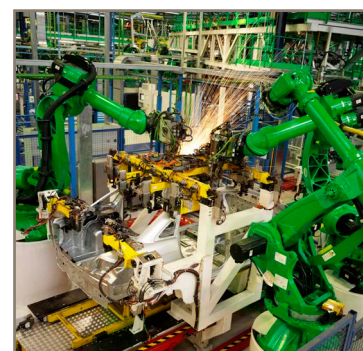


4MAP Safety Certified Rod Lock for 4MA Cylinder

Bulletin 0900-B12



ENGINEERING YOUR SUCCESS.

4MAP Rod Lock

The Parker 4MA cylinder now offers enhanced safety on machine with the introduction of the patented safety-certified 4MAP rod lock. The rod lock is available for 1.50" to 8.00" bore 4MA cylinders.

The 4MAP is a spring-engaged, air-released (or manual release) locking device to hold the 4MA cylinder piston rod during a power off or e-stop condition. It is suitable for use in applications up to Category 4 PLe.



Why Use a Rod Locking Device

Rod locks are important devices that help prevent unexpected movement of pneumatic machinery (usually during energization/de-energization of the circuit). Machinery Directives mandate the removal of trapped energy during a stop condition. This is not always possible given that energy can be maintained to hold a load in place. In the event energy is entrained, the rod-lock acts as a secondary means of stopping, blocking, or holding a load securely as required by Machinery Directives.

Why Choose a Safety Certified Rod Locking Device

Purchasing a safety rated rod lock ensures it is designed, tested, and conforms to the requirements of the necessary Category and Performance Level of the application. The safety rating (Intertek Cert # FS-CRT-0007) ensures the 4MAP meets all requirements such as redundancy where necessary, monitoring of engagement and disengagement while ensuring the components offer the endurance life, MTTFd and overall reliability required for different risk levels from Category B up to Category 4.

| SINGLE CHANNEL ARCHITECTURE | | | TWO CHANNEL ARCHITECTURE | |
|--|-----------------------------------|---|---|--------------------|
| (Category B, 1 and 2) require one 4MAP locking device on the cylinder. | | | (Category 3 and 4) are redundant for enhanced safety. These Categories require the use of two 4MAP locking devices which are mounted in tandem. | |
| (Category 2) applications require one sensor to meet the monitoring requirements of Category 2 | | | (Category 3) requires one sensor for each locking device | |
| | | | (Category 4) requires two sensors for each locking device which are required for redundant feedback of each lock. | |
| SINGLE CHANNEL ARCHITECTURE | | | TWO CHANNEL ARCHITECTURE | |
| Cat B | Cat 1 | Cat 2 | Cat 3 | Cat 4 |
| PL _a , PL _b | PL _b , PL _c | PL _a , PL _b , PL _c , PL _d | PL _a , PL _b , PL _c , PL _d | PL _e |
| 1 Lock | | 1 Lock | 2 Locks | 2 Locks |
| No Sensor | | 1 Sensor | 1 Sensor Per Lock | 2 Sensors Per Lock |

Table 1: Determination of the required Category is the responsibility of the machine designer in compliance with EN ISO 13849-1 / EN ISO 12100.

Features and Benefits



Safety Compliance is easy when your rod locking device is pre-tested by the manufacturer and third party certified by Intertek for global markets. 4MAP complies with the global requirements of the Machinery Directives EN ISO 13849-1:2015 as an e-stop suitable device.

Release of the lock can be done in two ways. A minimum 60 psi/4 bar (up to 120 psi/ 8 bar) pressure will release the locking mechanism. A manual release is also possible via a cam actuated lever which can be disengaged via a standard size hex head requiring no special tools.

Operating Mode Sensors are supplied where required to fulfill safe function. These sensors also maximize machine safety and efficiency by assisting with accurate linear positioning, predictive maintenance, and operational feedback. They can be set up as engagement or disengagement for either redundant or individual states. Sensors are offered in PNP (Sourcing) or NPN (Sinking).

Local Manufacturing of both the 4MA cylinder and the 4MAP rod lock ensure seamless delivery.

Highly Durable Design - 4MAP is a sealed, corrosion resistant locking device made of anodized aluminum and is IP67 ingress protected.

