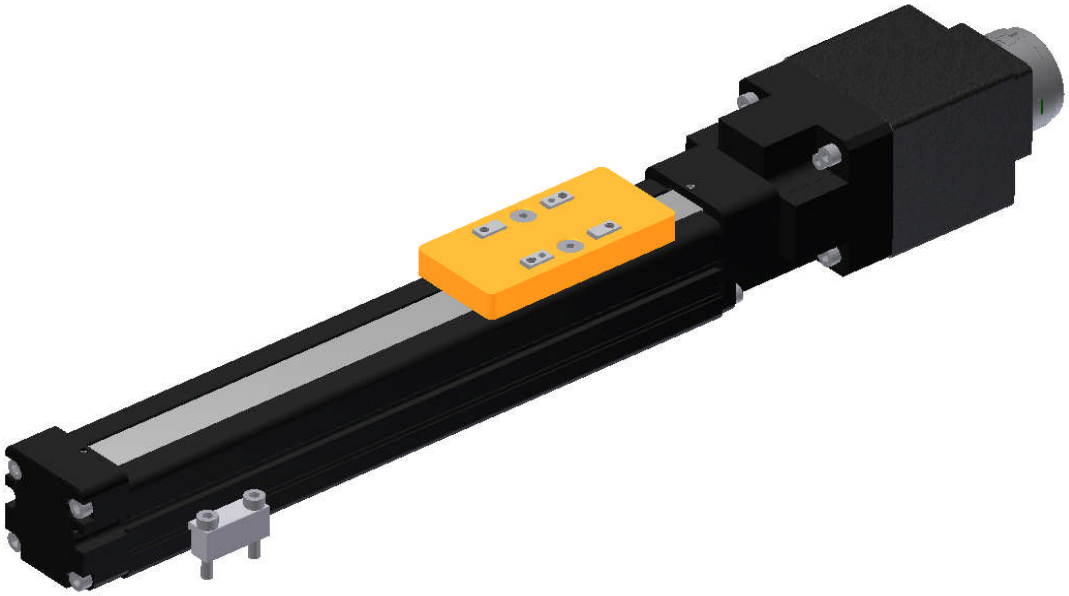
# LCR Series Positioners

Light Capacity Rodless
Miniature Linear Positioners

**MANUAL NO. 102-4109-01**
**REV 1**
**EFFECTIVE : MAY-15-11**
**SUPERCEDES :**



Parker

# Important User Information

**WARNING**

**FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.**

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The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.



Since Parker Hannifin Corporation, Electromechanical Automation-Parker constantly strives to improve all of its products, we reserve the right to change this product manual and equipment mentioned therein at any time without notice.

For assistance contact:
Parker Hannifin Corporation
Electro Mechanical Division
1140 Sandy Hill Road
Irwin , PA 15642

Ph 724-861-8200
800-245-6903
E-mail : ddlcat@parker.com
www.parkermotion.com

# LCR22/LC30 Series Product Manual
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## REVISON NOTES

REV 1 INITIAL RELEASE 5-15-11



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# Chapter 1 - Introduction

## Product Description

***LCR Positioner***

Thank you for your interest in the Light Capacity Rodless (LCR) series miniature actuators. The LCR is designed for maximum flexibility to deliver the most value for the customer. The LCR is ideal for Maldiplate, Titer tray, and slide automation , as well as any light weight payload. The “off the shelf” product will significantly reduce design , procurement, inspection, and handling time; in turn bringing your product to market faster. The following user guide will direct you in any needed maintenance items and basic features of the LCR series. If you have any questions or challenges please call our factory support team at 800-245-6903.

## Unpacking

**Unpacking**

Carefully remove the positioner from the shipping container and inspect the unit for any evidence of shipping damage. Report any damage immediately to your local authorized distributor. Please save the shipping container for damage inspection or future transportation.

Incorrect handling of the positioner may adversely affect the performance of the unit in its application. Please observe the following guidelines for handling and mounting of your new positioner.

DO NOT allow the positioner to drop onto the mounting surface. Dropping the positioner can generate impact loads that may result in flat spots on bearing surfaces or misalignment of drive components.

DO NOT drill holes into the positioner. Drilling holes into the positioner can generate particles and machining forces that may effect the operation of the positioner. Parker will drill holes if necessary; contact your local authorized distributor.

DO NOT subject the unit to impact loads such as hammering, riveting, etc. Impacts loads generated by hammering or riveting may result in flat spots on bearing surfaces or misalignment of drive components.

DO NOT lift the positioner by cables or cable management system. Lifting positioner by cables or cable management system may effect electrical connections and/or cable management assembly. The unit should be lifted by the base structure only.

# Return Information

Returns

All returns must reference a "*R*eturn *M*aterial *A*uthorization" *(RMA)* number. Please call your local authorized distributor or Parker Customer Service Department at 800-245-6903 to obtain a "RMA" number.

# Repair Information

Out-of-Warranty Repair

Our Customer Service Department repairs Out-of-Warranty products. All returns must reference a "RMA" number. Please call your local authorized distributor or Parker Customer Service Department at 800-245-6903 to obtain a "RMA" number. You will be notified of any cost prior to making the repair.

# Warnings and Precautions

**Hot Surfaces**

DO NOT touch rotary motor coils located on the MX45S after high duty operation. Motor temperature may approach 60°C. The unit itself may become warm or hot to the touch.

**Electrical Shock**

DO NOT take apart or touch any internal components of the positioner while unit is plugged into an electrical outlet. SHUT OFF power before replacing components to avoid electrical shock.

**Pinch Points**

Unit may have a pinch point because the top extends over the base of the table. Proper care should be exercised.

**Vertical Operation**

Depending upon your load and screw selection the carriage and load may 'backdrive' in power loss situations potentially causing product damage or personal injury.

**General Safety**

Sometimes positioners move without warning, keep all personnel away from dynamic travel range of positioner.

**Strain Relieve Electrical Components**

All electrical components (such as motor, encoders and limit/home switches) must be strain relieved. Failure to strain relieve electrical wires or cables may result in component failure and/or possible personal injury.

**Moving Cables**

If the LCR cables are to be moving. The use of high flex cabling to insure long life is recommended.

# Specification Conditions

## Specifications Are Temperature Dependent

Catalog specifications are obtained and measured at 20 Degrees C. Specifications at any other temperature may deviate from catalog specifications. Minimum to maximum continuous operating temperature range (with NO guarantee of any specification except motion) of a standard unit before failure is 5 - 40 degrees C.

## Specifications Are Mounting Surface Dependent

Catalog specifications are obtained and measured when the positioner is fully supported, bolted down, and is mounted to a work surface that has a maximum flatness error of:

0.001mm/300mm (0.00004”/ft)

Table will operate with work surface of 0.100mm/300mm flatness or worse, but performance specifications will be significantly effected.

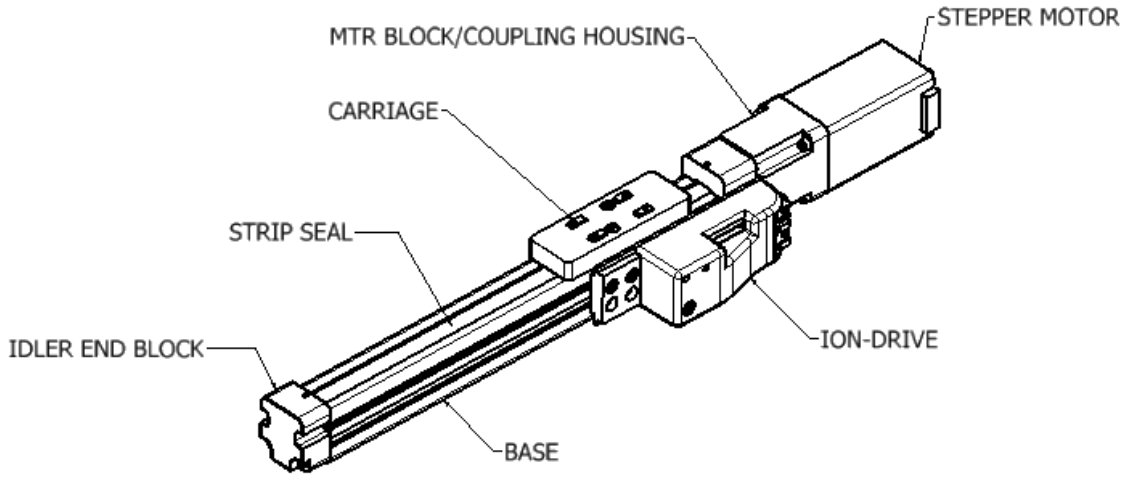
## Specifications Are Point of Measurement Dependent

Catalog specifications and specifications in this manual are measured from the center of the carriage, 38 mm above the carriage surface. All measurements taken at any other location may deviate from these values.

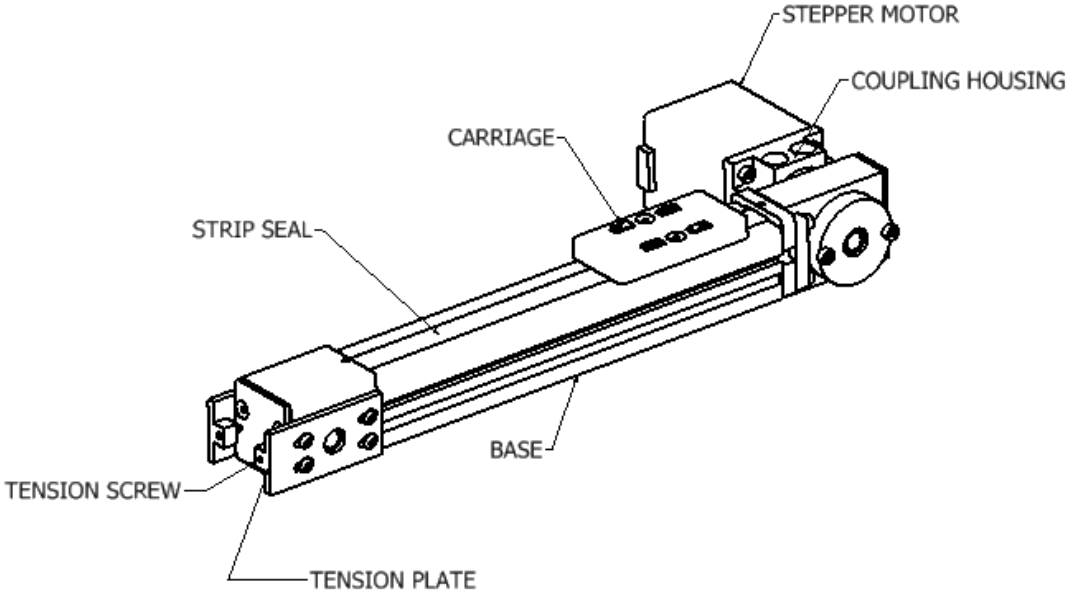
## Specifications Are Load Mounting Dependent

Catalog specifications are obtained and measured when the customer load is fixed to the carriage mounting surface(s) and has a flatness of equal to or less than 0.0025mm (0.0001”). The table will operate with customer load surface greater than 0.0025mm (0.0001”) flatness, but performance specifications will be significantly effected.

