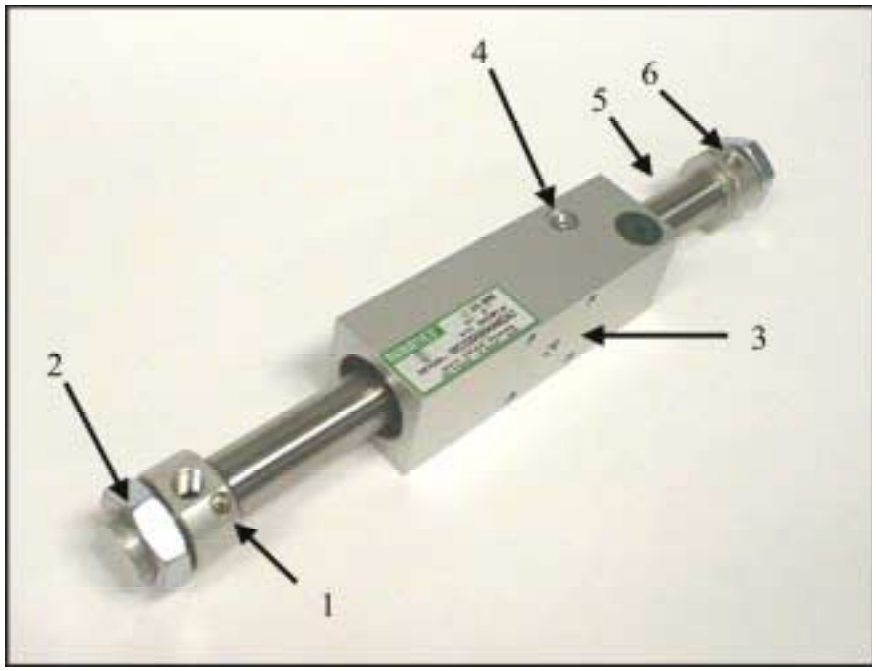

# *MCR General Care and Operation Manual*

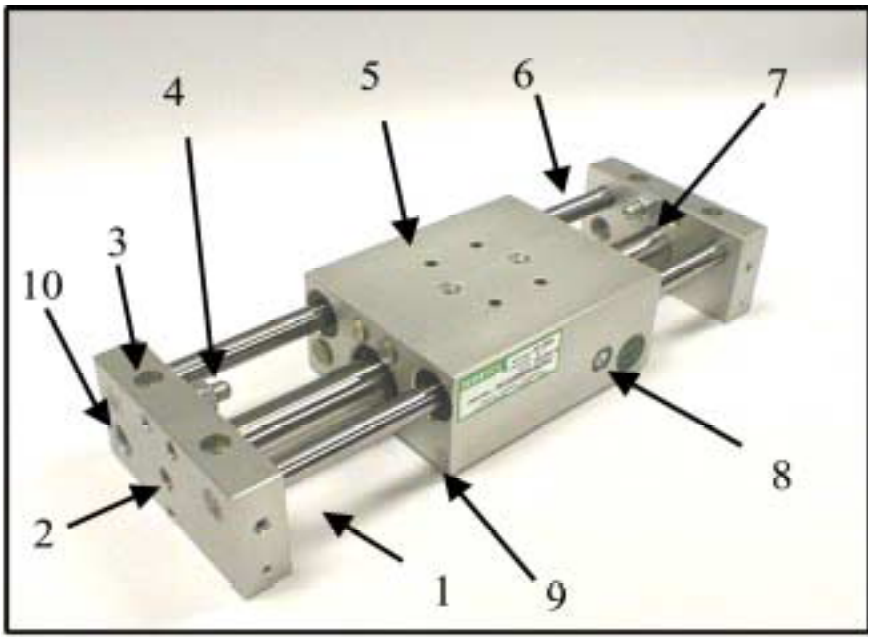
## MC1 and MC2

## MC3 to MC5




**MC1 and MC2**

1. End cap with adjustable cushion (except 12 bore)
2. Jam nut for mounting
3. Mounting surface for cylinder application
4. Grease fitting for carriage lubrication
5. Stainless steel tube
6. NPT port for air supply




**MC3 to MC5**

1. End plate with dowel pin groove, inductive proximity switch mounting location, and side mounting holes
2. NPT port for air supply
3. Holes to mount cylinder
4. Adjustable stop for stroke adjustment
5. Mounting surface for cylinder application
6. Linear guide rail
7. Stainless steel tube
8. Grease fitting for carriage lubrication
9. Magnet for stroke position sensing
10. Metric thread for shock absorber

## FUNCTION

The cylinder consists of a piston and a carriage, which are coupled together using rare earth magnets. When the cylinder is pressurized from one end, the piston will travel the length of the tube, which in turn moves the carriage. Pressurizing the other side the carriage will travel back the length of the tube.

