless Cylinder Hardened Steel Shafts
- MC4 = Magnetically Coupled Rodless Cylinder Stainless Steel Shafts**
- MC5 = Magnetically Coupled Rodless Cylinder*** Single End Supply Hollow Steel Shafts
**Stainless steel shafts, includes all stainless hardware
***Not available in 12mm bore

Bore Size

- 12 = 12 millimeters c/w 10-32 UNF ports
- 16 = 16 millimeters c/w 10-32 UNF ports
- 20 = 20 millimeters c/w 1/8" NPT ports
- 25 = 25 millimeters c/w 1/8" NPT ports
- 32 = 32 millimeters c/w 1/8" NPT ports
- 40 = 40 millimeters c/w 1/4" NPT ports

Full Inches or Millimeters of Stroke

Note: This section requires four digits
For Example: 24 inches would be entered as 0024
and 1000 millimeters would be entered as 1000

Fractional Inches of Stroke

- (if ordering cylinder stroke in millimeters, place the letter 'M' in this box)
- A = 0" F = 5/8"
 - B = 1/8" G = 3/4"
 - C = 1/4" H = 7/8"
 - D = 3/8" M = millimeters
 - E = 1/2"

Shock Absorbers & Stroke ADJ. Kit***

- 1 = Shock Only
 - 2 = No Shocks
 - 3 = Right Side Adj. Stroke Kit with Shocks**
 - 4 = Left Side Adj. Stroke Kit with Shocks**
 - 5 = Right & Left Side Adj. Stroke Kits with Shocks
 - 6 = Right Side Adj. Stroke Kit, no Shocks
 - 7 = Left Side Adj. Stroke Kit, no Shocks
 - 8 = Right & Left Side Adj. Stroke Kits, no Shocks
- **Stroke adder required
***Kit includes two shocks

Adapters and Options

- A = No Adapter
- B = NPT Male/BSP Female Port Adapter
- C = NuMate™ Adapter Plate
- D = Fittings (B) and NuMate™ Adapter Plate
- E = No Cushions (MC1 & MC2)
- G = Male Grease Nipple
- H = Hydraulic
- 5 = Ports in Pos. #5

Sensing Position

- A = Single Position Right
- B = Single Position Left
- C = Both Right & Left
- D = No Sensing
- E = Switch Rail

Sensing Type

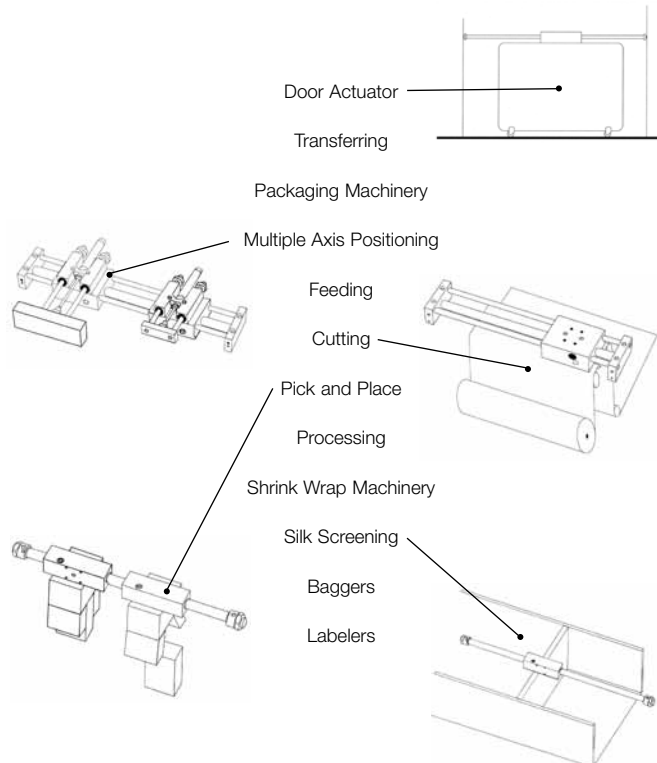
- Standard Cord
- 1 = Hall Effect PNP (Sourcing) - magnet sensing
 - 2 = Hall Effect NPN (Sinking) - magnet sensing
 - 3 = Reed Switch - magnet sensing
 - 4 = Prox Switch on Cylinder - PNP (Sourcing)***
 - 5 = Prox Switch on Cylinder - NPN (Sinking)***
 - 6 = No Sensing

Quick Disconnect Switch

- Z = Hall Effect PNP (Sourcing) - magnet sensing
- Y = Hall Effect NPN (Sinking) - magnet sensing
- X = Reed Switch - magnet sensing
- W = Prox Switch - PNP (Sourcing)***
- V = Prox Switch - NPN (Sinking)***

***Only available on the linear guided units (MC3-MC5).

Typical Applications

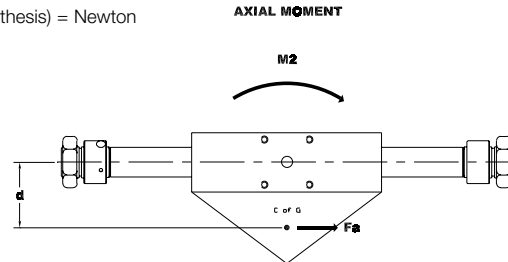
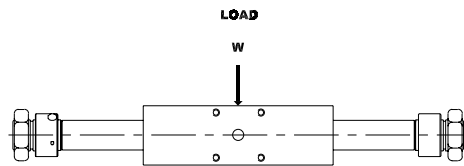


MC1 and MC2 Series

MC1 & MC2 Series

MC1 & MC2 Series										
Medium			Compressed air (filtered, lubricated or unlubricated) and hydraulics							
Design			Magnetically coupled non-guided cylinder line							
Max. operating range			7 bar / 100 psi							
Temperature range			-20° to 60° C / -4° to 140° F							
Material			Carriage, End cap: Anodized Aluminum, Bearings: Thermoplastic, Tube: Stainless Steel, Seals & O-rings: Polyurethane & Buna, Magnets: Rare Earth, Fasteners: Zinc Plated, Needle Valve: Brass							
Diameter	Stroke		Port Size*	Effective force at 100 psi/7bar ibf (N)	Breakaway force of magnetic coupling		Basic weight of zero stroke cylinder		Weight Adder per Unit of Stroke	
	in	mm			MC1 ibf (N)	MC2 ibf (N)	lbs	(kgs)	lbs	(kgs)
12 mm	.39 to 48	10 to 1220	10-32	18 (77.8)	25 (111.2)	18 (80.1)	0.600	(0.272)	0.010	(0.004)
16 mm	.39 to 100	10 to 2500	10-32	31 (138.8)	40 (177.9)	27 (120.1)	1.220	(0.553)	0.014	(0.006)
20 mm	.39 to 100	10 to 2500	1/8 NPT	49 (216.7)	75 (333.6)	44 (195.7)	1.850	(0.839)	0.018	(0.008)
25 mm	.39 to 100	10 to 2500	1/8 NPT	76 (338.6)	110 (485.0)	80 (355.9)	2.790	(1.266)	0.029	(0.013)
32 mm	.39 to 100	10 to 2500	1/8 NPT	125 (554.9)	175 (778.4)	105 (467.1)	4.670	(2.118)	0.034	(0.015)
40 mm	.39 to 100	10 to 2500	1/4 NPT	195 (866.8)	236 (1049.8)	150 (667.2)	8.050	(3.651)	0.045	(0.020)

Dimensions = inches & (in parenthesis) = millimeters • Force = pound force & (in parenthesis) = Newton



Load vs. Stroke - Non guided (MC1 & MC2)

Maximum Static Load

Diameter	Stroke Inches (mm)									
	6 (152.4)	12 (304.8)	18 (457.2)	20 (508.0)	32 (812.8)	36 (914.4)	42 (1066.8)	48 (1219.2)	54 (1371.6)	60 (1524.0)
Static Load lbs (N)										
12 mm	8 (35.6)	8 (35.6)	8 (35.6)	8 (35.6)	8 (35.6)	7 (29.8)	5 (22.2)	4 (17.8)	-	-
16 mm	12 (53.4)	12 (53.4)	12 (53.4)	12 (53.4)	12 (53.4)	12 (53.4)	11 (48.9)	9 (38.7)	7 (31.0)	6 (25.8)
20 mm	19 (84.5)	19 (84.5)	19 (84.5)	19 (84.5)	19 (84.5)	19 (84.5)	19 (84.5)	16 (71.6)	13 (57.8)	11 (47.6)
25 mm	27 (120.1)	27 (120.1)	27 (120.1)	27 (120.1)	27 (120.1)	27 (120.1)	27 (120.1)	27 (120.1)	27 (120.1)	21 (94.7)
32 mm	37 (164.6)	37 (164.6)	37 (164.6)	37 (164.6)	37 (164.6)	37 (164.6)	37 (164.6)	37 (164.6)	37 (164.6)	37 (164.6)
40 mm	47 (209.1)	47 (209.1)	47 (209.1)	47 (209.1)	47 (209.1)	47 (209.1)	47 (209.1)	47 (209.1)	47 (209.1)	47 (209.1)

Maximum Dynamic Moment

Diameter	Stroke Inches (mm)						
	66 (1676.4)	72 (1828.8)	78 (1981.2)	84 (2133.6)	90 (2286.0)	96 (2438.4)	100 (2540.0)
Static Load lbs (N)							
12 mm	-	-	-	-	-	-	-
16 mm	5 (21.4)	4 (18.2)	3.5 (15.6)	3 (13.3)	3 (12.0)	2 (10.7)	2 (9.8)
20 mm	9 (40.0)	8 (34.2)	6 (27.1)	6 (25.4)	5 (22.2)	5 (20.0)	4 (18.2)
25 mm	18 (80.1)	16 (68.9)	14 (60.0)	12 (52.5)	10 (46.3)	9 (41.4)	9 (38.3)
32 mm	37 (164.6)	37 (164.6)	32 (143.7)	28 (124.5)	25 (110.3)	22 (97.9)	20 (90.7)
40 mm	47 (209.1)	47 (209.1)	47 (209.1)	47 (209.1)	46 (206.0)	41 (183.3)	38 (169.9)

Diameter	Maximum Axial Moment M2 In-Lbs (Nm)
12 mm	9 (1.0)
16 mm	21 (2.3)
20 mm	34 (3.9)
25 mm	55 (6.2)
32 mm	84 (9.5)
40 mm	128 (14.4)

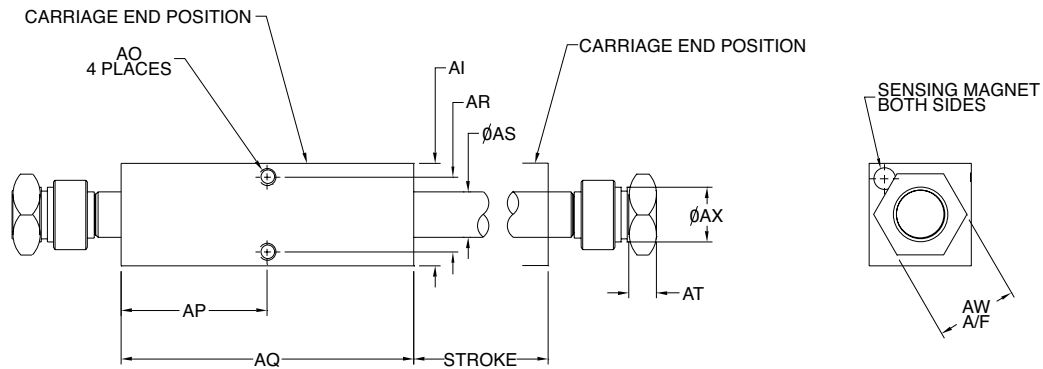
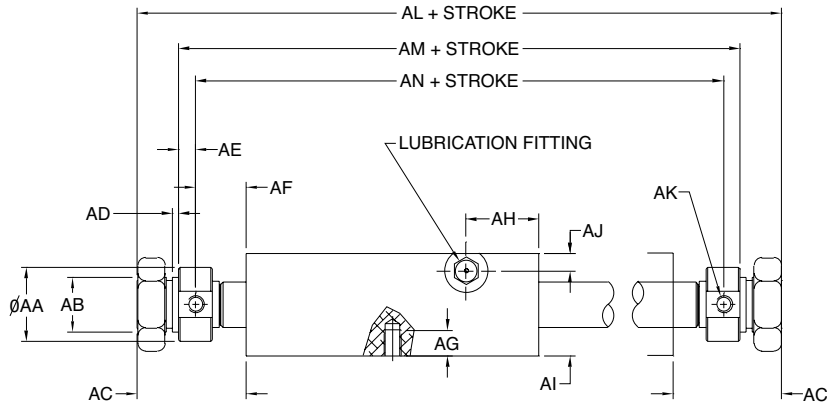
$$\text{Axial Moment} = M2 = Fa \times d$$