## SCREW DRIVE




## BELT DRIVE



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# Chapter 2 - LCR Specifications

**Order Example:**

| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ |
|---|---|---|---|---|---|---|---|---|
| LCR | 22 | LNP5 | 75 | S | S | M08E0 | L0 | A0 |

**① Series**

| | |
|---|---|
| **LCR** | Series |

**② Size (width in mm)**

| | |
|---|---|
| **22** | 22 mm wide profile |
| **30** | 30 mm wide profile |

**③ Drive Train**

| | |
|---|---|
| **IDLR** | Idler unit; no drive mechanism |
| **LN02** | 2 mm leadscrew with in-line motor mount |
| **LN10** | 10 mm leadscrew with in-line motor mount (available with LCR30 size only) |
| **BLTL** | Single axis belt drive; motor left |
| **BLTR** | Single axis belt drive; motor right |

**④ Travel Length (mm)**

| | |
|---|---|
| **xx** | 25 mm increments of travel<br>LCR22 Screw-Driven: 25 to 150 mm<br>LCR30 Screw-Driven: 25 to 600 mm<br>LCR22 Belt-Driven: 25 to 500 mm<br>LCR30 Belt-Driven: 25 to 1000 mm |

**⑤ Bearing Type**

| | |
|---|---|
| **S** | Square rail bearing |
| **B** | Glider bushing bearing |

**⑥ Environmental Protection**

| | |
|---|---|
| **S** | Strip seal protection (standard) |

**⑦ Motor**

| | |
|---|---|
| **M11E0** | NEMA 11 stepper motor with no encoder [1] |
| **M11E1** | NEMA 11 stepper motor with 400 count encoder [1] |
| **M11E2** | NEMA 11 stepper motor with 500 count encoder [1] |
| **M17E0** | NEMA 17 stepper motor with no encoder [2] |
| **M17E1** | NEMA 17 stepper motor with 400 count encoder [2] |
| **M17E2** | NEMA 17 stepper motor with 500 count encoder [2] |
| **M23E0** | NEMA 23 stepper motor with no encoder [3] |
| **M23E1** | NEMA 23 stepper motor with 400 count encoder [3] |
| **M23E2** | NEMA 23 stepper motor with 500 count encoder [3] |
| **M16E1** | SM162AQ-FLCN motor mounted with smart encoder [2] |
| **M16E2** | SM162AE-FLCN motor mounted with 2000 count encoder [2] |
| **N00E0** | Idler version; no motor mount included |
| **N08E0** | NEMA 8 motor mount and coupling only; no motor [4] |
| **N11E0** | NEMA 11 motor mount and coupling only; no motor [1] |
| **N17E0** | NEMA 17 motor mount and coupling only; no motor |
| **N16E0** | SM16 motor mount and coupling only; no motor |
| **N23E0** | LV23 motor mount and coupling only; no motor [5] |

[1] Not available with BLTL/BLTR belt Drive Train options
[2] Not available with LCR22LN02 configuration
[3] Only compatible with the LCR30 BLTL & LCR30 BLTR drive options
[4] Only available with LCR22LN02 configuration
[5] Not available with LN02 Drive Train option

**⑧ Home and End-of-Travel Option**

| | |
|---|---|
| **L0** | No limit or home sensors |
| **L1** | 3 NPN Sensor (1 N.O.; 2 N.C.) |
| **L2** | 1 NPN Sensor (1 N.O.) |
| **L3** | 3 PNP Sensor (1 N.O.; 2 N.C.) |
| **L4** | 1 PNP Sensor (1 N.O.) |
| **L5** | 3 NPN Sensor (2 N.O.; 1 N.C.) |
| **L6** | 1 NPN Sensor (1 N.C.) |
| **L7** | 3 PNP Sensor (2 N.O.; 1 N.C.) |
| **L8** | 1 PNP Sensor (1 N.C.) |

**⑨ Amplifier Option**

| | |
|---|---|
| **A0** | No amplifier included |
| **A1** | Ion stepper drive/amplifier included (order cable set separately -- see page xx for cable part numbers) |
| **A2** | Ion stepper drive with 1 meter flying lead cable set |
| **A3** | ion stepper drive with 1 meter cable set to ACR controller |
| **A4** | ion stepper drive with 1 meter cable set to 6k controller |

For longer cable needs, please order the A1 option and order cables separately



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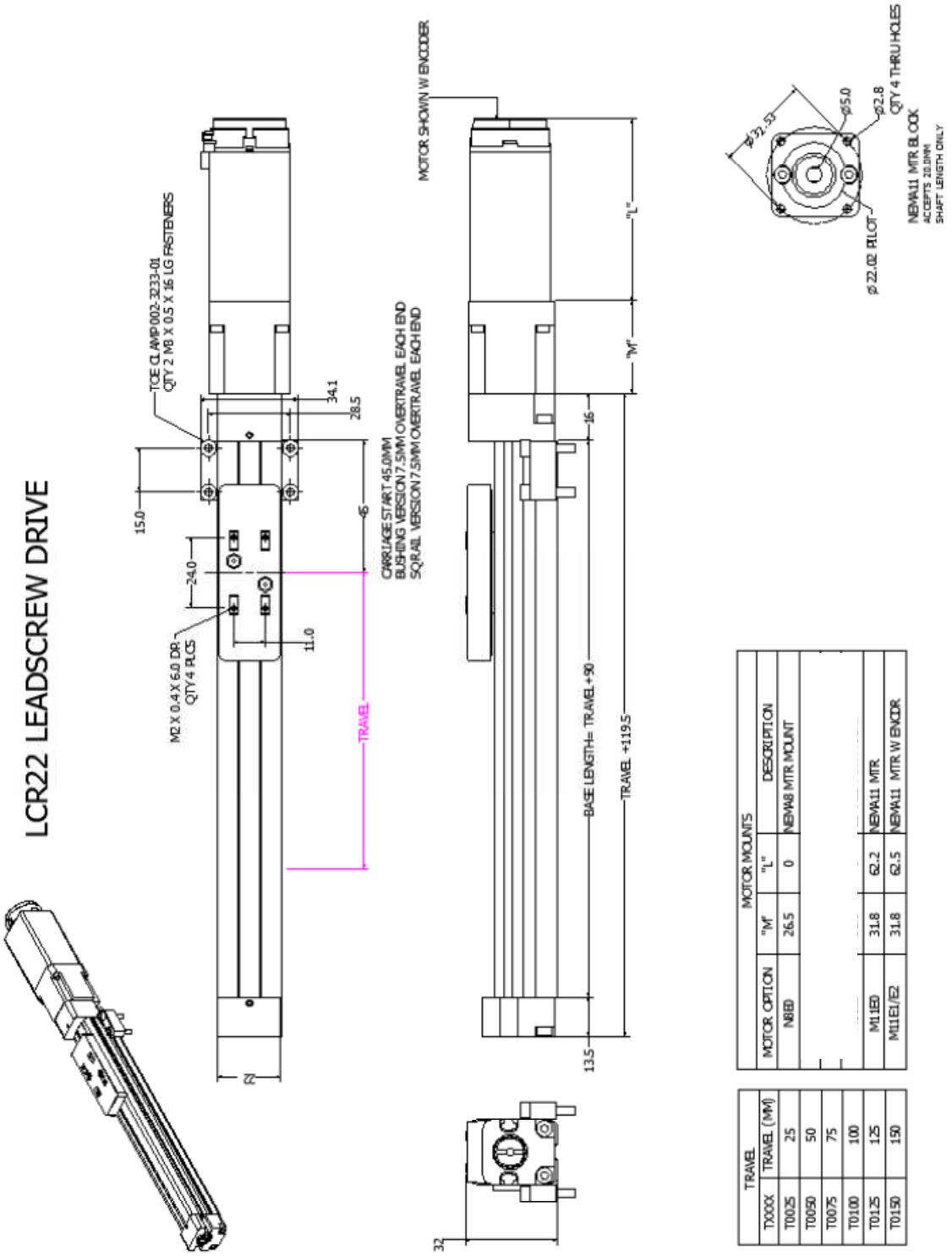
# Dimensional Drawings– LCR22 Leadscrew Drive




| MOTOR MOUNTS | | | |
|---|---|---|---|
| MOTOR OPTION | "M" | "L" | DESCRIPTION |
| N8B | 26.5 | 0 | NEMA8 MTR MOUNT |
| M11B | 31.8 | 62.2 | NEMA11 MTR |
| M11E1/E2 | 31.8 | 62.5 | NEMA11 MTR W ENCDR |

| TRAVEL | |
|---|---|
| TXXXX | TRAVEL (MM) |
| T0025 | 25 |
| T0050 | 50 |
| T0075 | 75 |
| T0100 | 100 |
| T0125 | 125 |
| T0150 | 150 |



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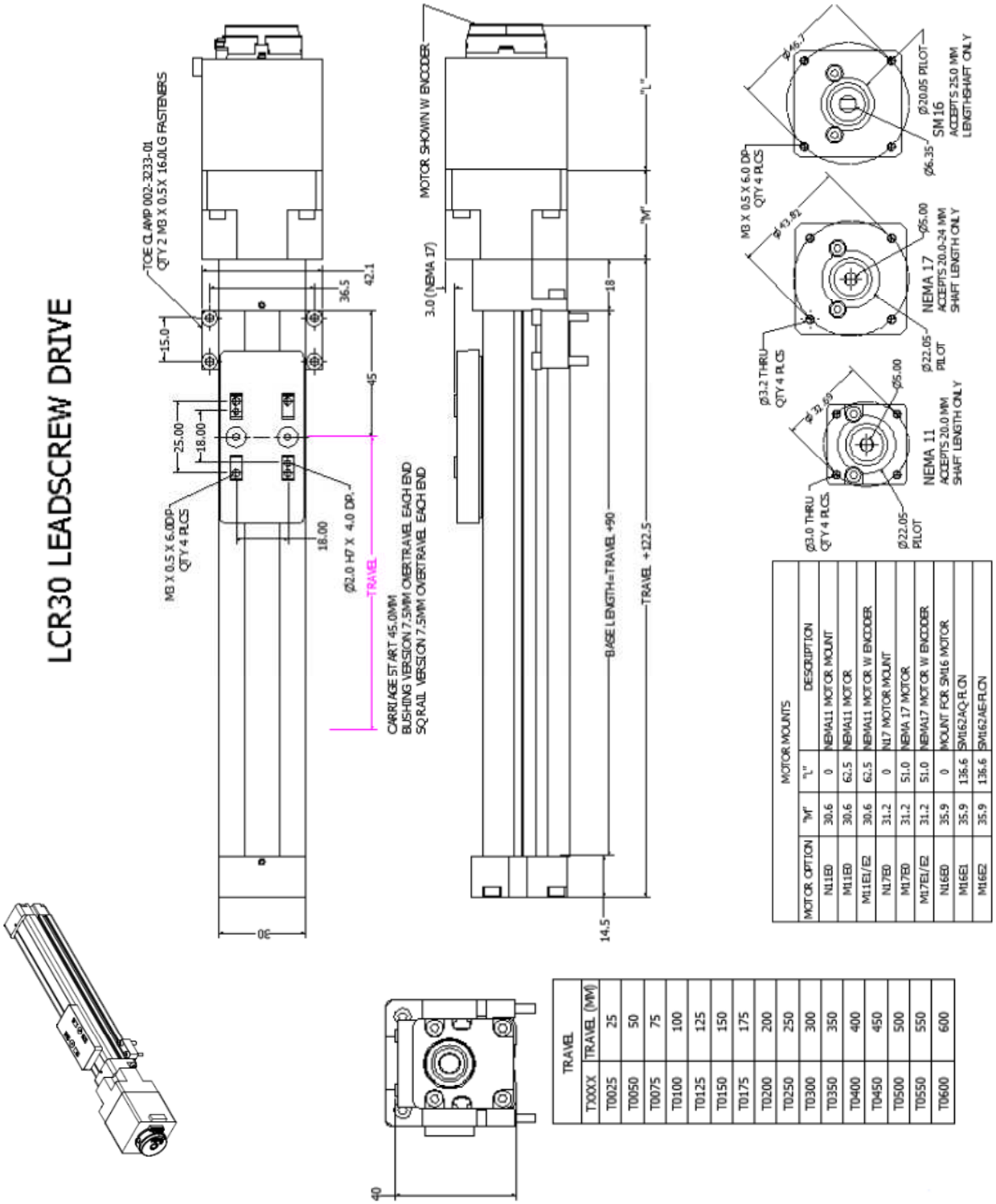
# Dimensional Drawings– LCR30 Leadscrew Drive




| MOTOR MOUNTS | | | |
|---|---|---|---|
| MOTOR OPTION | "M" | "L" | DESCRIPTION |
| N11E0 | 30.6 | 0 | NEMA11 MOTOR MOUNT |
| M11E0 | 30.6 | 62.5 | NEMA11 MOTOR |
| M11E1/E2 | 30.6 | 62.5 | NEMA11 MOTOR W ENCODER |
| N17E0 | 31.2 | 0 | N17 MOTOR MOUNT |
| M17E0 | 31.2 | 51.0 | NEMA 17 MOTOR |
| M17E1/E2 | 31.2 | 51.0 | NEMA17 MOTOR W ENCODER |
| N16E0 | 35.9 | 0 | MOUNT FOR SM16 MOTOR |
| M16E1 | 35.9 | 136.6 | SM162AQ-FLCN |
| M16E2 | 35.9 | 136.6 | SM162AE-FLCN |

| TRAVEL | |
|---|---|
| T00XX | TRAVEL (MM) |
| T0025 | 25 |
| T0050 | 50 |
| T0075 | 75 |
| T0100 | 100 |
| T0125 | 125 |
| T0150 | 150 |
| T0175 | 175 |
| T0200 | 200 |
| T0250 | 250 |
| T0300 | 300 |
| T0350 | 350 |
| T0400 | 400 |
| T0450 | 450 |
| T0500 | 500 |
| T0550 | 550 |
| T0600 | 600 |