## APPLICATIONS

1. 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.
2. 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.
3. 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.
4. In harsh environments consider a boot or bellows for added cylinder protection.
5. 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.
6. Position sensing can be achieved by incorporating the Numatics end of stroke inductive proximity switch (MC3 – MC5) or the rail mounted magnetic switch (ALL). Rail mounting enables sensing along the entire stroke length.
7. 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.

**NOTE:** For technical questions or application assistance, phone 519-452-1777

## CYLINDER CARE

1. Do not scratch or damage the barrel or guide shafts. They are bearing surfaces.
2. Periodically clean cylinder barrel and external guide shafts.
3. 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.

## SAFETY CONDITIONS

Please observe these general rules for safety and environment conditions, for the correct use of the product.

1. Maximum operating temperature must be between –20$^{o}$C to 60$^{o}$C (-4$^{o}$F to 140$^{o}$F).
2. Maximum operating pressure 7 bar (100 PSI).
3. Observe the limits for pressure, force, torque, mass, speed, and temperature.
4. Do not install on equipment where metal particulate can damage the cylinder barrel.
5. Ensure that the compressed air is filtered and regulated.
6. 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.

## SERVICE OR REPAIR

Numatics recommends that the factory or your local Numatics Distributor perform repairs of any MCR Series.

### Eliminating faults

| Problem | Possible cause | Possible solution |
|---|---|---|
| Jerky movement of carriage | 1. Lack of lubrication.<br>2. Flow control incorrectly fitted.<br>3. Cylinder barrel dirty.<br>4. Cylinder barrel damaged. | 1. Lubricate<br>2. If possible use meter out circuit<br>3. Contact NUMATICS |
| Carriage does not complete stroke | 1. Adjustable cushion is closed | Open up cushion screw |
| | 2. Magnetic coupling has become decoupled | Recouple: refer to recoupling section |

## Recoupling

If the cylinder becomes uncoupled it will have to be manually recoupled. The system will have to be shut off and depressurized. Stroke the carriage to the end of stroke where the piston rests. You will feel resistance once you are in this position. Depending on the size of the cylinder bore; you will have to exert a force on the carriage to break the magnet coupling force. You will have to break the force twice, the second requiring more force than the first, before the unit is properly orientated. If the unit is a guided unit (MC3 – MC5), the positive stop will need to be backed off in order to recouple the cylinder. To test if the cylinder is properly coupled, stroke the carriage to both end positions and if the distance is the same on both end positions, the cylinder is coupled properly. If it is not, repeat the steps above until it is properly coupled.

## Lubrication

All internal components have been lubricated upon assembly. The Numatics MCR series cylinder 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 are equipped with a lubrication fitting and have been lubricated during assembly. The mating grease coupler is a Type D, DIN 3405 (cup style) nipple, part number **113-073**. Additional grease is recommended every 120 miles of linear travel, type EP-2. Over filling the carriage with grease will reduce the effectiveness of the tube wiper.

## INSTALLATION

After removing the cylinder from the packaging, an initial inspection of the cylinder should be done to detect any damage that may have occurred during shipping and to ensure that you received the cylinder applicable to your application. Care must be practiced when handling as not to damage the tube or guide rails. When installing your MCR series cylinder, several precautions should be observed to ensure proper operation.

- The cylinder mounting should allow room for installing flow controls to the air ports and for adjusting the cushions if applicable.
- The grease fitting must be accessible for future lubrication.
- The tube should not bend or distort before the load is applied. Ensure that the mounting holes are within the overall tolerance.
- When the cylinder is completely installed the flow controls and cushions should be slightly opened and the system should be pressurized slowly. Please ensure that there are no objects in the path of the carriage and that adjustments for the velocity and cushioning should be done when the cylinder is not cycling.

The charts on the following page must be referenced when there is a load applied to your unit. Never exceed the maximum values illustrated or the cylinder life will decrease and or possible injury may occur to you or others.

### MC1 and MC2

| Cylinder Bore (mm) | Max. load W (Lbs.) | Axial moment M2 (in.-lbs.) | Coupling force MC1 (lbs.) | Coupling force MC2 (lbs.) | Effective Force at 7 bar/100psi N (lbf) | Port connection |
|---|---|---|---|---|---|---|
| **12** | 8 | 9.2 | 110 (25) | 80 (18) | 77.8 (17.5) | 10-32 |
| **16** | 12 | 20.5 | 178 (40) | 120 (27) | 138.8 (31.2) | 10-32 |
| **20** | 19 | 34.1 | 333 (75) | 195 (44) | 216.7 (48.7) | 1/8 NPT |
| **25** | 27 | 55.1 | 485 (110) | 335 (80) | 338.6 (76.1) | 1/8 NPT |
| **32** | 37 | 84.2 | 778 (175) | 467 (105) | 554.9 (124.7) | 1/8 NPT |
| **40** | 47 | 127.7 | 1050 (236) | 667 (150) | 866.8 (194.8) | 1/4 NPT |