Fa = Applied Force

d = Distance from Center of the Bore, of the cylinder, to the Center of Gravity of the Load

Dimensions: Inches (mm)

MC1 and MC2 Series Non-Guided Unit 12mm Bore



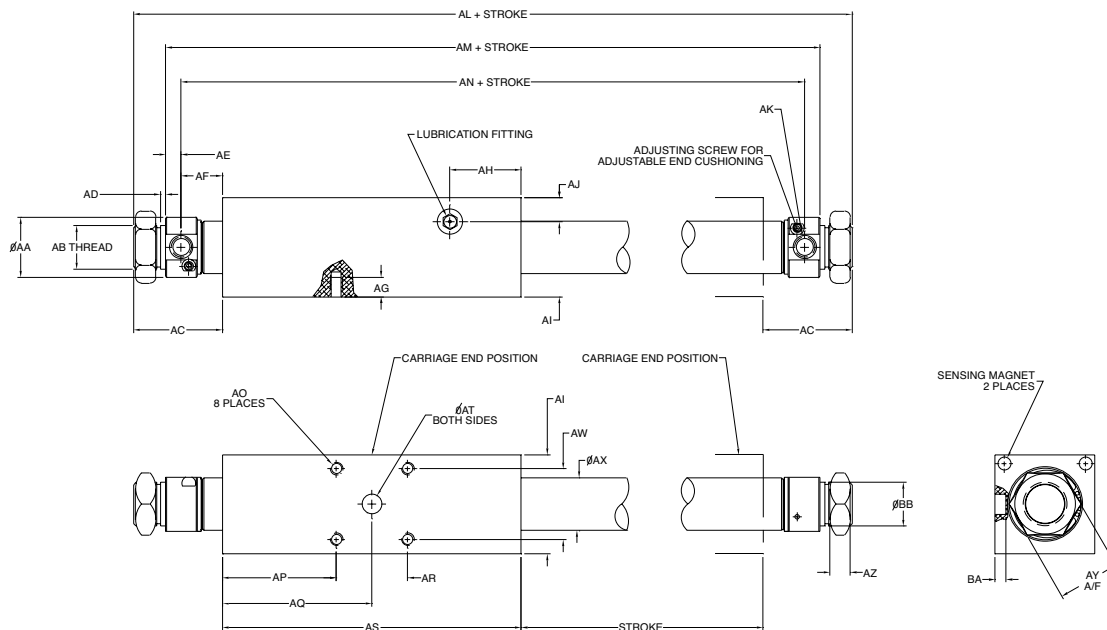
Bore in. (mm)	AA in. (mm)	AB mm	AC in. (mm)	AD in. (mm)	AE in. (mm)	AF in. (mm)	AG in. (mm)	AH in. (mm)
12 mm	0.86 (21.7)	M16 x 1.5	1.26 (31.9)	0.07 (1.8)	0.20 (5.1)	0.58 (14.8)	0.38 (9.5)	0.84 (21.4)

Bore in. (mm)	AI in. (mm)	AJ in. (mm)	AK in.	AL in. (mm)	AM in. (mm)	AN in. (mm)	AO mm	AP in. (mm)
12 mm	1.18 (30.0)	0.21 (5.2)	#10-32 UNF	5.90 (150.0)	4.95 (125.7)	4.55 (115.6)	M5 x .8	1.69 (43.0)

Bore in. (mm)	AQ in. (mm)	AR in. (mm)	AS in. (mm)	AT in. (mm)	AW in. (mm)	AX in. (mm)
12 mm	3.39 (86.0)	0.87 (22.1)	0.52 (13.3)	0.32 (8.0)	0.95 (24.0)	0.63 (16.0)

Dimensions: Inches (mm)

MC1 and MC2 Series Non-Guided Unit 16mm – 40mm Bore



Diameter	AA	AB	AC	AD	AE	AF	AG	AH	AI
16 mm	0.90 (22.7)	M16 x 1.5	1.49 (37.7)	0.07 (1.8)	0.63 (16.1)	0.38 (9.6)	0.32 (8.0)	1.26 (32.0)	1.41 (36.0)
20 mm	1.30 (33.0)	M22 x 1.5	1.66 (42.0)	0.07 (1.8)	0.31 (7.7)	0.72 (18.2)	0.32 (8.0)	1.34 (34.0)	1.66 (42.0)
25 mm	1.19 (30.2)	M22 x 1.5	1.76 (44.7)	0.10 (2.5)	0.31 (7.7)	0.82 (20.9)	0.39 (10.0)	1.41 (35.8)	1.97 (50.0)
32 mm	1.56 (39.5)	M30 x 1.5	1.97 (50.0)	0.10 (2.5)	0.36 (9.1)	0.96 (24.4)	0.50 (12.7)	1.68 (42.5)	2.34 (59.5)
40 mm	1.80 (45.7)	M38 x 1.5	2.49 (63.2)	0.10 (2.5)	0.48 (12.2)	1.38 (35.0)	0.63 (16.0)	1.97 (50.0)	2.91 (74.0)

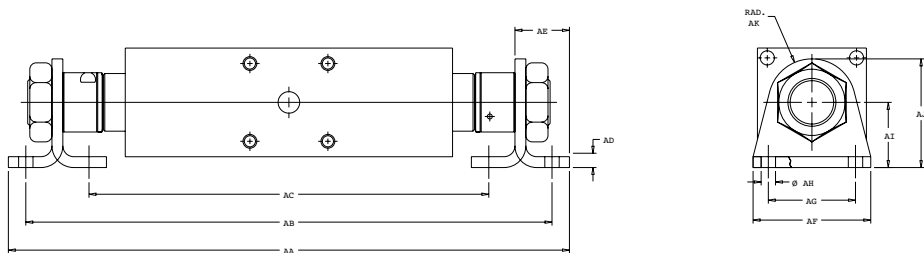
Diameter	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
16 mm	0.29 (7.4)	#10-32 UNF	7.89 (200.5)	6.94 (176.4)	5.68 (144.2)	M5 x .8	1.95 (49.5)	2.47 (62.5)	1.02 (26.0)
20 mm	0.40 (10.1)	1/8-27 NPTF	8.63 (219.2)	7.36 (187.0)	6.75 (171.4)	M5 x .8	2.03 (51.5)	2.66 (67.5)	1.26 (32.0)
25 mm	0.48 (12.2)	1/8-27 NPTF	9.44 (239.7)	8.17 (207.5)	7.56 (192.0)	M6 x 1.0	2.25 (57.0)	2.96 (75.0)	1.41 (35.8)
32 mm	0.56 (14.2)	1/8-27 NPTF	10.63 (270.0)	9.36 (237.6)	8.61 (218.6)	M6 x 1.0	2.40 (61.0)	3.34 (84.9)	1.89 (47.9)
40 mm	0.97 (24.7)	1/4-18 NPTF	12.85 (326.4)	11.59 (294.4)	10.63 (270.0)	M8 x 1.25	2.95 (75.0)	3.94 (100.0)	1.97 (50.0)

Diameter	AS	AT	AW	AX	AY	AZ	BA	BB
16 mm	4.92 (125.0)	0.32 (8.0)	1.02 (26.0)	0.68 (17.3)	0.95 (24.0)	0.32 (8.0)	0.16 (4.0)	0.63 (16.0)
20 mm	5.32 (135.0)	0.32 (8.0)	1.26 (32.0)	0.84 (21.3)	1.24 (31.5)	0.40 (10.2)	0.12 (3.0)	0.87 (22.0)
25 mm	5.91 (150.0)	0.39 (10.0)	1.41 (35.8)	1.04 (26.5)	1.24 (31.5)	0.40 (10.2)	0.22 (5.5)	0.87 (22.0)
32 mm	6.69 (169.8)	0.39 (10.0)	1.89 (47.9)	1.32 (33.6)	1.65 (42.0)	0.32 (8.0)	0.18 (4.4)	1.18 (30.0)
40 mm	7.87 (200.0)	0.47 (12.0)	2.21 (56.0)	1.64 (41.6)	1.97 (50.0)	0.32 (8.0)	0.18 (4.5)	1.50 (38.0)

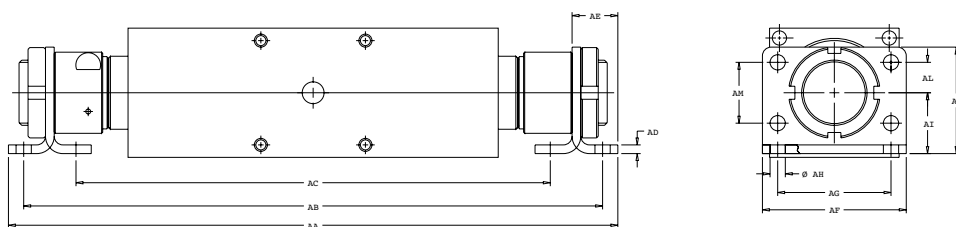
Dimensions: Inches (mm)

MC1 and MC2 Series Mounting Accessories – Foot Mount 16 mm through 40 mm Bore Sizes

MC1 & MC2 - 12 MM THROUGH TO 25 MM BORE FOOT MOUNT



MC1 & MC2 - 32 MM AND 40 MM BORE FOOT MOUNT



Diameter	AA	AB	AC	AD	AE	AF	AG	AH	AI
12 mm	6.52 (165.7)	6.05 (153.7)	4.16 (105.7)	0.16 (3.9)	0.79 (19.9)	1.65 (42.0)	1.26 (32.0)	0.22 (5.5)	0.79 (19.9)
16 mm	8.62 (216.4)	8.05 (204.4)	6.16 (156.4)	0.16 (3.9)	0.79 (19.9)	1.65 (42.0)	1.26 (32.0)	.022 (5.5)	0.79 (19.9)
20 mm	9.33 (236.9)	8.70 (220.9)	6.41 (162.9)	0.20 (5.0)	0.98 (24.9)	2.13 (54.0)	1.58 (40.0)	0.26 (6.6)	0.98 (24.9)
25 mm	10.14 (257.5)	9.51 (241.5)	7.22 (183.5)	0.20 (5.0)	0.98 (24.9)	2.13 (54.0)	1.58 (40.0)	0.26 (6.6)	0.98 (24.9)
32 mm	11.01 (279.6)	10.46 (265.6)	8.57 (217.6)	0.16 (3.9)	0.83 (21.0)	2.60 (65.9)	2.05 (51.9)	0.28 (7.0)	1.10 (27.9)
40 mm	13.95 (354.4)	13.16 (334.4)	10.41 (264.4)	0.20 (5.0)	1.18 (29.9)	3.46 (87.9)	2.36 (59.9)	0.35 (8.9)	13.0 (32.9)