High Holding Forces yield a high degree of safety when required. Higher categories requiring redundant tandem locking devices will achieve double the lock holding force. Fast engagement time ensures a safe state quickly.

| ROD LOCK HOLDING FORCE | | | | |
|------------------------|---------------------------------|--|--|------------------------------|
| 4MA Bore (Inches) | 4MA Rod Diameter (Inches) | Single Lock Holding Force (Pounds) | Double Lock Holding Force (Pounds) | Engagement Time (Seconds) |
| 1.5 | 5/8 | 180 | 360 | 0.030 |
| 2.00 | 5/8 | 314 | 628 | 0.040 |
| 2.00 | 1 | 250 | 500 | 0.040 |
| 2.50 | 5/8 | 491 | 982 | 0.045 |
| 2.50 | 1 | 491 | 982 | 0.050 |
| 3.25 | 1 | 830 | 1660 | 0.070 |
| 3.25 | 1 3/8 | 830 | 1660 | 0.060 |
| 4.00 | 1 | 1256 | 2512 | 0.100 |
| 4.00 | 1 3/8 | 1256 | 2512 | 0.100 |
| 5.00 | 1 | 1963 | 3926 | 0.150 |
| 5.00 | 1 3/8 | 1963 | 3926 | 0.130 |

Table 2: Determination of the required Category is the responsibility of the machine designer in compliance with EN ISO 13849-1 / EN ISO 12100. Contact factory for 6" and 8" bore holding forces.

Note – Control systems should be designed to utilize the 4MAP in static conditions.

E-stops performed with rod locks (dynamic braking) should be limited, as the rod lock and shaft friction may result in surface wear from energy dissipated. This will result in reduced locking performance after each stop and will derate the anticipated service life of the locking assembly and rod finish, thereby voiding the factory warranty.

Technical Specifications Locking Device

| | CAT B | | CAT 1 | | CAT 2 | | | | | | CAT 3 | | | | CAT 4 | | |
|--|--|-----------|-----------|-----------|------------|---|------------|------------|------------|----------------|------------|------------|------------|------------|------------|------------|-----------|
| Performance Level | a | b | b | c | a | b | | c | | d | | a | b | c | d | | e |
| If DC is: | None <60% | None <60% | None <60% | None <60% | Low 60-90% | Low 60-90% | Med 90-99% | Low 60-90% | Med 60-90% | Low 60-90% | Med 90-99% | Low 60-90% | Low 60-90% | Med 90-99% | Low 60-90% | Med 90-99% | High >99% |
| MTTF _D (years) | 3.1 | 13 | 31 | 40 | 3.1 | 8 | 6 | 23 | 17 | 63 | 37 | 3.1 | 4 | 6 | 25 | 14 | 31 |
| Maximum Average Cycle Rate (sec/cycle) | 2.3 | 9.7 | 23.2 | 30 | 2.3 | 6 | 4.5 | 17.2 | 12.7 | 47.2 | 27.7 | 2.3 | 3 | 4.5 | 18.7 | 10.5 | 23.2 |
| Max Operating Time (years) | .3 | 1.3 | 3.1 | 4 | .3 | .8 | .6 | 2.3 | 1.7 | 6.3 | 3.7 | .3 | .4 | .6 | 2.5 | 1.4 | 3.1 |
| Cycle Life B10 _D 4MA | Consult Factory | | | | | | | | | | | | | | | | |
| Cycle Life B10 _D 4MAP | 2 Million Engagement Cycles (Static) | | | | | | | | | | | | | | | | |
| CCF | 75% | | | | | | | | | | | | | | | | |
| Ambient Temp | 4.5°C – 65.5°C (40°F to 150°F) | | | | | | | | | | | | | | | | |
| Filtration | 40 micron, dry filtered air | | | | | | | | | | | | | | | | |
| Suitable For | Up to Category 4, PLe / SIL 3 applications | | | | | | | | | | | | | | | | |
| Certified By | Intertek FS-CRT-0007 | | | | | | | | | | | | | | | | |
| Certified To | 2006/42/EC Machinery Directive / EN ISO 13849-1, CE Requirements, RoHS Compliant | | | | | | | | | | | | | | | | |
| Ingress Rating | IP67 | | | | | | | | | | | | | | | | |
| DC | DC is dependent on brake redundancy and sensor setup | | | | | | | | | | | | | | | | |
| If DC is 0% | If DC is 60% | | | | | If DC is 90% | | | | If DC is 99% | | | | | | | |
| No sensor Feedback is necessary | Feedback sensor shall be used to monitor the operating mode of the brake. | | | | | Feedback sensor shall be used to monitor the operating mode of the brake. The brake must be cycled (engaged and disengaged) at least this often to check for brake functionality: | | | | | | | | | | | |
| | | | | | | Every 3 months | | | | Once every day | | | | | | | |