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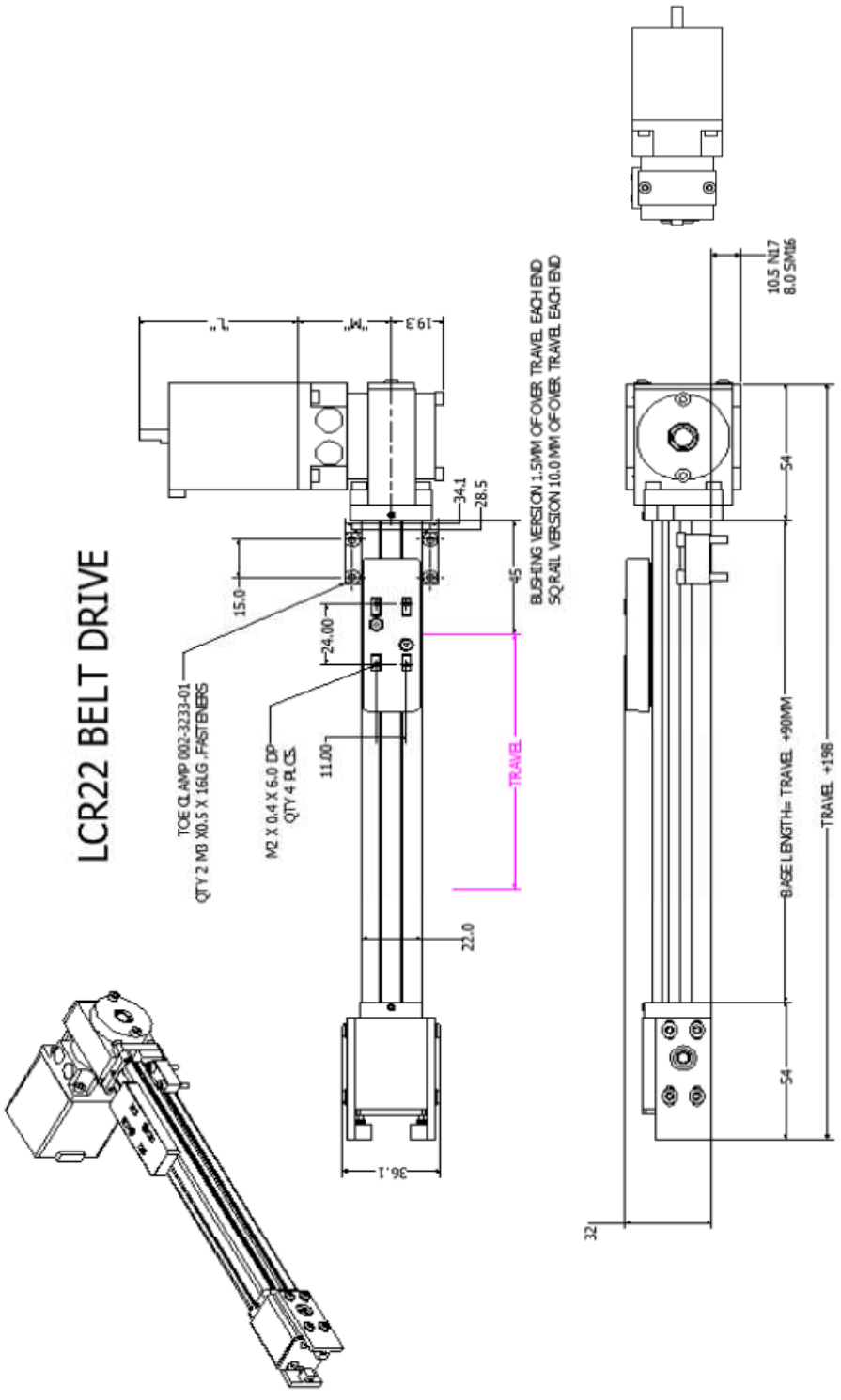
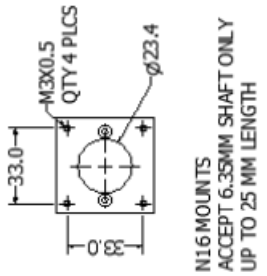
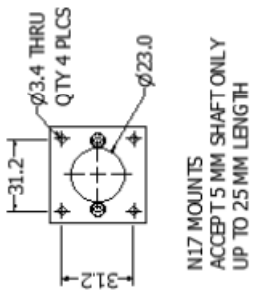
# Dimensional Drawing– LCR22 Belt Drive




| MOTOR MOUNTS | | | |
|---|---|---|---|
| MOTOR OPTION | "M" | "L" | DESCRIPTION |
| M17E0 | 34.5 | 59 | NEMA 17 STEPPER MOTOR |
| M17E1 | 34.5 | 59 | NEMA 17 STEPPER MOTOR W 400 COUNT ENCODER |
| M17E2 | 34.5 | 59 | NEMA 17 STEPPER MOTOR W 500 COUNT ENCODER |
| M16E1 | 39.5 | 137 | SM16 MOTOR MOUNT WITH SM162-AQ-PLCN |
| M16E2 | 39.5 | 137 | SM16 MOTOR MOUNT WITH SM162-AE-PLCN |
| N17E0 | 34.5 | NA | NEMA17 MOUNT 5MM INPUT |
| N16E0 | 39.5 | NA | SM16 MOTOR MOUNT 6.35MM INPUT |



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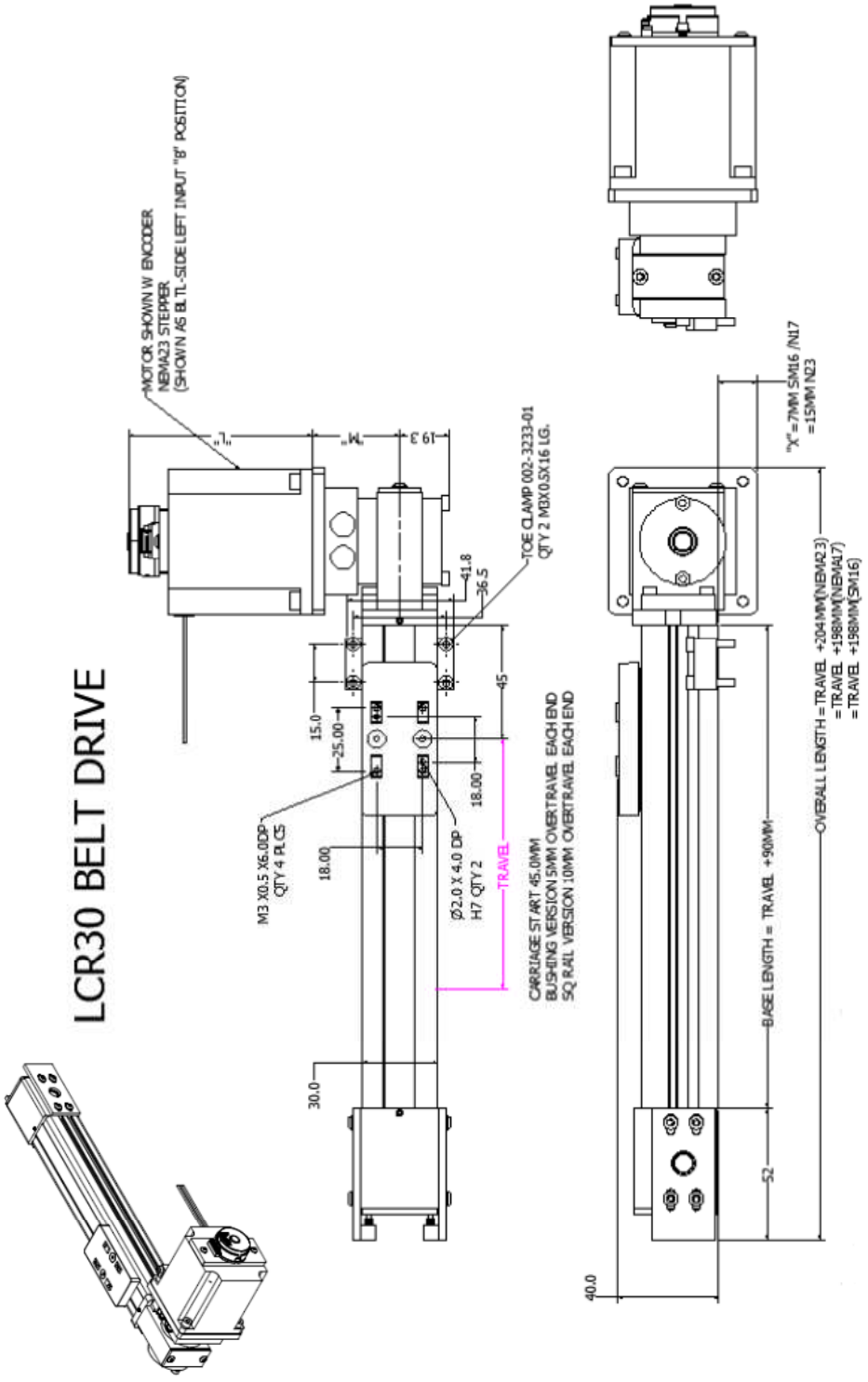
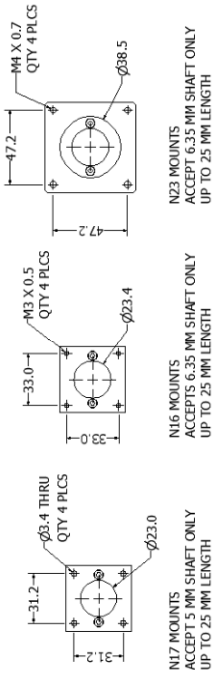
# Dimensional Drawings– LCR30 Belt Drive




| MOTOR MOUNTS | | | |
|---|---|---|---|
| MOTOR OPTION | "M" | "L" | DESCRIPTION |
| M23E0 | 34.3 | 73 | NEMA23 LV232 STEPPER MOTOR |
| M23E1 | 34.3 | 73 | NEMA23 LV232 STEPPER MOTOR W 400 COUNT ENCODER |
| M23E2 | 34.3 | 73 | NEMA23 LV232 STEPPER MOTOR W 500 COUNT ENCODER |
| M17E0 | 34.3 | 59 | NEMA17 STEPPER |
| M17E1 | 34.3 | 59 | NEMA 17 STEPPER W 400 COUNT ENCODER |
| M17E2 | 34.3 | 59 | NEMA 17 STEPPER W 500 COUNT ENCODER |
| M16E1 | 39.5 | 137 | SM16 MOTOR MOUNT WITH SM162-AQ-FLCN |
| M16E2 | 39.5 | 137 | SM16 MOTOR MOUNT WITH SM162-AE-FLCN |
| N17E0 | 34.3 | 0 | NEMA 17 MOUNT (5MM SHAFT INPUT) |
| N23E0 | 34.3 | 0 | NEMA23 MOUNT (6.35 MM INPUT) |
| SM16E0 | 39.5 | 0 | SM16 MOUNT (6.35 MM INPUT) |