Diameter	AJ	AK	AL	AM
12 mm	13.2 (33.4)	0.53 (13.4)	-	-
16 mm	1.32 (33.4)	0.53 (13.4)	-	-
20 mm	1.69 (43.0)	0.71 (18.0)	-	-
25 mm	1.69 (43.0)	0.71 (18.0)	-	-
32 mm	1.93 (48.9)	-	0.55 (13.9)	1.10 (27.9)
40 mm	2.28 (58.0)	-	0.59 (15.0)	1.18 (39.9)

Foot Mounting for MC1 and MC2 Cylinders

Diameter	12 & 16	20 & 25	32	40
	155-115	155-116	155-138*	155-139*

*The 32 and 40mm Brackets are a combination Foot and Flange Mount

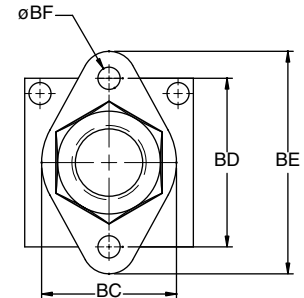
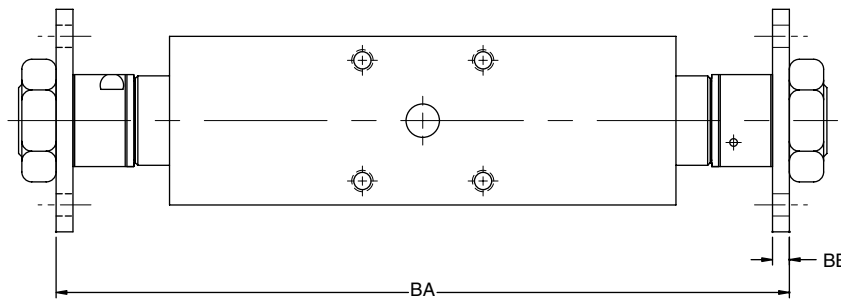
Nuts for Mounting Accessories**

Bore	12 & 16	20 & 25	32	40
	128-343	N90-1213	128-228	128-229

**End cap nuts are included with the MC1 and MC2 Series

Dimensions: Inches (mm)

MC1 and MC2 Series Mounting Accessories – Flange Mount



Diameter	BA	BB	BC	BD	BE	BF
12 mm	5.26 (133.7)	0.16 (3.9)	1.18 (29.9)	1.58 (40.0)	2.05 (51.9)	0.22 (5.5)
16 mm	7.26 (184.4)	0.16 (3.9)	1.18 (29.9)	1.58 (40.0)	2.05 (51.9)	0.22 (5.5)
20 mm	7.75 (196.9)	0.20 (5.0)	1.58 (40.0)	1.97 (50.0)	2.60 (65.9)	0.26 (6.6)
25 mm	8.56 (217.5)	0.20 (5.0)	1.58 (40.0)	1.97 (50.0)	2.60 (65.9)	0.26 (6.6)
32 mm	–	–	–	–	–	–
40 mm	–	–	–	–	–	–



Flange Mounting for MC1 and MC2 Cylinders

Diameter	12 & 16	20 & 25	32	40
	155-112	155-113	155-138*	155-139*

*Foot and Flange Mounting

Nuts for Mounting Accessories***

Diameter	12 & 16	20 & 25	32	40
	128-343	N90-1213	128-228	128-229

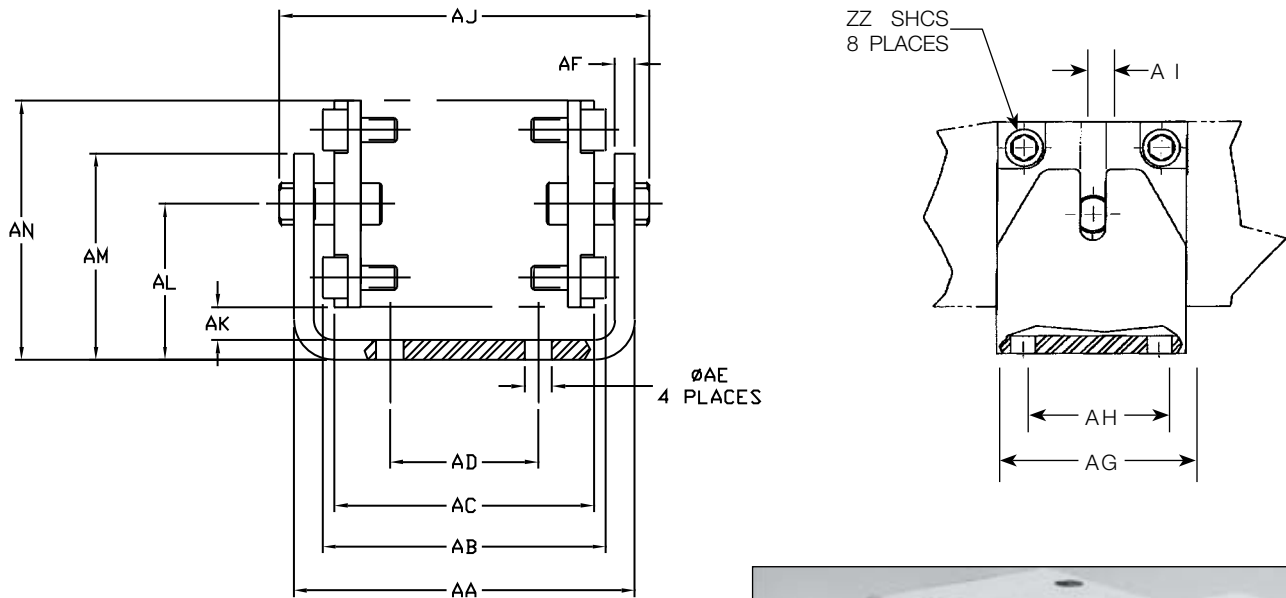
***Nuts are included with the MC1 & MC2 Series

Dimensions: Inches (mm)

MC1 and MC2 Series Floating Mounting Bracket 16mm – 40mm Bore

Floating Mounting Bracket Kit Part Numbers

Bore	12	16	20	25	32	40
	N/A	239-1429	239-1430	239-1431	239-1432	239-1433



When incorporating the MC1 or MC2 Series with external guides it is necessary to include the floating mounting bracket. This will compensate for any non-parallel alignment between the cylinder and the external guiding mechanism.



Part Number	Diameter	AA	AB	AC	AD	AE	AF	AG	AH
239-1429	16 mm	2.48 (63.0)	1.96 (49.7)	1.92 (48.7)	1.02 (26.0)	0.22 (5.6)	0.13 (3.2)	1.58 (40.0)	1.02 (26.0)
239-1430	20 mm	2.80 (71.1)	2.20 (55.7)	2.15 (54.7)	1.26 (32.0)	0.22 (5.6)	0.13 (3.2)	1.65 (42.0)	1.26 (32.0)
239-1431	25 mm	3.24 (82.3)	2.69 (68.4)	2.47 (62.7)	1.41 (35.8)	0.26 (6.6)	0.19 (4.8)	1.97 (50.0)	1.41 (35.8)
239-1432	32 mm	3.61 (91.7)	3.06 (77.8)	2.84 (72.2)	1.89 (48.0)	0.26 (6.6)	0.19 (4.8)	2.36 (59.9)	1.89 (48.0)
239-1433	40 mm	4.46 (113.3)	3.79 (96.3)	3.54 (89.9)	2.21 (56.0)	0.35 (8.8)	0.25 (6.4)	2.76 (70.0)	1.97 (50.0)

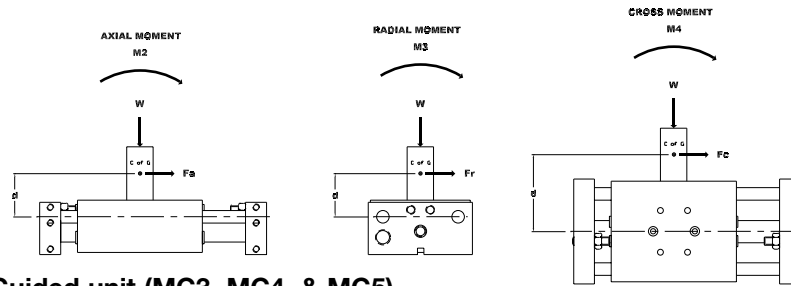
Part Number	Diameter	AI	AJ	AK	AL	AM	AN	ZZ
239-1429	16 mm	0.21 (5.3)	2.80 (71.1)	0.33 (8.3)	1.14 (29.0)	1.58 (40.0)	1.85 (47.0)	M5x.8
239-1430	20 mm	0.22 (5.6)	3.12 (79.3)	0.28 (7.0)	1.23 (31.2)	1.69 (43.0)	2.06 (52.2)	M5x.8
239-1431	25 mm	0.26 (6.6)	3.52 (89.3)	0.32 (8.0)	1.49 (37.8)	1.97 (50.0)	2.47 (62.8)	M6x1.0
239-1432	32 mm	0.26 (6.6)	3.89 (98.8)	0.32 (8.0)	1.68 (42.8)	2.17 (55.0)	2.85 (72.5)	M6x1.0
239-1433	40 mm	0.38 (9.5)	4.70 (119.3)	0.39 (10.0)	1.85 (47.0)	2.76 (70.0)	3.56 (90.3)	M8x1.25

MC3, MC4 and MC5 Series

Specifications	
Medium	Compressed air (filtered, lubricated or unlubricated) and hydraulics
Design	Magnetically coupled guided cylinder line
Max. operating range	100 psi / 7 bar
Temperature Range	-4° to 140° F / -20° to 60° C
Material	Carriage, End Plate and Stop Plate: Anodized Aluminum, Bearings: Thermoplastic & Topball slide bush, Guide rods: Steel & Stainless Steel, Seals & O-rings: Polyurethane & Buna, Magnets: Rare Earth, Fasteners: Zinc Plated

Diameter	Standard Stroke		Port Size*	Effective force at 100 psi/7 Bar lbf (N)	Breakaway force of magnetic coupling lbf (N)	Basic Weight of Zero Stroke Cylinder		Slide Weight		Weight Adder per Unit of Stroke	
	in	(mm)				lbs.	(kgs)	lbs.	(kgs)	lbs.	(kgs)
12 mm	.39 to 20	(10 to 500)	10-32	18 (77.8)	25 (110.0)	2.140	(0.971)	1.390	(0.630)	0.055	(0.020)
16 mm	.39 to 32	(10 to 800)	10-32	31 (138.8)	40 (178.0)	2.960	(1.343)	1.460	(0.662)	0.084	(0.040)
20 mm	.39 to 32	(10 to 800)	1/8 NPT	49 (216.7)	75 (333.6)	5.140	(2.331)	3.340	(1.515)	0.118	(0.050)
25 mm	.39 to 60	(10 to 1524)	1/8 NPT	76 (338.6)	110 (485.0)	7.650	(3.470)	3.880	(1.760)	0.206	(0.090)
32 mm	.39 to 60	(10 to 1524)	1/8 NPT	125 (554.9)	175 (778.4)	14.020	(6.369)	7.500	(3.402)	0.311	(0.140)
40 mm	.39 to 60	(10 to 1524)	1/4 NPT	195 (866.8)	236 (1049.8)	20.860	(9.462)	10.70	(4.853)	0.476	(0.220)

*Metric porting available through port adapters on page 19.