Table 3: Determination of the required Category is the responsibility of the machine designer in compliance with EN ISO 13849-1 / EN ISO 12100

Operating Mode Sensor

| | |
|----------------------------|--|
| Sensor Type | Magneto-resistive |
| Supply Voltage | 10 to 30 V DC |
| Operational Current | < 150 mA |
| Switching Type | Normally Open (PNP or NPN Available) |
| Ambient Temperature | -25 to 70°C (-13 to +158°F) |
| Switching Status Indicator | LED, Yellow |
| Cable Length | 7 meters (22.9 feet) |
| Protection Class | IP68 |
| Circuit Protection | Short circuit, wire breakage, Reverse Polairty |

The Operating Mode Sensor(s) can be used to signal Engagement or Disengagement of the rod lock on the shaft. In an effort to give the system manufacturer the most versatility, the Operating Mode Sensors can be setup as Engagement or Disengagement and either redundant or individual states. All Safety Rod Locks can come equipped with two sensor slots. The sensors, ordered separately, are available in both PNP and NPN modes.

Disengagement Sensor: Sensor is activated when the rated air pressure is applied and the piston moves to a disengagement position.

Engagement Sensor: Sensor is activated when the piston moves out of the disengaged position into a position in which the clamp collar constricts on the rod.

Cylinder Mounting with Rod Lock

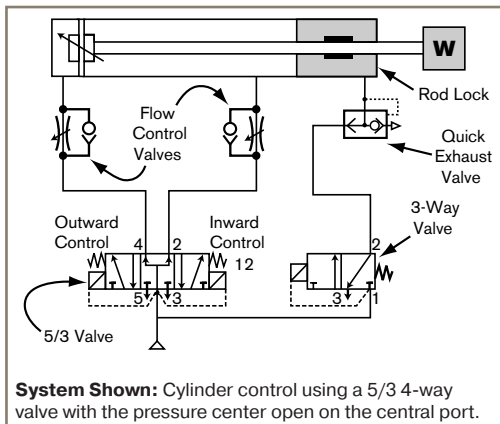
Design the control system to use the Rod Lock in static conditions.

Cylinder functioning is regulated by a 5/3 (5 ported, 4-way, 3 [center] position) valve (use cylinder manufacturers' recommended Cv valves), center open on the central port and supplied by exhaust ports.

NOTE: Do not use a valve with a closed center. This will cause an imbalance in the piston if any of the circuits leak.

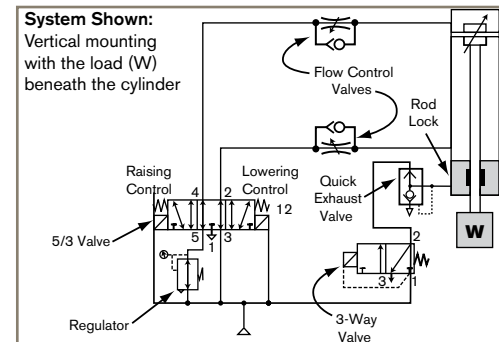
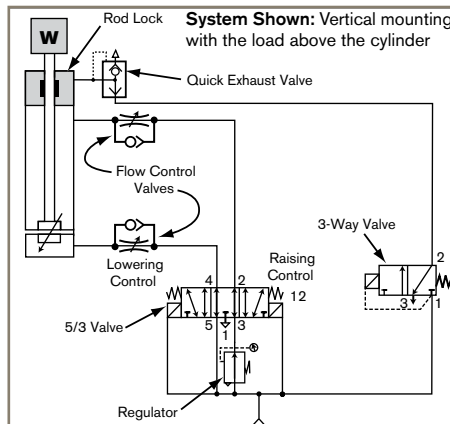
Horizontal Mounting

Pressure is maintained on both sides of the cylinder piston, keeping it balanced and preventing rod displacement upon release.



Vertical Mounting

The force on the piston must not exceed its locking capacity when it is combined with the force of the load. The use of a 5/3 (5 ported, 4-way, 3 [center] position) valve provides a braking effect and maintains accurate rod positioning. Stopping precision is determined by the rate of speed of the rod and loads in motion.