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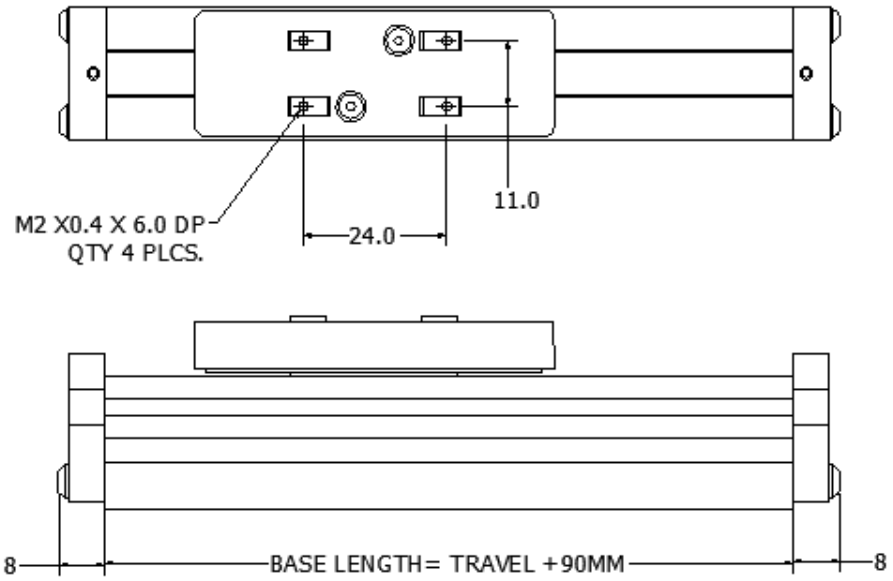
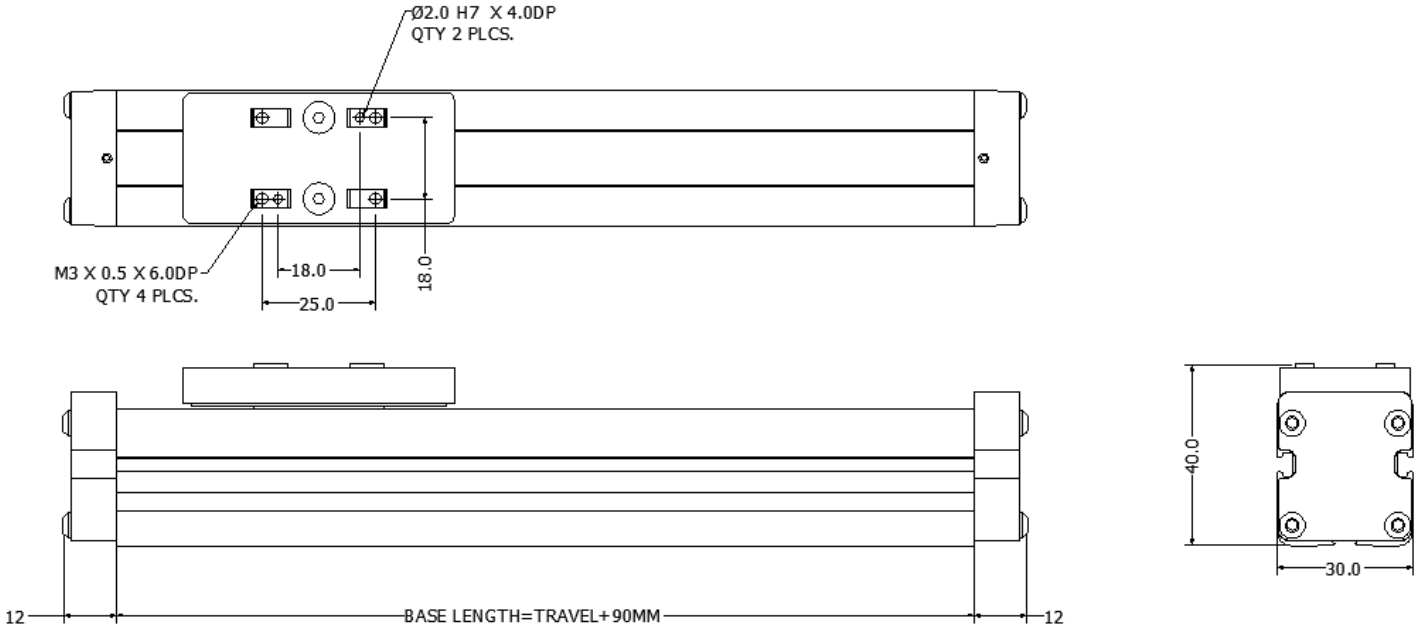
## LCR22 IDLER UNIT ( SQ RAIL ONLY)




## LCR30 IDLER UNIT ( SQ RAIL ONLY)



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# Performance Specifications– LCR Screw Driven

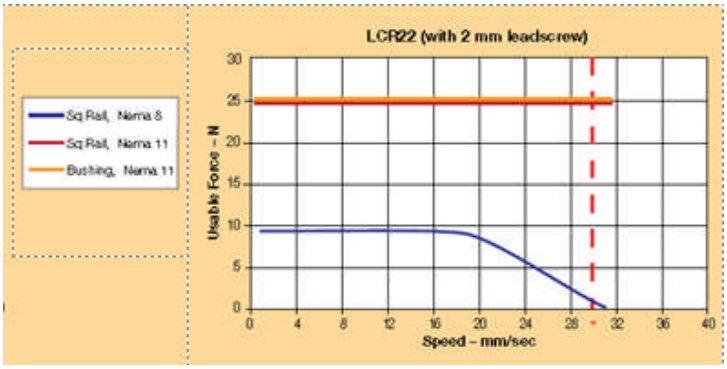
| Specification | Units | LCR22 | | LCR30 | |
|---|---|---|---|---|---|
| Grade | | S (Square Rail) | B (Bushing) | S (Square Rail) | B (Bushing) |
| Bidirectional Repeatability | mm | ± 0.1 | ± 0.2 | ± 0.1 | ± 0.2 |
| Duty Cycle | % | 100 | 100 | 100 | 100 |
| Max Acceleration | $m/s^2$ | 20 | 20 | 20 | 20 |
| Normal Load | N | 45 | 25 | 90 | 45 |
| Moment Load * | Nm | | | | |
| Roll | | 0.9 | 0.1 | 2.6 | 0.3 |
| Yaw | | 2 | 0.3 | 6.5 | 0.8 |
| Pitch | | 2.5 | 0.8 | 8.2 | 1.5 |
| Max Axial Load | N | 25 | 25 | 70 | 70 |
| Screw Efficiency | % | | | | |
| 2.0 mm Lead | | 50 | 50 | 50 | 50 |
| 10.0 mm Lead | | - | - | 70 | 70 |
| Breakaway Torque | Nm | 0.02 | 0.03 | 0.03 (2mm lead) 0.05(10mm lead) | 0.04 (2mm lead) 0.09(10mm lead) |
| Screw Diameter | mm | 3.3 | 3.3 | 6.4 | 6.4 |
| Coefficient of Friction | | 0.02 | 0.10 | 0.02 | 0.10 |
| Carriage Weight | N | 0.2 | 0.2 | 0.5 | 0.5 |
| Base Moment of Inertia | $mm^4$ | | | | |
| Ixx | | 10,332 | 10,332 | 39,778 | 36,162 |
| Iyy | | 11,808 | 11,808 | 46,273 | 42,066 |

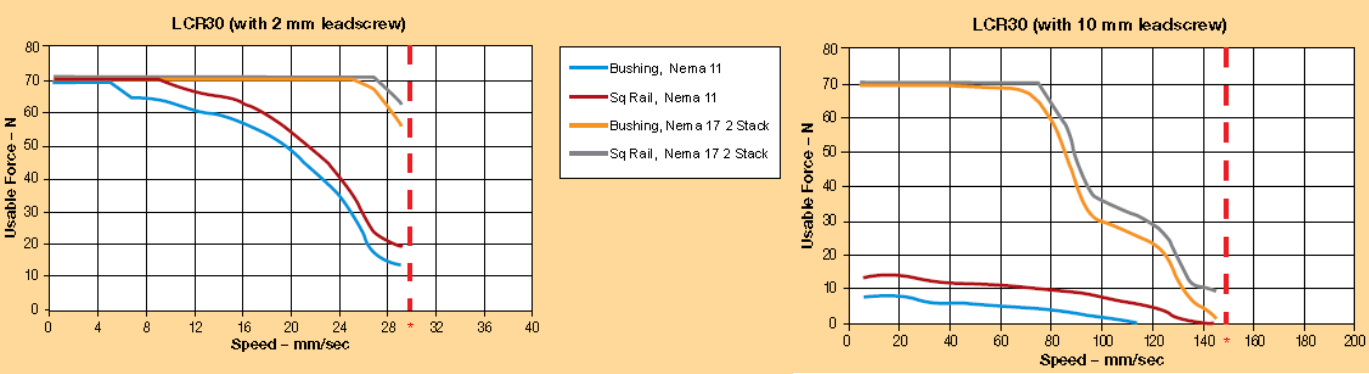
- Moment loading : Moment ratings are reduced ,when multiple moments/forces are applied , see page 26.

| Positioner Weight- Screw Driven LCR | Nema 11 | Nema 17 |
|---|---|---|
| LCR22 | | |
| Unit Weight (Basic Unit with 0 travel)- Kgf(lbs) | 0.394 (0.867) | NA |
| Weight of Additional Travel Length- Kgf/mm (lbs/mm) | 0.001 (0.002) | NA |
| LCR30 | | |
| Unit Weight (Basic Unit with 0 travel)- Kgf(lbs) | 0.660 (1.452) | 0.759 (1.670) |
| Weight of Additional Travel Length- Kgf/mm (lbs/mm) | 0.002 (0.004) | 0.002 (0.004) |

# LCR Screw-Driven Specifications

## Linear Speed Versus Thrust Graphs




* Maximum speed with Parker ion stepper drive at 24 VDC. To achieve faster speeds, motor must be connected to a drive with active damping, electronic viscosity or other advancd anti-resonance zone features.

**Performance Graph Notes:**

To simplify application, the different aspects of positioner performance including motor torque, motor speed, screw efficiency, friction, safety margin, etc. have been consolidated into these speed versus thrust graphs. To make a selection first use the X axis scale of the different graphs to identify a screw lead that will deliver the desired peak velocity. Next, using the specific screw lead graph, identify the motor with enough torque to deliver the needed thrust to lift or accelerate the load.



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# Performance Specifications– LCR Belt Driven

| Specification | Units | LCR22 | | LCR30 | |
|---|---|---|---|---|---|
| Grade | | S (Square Rail) | B (Bushing) | S (Square Rail) | B (Bushing) |
| Bidirectional Repeatability | mm | ± 0.5 | ± 0.5 | ± 0.5 | ± 0.5 |
| Duty Cycle | % | 100 | 100 | 100 | 100 |
| Max Acceleration | $m/s^2$ | 20 | 20 | 20 | 20 |
| Max. Linear Speed | mm/s | 675 | 675 | 825 | 825 |
| Normal Load | N | 45.0 | 25.0 | 90.0 | 45.0 |
| Moment Load* | Nm | | | | |
| Roll | | 0.9 | 0.1 | 2.6 | 0.3 |
| Yaw | | 2.0 | 0.3 | 6.5 | 0.8 |
| Pitch | | 2.5 | 0.8 | 8.2 | 1.5 |
| Max Axial Load | N | 25 | 25 | 45 | 45 |
| Linear Travel/Rev | mm | 44.0 | 44.0 | 58.0 | 58.0 |
| Breakaway Torque | Nm | 0.075 | 0.075 | 0.085 | 0.085 |
| Coefficient of Friction | | 0.02 | 0.10 | 0.02 | 0.10 |
| Carriage Weight | N | 0.2 | 0.2 | 0.5 | 0.5 |
| Base Moment of Inertia | $mm^4$ | | | | |
| Ixx | | 11,365 | 10,332 | 39,778 | 36,162 |
| Iyy | | 12,989 | 11,808 | 46,273 | 42,066 |

* Moment loading : Moment ratings are reduced ,when multiple moments/forces are applied , see page 26.

| Positioner Weight- Belt Driven LCR | Nema 17 | Nema 23 |
|---|---|---|
| LCR22 | | |
| Unit Weight (Basic Unit with 0 travel)- Kgf(lbs) | 0.635 (1.397) | 0.712( 1.566) |
| Weight of Additional Travel Length- Kgf/mm (lbs/mm) | 0.025 (0.055) | 0.025 (0.055) |
| LCR30 | | |
| Unit Weight (Basic Unit with 0 travel)- Kgf(lbs) | 1.121 (2.466) | 1.198 (2.636) |
| Weight of Additional Travel Length- Kgf/mm (lbs/mm) | 0.035 (0.077) | 0.035 (0.077) |