Load vs. Stroke - Guided unit (MC3, MC4, & MC5)

Maximum Static Load

Diameter	Stroke Inches (mm)									
	6 (152)	12 (305)	18 (457)	20 (508)	32 (813)	36 (914)	42 (1067)	48 (1219)	54 (1372)	60 (1524)
12 mm	11 (48.9)	11 (48.9)	11 (48.9)	11 (48.9)	-	-	-	-	-	-
16 mm	15 (68.5)	15 (68.5)	15 (68.5)	15 (68.5)	14 (60.9)	-	-	-	-	-
20 mm	45 (201.6)	45 (201.6)	45 (201.6)	45 (201.6)	26 (116.2)	-	-	-	-	-
25 mm	54 (240.7)	54 (240.7)	54 (240.7)	54 (240.7)	54 (240.7)	54 (240.7)	54 (240.7)	40 (175.7)	140 (31.4)	25 (113.0)
32 mm	89 (397.0)	89 (397.0)	89 (397.0)	89 (397.0)	89 (397.0)	89 (397.0)	89 (397.0)	89 (397.0)	76 (336.3)	62 (274.0)
40 mm	126 (560.7)	126 (560.7)	126 (560.7)	126 (560.7)	126 (560.7)	126 (560.7)	126 (560.7)	126 (560.7)	126 (560.7)	126 (560.7)

Maximum Dynamic Moments

Diameter	Axial Moment - M2 in-lbs (Nm)	Radial Moment - M3 in-lbs (Nm)	Cross Moment - M4 in-lbs (Nm)
12 mm	8 (0.9)	1 (0.2)	8 (0.9)
16 mm	18 (2.0)	3 (0.3)	18 (2.0)
20 mm	54 (6.0)	9 (1.0)	54 (6.0)
25 mm	113 (12.7)	19 (2.1)	113 (12.7)
32 mm	188 (21.2)	31 (3.5)	188 (21.2)
40 mm	271 (30.6)	45 (5.1)	271 (30.6)

Axial moment = $M2 = Fa \times d$

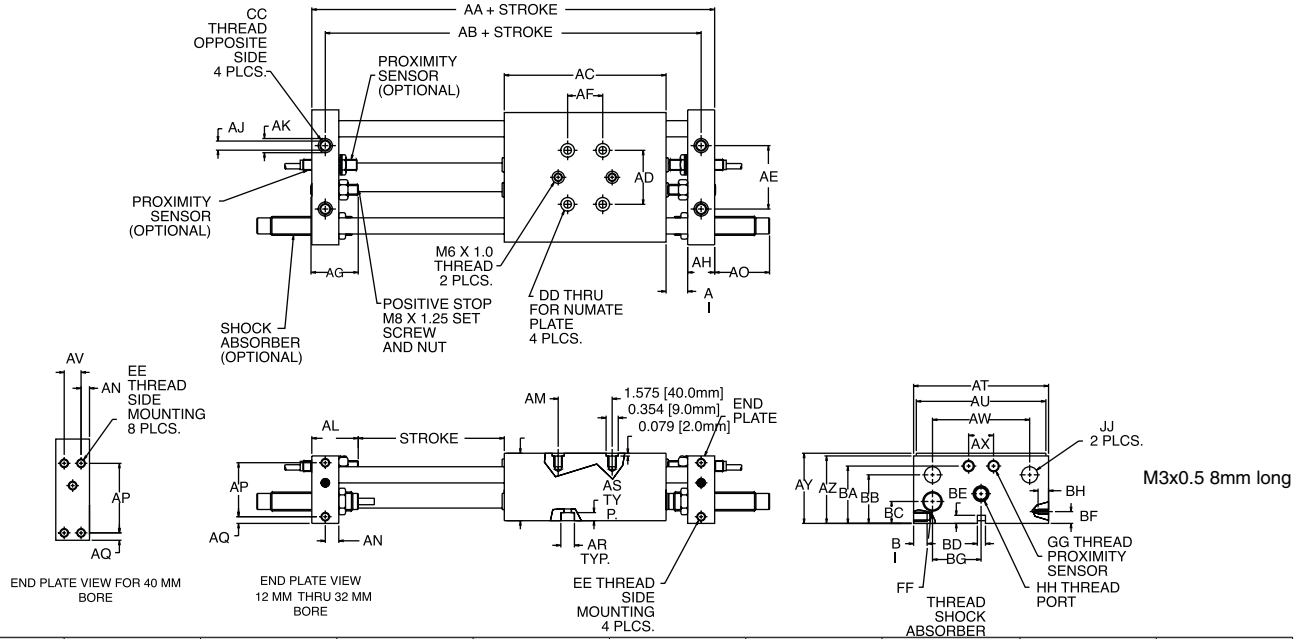
Radial moment = $M3 = Fr \times d$

Cross moment = $M4 = Fc \times d$

$$\text{Compound moment \%} = 100 \times \left(\frac{M2}{M2_{MAX}} + \frac{M3}{M3_{MAX}} + \frac{M4}{M4_{MAX}} \right) \leq 100\%$$

Dimensions: Inches (mm)

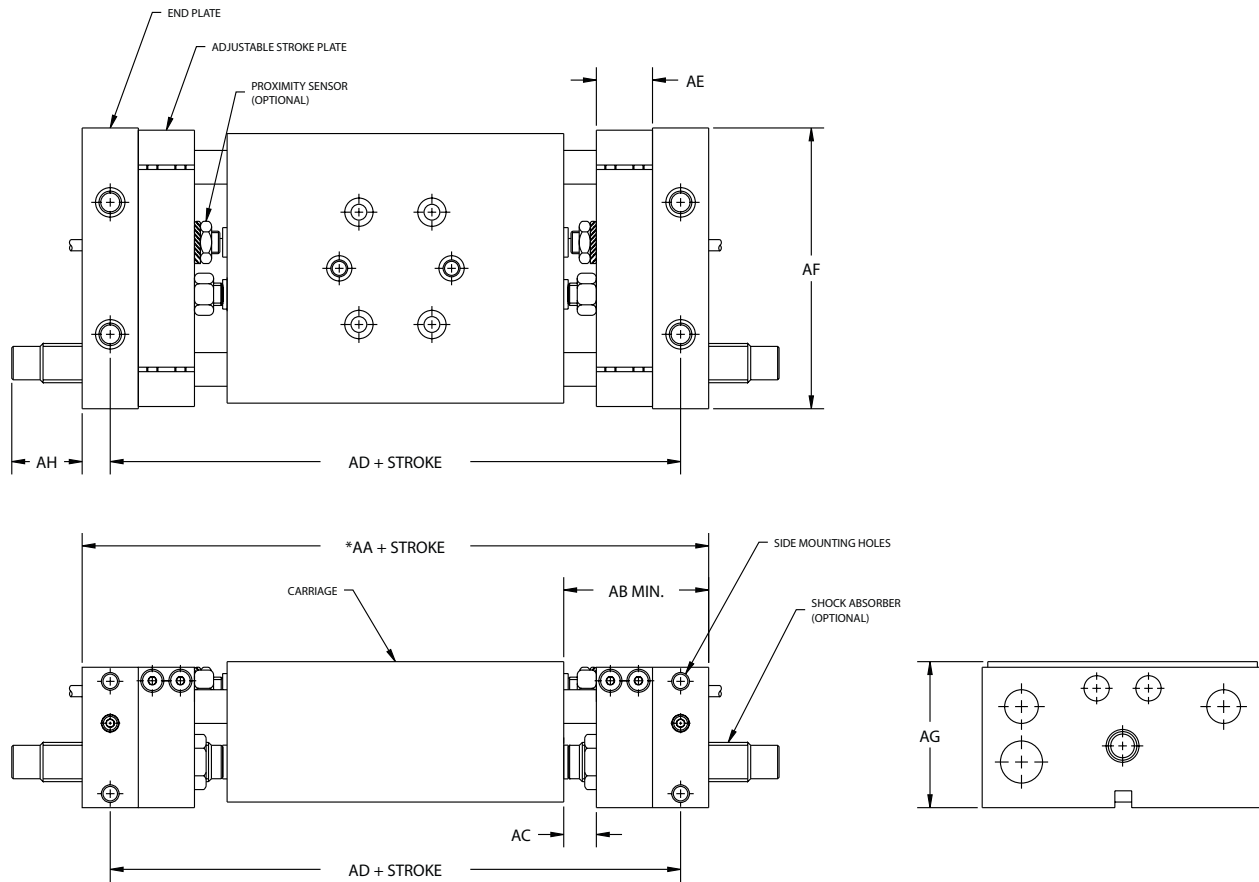
MC3, MC4 and MC5 Series Guided Unit



Diameter	AA	AB	AC	AD	AE	AF	AG	AH	AI
12 mm	5.48 (139.1)	4.89 (124.1)	3.35 (84.9)	1.02 (25.9)	1.38 (35.1)	0.75 (18.9)	1.378 (35.0)	0.59 (15.0)	0.47 (11.9)
16 mm	6.07 (154.1)	5.48 (139.1)	3.94 (99.9)	1.26 (32.0)	1.58 (40.0)	1.26 (32.0)	1.378 (35.0)	0.59 (15.0)	0.47 (11.9)
20 mm	7.56 (192.0)	6.77 (171.9)	4.72 (119.9)	1.58 (40.0)	1.85 (46.9)	1.02 (26.0)	1.378 (35.0)	0.79 (19.9)	0.63 (16.0)
25 mm	8.35 (211.9)	7.56 (191.9)	5.51 (139.9)	1.77 (44.9)	1.89 (48.0)	1.02 (26.0)	1.378 (35.0)	0.79 (19.9)	0.63 (16.0)
32 mm	9.84 (249.9)	8.86 (224.9)	6.30 (159.9)	2.56 (64.9)	2.28 (58.0)	1.58 (40.0)	1.378 (35.0)	0.98 (24.9)	0.79 (19.9)
40 mm	10.86 (275.8)	9.87 (250.8)	7.32 (185.8)	2.95 (75.0)	3.07 (78.0)	1.97 (49.9)	1.378 (35.0)	0.98 (24.9)	0.79 (19.9)
Diameter	AJ	AK	AL	AM	AN	AO	AP	AQ	AR
12 mm	0.21 (5.3)	0.40 (10.1)	1.00 (25.4)	1.50 (37.9)	0.30 (7.5)	1.22 (30.9)	1.22 (31.0)	0.14 (3.5)	0.36 (9.1)
16 mm	0.21 (5.3)	0.40 (10.1)	1.00 (25.4)	1.58 (40.0)	0.30 (7.5)	1.22 (30.9)	1.22 (31.0)	0.18 (4.5)	0.39 (10.0)
20 mm	0.27 (6.8)	0.41 (10.5)	1.36 (34.4)	1.97 (49.9)	0.39 (10.0)	1.60 (40.7)	1.58 (40.0)	0.20 (5.0)	0.39 (10.0)
25 mm	0.27 (6.8)	0.41 (10.5)	1.36 (34.4)	2.17 (54.9)	0.39 (10.0)	1.60 (40.7)	1.66 (42.0)	0.20 (5.0)	0.39 (10.0)
32 mm	0.34 (8.6)	0.59 (15.0)	1.71 (43.4)	2.76 (69.9)	0.49 (12.5)	2.85 (72.5)	2.26 (57.3)	0.24 (5.9)	0.44 (11.1)
40 mm	0.34 (8.6)	0.59 (15.0)	1.71 (43.4)	2.95 (75.0)	0.25 (6.2)	2.85 (72.5)	2.03 (51.5)	0.22 (5.5)	0.44 (11.1)
Diameter	AS	AT	AU	AV	AW	AX	AY	AZ	BA
12 mm	0.30 (7.6)	2.91 (73.9)	2.8 (70.9)	-	2.05 (51.9)	0.65 (16.4)	1.58 (40.0)	1.50 (37.9)	1.18 (29.9)
16 mm	0.22 (5.6)	3.31 (83.9)	3.15 (80.0)	-	2.28 (58.0)	0.84 (21.3)	1.66 (42.0)	1.58 (40.0)	1.27 (32.4)
20 mm	0.24 (5.9)	3.94 (99.9)	3.78 (96.0)	-	2.84 (72.0)	0.73 (18.5)	2.05 (51.9)	1.97 (50.0)	1.67 (42.5)
25 mm	0.23 (5.7)	4.49 (113.9)	4.33 (109.9)	-	3.15 (80.0)	0.95 (24.1)	2.24 (56.9)	2.17 (55.1)	1.86 (47.3)
32 mm	0.30 (7.6)	5.51 (139.9)	5.32 (135.0)	-	3.94 (99.9)	1.02 (25.9)	2.87 (72.9)	2.76 (70.0)	2.34 (59.5)
40 mm	0.55 (13.9)	6.54 (165.9)	6.30 (159.9)	0.49 (12.5)	4.65 (118.0)	1.86 (47.2)	3.07 (78.0)	2.95 (75.0)	2.53 (64.4)
Diameter	BB	BC	BD	BE	BF	BG	BH	BI	CC
12 mm	1.06 (27.0)	0.37 (9.5)	0.20 (5.0)	0.20 (5.0)	0.64 (16.2)	1.09 (27.6)	0.31 (7.8)	0.32 (8.0)	M6
16 mm	1.12 (28.5)	0.37 (9.5)	0.20 (5.0)	0.20 (5.0)	0.69 (17.1)	1.22 (30.9)	0.31 (7.8)	0.32 (8.0)	M6
20 mm	1.42 (35.9)	0.64 (16.3)	0.24 (5.9)	0.24 (5.9)	0.34 (8.7)	1.42 (35.9)	0.31 (7.8)	0.39 (10.0)	M8
25 mm	1.44 (36.5)	0.54 (13.8)	0.24 (5.9)	0.24 (5.9)	0.34 (8.7)	1.58 (40.0)	0.31 (7.8)	0.39 (10.0)	M8
32 mm	1.95 (49.5)	0.74 (18.9)	0.24 (5.9)	0.24 (5.9)	0.34 (8.7)	1.97 (50.0)	0.31 (7.8)	0.55 (13.9)	M10
40 mm	2.01 (51.0)	0.60 (15.2)	0.24 (5.9)	0.24 (5.9)	0.34 (8.7)	2.32 (59.0)	0.31 (7.8)	0.39 (10.0)	M10
Diameter	DD	EE	FF	GG	HH	JJ			
12 mm	0.21 (5.4)	M5	M12 x 1.0	M8 x 1.0	10-32 UNF	0.32 (8.0)			
16 mm	0.22 (5.6)	M5	M12 x 1.0	M8 x 1.0	10-32 UNF	0.39 (10.0)			
20 mm	0.22 (5.6)	M6	M14 x 1.5	M8 x 1.0	1/8 NPT	0.47 (11.9)			
25 mm	0.22 (5.6)	M6	M14 x 1.5	M8 x 1.0	1/8 NPT	0.63 (16.0)			
32 mm	0.26 (6.6)	M8	M20 x 1.5	M8 x 1.0	1/8 NPT	0.79 (19.9)			
40 mm	0.26 (6.6)	M8	M20 x 1.5	M8 x 1.0	1/4 NPT	0.98 (24.9)			