One-directional flow reducers can be used to control the speed of the cylinder rod. To ensure fast braking of the rod, a quick exhaust valve can be installed on or near the rod lock.

A normally closed (NC) 3-way solenoid valve directs air supply to the rod lock, keeping it disengaged until the electrical signal is interrupted.

NOTE: Avoid repeated overlapping conditions when programming the Rod Lock into your system. (i.e.: forced motion during engagement or disengagement of the Rod Lock.) Shaft and/or collar wear will result.

How to Order

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|------------------------------------|-------------------|-------------|--|---|--|---|---|---|--|---|---|--|--|--|---|-------------------------------------|--|---|--|--|---------------------------|------------------|--|--------------------------|---|--|--|-------------------------|----------|------------------------------------|--|--|----------------------|---|
| 2.00 | C | J | 4MAP | U | 1 | 4 | A | C | 6.000 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;">Bore Size</td></tr> <tr><td>1.50 ¹</td></tr> <tr><td>2.00</td></tr> <tr><td>2.50</td></tr> <tr><td>3.25</td></tr> <tr><td>4.00</td></tr> <tr><td>5.00</td></tr> <tr><td>6.00 ¹¹</td></tr> <tr><td>8.00 ¹¹</td></tr> </table> | Bore Size | 1.50 ¹ | 2.00 | 2.50 | 3.25 | 4.00 | 5.00 | 6.00 ¹¹ | 8.00 ¹¹ | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;">Double Rod Cylinder</td></tr> <tr><td>Specify "K" only if double rod cylinder is required.</td></tr> </table> | Double Rod Cylinder | Specify "K" only if double rod cylinder is required. | | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;">Series</td></tr> <tr> <td style="width: 50%; text-align: center;">4MAP</td> <td style="width: 50%;">4MA Rod Lock Cylinder</td> </tr> </table> | Series | 4MAP | 4MA Rod Lock Cylinder | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;">Ports ⁴</td></tr> <tr><td>U NPTF</td></tr> <tr><td>R BSPP</td></tr> <tr><td>B BSPT</td></tr> <tr><td>T SAE</td></tr> </table> | Ports ⁴ | U NPTF | R BSPP | B BSPT | T SAE | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;">Piston Rod Number</td></tr> <tr><td>Specify rod code number for required diameter. ⁸</td></tr> </table> | Piston Rod Number | Specify rod code number for required diameter. ⁸ | | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;">Cushion Head End</td></tr> <tr> <td style="width: 50%; text-align: center;">C</td> <td style="width: 50%;">Cushioned Head End "C" Is Required</td> </tr> </table> | Cushion Head End | C | Cushioned Head End "C" Is Required | | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;">Stroke Length</td></tr> <tr><td>Specify stroke length required in inches. ¹⁰</td></tr> </table> | Stroke Length | Specify stroke length required in inches. ¹⁰ |
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| 2.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.50 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.00 ¹¹ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8.00 ¹¹ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 4MAP | 4MA Rod Lock Cylinder | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Ports ⁴ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U NPTF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R BSPP | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B BSPT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T SAE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Specify rod code number for required diameter. ⁸ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cushion Head End | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Z* Extruded Body, Round Lobe Orientation Rotated 270 Degrees from Standard | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| T Aluminum Round Tube and Carbon Steel Tie Rods & Nuts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Seals | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Y 17-4 PH Stainless Steel Rod and Standard Gland | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Z 17-4 PH Stainless Steel Rod and HI LOAD Gland | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="text-align: center;">Piston Type ¹¹</td></tr> <tr><td>2 Lipseals, No Magnetic Ring</td></tr> <tr><td>3 Lipseals and Magnetic Ring (standard for 4ML)</td></tr> <tr><td>4 Bumper Seals, No Magnetic Ring</td></tr> <tr><td>6 Bumper Seals and Magnetic Ring</td></tr> <tr><td>B Lipseals, 1/4" Thick Bumpers Both Ends ³</td></tr> <tr><td>H Lipseals, 1/4" Thick Bumper Head End ³</td></tr> <tr><td>C Lipseals, 1/4" Thick Bumper Cap End ³</td></tr> <tr><td>D Lipseals and