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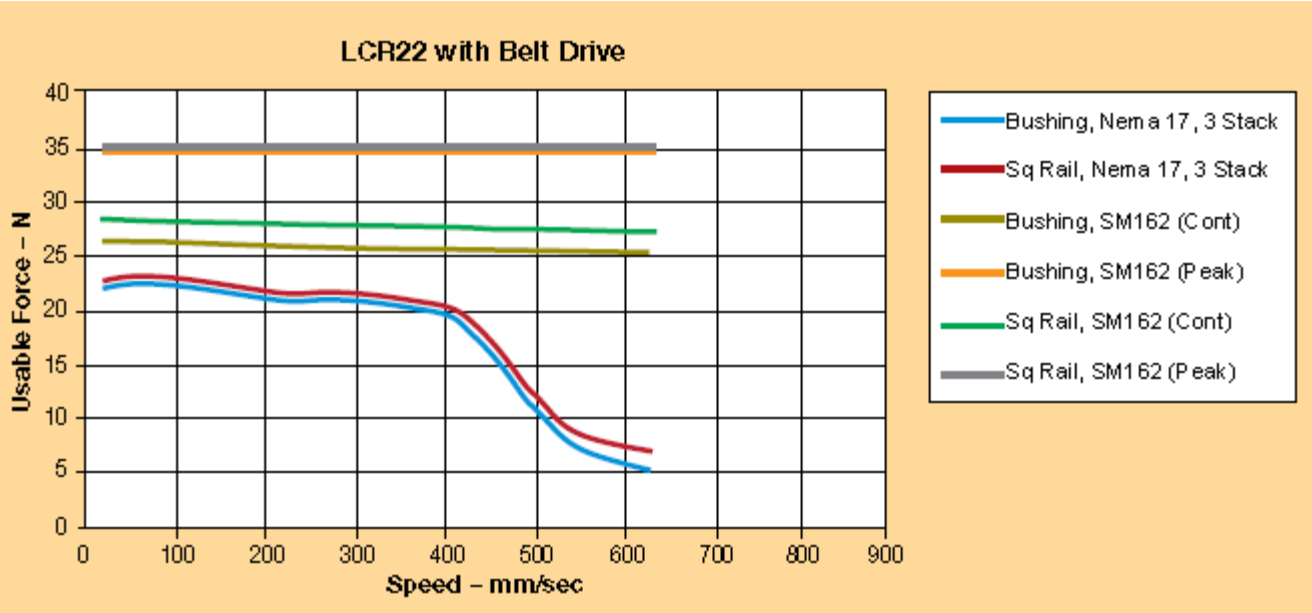


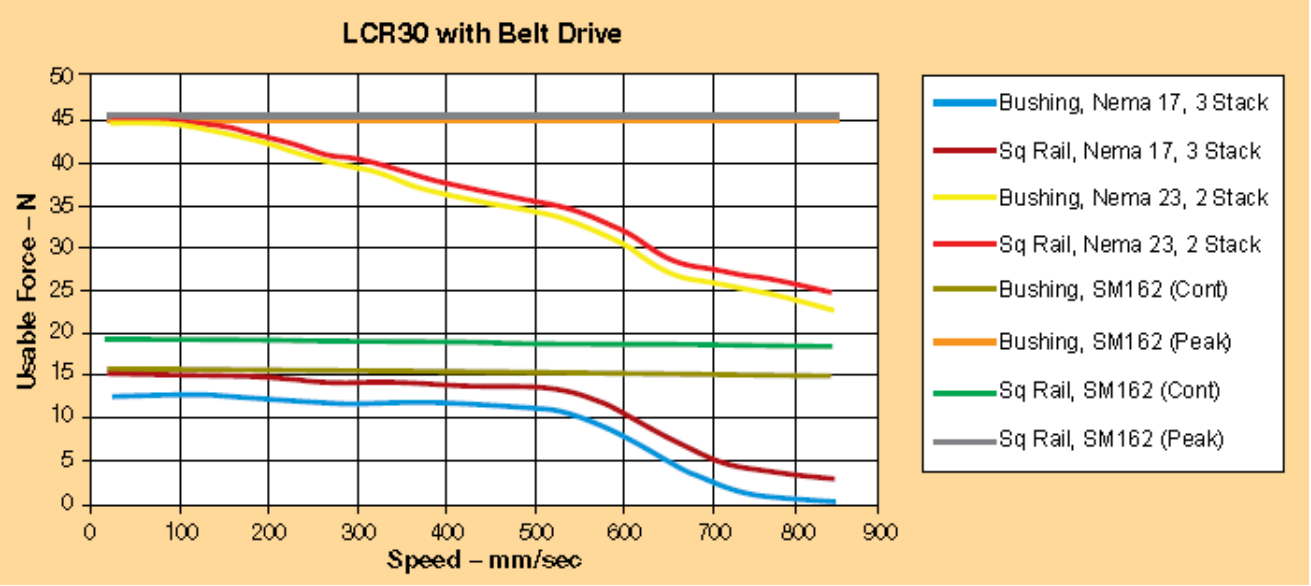


## Performance Graph Notes:

To simplify application, the different aspects of positioner performance including motor torque, motor speed, efficiency, friction, safety margin, etc. have been consolidated into these speed versus thrust graphs. To make a selection first use the X axis scale of the different graphs to identify a screw lead that will deliver the desired peak velocity. Next, using the specific screw lead graph, identify the motor with enough torque to deliver the needed thrust to lift or accelerate the load.

# Chapter 3– Component Specifications

## LCR Motor Information

| LCR Motor Specifications | | M11Ex Screw | M17Ex Screw | M17Ex Belt | M23Ex Belt | M16E1 |
|---|---|---|---|---|---|---|
| | | P/N 003-4457-08 | P/N 003-4457-10 | P/N 003-4457-12 | P/N 003-4653-01 | P/N SM162AE-FLCN |
| Rated Torque | mN-M | 100 | 360 | 440 | 990 | 330/990(PEAK) |
| Rated Current (rms) | Amps/Phase | 0.67 | 1.67 | 1.67 | 2.33 | 2.6(Peak of Sine) |
| Max Current (peak) | Amps/Phase | 0.94 | 2.36 | 2.36 | 3.29 | 7.8(Peak of Sine) |
| Rated Resistance | Ohms/Phase | 8.6 | 8.6 | 1.6 | 0.88 | 6.5 |
| Rated Inductance | mH | 6.7 | 3.2 | 3.2 | 2.7 | 1.39 |
| Rotor Inertia | $g\text{-}cm^2$ | 18 | 61 | 68 | 275 | 180 |
| # Phases | | 2 | 2 | 2 | 2 | 4 pole |
| Step Angle | Degrees | 1.8 | 1.8 | 1.8 | 1.8 | na |

### Stepper Motor Wire Color Code

| P/N | Placement | Motor | A+ | A- | B+ | B- |
|---|---|---|---|---|---|---|
| M11Ex Screw | LCR22/30 Screw Drive | NEMA11 | Red | Blue | Green | Black |
| | | | Red | Yellow | Grey | Green |
| M17Ex Screw | LCR30 Screw Drive | NEMA17 | Red | Blue | Green | Black |
| M17Ex Belt | LCR22/30 Belt Drive | NEMA17 | Red | Blue | Green | Black |
| M23Ex Belt | LCR30 Belt Drive | NEMA23 | Black | Red | White | Green |

| STEPPER MOTOR CONNECTOR | |
|---|---|
| PIN# | FUNCTION |
| 1 | A+ |
| 2 | A- |
| 3 | B+ |
| 4 | B- |

| Stepper Motor Switching Sequence | | | | |
|---|---|---|---|---|
| CCW | A+ | A- | B+ | B- |
| Step 1 | + | - | + | - |
| Step 2 | + | - | - | + |
| Step 3 | - | + | - | + |
| Step 4 | - | + | + | - |
| Note: Viewed from Front Shaft End | | | | |

### Servo Motor Connector Pin Outs

| M16E1 POWER CONNECTOR | | |
|---|---|---|
| PIN# | COLOR | FUNCTION |
| 1 | RED/YELLOW | PHASE A |
| 2 | WHITE/YELLOW | PHASE B |
| 3 | BLACK/YELLOW | PHASE C |
| 4 | GREEN/YELLOW | GROUND |

| M16E1 ENCODER FEED BACK CONNECTOR PIN OUT | | |
|---|---|---|
| PIN# | WIRE COLOR | FUNCTION |
| 1 | ORANGE | INDEX + |
| 2 | ORANGE/WHITE | INDEX - |
| 3 | BLACK & BLACK/ WHITE | ENC RET / HALL RET |
| 5 | RED & BROWN/WHITE | +5 & +5 HALL |
| 6 | GREEN/WHITE | TEMP - |
| 7 | YELLOW/WHITE | CH A - |
| 8 | YELLOW | CH A + |
| 9 | BROWN | HALL CH 1 |
| 10 | VILOET/WHITE | TEMP + |
| 11 | BLUE/WHITE | CH B - |
| 12 | BLUE | CH B + |
| 13 | GREEN | HALL CH 2 |
| 14 | VIOLET | HALL CH3 |



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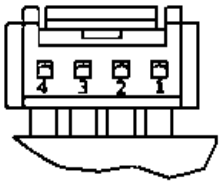
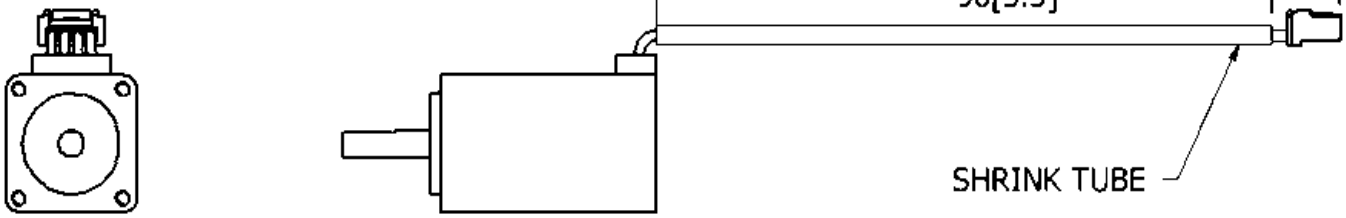
# Motor Information

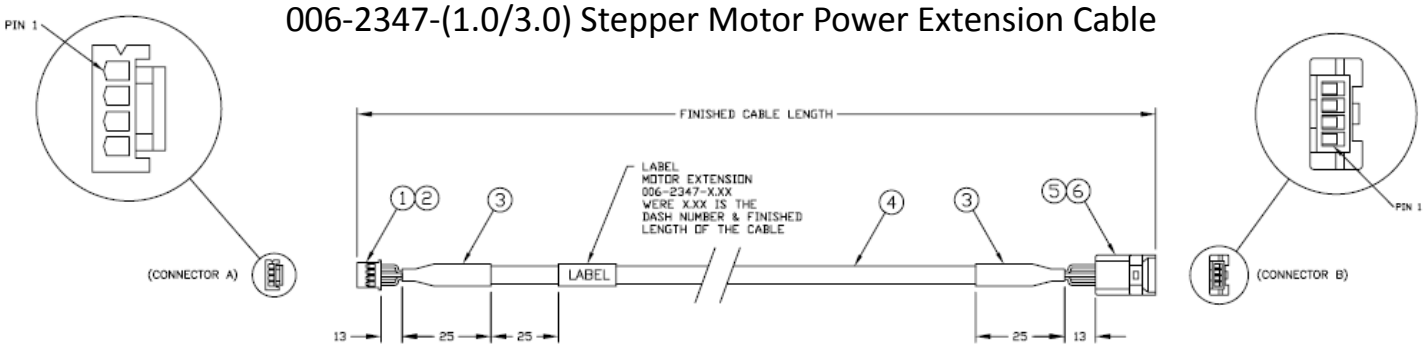
## Motor Cable Connector Pin Out




| Connector | |
|---|---|
| Pin | Function |
| Pin 1 | A+ |
| Pin 2 | A- |
| Pin 3 | B+ |
| Pin 4 | B- |




## 006-2347-(1.0/3.0) Stepper Motor Power Extension Cable




DASH No. = FINISHED CABLE LENGTH
EX. 006-2347-1.0 = 1 METER FINISHED CABLE LENGTH

| CONNECTOR A | | |
|---|---|---|
| WIRE COLOR | FUNCTION | PIN # |
| RED | A+ | 1 |
| BLK | A– | 2 |
| WHT | B+ | 3 |
| GRN | B– | 4 |

| CONNECTOR B | | |
|---|---|---|
| WIRE COLOR | FUNCTION | PIN # |
| RED | A+ | 1 |
| BLK | A– | 2 |
| WHT | B+ | 3 |
| GRN | B– | 4 |



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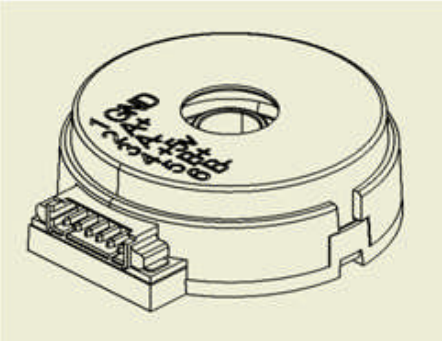
# LCR Stepper Motor Encoder

| Part # | Counts/REV | Bore |
|---|---|---|
| 003-4590-02 | 400 | 5mm |
| 003-4590-04 | 500 | 5mm |
| 003-4590-05 | 400 | 6.35mm |
| 003-4590-06 | 500 | 6.35mm |



| | Encoder Cable Pin Out | |
|---|---|---|
| Pin | Color | Function |
| 1 | White | Ground |
| 2 | Green | A |
| 3 | Yellow | A- |
| 4 | Brown | +5 VDC |
| 5 | Blue | B |
| 6 | Red | B- |

| Part # | Stepper Motor Encoder Cable |
|---|---|
| 006-2398-1.0 | Encoder Cable 6 Pin Differential Flying Leads 1m |
| 006-2398-3.0 | Encoder Cable 6 Pin Differential Flying Leads 3m |

* note wire colors pink & grey not used.