Dimensions: Inches (mm)

MC3, MC4 and MC5 Series Stroke Adjustment Plate



Mid-Plate Dimensions for all Bore Sizes

Kit Part Number	Diameter	AA*	AB	AC	AD	AE	AF	AG	AH**
SA-010012	12 mm	6.55 (166.3)	1.60 (40.6)	0.42 (10.6)	5.96 (151.2)	0.59 (15.0)	2.91 (73.9)	1.58 (40.1)	0.68 (17.3)
SA-010016	16 mm	7.14 (181.2)	1.60 (40.6)	0.42 (10.6)	6.55 (166.2)	0.59 (15.0)	3.31 (83.9)	1.65 (42.0)	0.68 (17.3)
SA-010020	20 mm	8.79 (223.1)	2.03 (51.6)	0.46 (11.6)	8.00 (203.1)	0.79 (19.9)	3.94 (99.9)	2.05 (51.9)	0.99 (25.1)
SA-010025	25 mm	9.58 (243.2)	2.03 (51.6)	0.46 (11.6)	8.79 (223.2)	0.79 (19.9)	4.49 (113.9)	2.25 (57.1)	0.99 (25.1)
SA-010032	32 mm	11.34 (288.1)	2.52 (64.1)	0.55 (14.0)	10.36 (263.1)	0.98 (25.0)	5.51 (139.9)	2.87 (75.5)	2.10 (53.4)
SA-010040	40 mm	12.36 (313.9)	2.52 (64.1)	0.55 (14.0)	11.37 (288.9)	0.98 (25.0)	6.54 (165.9)	3.07 (78.0)	2.10 (53.4)

*If using only one Mid Plate subtract "AE" from this dimension
 ** Add this dimension to "AA" for each shock absorber for total length

Magnetically Coupled Rodless Cylinders

MCR Series Switch Options

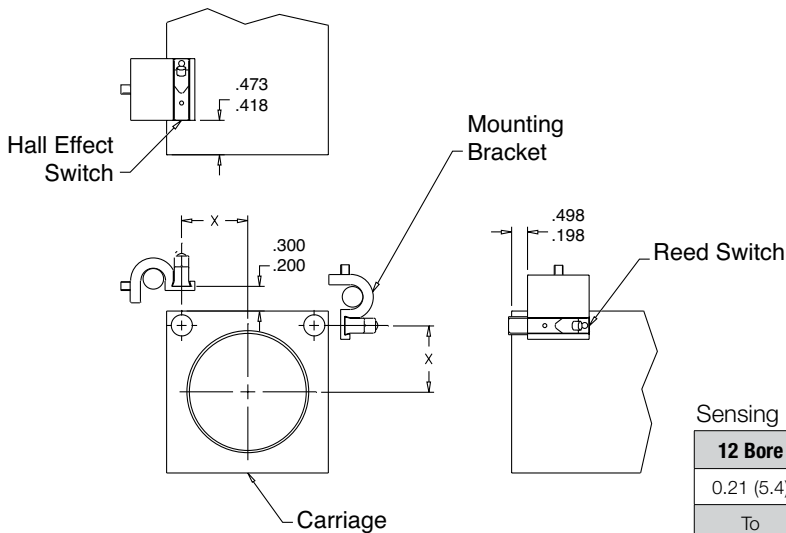
Switch Magnets are Standard on all MCR Series Carriages

Switch mounting for the MC1 and MC2 Series is achieved by an adjacent rod running the entire length of the cylinder. Refer to the switch rail/rod chart below.

MC3, MC4, and MC5 Series include a switch rail that is mounted to the end plates running the entire length of the cylinder. It is included when the switch option is ordered.



MC1 and MC2 Series Switch Mounting Rods



Sensing Dimension "X" in. (mm)

12 Bore	16 Bore	20 Bore	25 Bore	32 Bore	40 Bore
0.21 (5.4)	0.33 (8.4)	0.45 (11.4)	0.61 (15.4)	0.79 (20.1)	1.08 (27.5)
To 0.61 (15.5)	To 0.73 (18.5)	To 0.85 (21.6)	To 1.01 (25.6)	To 1.19 (30.3)	To 1.28 (31.9)

Magnetic Switches

Switch Description	Standard Part No.	Quick Disconnect Part No.
Hall Effect-PNP (Sourcing)	PNP-FL2-00-U	PNP-QDS-M8-U
Hall Effect-NPN (Sinking)	NPN-FL2-00-U	NPN-QDS-M8-U
Reed Switch	REED-FL2-00	REED-QDS-M8U

Switch Rail/Rod and Brackets

Rail for Linear Slide	Hardware
RM001*	PNP-FL2-00-U
Rod for Non-Guided	Switch Bracket
1/4-304-SSR*	900-F00-000

*Specify Length

MCR (Magnetically Coupled Non-Guided)

Bore	Bracket P/N
12mm	N99-1181
16mm	N99-1181
20mm	N99-1181
25mm	N99-1181
32mm	N99-1181
40mm	N99-1181



Sensor Description	Standard Cord Set	Quick Disconnect
Reed Switch	REED-FL2-00	REED-QDS-M8U
Hall PNP	PNP-FL2-00-U	PNP-QDS-M8-U
Hall NPN	NPN-FL2-00-U	NPN-QDS-M8-U

See page 16, 17, & 18 for sensor specifications

MCR (Magnetically Coupled Guided)

Bore	Bracket P/N
12mm	RM001+N99-1185
16mm	RM001+N99-1185
20mm	RM001+N99-1185
25mm	RM001+N99-1185
32mm	RM001+N99-1185
40mm	RM001+N99-1185

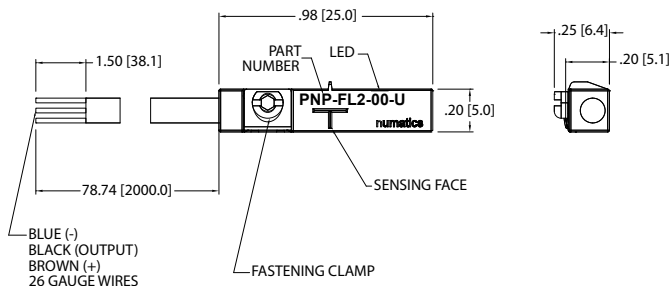


Sensor Description	Standard Cord Set	Quick Disconnect
Reed Switch	REED-FL2-00	REED-QDS-M8U
Hall PNP	PNP-FL2-00-U	PNP-QDS-M8-U
Hall NPN	NPN-FL2-00-U	NPN-QDS-M8-U

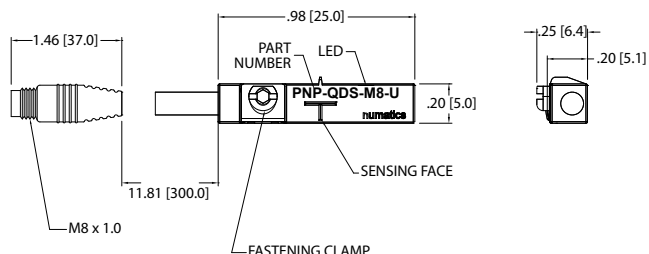
See page 16, 17, & 18 for sensor specifications
Also available with 8mm Prox sensor see page 21

Sensing Part Numbers

PNP-FL2-00-U



PNP-QDS-M8-U

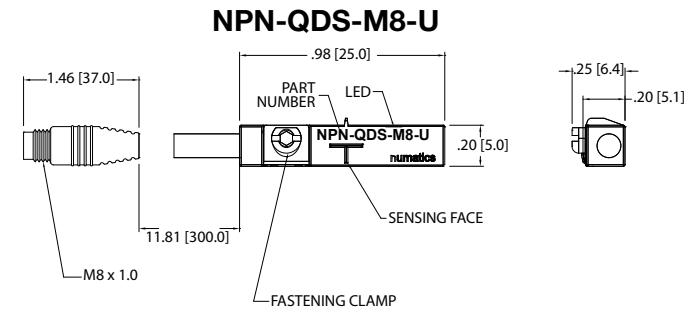
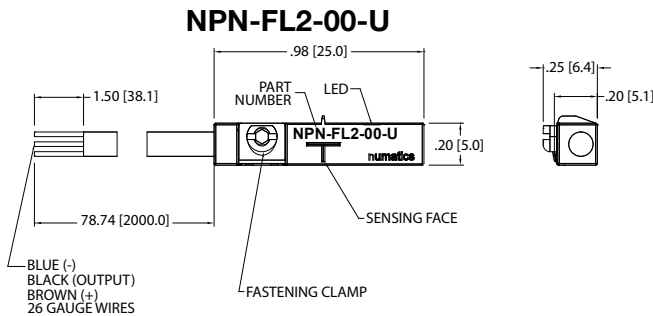