### MC3 to MC5

| Cylinder Bore (mm) | Max. load W (Lbs.) | Axial moment M2 (in.-lbs.) | Radial moment M3 (in.-lbs.) | Cross moment M4 (in.-lbs.) | Coupling force (lbs.) | Effective Force at 7 bar/100psi N (lbf) | Port connection |
|---|---|---|---|---|---|---|---|
| **12** | 11.0 | 8.2 | 1.4 | 8.2 | 110 (25) | 77.8 (17.5) | 10-32 |
| **16** | 15.4 | 17.8 | 3.0 | 17.8 | 178 (40) | 138.8 (31.2) | 10-32 |
| **20** | 45.0 | 53.5 | 8.9 | 53.5 | 333 (75) | 216.7 (48.7) | 1/8 NPT |
| **25** | 54.0 | 112.7 | 18.8 | 112.7 | 485 (110) | 338.6 (76.1) | 1/8 NPT |
| **32** | 89.0 | 188.0 | 31.3 | 188.0 | 778 (175) | 554.9 (124.7) | 1/8 NPT |
| **40** | 126.0 | 271.0 | 45.2 | 271.0 | 1050 (236) | 866.8 (194.8) | 1/4 NPT |

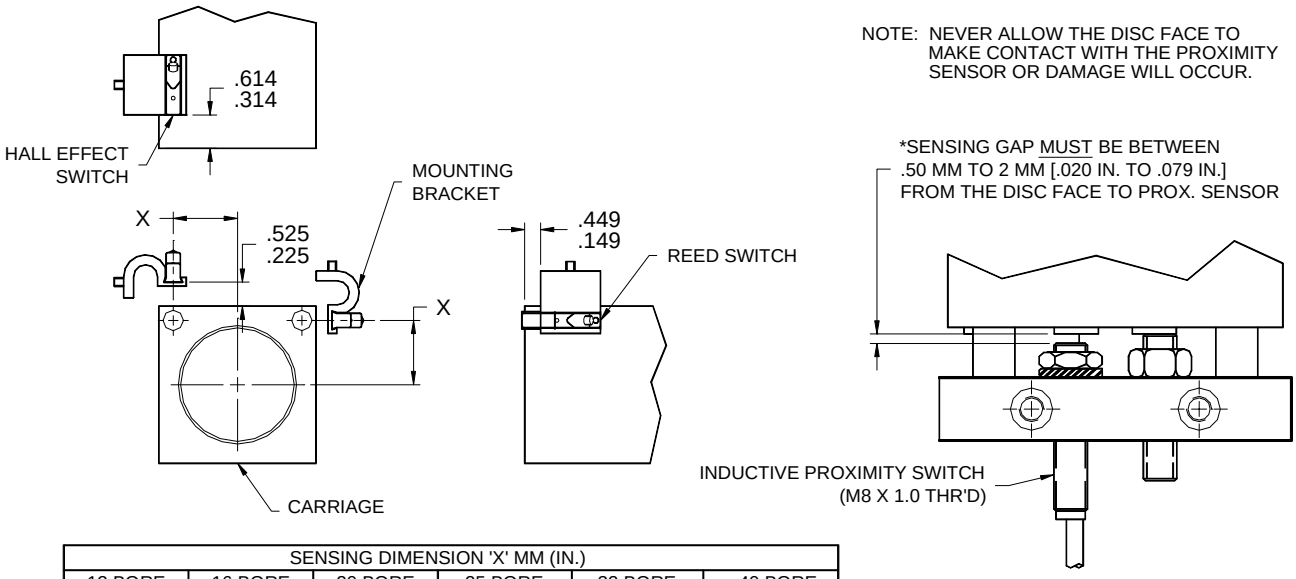
Once the cylinder has been through the initial setup apply the working load and perform a test run, checking for proper velocity and cushioning once again ensuring there are no objects in the path of the carriage.

## Shock absorbers

It is recommended that the guided unit be equipped with shock absorbers unless small loads and moments are experienced with lower operating velocities. There are specified shocks for each bore size and the catalogue should be consulted when shocks are required.

## Sensing position

Each cylinder has a sensing magnet built into the carriage. The following graphic illustrates where the proximity sensor should be located.




| SENSING DIMENSION 'X' MM (IN.) | | | | | |
|---|---|---|---|---|---|
| 12 BORE | 16 BORE | 20 BORE | 25 BORE | 32 BORE | 40 BORE |
| 5.4 (.212) TO 15.5 (.612) | 8.4 (.330) TO 18.5 (.730) | 11.4 (.449) TO 21.6 (.849) | 15.4 (.606) TO 25.6 (1.006) | 20.1 (.792) TO 30.3 (1.192) | 27.5 (1.084) TO 31.9 (1.284) |

* The Inductive sensor is mounted during assembly. If adjusting is desired, the sensing gap distance must be maintained. Failure to respect these parameters will result in damage to the proximity sensor or loss of end of stroke sensing.

## Accessories

Please consult the catalogue for all accessories available to the MCR series cylinders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