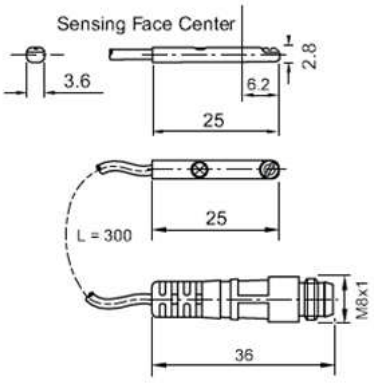
| Specifications | Min. | Typ. | Max. | Units | Notes |
|---|---|---|---|---|---|
| Supply Current | - | 22 | 30 | mA | |
| Supply Voltage | 4.5 | - | 5.5 | V | |
| High Level Output | 2.4 | 3.4 | - | V | $I_{oh}$ = -20mA |
| Low Level Output | - | 0.2 | 0.4 | V | $I_{ol}$ = 20mA |
| Rise Time | - | 500 | - | ns | |
| Fall Time | - | 100 | - | ns | |
| Frequency Response | - | - | 44 | kHz | |

| Parameter | Typ. | Max. | Units |
|---|---|---|---|
| Symmetry Error | 16 | 75 | deg. |
| Quadrature Error | 12 | 60 | deg. |

# Limit/Home Switch Information

| Specifications | L3,L7,L8 | L1,L5,L6 | L3,L4,L7 | L1,L2,L5 |
|---|---|---|---|---|
| Parker EMN P/N | 003-4475-02 | 003-4475-04 | 003-4475-06 | 003-4475-08 |
| Switch Type | N.C. | N.C. | N.O. | N.O. |
| Logic | PNP | NPN | PNP | NPN |
| Type | Electronic | | | |
| Operating Voltage | 10-30 VDC | | | |
| Voltage Drop | ≤ 2.5 VDC | | | |
| Continuous Current | ≤ 70 mA | | | |
| Response Sensitivity | ≤ 48 Gauss | | | |
| Switching Frequency | 1000 Hz | | | |
| Power Consumption | ≤ 8 mA without load | | | |
| Ripple | 10% of operating voltage | | | |
| Hysteresis | ≤ 15 Gauss | | | |
| Repeatability | ≤ ± 0.1 mm | | | |
| EMC | EN 60 947-5-2 | | | |
| Short-circuit protection | Yes | | | |
| Power-up Pulse suppression | No | | | |
| Reverse Polarity Protection | Yes | | | |
| Enclosure Rating | IP 67 | | | |
| Shock and Vibration Stress | 30g, 11ms, 10-55 Hz, 1mm | | | |
| Operating Temperature range | - 25°C to +75°C (-13°F to 167°F) | | | |
| Housing Material | PA 12 | | | |
| Connector Cable | PUR 3 x 0.09 $mm^2$ | | | |
| Connector | PUR cable w/8mm connector | | | |
| Cabling* | 0.3m with M8 | | | |

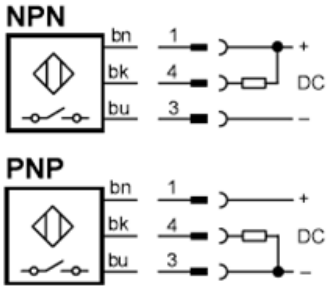
*** P/N 003-2918-01 5m flying lead extension cable is available**





WIRING CONNECTION

| Pin | Wire | Function |
|---|---|---|
| 1 | Brown | +VDC |
| 4 | Black | NO |
| 3 | Blue | - VDC |



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# LCR Motor Sizing Information : Screw Drives

| LCR22 | | INLINE |
|---|---|---|
| TRAVEL(MM) | LEAD(M) | INERTIA REFLECTED(KG-M^2) |
| 25 | 0.002 | 1.249676E-07 |
| 50 | 0.002 | 1.272379E-07 |
| 75 | 0.002 | 1.295083E-07 |
| 100 | 0.002 | 1.317786E-07 |
| 125 | 0.002 | 1.340489E-07 |
| 150 | 0.002 | 1.363193E-07 |

| LCR22 MAXIMUM SPEED MM/SEC | | |
|---|---|---|
| | | MAXIMUM LINEAR SPEED MM/S |
| TRAVEL (MM) | MAX RPS | LEAD 2.0MM |
| 25 | 15 | 30 |
| 50 | 15 | 30 |
| 75 | 15 | 30 |
| 100 | 15 | 30 |
| 125 | 15 | 30 |
| 150 | 15 | 30 |

| LCR30 | | INLINE |
|---|---|---|
| TRAVEL(MM) | LEAD(M) | INERTIA REFLECTED(KG-M^2) |
| 25 | 0.002 | 4.117468E-07 |
| 50 | 0.002 | 4.428732E-07 |
| 75 | 0.002 | 4.739997E-07 |
| 100 | 0.002 | 5.051261E-07 |
| 125 | 0.002 | 5.362526E-07 |
| 150 | 0.002 | 5.673790E-07 |
| 175 | 0.002 | 5.985054E-07 |
| 200 | 0.002 | 6.296319E-07 |
| 225 | 0.002 | 6.607583E-07 |
| 250 | 0.002 | 6.918847E-07 |
| 275 | 0.002 | 7.230112E-07 |
| 300 | 0.002 | 7.541376E-07 |
| 325 | 0.002 | 7.852641E-07 |
| 350 | 0.002 | 8.163905E-07 |
| 375 | 0.002 | 8.475169E-07 |
| 400 | 0.002 | 8.786434E-07 |
| 425 | 0.002 | 9.097698E-07 |
| 450 | 0.002 | 9.408962E-07 |
| 475 | 0.002 | 9.720227E-07 |
| 500 | 0.002 | 1.003149E-06 |
| 525 | 0.002 | 1.034276E-06 |
| 550 | 0.002 | 1.065402E-06 |
| 575 | 0.002 | 1.096528E-06 |
| 600 | 0.002 | 1.127655E-06 |

| LCR30 | | INLINE |
|---|---|---|
| TRAVEL(MM) | LEAD(M) | INERTIA REFLECTED(KG-M^2) |
| 25 | 0.01 | 5.260371E-07 |
| 50 | 0.01 | 5.571635E-07 |
| 75 | 0.01 | 5.882900E-07 |
| 100 | 0.01 | 6.194164E-07 |
| 125 | 0.01 | 6.505429E-07 |
| 150 | 0.01 | 6.816693E-07 |
| 175 | 0.01 | 7.127957E-07 |
| 200 | 0.01 | 7.439222E-07 |
| 225 | 0.01 | 7.750486E-07 |
| 250 | 0.01 | 8.061750E-07 |
| 275 | 0.01 | 8.373015E-07 |
| 300 | 0.01 | 8.684279E-07 |
| 325 | 0.01 | 8.995543E-07 |
| 350 | 0.01 | 9.306808E-07 |
| 375 | 0.01 | 9.618072E-07 |
| 400 | 0.01 | 9.929337E-07 |
| 425 | 0.01 | 1.024060E-06 |
| 450 | 0.01 | 1.055187E-06 |
| 475 | 0.01 | 1.086313E-06 |
| 500 | 0.01 | 1.117439E-06 |
| 525 | 0.01 | 1.148566E-06 |
| 550 | 0.01 | 1.179692E-06 |
| 575 | 0.01 | 1.210819E-06 |
| 600 | 0.01 | 1.241945E-06 |

| LCR30 MAXIMUM SPEED MM/SEC | | | |
|---|---|---|---|
| | | MAXIMUM LINEAR SPEED MM/S | |
| TRAVEL (MM) | MAX RPS | LEAD 2.0MM | LEAD 10.0 MM |
| 25 | 15 | 30 | 150 |
| 50 | 15 | 30 | 150 |
| 75 | 15 | 30 | 150 |
| 100 | 15 | 30 | 150 |
| 125 | 15 | 30 | 150 |
| 150 | 15 | 30 | 150 |
| 175 | 15 | 30 | 150 |
| 200 | 15 | 30 | 150 |
| 225 | 15 | 30 | 150 |
| 250 | 15 | 30 | 150 |
| 275 | 15 | 30 | 150 |
| 300 | 15 | 30 | 150 |
| 325 | 15 | 30 | 150 |
| 350 | 15 | 30 | 150 |
| 375 | 14 | 28 | 140 |
| 400 | 12 | 24 | 120 |
| 425 | 11 | 22 | 110 |
| 450 | 10 | 20 | 100 |
| 475 | 9 | 18 | 90 |
| 500 | 9 | 18 | 90 |
| 525 | 8 | 16 | 80 |
| 550 | 7 | 14 | 70 |
| 575 | 7 | 14 | 70 |
| 600 | 6 | 12 | 60 |



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## LCR Motor Sizing information : Belt Drive Information

| LCR22 BELT TRAVEL(MM) | PULLEY RADIUS | TOTAL INERTIA REFLECTED(KG-M^2) |
|---|---|---|
| 25 | 0.0072 | 1.310099E-04 |
| 50 | 0.0072 | 1.310364E-04 |
| 75 | 0.0072 | 1.310628E-04 |
| 100 | 0.0072 | 1.310892E-04 |
| 125 | 0.0072 | 1.311157E-04 |
| 150 | 0.0072 | 1.311421E-04 |
| 175 | 0.0072 | 1.311686E-04 |
| 200 | 0.0072 | 1.311950E-04 |
| 225 | 0.0072 | 1.312214E-04 |
| 250 | 0.0072 | 1.312479E-04 |
| 275 | 0.0072 | 1.312743E-04 |
| 300 | 0.0072 | 1.313007E-04 |
| 325 | 0.0072 | 1.313272E-04 |
| 350 | 0.0072 | 1.313536E-04 |
| 375 | 0.0072 | 1.313801E-04 |
| 400 | 0.0072 | 1.314065E-04 |
| 425 | 0.0072 | 1.314329E-04 |
| 450 | 0.0072 | 1.314594E-04 |
| 475 | 0.0072 | 1.314858E-04 |
| 500 | 0.0072 | 1.315123E-04 |

| LCR30 BELT TRAVEL(MM) | PULLEY RADIUS | TOTAL INERTIA REFLECTED(KG-M^2) |
|---|---|---|
| 25 | 0.0095 | 2.285894E-04 |
| 50 | 0.0095 | 2.286262E-04 |
| 75 | 0.0095 | 2.286722E-04 |
| 100 | 0.0095 | 2.287182E-04 |
| 125 | 0.0095 | 2.287643E-04 |
| 150 | 0.0095 | 2.288103E-04 |
| 175 | 0.0095 | 2.288563E-04 |
| 200 | 0.0095 | 2.289024E-04 |
| 225 | 0.0095 | 2.289484E-04 |
| 250 | 0.0095 | 2.289944E-04 |
| 275 | 0.0095 | 2.290404E-04 |
| 300 | 0.0095 | 2.290865E-04 |
| 325 | 0.0095 | 2.291325E-04 |
| 350 | 0.0095 | 2.291785E-04 |
| 375 | 0.0095 | 2.292245E-04 |
| 400 | 0.0095 | 2.292706E-04 |
| 425 | 0.0095 | 2.293166E-04 |
| 450 | 0.0095 | 2.293626E-04 |
| 475 | 0.0095 | 2.294087E-04 |
| 500 | 0.0095 | 2.294547E-04 |
| 525 | 0.0095 | 2.295099E-04 |
| 550 | 0.0095 | 2.295467E-04 |
| 575 | 0.0095 | 2.295928E-04 |
| 600 | 0.0095 | 2.296388E-04 |
| 625 | 0.0095 | 2.296848E-04 |
| 650 | 0.0095 | 2.297308E-04 |
| 675 | 0.0095 | 2.297769E-04 |
| 700 | 0.0095 | 2.298229E-04 |
| 725 | 0.0095 | 2.298689E-04 |
| 750 | 0.0095 | 2.299150E-04 |
| 775 | 0.0095 | 2.299610E-04 |
| 800 | 0.0095 | 2.300070E-04 |
| 825 | 0.0095 | 2.300530E-04 |
| 850 | 0.0095 | 2.300991E-04 |
| 875 | 0.0095 | 2.301451E-04 |
| 900 | 0.0095 | 2.301911E-04 |
| 925 | 0.0095 | 2.302372E-04 |
| 950 | 0.0095 | 2.302832E-04 |
| 975 | 0.0095 | 2.303292E-04 |
| 1000 | 0.0095 | 2.303752E-04 |