ELECTRICAL DESIGN	DC PNP
OUTPUT	Normally Open
OPERATING VOLTAGE	10-30 VDC
CURRENT RATING	100 mA
SHORT-CIRCUIT PROTECTION	Yes
OVERLOAD PROTECTION	Yes
REVERSE POLARITY PROTECTION	Yes
VOLTAGE DROP	< 2.5 V
CURRENT CONSUMPTION	< 12 mA
REPEATABILITY	< .2mm
POWER-ON DELAY TIME	< 30 ms
SWITCH FREQUENCY	> 3000 Hz
AMBIENT TEMPERATURE	-25°C to 85°C
PROTECTION	IP 67, III
HYSTERESIS	1.0mm
MAGNETIC SENSITIVITY	2.0 mT
TRAVEL SPEED	> 10 m/s
HOUSING MATERIAL	PA (Polyamide) Black; Fastening Clamp: Stainless Steel
FUNCTION DISPLAY SWITCHING STATUS	Yellow LED
CONNECTION	Flying Leads, Pur Cable (2m Long, 3 x26 Gauge Wire)
REMARKS	Clamping Screw with Combined Slot/Hexagon Socket Head AF 1.5 cULus - Class 2 Source Required
ACCESSORIES	Rubber Placeholder, Cable Clip, and Cut Sheet To Be Provided with Every Switch
AGENCY APPROVALS	




ELECTRICAL DESIGN	DC PNP
OUTPUT	Normally Open
OPERATING VOLTAGE	10-30 VDC
CURRENT RATING	100 mA
SHORT-CIRCUIT PROTECTION	Yes
OVERLOAD PROTECTION	Yes
REVERSE POLARITY PROTECTION	Yes
VOLTAGE DROP	< 2.5 V
CURRENT CONSUMPTION	< 12 mA
REPEATABILITY	< .2mm
POWER-ON DELAY TIME	< 30 ms
SWITCH FREQUENCY	> 3000 Hz
AMBIENT TEMPERATURE	-25°C to 85°C
PROTECTION	IP 67, III
HYSTERESIS	1.0mm
MAGNETIC SENSITIVITY	2.0 mT
TRAVEL SPEED	> 10 m/s
HOUSING MATERIAL	PA (Polyamide) Black; Fastening Clamp: Stainless Steel
FUNCTION DISPLAY SWITCHING STATUS	Yellow LED
CONNECTION	M8 Connector (Snap Fit) , Pur Cable (.3 m)
REMARKS	Clamping Screw with Combined Slot/Hexagon Socket Head AF 1.5 cULus - Class 2 Source Required
ACCESSORIES	Rubber Placeholder, Cable Clip, and Cut Sheet To Be Provided with Every Switch
AGENCY APPROVALS	

*Switches are not designed for wet environments. Please see your distributor for additional information.

Sensing Part Numbers

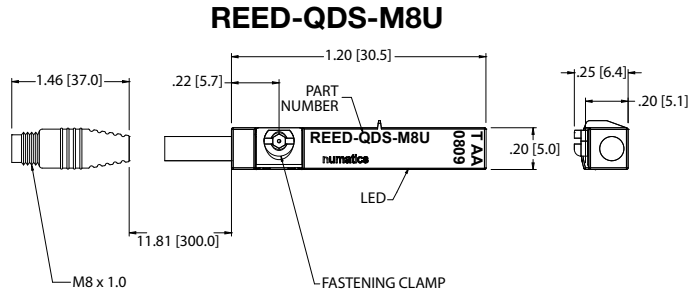
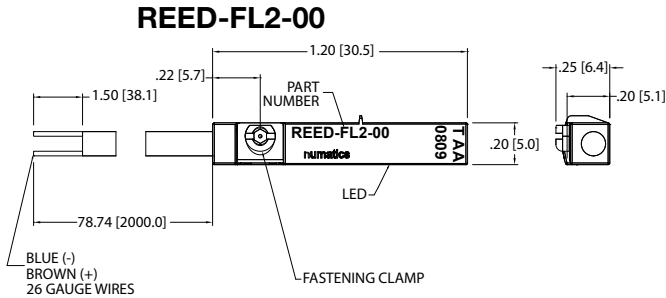


ELECTRICAL DESIGN	DC NPN
OUTPUT	Normally Open
OPERATING VOLTAGE	10-30 VDC
CURRENT RATING	100 mA
SHORT-CIRCUIT PROTECTION	Yes
OVERLOAD PROTECTION	Yes
REVERSE POLARITY PROTECTION	Yes
VOLTAGE DROP	< 2.5 V
CURRENT CONSUMPTION	< 12 mA
REPEATABILITY	< .2mm
POWER-ON DELAY TIME	< 30 ms
SWITCH FREQUENCY	> 3000 Hz
AMBIENT TEMPERATURE	-25°C to 85°C
PROTECTION	IP 67, III
HYSTERESIS	1.0mm
MAGNETIC SENSITIVITY	2.0 mT
TRAVEL SPEED	> 10 m/s
HOUSING MATERIAL	PA (Polyamide) Black; Fastening Clamp: Stainless Steel
FUNCTION DISPLAY SWITCHING STATUS	Yellow LED
CONNECTION	Flying Leads, Pur Cable (2m Long, 3 x26 Gauge Wire)
REMARKS	Clamping Screw with Combined Slot/Hexagon Socket Head AF 1.5 cULus - Class 2 Source Required
ACCESSORIES	Rubber Placeholder, Cable Clip, and Cut Sheet To Be Provided with Every Switch
AGENCY APPROVALS	  

ELECTRICAL DESIGN	DC NPN
OUTPUT	Normally Open
OPERATING VOLTAGE	10-30 VDC
CURRENT RATING	100 mA
SHORT-CIRCUIT PROTECTION	Yes
OVERLOAD PROTECTION	Yes
REVERSE POLARITY PROTECTION	Yes
VOLTAGE DROP	< 2.5 V
CURRENT CONSUMPTION	< 12 mA
REPEATABILITY	< .2mm
POWER-ON DELAY TIME	< 30 ms
SWITCH FREQUENCY	> 3000 Hz
AMBIENT TEMPERATURE	-25°C to 85°C
PROTECTION	IP 67, III
HYSTERESIS	1.0mm
MAGNETIC SENSITIVITY	2.0 mT
TRAVEL SPEED	> 10 m/s
HOUSING MATERIAL	PA (Polyamide) Black; Fastening Clamp: Stainless Steel
FUNCTION DISPLAY SWITCHING STATUS	Yellow LED
CONNECTION	M8 Connector (Snap Fit) , Pur Cable (.3 m)
REMARKS	Clamping Screw with Combined Slot/Hexagon Socket Head AF 1.5 cULus - Class 2 Source Required
ACCESSORIES	Rubber Placeholder, Cable Clip, and Cut Sheet To Be Provided with Every Switch
AGENCY APPROVALS	  

*Switches are not designed for wet environments. Please see your distributor for additional information.

Sensing Part Numbers

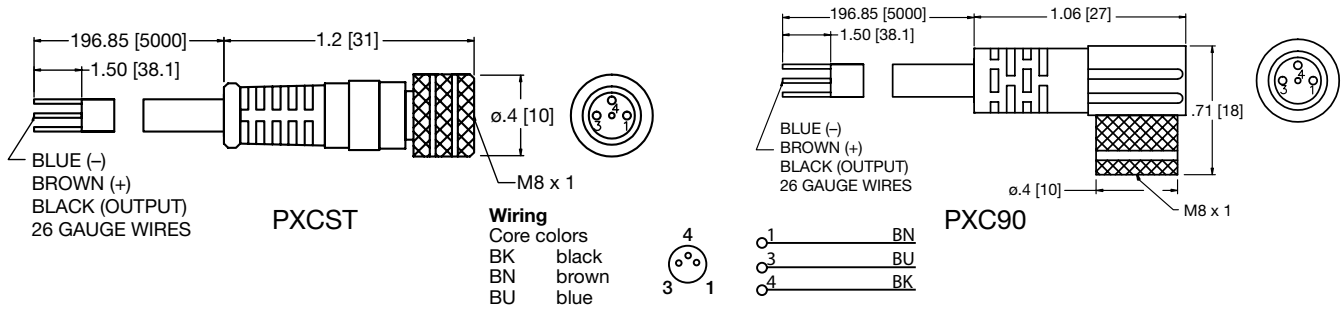


ELECTRICAL DESIGN	AC/DC REED
OUTPUT	Normally Open
OPERATING VOLTAGE	5-120 VAC/DC
CURRENT RATING	100 mA*
SHORT-CIRCUIT PROTECTION	No
OVERLOAD PROTECTION	No
REVERSE POLARITY PROTECTION	Yes
VOLTAGE DROP	< 5 V
REPEATABILITY	± .2mm
MAKETIME INCLUDING BOUNCE	< .6 ms
BREAKTIME	< .1 ms
SWITCHING POWER (MAX)	5 W
SWITCH FREQUENCY	1000 Hz
AMBIENT TEMPERATURE	-25°C to 70°C
PROTECTION	IP 67, II
HYSTERESIS	.9mm
HOUSING MATERIAL	PA (Polyamide) Black; Fastening Clamp: Stainless Steel
FUNCTION DISPLAY SWITCHING STATUS	Yellow LED
CONNECTION	Flying Leads, Pur Cable (2m Long, 2 x26 Gauge Wire)
REMARKS	<p>*External Protective Circuit for Inductive Load (Valve, Contactor, Etc..) Necessary. Conforms to 2008 NEC Section 725 III, Class 2 Circuits</p> <p>Clamping Screw with Combined Slot/Hexagon Socket Head AF 1.5.</p> <p>No LED Function in case of Polarity in DC Operation</p>
ACCESSORIES	Rubber Placeholder, Cable Clip, and Cut Sheet To Be Provided with Every Switch
AGENCY APPROVALS	RoHS

ELECTRICAL DESIGN	AC/DC REED
OUTPUT	Normally Open
OPERATING VOLTAGE	*5-60 VDC / 5-50 VAC
CURRENT RATING	100 mA
SHORT-CIRCUIT PROTECTION	No
OVERLOAD PROTECTION	No
REVERSE POLARITY PROTECTION	Yes
VOLTAGE DROP	< 5 V
REPEATABILITY	± .2mm
MAKETIME INCLUDING BOUNCE	< .6 ms
BREAKTIME	< .1 ms
SWITCHING POWER (MAX)	5 W
SWITCH FREQUENCY	1000 Hz
AMBIENT TEMPERATURE	-25°C to 70°C
PROTECTION	IP 67, II
HYSTERESIS	.9mm
HOUSING MATERIAL	PA (Polyamide) Black; Fastening Clamp: Stainless Steel
FUNCTION DISPLAY SWITCHING STATUS	Yellow LED
CONNECTION	M8 Connector (Snap Fit), Pur Cable (.3m)
REMARKS	<p>*External Protective Circuit for Inductive Load (Valve, Contactor, Etc..) Necessary. Conforms to 2008 NEC Section 725 III, Class 2 Circuits</p> <p>M8 Connector voltage limited to 5-60 vdc / 5-50 vac to conform with 2008 IEC 61076-2-104</p> <p>Clamping Screw with Combined Slot/Hexagon Socket Head AF 1.5.</p> <p>No LED Function in case of Polarity in DC Operation</p>
ACCESSORIES	Rubber Placeholder, Cable Clip, and Cut Sheet To Be Provided with Every Switch
AGENCY APPROVALS	RoHS

*Switches are not designed for wet environments. Please see your distributor for additional information.