Magnetic Ring, 1/4" Thick Bumpers Both Ends ³</td></tr> <tr><td>F Lipseals and Magnetic Ring, 1/4" Thick Bumper Head End ³</td></tr> <tr><td>R Lipseals and Magnetic Ring, 1/4" Thick Bumper Cap End ³</td></tr> </table> | | | | Piston Type ¹¹ | 2 Lipseals, No Magnetic Ring | 3 Lipseals and Magnetic Ring (standard for 4ML) | 4 Bumper Seals, No Magnetic Ring | 6 Bumper Seals and Magnetic Ring | B Lipseals, 1/4" Thick Bumpers Both Ends ³ | H Lipseals, 1/4" Thick Bumper Head End ³ | C Lipseals, 1/4" Thick Bumper Cap End ³ | D Lipseals and Magnetic Ring, 1/4" Thick Bumpers Both Ends ³ | F Lipseals and Magnetic Ring, 1/4" Thick Bumper Head End ³ | R Lipseals and Magnetic Ring, 1/4" Thick Bumper Cap End ³ | <p><small>* Please reference table on page B5. Only applies to 1-1/2" to 4" bore.</small></p> <p><small>¹ Not available with 1" rod diameter (rod number 2) for 1-1/2" bore. Not available with Linear Position Sensor Option (LPSO).</small></p> <p><small>³ Addition of 1/4" bumper results in a 1/4" stroke loss per bumper, per end. For example, a 6" stroke cylinder with 1/4" bumpers at both ends (option B) has an effective stroke of 5-1/2".</small></p> <p><small>⁴ Port thread styles only for base cylinder. Rod lock port is always NPTF. If a different rod lock port thread style is required, place an "S" for special in the Special Modification field and indicate the desired rod lock port thread style in the item notes.</small></p> <p><small>⁵ Fluorocarbon seals for 4MAP are only for external chemical compatibility applications, not high temperature.</small></p> <p><small>⁶ Used for external chemical compatibility applications, not high temperature.</small></p> <p><small>⁷ For Linear Position Sensor Option (LPSO), please include the following information for the Special Modification item notes:</small></p> <p style="margin-left: 20px;"><small>a. Sensor part number (please reference pages B72-B78)</small></p> <p style="margin-left: 20px;"><small>b. Sensor position</small></p> <p style="margin-left: 20px;"><small>c. Port position (if other than position 1)</small></p> <p style="margin-left: 20px;"><small>d. Length of stop tubing, gross stroke and net stroke (if required)</small></p> <p><small>Cylinder dimensions will approximate dimensions for 4MAP. Piston Type option (blank), 3, 6, D, F or R is required. Please consult the Pneumatic Division for additional information.</small></p> <p><small>⁸ Review Piston Rod Selection Chart, please reference page A14 to determine proper piston rod diameter.</small></p> <p><small>⁹ For additional information regarding this style, please reference page B79. If non-standard Rod Material and Gland Code is required with this option, please place an "S" for special in Special Modification field and specify Rod Material and Gland Code in the item notes.</small></p> <p><small>¹⁰ If a stop tube is required, specify gross stroke (net stroke + stop tube) in the model number, then place an "S" for special in the Special Modification field and specify the stop tube length in the item notes. Not available with Piston Types (blank) and 1 for 1-1/2" - 5" bore cylinders.</small></p> <p><small>¹¹ 6"-8" bore 4MAP can accept only Piston Types (blank) and 3. The (blank) piston for 6"-8" bores is aluminum, lipseals, no magnetic ring.</small></p> | | | | | | | | | | | | | | | | | | | | |
| Piston Type ¹¹ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 Lipseals, No Magnetic Ring | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 Lipseals and Magnetic Ring (standard for 4ML) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 Bumper Seals, No Magnetic Ring | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 Bumper Seals and Magnetic Ring | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| B Lipseals, 1/4" Thick Bumpers Both Ends ³ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| H Lipseals, 1/4" Thick Bumper Head End ³ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C Lipseals, 1/4" Thick Bumper Cap End ³ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| D Lipseals and Magnetic Ring, 1/4" Thick Bumpers Both Ends ³ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| F Lipseals and Magnetic Ring, 1/4" Thick Bumper Head End ³ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| R Lipseals and Magnetic Ring, 1/4" Thick Bumper Cap End ³ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Parker Part Number | Description |
|--------------------|-----------------------|
| 966190 | 4MAP RL Sensor NPN NO |
| 966195 | 4MAP RL Sensor PNP NO |

Factory recommended sensors **must be used** to achieve safety certification.