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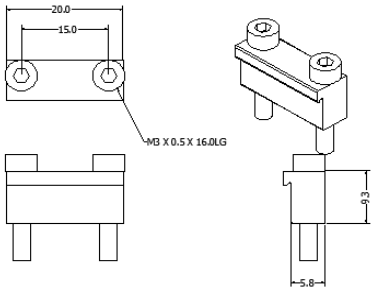
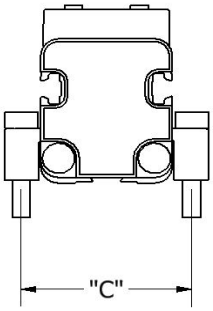
# Chapter 4– Setup and Usage

## Base Mounting

Securing the LCR22/LCR30 is done by toe clamp mounting

002-3233-01 1PC TOE CLAMP ASSY ( INCLUDES 1 TOE CLAMP 2 FASTENERS)




Toe clamp centers “C”:

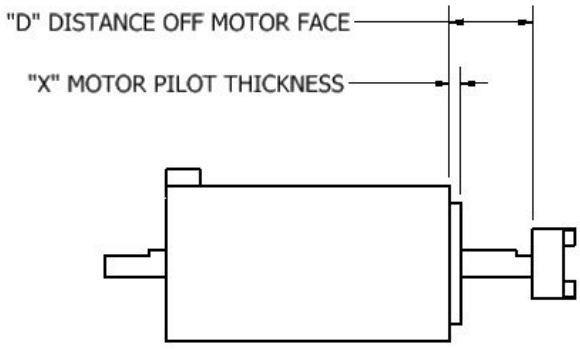
“C”= 28.5MM LCR22
“C”= 36.5MM LCR30

Tap depth recommended to be M3 x 0.5 x 7.0LG. minimum

# Installation of coupling half onto Motor Shaft:

Screw driven actuators : To provide coupling engagement and avoid preloading motor bearing, the coupling half Must be accurately placed on motor shaft. See chart below.

Set screw of coupling should be aligned to flat on motor and torque to 0.5 N-m




| Coupling Placement | | | | | |
|---|---|---|---|---|---|
| Table Size | Motor Mount | “D” mm | “D” in. | “X” mm | “X” in. |
| LCR22 | N11E0 | 14.7 | 0.58 | 2.0 | 0.08 |
| LCR30 | N11E0 | 14.2 | 0.56 | 2.0 | 0.08 |
| LCR30 | N17E0 | 14.8 | 0.58 | 2.0 | 0.08 |



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# Payload Mounting– LCR22/30

Payload mounting to LCR using the **M3 x0.5 (LCR30) M2.0 x 0.4 (LCR22**) in the load plate. When fastening to load take precaution in using screws with no more than 5.5mm of thread engagement, as to not damage positioner.

The LCR30 contains 2.5 diameter H7 (slip fit) dowel holes for repeatable mounting to customer load plate if desired. See pages 10 thru 13 for detailed carriage specifications.

**WARNING** : To avoid damage to nut-carriage assembly
Do not back drive (push by hand) the carriage. Carriage should be only moved by input to the drive shaft via motor or hand crank.

## Moment loading pre-cautions :

The LCR positioners have rated individual moment and load ratings. When multiple moments are applied to carriage these rating must be reduced use the equation below as a guideline.

| MOMENT | LCR22 SQ RAIL/BUSHING | LCR30 SQ RAIL/BUSHING |
|---|---|---|
| Mroll (N-M) | 0.9/0.1 | 2.6/0.3 |
| Mpitch (N-M) | 2.5/0.8 | 8.2/1.5 |
| Myaw (N-M) | 2.0/0.3 | 6.5/0..8 |

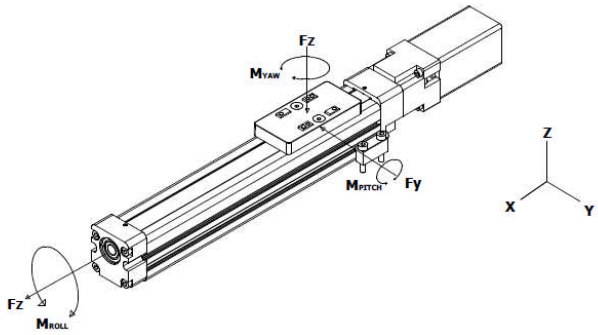
**Moment Factor:**

**Take each existing moment/ corresponding maximum allowable moment = moment factor.**

**Sum all the moment factors and result must be less than 1.8**
**Example : LCR30 screw drive sq rail version with the following:**

**Mroll =0.5 N-m = 0/2.6 (0.00)**
**Mpitch =2.5 N-m = 2.5/8.2 (0.30)**
**Myaw =1.0 N-m =1.0/6.5 (0.15)**

**SUM THE ABOVE=(0.00+0.30+0.15)=0.45 WHICH IS LESS THAN 1.8**
**Moment loading is acceptable.**



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# Limit/Home Switch Mounting/Adjustment

Travel limit sensors signal the motor to stop whenever the carriage is approaching end of travel. The home sensor provides a fixed reference point to which the carriage can be commanded to return repeatedly.

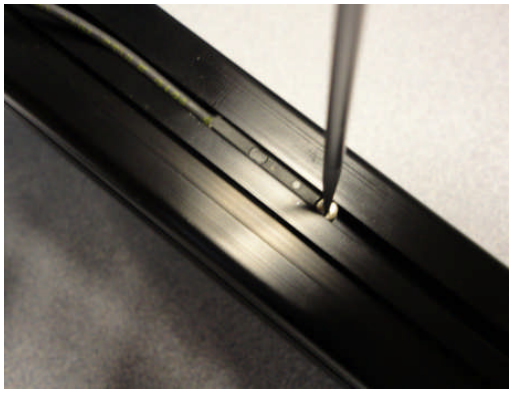
If equipped the LCR limit home switches are installed at factory but not set. To adjust the switches . Loosen the flat head screw by turning (CCW) and position the switch to desired location and then retighten.

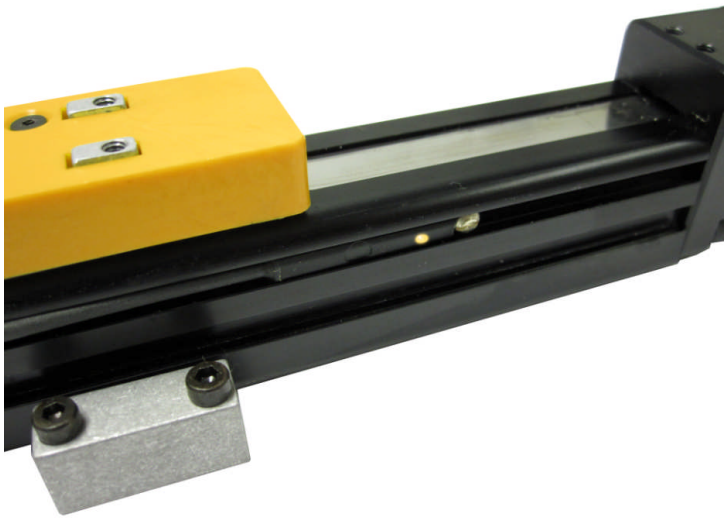
Insert the switch into t-slot ( screw head facing up and then rotate 90') and mount

The limit switches must be inserted into the top t-slot for the magnet in carriage to trigger.

The limit switches can be mounted to either side of unit

See page 22 for detailed switch specifications







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# Chapter 5– Maintenance and Repair

## Lubrication

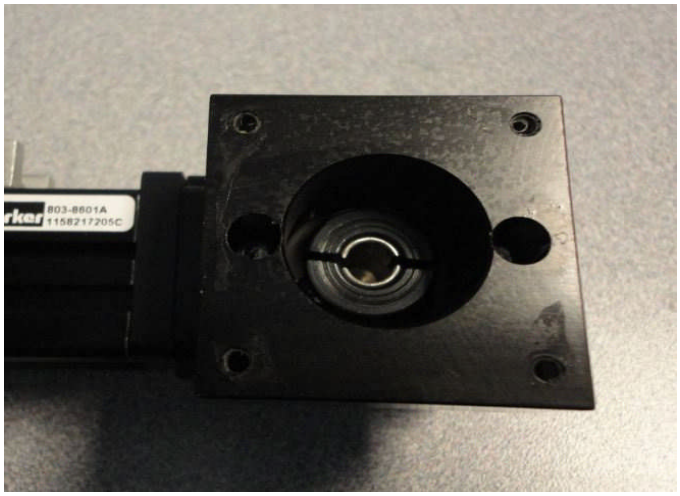
No lubrication is required in standard operating conditions.

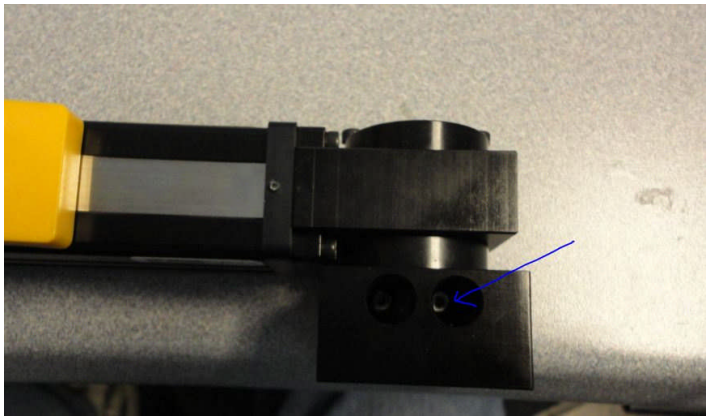
# LCR BELT DRIVE INFORMATION:

Mounting Motor to belt LCR belt drives

Mount motor to motor block by inserting the motor /motor shaft into input shaft of table.
Secure motor with its mouNting hardware to motor block.
Tighten the clamp collar(003-2604-08) to secure to 1.9 N-m (16 in-lbs)

.





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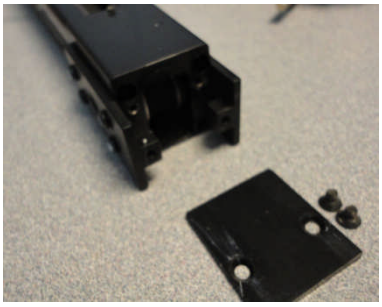
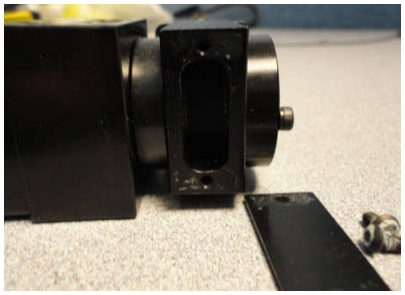
# LCR BELT DRIVE INFORMATION:

Replacing Belt :

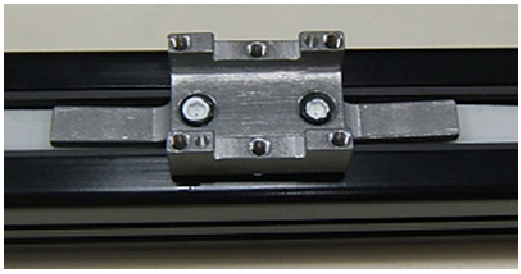
One should remove the idler cover plate and drive end cover plate.

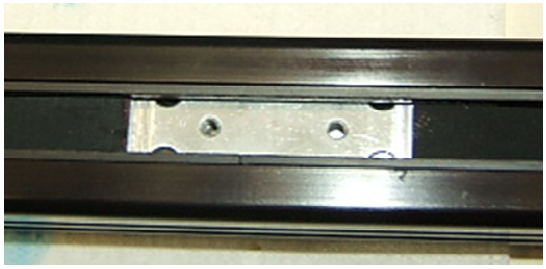




Remove strip seal per instruction page 29.