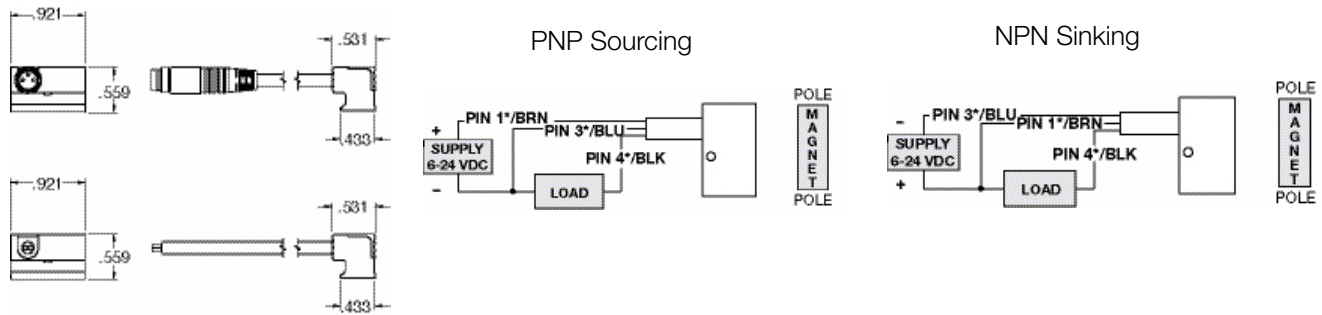
Quick Disconnect Cables



Order Code	Type	Operating Voltage	Current Rating	Cable Material	Protection	Connector
PXCST	Straight 5 m Cable (3 x 26 Gauge wire)	60 AC/75 DC	3 A	PUR	IP 68, III	M8
PXC90	90° 5 m Cable (3 x 26 Gauge wire)	60 AC/75 DC	3 A	PUR	IP 68, III	M8

World Switch Hall Effect Part Numbers

MCR Series World Switch Hall Effect Part Numbers



P/N	Switch Style	Electrical Design	Output	Operating Voltage	Current Rating	Switching Power	Voltage Drop	NEMA IP Rating	Temperature Rating
SH6-031	Flying Lead	DC PNP	Normally Open	6-24 VDC	0.3 Amps Max.	7.2 Watts Max.	.5 Volts	NEMA 6	-25° to +75° C
SH6-032	Flying Lead	DC PNP	Normally Open	6-24 VDC	0.3 Amps Max.	7.2 Watts Max.	.5 Volts	NEMA 6	-25° to +75° C
SH6-021	M8 Connector	DC NPN	Normally Open	6-24 VDC	0.3 Amps Max.	7.2 Watts Max.	.5 Volts	NEMA 6	-25° to +75° C
SH6-022	M8 Connector	DC NPN	Normally Open	6-24 VDC	0.3 Amps Max.	7.2 Watts Max.	.5 Volts	NEMA 6	-25° to +75° C

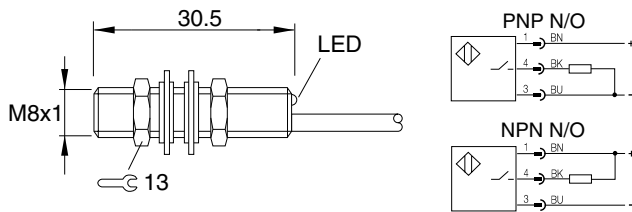
Magnetically Coupled Rodless Cylinders

End of Stroke Proximity Switch



Proximity Sensor

Prox Switch (NPN NO) Flying Leads - PX08NS (PNP NO) Flying Leads - PX08PS



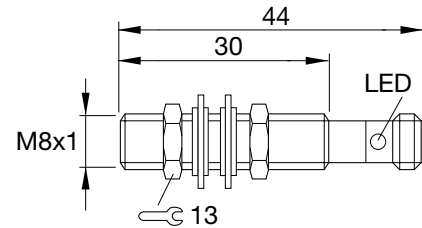
Sensing Data

Repeat accuracy R		≤5%
Ambient temperature range t_d	(°C)	-25...+70°C
Operating frequency f	(Hz)	1000
Utilization categories	(DC)	13
Function indication		YES

Electrical Data

Rated operational voltage U_e	(V)	24 DC
Supply voltage U_B	(V)	10...30 DC
Voltage drop U_d at I_e Stat./dyn.	(V)	≤2.5
Rated insulation voltage U_i	(V)	75 VDC
Load current capacity	(mA)	200
Current consumption	(mA)	≤25 / ≤12
Off-State Current I_r	(uA)	≤80
Protected against polarity reversal		YES
Short circuit protected		YES
Load Capacitance	(uF)	≤1.00

Prox Switch (NPN NO) 8 mm connector - PX08NQ (PNP NO) 8 mm connector - PROX-8QDS-PN



Electrical Design

Output	3-wire DC PNP; 2-wire DC PNP/NPN
Normally Open	Normally Open
Operating Voltage	10-30 VDC
Current Rating	100 mA
Minimum Load Current	2 mA*
Leakage Current	< .5 mA
Short-Circuit Protection	Yes (Non latching)
Overload Protection	Yes
Reverse Polarity Protection	Yes
Voltage Drop	< 2.8 V
Current Consumption	< 10 mA**
Switching Frequency	> 1000 Hz
Ambient Temperature	0 °C to 60°C
Protection	IP 67, III
Hysteresis	1 -15% of Sr
Operating Distance	0 - 2.4mm
Correction Factor	Mild Steel = 1, Stainless Steel = .8, Brass = .5, Alum = .4, Copper = .3

Housing Material

Function Display Switching Status	Yellow LED (4 x 90°)
Connection	M8 Connector
Remarks	2 M8 lock nuts included
Accessories	2 M8 lock nuts included
Agency Approvals	



MC1 and MC2 Series Cushion Capacity Chart

Adjustable cushions are standard on the MC1 & MC2 Series (16mm - 40mm Bores). They reduce the end of stroke piston energy. If the application exceeds the capacities listed an external shock or deceleration circuit must be incorporated.



Cushioning Capacity (Maximum Kinetic Energy)

	12 Bore	16 Bore	20 Bore	25 Bore	32 Bore	40 Bore
in./lbs.	3.79	10.68	20.33	33.12	64.71	101.26
Nm	(0.43)	(1.21)	(2.30)	(3.75)	(7.32)	(11.45)

Cushion Capacity – Weight versus Speed

Piston Speed		12mm Bore Maximum Mass To Be Cushioned		16mm Bore Maximum Mass To Be Cushioned		20mm Bore Maximum Mass To Be Cushioned		25mm Bore Maximum Mass To Be Cushioned		32mm Bore Maximum Mass To Be Cushioned		40mm Bore Maximum Mass To Be Cushioned	
in/sec	(m/sec)	lb	(kg)	lb	(kg)	lb	(kg)	lb	(kg)	lb	(kg)	lb	(kg)
3.94	(0.1)	220.46	(100.0)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
7.87	(0.2)	55.12	(25.0)	154.32	(70.0)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
11.81	(0.3)	21.61	(9.8)	66.14	(30.0)	121.25	(55.0)	198.42	(90.0)	N/A	N/A	N/A	N/A
15.75	(0.4)	11.02	(5.0)	37.48	(17.0)	66.14	(30.0)	110.23	(50.0)	198.42	(90.0)	N/A	N/A
19.69	(0.5)	7.17	(3.3)	22.05	(10.0)	39.68	(18.0)	66.14	(30.0)	127.87	(58.0)	209.44	(95.0)
23.62	(0.6)	4.96	(2.3)	14.77	(6.7)	28.66	(13.0)	44.09	(20.0)	88.18	(40.0)	141.10	(64.0)
27.55	(0.7)	3.75	(1.7)	10.14	(4.6)	19.84	(9.0)	33.07	(15.0)	66.14	(30.0)	103.62	(47.0)
31.50	(0.8)	2.87	(1.3)	7.72	(3.5)	15.43	(7.0)	26.46	(12.0)	52.91	(24.0)	77.16	(35.0)
35.43	(0.9)	2.20	(1.0)	5.73	(2.6)	12.13	(5.5)	19.84	(9.0)	39.68	(18.0)	61.73	(28.0)
39.37	(1.0)	1.76	(0.8)	4.41	(2.0)	9.92	(4.5)	14.99	(6.8)	31.97	(14.5)	49.60	(22.5)

Cushion adjustment: To increase cushioning turn adjustment screw clockwise. All MCR Series cushion adjustment screws are mechanically retained for safety and to prevent loss.

MC3, MC4 and MC5 Series Shock Absorbers

$$E_3 = \text{Kinetic Energy} + (\text{propelling force} \times \text{shock stroke})$$

$$\text{Effective weight} = \frac{E_3}{0.2 \times \text{Velocity}^2}$$



Shocks

Diameter	Part Number	Shock Stroke		Effective Weight		Max. Energy Capacity				Accessories	
		in	(mm)	in	(kg)	Per Cycle E3		Per Hour E4		JAM NUTS	SOFT PADS
12 mm	NC-S0.2-1A	0.472	12	4.4 - 24	2 -- 11	194	22	309,760	35,200	NU-17012	NU-17011
16 mm	NC-S0.2-1A	0.472	12	4.4 - 24	2 -- 11	194	22	309,760	35,200	NU-17012	NU-17011
20 mm	NC-S0.25-3L	0.551	14	136 - 554	62 - 252	264	30	440,000	50,000	NU-21052	NU-21011
25 mm	NC-S0.25-3L	0.551	14	136 - 554	62 - 252	264	30	440,000	50,000	NU-21052	NU-21011
32 mm	NC-S0.5x19-2L	0.748	19	88 - 460	40 - 209	880	100	673,200	76,500	NU-21152	NU-21111
40 mm	NC-S0.5x19-2L	0.748	19	88 - 460	40 - 209	880	100	673,200	76,500	NU-21152	NU-21111

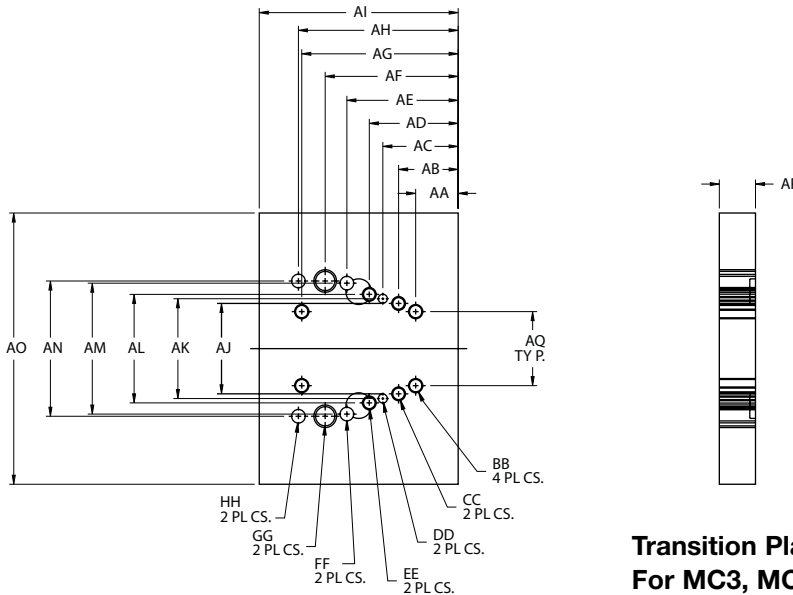
More shocks are available, consult factory

NuMate Interface Plates for MC3, MC4 and MC5 Series Guided Units

Enables the mounting of slides, grippers and rotary actuators incorporating the NuMate Mounting Pattern.

NuMate Transition Plate for Linear Guided Cylinders Model Number Chart

12 Bore	16 Bore	20 Bore	25 Bore	32 Bore	40 Bore
AP-010012	AP-010016	AP-010020	AP-010025	AP-010032	AP-010040



NuMate Plate Kit Weight For MC3, MC4 and MC5

Diameter	Plate Weight lbs (kg)	Bolt Weight lbs (kg)	Total Weight lbs (kg)
12mm	0.38 (0.172)	0.015 (0.007)	0.44 (0.200)
16mm	0.46 (0.209)	0.018 (0.008)	0.53 (0.240)
20mm	0.65 (0.295)	0.02 (0.009)	0.73 (0.331)
25mm	0.93 (0.422)	0.023 (0.010)	1.02 (0.463)
32mm	1.76 (0.798)	0.038 (0.017)	1.91 (0.866)
40mm	2.43 (1.102)	0.038 (0.017)	2.56 (1.161)

Transition Plate For MC3, MC4 and MC5

Transition Plate	Bolt P.N.	Bolt Size
AP-010012 SPEC	127-413	M5 x 40
AP-010016 SPEC	127-353	M5 x 45
AP-010020 SPEC	127-416	M5 x 55
AP-010025 SPEC	127-620	M5 x 60
AP-010032 SPEC	127-432	M6 x 70
AP-010040 SPEC	127-432	M6 x 70

Diameter	Magnetically Coupled Compatibility with Motion Control Slides						
12mm	SH031	LC056	LC075	B04	—	—	—
16mm	SH031	LC056	LC075	B04	B06	—	—
20mm	SH056	LC056	LC075	LC106	B04	B06	B08
25mm	SH056	LC056	LC075	LC106	B04	B06	B08
32mm	SH075	LC075	LC106	LC150	—	—	—
40mm	SH075	LC075	LC106	LC150	—	—	—

Part Number	Diameter	AA	AB	AC	AD	AE	AF	AG	AH
AP-010012 SPEC	12 mm	0.74 (18.8)	0.90 (22.7)	1.12 (28.3)	1.25 (31.8)	1.56 (39.6)	1.80 (45.6)	1.76 (44.7)	2.17 (55.0)
AP-010016 SPEC	16 mm	0.75 (18.9)	0.91 (23.0)	1.12 (28.3)	1.25 (31.8)	1.56 (39.6)	1.76 (44.7)	2.01 (50.9)	2.13 (54.1)
AP-010020 SPEC	20 mm	0.84 (21.3)	1.07 (27.3)	1.38 (35.1)	1.57 (39.9)	1.95 (49.4)	2.25 (57.0)	2.41 (61.3)	2.62 (66.4)
AP-010025 SPEC	25 mm	1.11 (28.3)	1.36 (34.5)	1.67 (42.4)	1.86 (47.2)	2.23 (56.7)	2.53 (64.3)	2.89 (73.3)	2.90 (73.7)
AP-010032 SPEC	32 mm	1.22 (31.0)	1.50 (38.1)	1.88 (47.6)	2.18 (55.4)	2.56 (64.9)	2.95 (74.9)	3.78 (96.0)	3.38 (85.8)
AP-010040 SPEC	40 mm	1.34 (33.9)	1.50 (38.1)	1.88 (47.6)	2.25 (57.2)	2.63 (66.7)	2.95 (74.9)	4.29 (108.9)	3.38 (85.8)

Part Number	Diameter	AI	AJ	AK	AL	AM	AN	AO	AP
AP-010012 SPEC	12 mm	2.50 (63.5)	1.00 (25.4)	1.25 (31.8)	1.37 (34.9)	1.50 (38.1)	1.81 (46.0)	3.25 (82.5)	0.50 (12.7)
AP-010016 SPEC	16 mm	2.75 (69.9)	1.00 (25.4)	1.25 (31.8)	1.37 (34.9)	1.50 (38.1)	1.81 (46.0)	3.50 (88.9)	0.50 (12.7)
AP-010020 SPEC	20 mm	3.25 (82.5)	1.25 (31.8)	1.37 (34.9)	1.50 (38.1)	1.81 (46.0)	1.87 (47.6)	4.25 (108.0)	0.50 (12.7)
AP-010025 SPEC	25 mm	4.00 (101.6)	1.25 (31.8)	1.37 (34.9)	1.50 (38.1)	1.81 (46.0)	1.87 (47.6)	5.00 (127.0)	0.50 (12.7)
AP-010032 SPEC	32 mm	5.00 (127.0)	1.50 (38.1)	1.81 (46.0)	1.87 (47.6)	2.25 (57.2)	2.50 (63.5)	6.00 (152.4)	0.63 (16.0)
AP-010040 SPEC	40 mm	5.63 (143.0)	1.50 (38.1)	1.81 (46.0)	1.87 (47.6)	2.25 (57.2)	2.50 (63.5)	7.00 (177.8)	0.63 (16.0)

Part Number	Diameter	AQ	BB	CC	DD	EE	FF	GG	HH
AP-010012 SPEC	12 mm	0.75 (19.0)	M5x.8	6-32 UNC	.094/.095 (2.3/2.4)	10-32 UNC	.125/.126 (3.1/3.2)	1/4-20 UNC	.187/.188 (4.7/4.8)
AP-010016 SPEC	16 mm	1.26 (32.0)	M5x.8	6-32 UNC	.094/.095 (2.3/2.4)	10-32 UNC	.125/.126 (3.1/3.2)	1/4-20 UNC	.187/.188 (4.7/4.8)
AP-010020 SPEC	20 mm	1.02 (26.0)	M5x.8	10-32 UNC	.125/.126 (3.1/3.2)	1/4-20 UNC	.187/.188 (4.7/4.8)	5/16-18 UNC	.187/.188 (4.7/4.8)
AP-010025 SPEC	25 mm	1.02 (26.0)	M5x.8	10-32 UNC	.125/.126 (3.1/3.2)	1/4-20 UNC	.187/.188 (4.7/4.8)	5/16-18 UNC	.187/.188 (4.7/4.8)
AP-010032 SPEC	32 mm	1.58 (40.0)	M6x1.0	1/4-20 UNC	.187/.188 (4.7/4.8)	5/16-18 UNC	.187/.188 (4.7/4.8)	5/16-18 UNC	.187/.188 (4.7/4.8)
AP-010040 SPEC	40 mm	1.97 (50.0)	M6x1.0	1/4-20 UNC	.187/.188 (4.7/4.8)	5/16-18 UNC	.187/.188 (4.7/4.8)	5/16-18 UNC	.187/.188 (4.7/4.8)

Dimensions = inches & (in parenthesis) = millimeters

Theoretical Force

The forces listed below are theoretical. Due to Internal & external friction it is recommended that 75% of the available cylinder force be utilized. If the system requirement exceeds that value select the next larger bore size.

Maximum Thrust Force

dimensions = inches (dimensions in parenthesis = millimeters)

Diameter	Pressure PSI (bar)							
	25 (1.7)	40 (2.8)	50 (3.4)	60 (4.1)	70 (4.8)	80 (5.5)	90 (6.2)	100 (6.9)
Theoretical Thrust Force lbf (N)								
12 mm	4.4 (19.5)	7.0 (31.2)	8.8 (39.0)	10.5 (46.8)	12.3 (54.6)	14.0 (62.4)	15.8 (70.2)	17.5 (78.0)
16 mm	7.8 (34.7)	12.5 (55.5)	15.6 (69.3)	18.7 (83.2)	21.8 (97.1)	24.9 (110.9)	28.0 (124.8)	31.2 (138.7)
20 mm	12.2 (54.2)	19.5 (86.7)	24.3 (108.3)	29.3 (130.0)	34.1 (151.7)	39.0 (173.3)	43.8 (195.0)	48.7 (216.7)
25 mm	19.0 (84.6)	30.4 (135.4)	38.0 (169.3)	45.7 (203.1)	53.3 (237.0)	60.9 (270.8)	68.5 (304.7)	76.1 (338.6)
32 mm	31.2 (138.7)	49.9 (221.9)	62.3 (277.3)	74.8 (332.8)	87.3 (388.3)	99.7 (443.8)	112.2 (499.2)	124.7 (554.7)
40 mm	48.7 (216.7)	77.9 (346.7)	97.4 (433.4)	116.9 (520.0)	136.3 (606.7)	155.8 (693.4)	175.3 (780.0)	194.8 (866.7)

Port Adapters

To Convert the standard NPT port to BSP select the appropriate adapter.

Port Adapters – NPTF Male/BSP Female

NPT	G Thread	Part Number
10-32	M5	IN438-036-005
1/8	1/8	IN438-020-000
1/4	1/4	IN438-021-001



Hydraulic Operation

The MCR Series Magnetically Coupled Rodless Cylinders are rated for up to 100 PSI non-shock hydraulic operation.

When To Consider

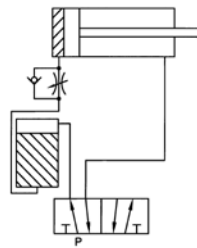
Due to the non-compressible quality of hydraulic fluids they may be utilized when slow speed, constant velocity or constant force are critical. Since the MCR Series incorporates a totally sealed barrel configuration it is well suited for low pressure hydraulic operation.

Service

The hydraulic supply must be regulated to no more than 100 PSI. If a hydraulic supply is not available an air over oil tank can be utilized. A sample circuit is shown.

For more information concerning this type of circuitry contact Numatics or your local Numatics Distributor.

NOTE: The MC1 and MC2 Series will not include an adjustable cushion when used in conjunction with hydraulic fluid.



Vertical Applications

When applying into a vertical orientation only 60% of the magnetic coupling force should be considered. If the application requires greater than 60% of the rated coupling force the next size larger should be selected.

Lubrication

The internal piston seals and bearings are lubricated during assembly. All Numatics MCR Series can be operated with a non-lubricated air supply. If airline lubrication is supplied it must be maintained for the life of the cylinder.

All carriages include a grease fitting. The mating grease coupler is a Type D, DIN 3405 (Cup type) nipple, Part number 113-073. Carriages have been lubricated at assembly. Additional grease is required after every 120 miles of travel. Do not over fill the carriage or barrel wiper effectiveness may be reduced. Utilize Grease EP-2.

Recoupling

Magnet decoupling can occur if the external force or weight exceeds the rated coupling force of any given unit. To recouple the carriage to the internal piston it is necessary to manually push the carriage fully to the end of stroke where the piston is located. If this continues the application should be reviewed.

Service or Repair

Numatics recommends that repair of any MCR Series be performed by the factory or your local Numatics Distributor.

Ambient Conditions

The MCR Series Cylinders should not be used in areas where they will be exposed to acids, chlorine or sulfur gas, organic solvents, or ester type machine oils.

Do not install on equipment where metal particulate or dust is present.

General Cylinder Care

- Do not scratch or damage the barrel or guide shafts. They are bearing surfaces.
- Periodically clean cylinder barrel and external guide shafts.
- If shocks are used for the deceleration of the load they should be inspected on a regular basis to determine their effectiveness and general condition.
- Do not scratch or damage the barrel or guide shafts. They are bearing surfaces.
- Periodically clean cylinder barrel and external guide shafts.
- If shocks are used for the deceleration of the load they should be inspected on a regular basis to determine their effectiveness and general condition.

Application Considerations

- If the load is externally guided and the MC1 or MC2 Series is utilized a floating mounting bracket must be installed between the cylinder carriage and the externally guided carriage. It will compensate for any nonparallel alignment between them.
- To inch, jog, or stop a cylinder in a mid-position use a 3-position 5-function four-way valve. The middle position enables pressurization of both sides of the piston. This will allow positive hold on cylinder position.
- For proper cylinder selection the following must be known. The orientation of the cylinder, stroke length, operating pressure, velocity, and center of gravity of the load in respect to the carriage. This information is required to calculate dynamic moments and cushion capacity.
- In harsh environments consider a boot or bellows for added cylinder protection.
- Consider a slow start valve. Once the air is exhausted from the machine system vertically mounted cylinders may drift down. Returning air to the system may cause damage to the cylinder or tooling due to the fact there is no pressure in the cylinder for the flow control to meter. This condition may exceed the internal cushion, shock capacity, or magnet coupling force of the cylinder.
- Position sensing can be achieved by incorporating the Numatics end of stroke inductive proximity switch or the rail mounted magnetic switch. Rail mounting enables sensing along the entire stroke length.
- Guided units, MC3, MC4, and MC5 Series should always incorporate a shock at both ends. If you are using the adjustable stroke kit a shock must be mounted into the hole provided.

numatics®

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