Remove the carriage load plate

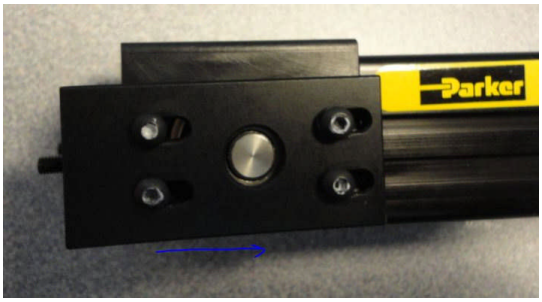




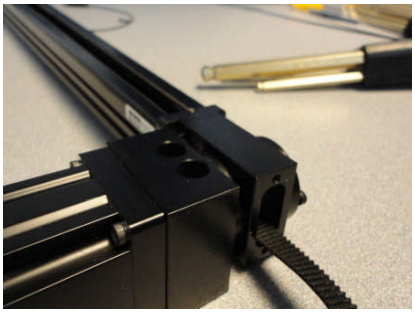
Remove belt from Unit

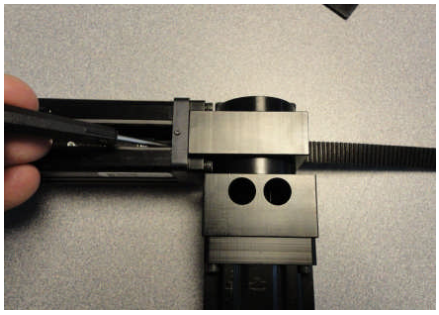
Do not discard belt. One should use this belt as a guide to cutting the replacement belt to proper length. Cut new/replacement belt to match old belt. Put to side

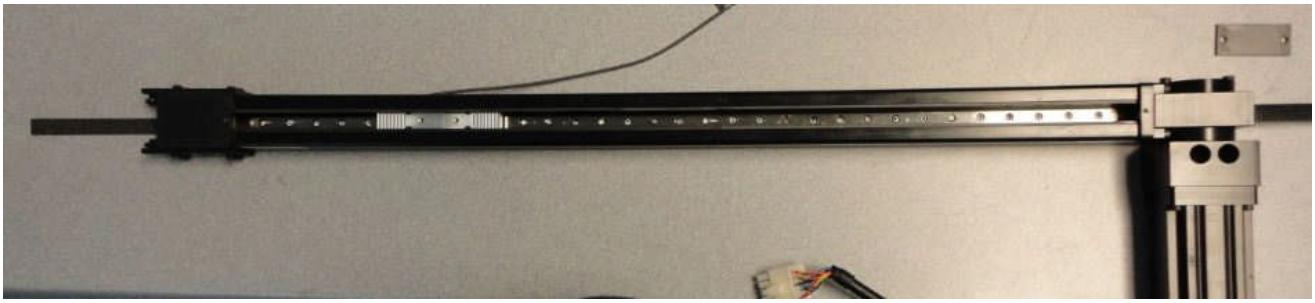
Next go to idler end and **loosen** the 8 (4 each side) button head screws attaching the belt tension plates to allow the tens ion plate to slide , one will also have to back out the set screws in the end of plates to allow the tension plate to be pushed to a position that puts the plate and idler pulley closest to base extrusion. And then lightly tighten the 8 button heads so tension plates and pulley are fixed.



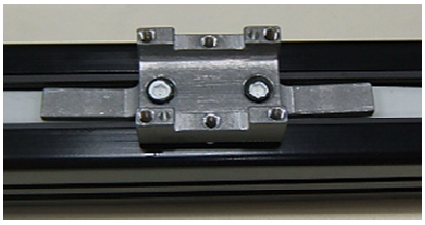
Replace belt
Run belt under drive pulley and into pocket of base. The use of screw driver /allen key can assiat into assuring the belt enters the pocket in base and does not raise up into main body extrusion. Push belt through extrusion and use same screw driver/allen key to assist in allowing belt to go under idler pulley and out the idler end.



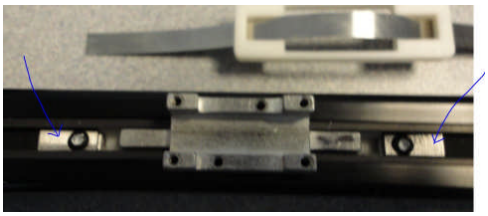




Wrap the belt around the drive and idler pulleys and bring belt ends to carriage. Make sure the tension plates are fixed as stated on previous page( pushed toward the base extrusion.) . Lay Belt teeth on carriage teeth as shown. Make sure to achieve at least 5 teeth engament of belt on each side and then place/mount top of carriage to clamp belt utilizing the Qty2 socket head fasteners..



LCR22 Bushing carriage employs clamping nuts and requires the belt be punched with 2.0mm hole.





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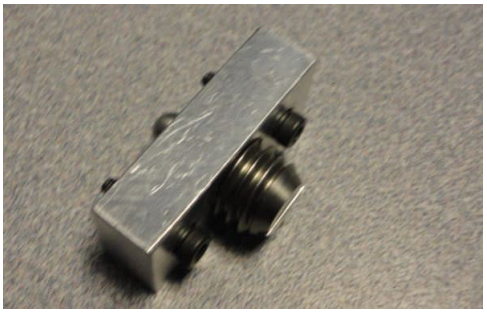
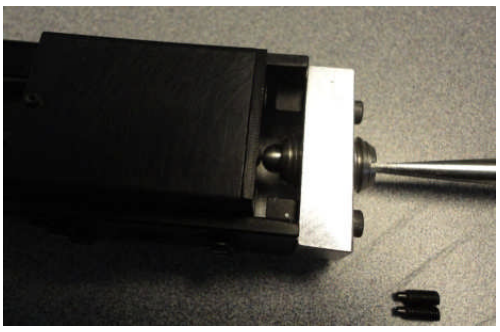
BELT TENSION CONTINUED

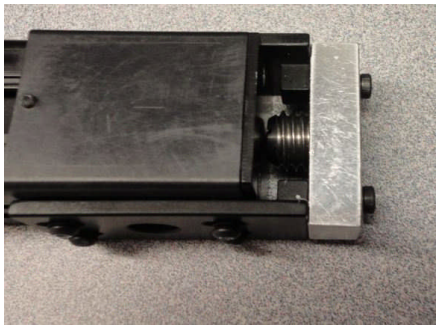
Once the belt is clamped via the carriage top . Next is to tension the belt.
Replace the cover plate on idler end

Remove the flat head set screws in the tension plates

Utilize belt tension fixture to provide uniform tension/pull force on tension plates/belt.
P/N **005-3044-01** LCR 22 provides pull force of 80N and a belt tension of **40N**
P/N **005-3044-02** LCR 30 provides pull force of 120N and a belt tension of **60N**







Now tighten the qty button heads that secure the tension plates into position.
Remove the belt tension fixture
Re-insert the flat head set screws.



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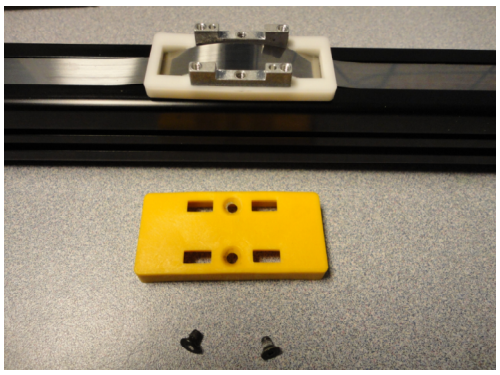
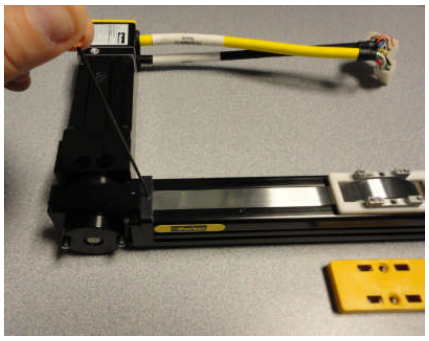
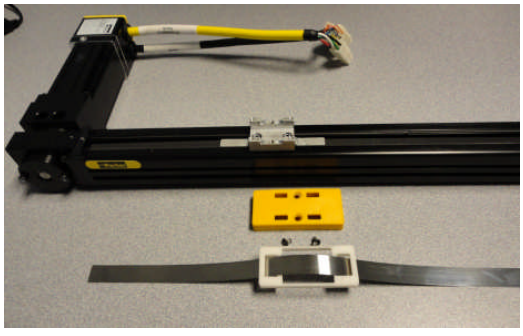
# Strip Seal Replacement

REPLACEMENT OF STRIP SEAL AS FOLLOWS:

1. Remove the yellow load plate , QTY 2 M3 X 0.5 X 6.0 LG Socket flat heads w 2mm allen key.
2. Loosen the QTY 2 M2 X 0.4 X 6LG socket head set screws with 1.27mm alleny key
3. Remove and replace strip seal.
4. Reverse the steps above







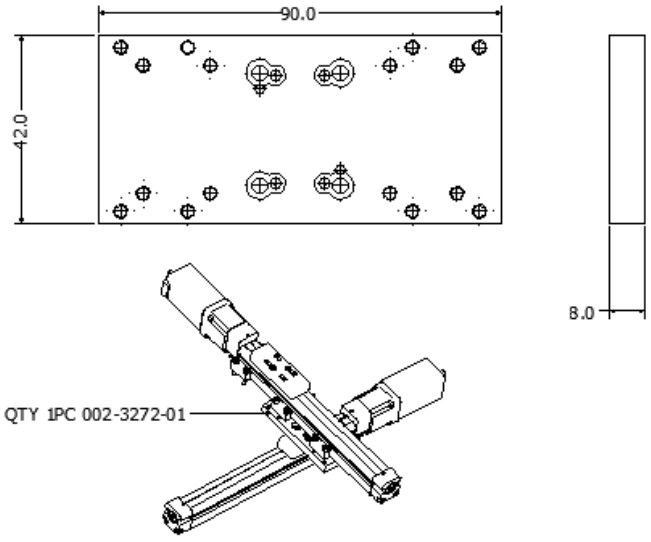
## Accessories & Spare Parts

| Part Number | Description |
|---|---|
| 003-4447-01 | Strip seal LCR22 7mm wide (QTY = TABLE TRAVEL+98mm required) |
| 003-4447-02 | Strip seal LCR30 12mm wide (QTY = TABLE TRAVEL+98mm required) |
| | |
| 003-4707-01 | Belt LCR30-GT2-2mr-6mm wide (QTY= 2 x TABLE TRAVEL +287mm required) |
| 003-4707-02 | Belt LCR30 GT2-2mr-9mm wide (QTY=2 x TABLE TRAVEL +298mm required) |
| | |
| 006-2360-08 | Stepper motor with connector Nema 11 double stack (LCR22/LCR30-SCRW) |
| 006-2360-10 | Stepper motor with connector Nema 17 double stack (LCR30-SCRW ) |
| 006-2360-12 | Stepper motor with connector Nema 17 triple stack (LCR22/30 –BLT) |
| 003-4653-01 | Stepper motor with flying leads Nema 23 double stack (LCR30 –BLT) |
| | |
| 002-3233-01 | Toe clamp Assy (includes 1pc Toe clamp and 2pc m3 x 16lg fasteners) |
| 002-3233-02 | Toe clamp Assy (includes 2pc Toe clamp and 2pc m3 x 16lg fasteners) |
| 002-3233-04 | Toe clamp Assy (includes 4pc Toe clamp and 2pc m3 x 16lg fasteners) |
| 002-3233-100 | Toe clamp Assy (includes 100pc Toe clamp and 2pc m3 x 16lg fasteners) |
| | |
| 003-3560-01 | Coupling torque disk LCR22/30 screw drive |
| 003-3560-03 | Coupling torque disk with thru hole LCR22/30 screw drive |
| 003-3558-01 | Coupling half motor side 5mm bore (nema11/17) |
| 003-3558-07 | Coupling half motor side 6.35mm bore (nema23) |
| | |
| 003-2604-06 | Clamp collar motor input LCR22/30 Belt drive |
| | |
| 003-4475-02 | LCR Switch PNP Normally Closed w 300mm cable length m8 connector type |
| 003-4475-04 | LCR Switch npn Normally Closed w 300mm cable length m8 connector type |
| 003-4475-06 | LCR Switch PNP Normally Open w 300mm cable length m8 connector type |
| 003-4475-08 | LCR Switch PNP Normally Open w 300mm cable length m8 connector type |
| 003-2918-01 | Extension cable LCR switch 5m flying leads |
| | |
| 002-3272-01 | XY bracket assy LCR22/30 Screw drives |
| 002-3273-01 | XZ bracket assy LCR22/30 |
| 002-3274-01 | XY bracket assy LCR22/30 Belt drives |
| | |
| 002-3283-01 | Pack of 10pc M2.5 sq nuts |

# Accessories :XYZ Bracketry

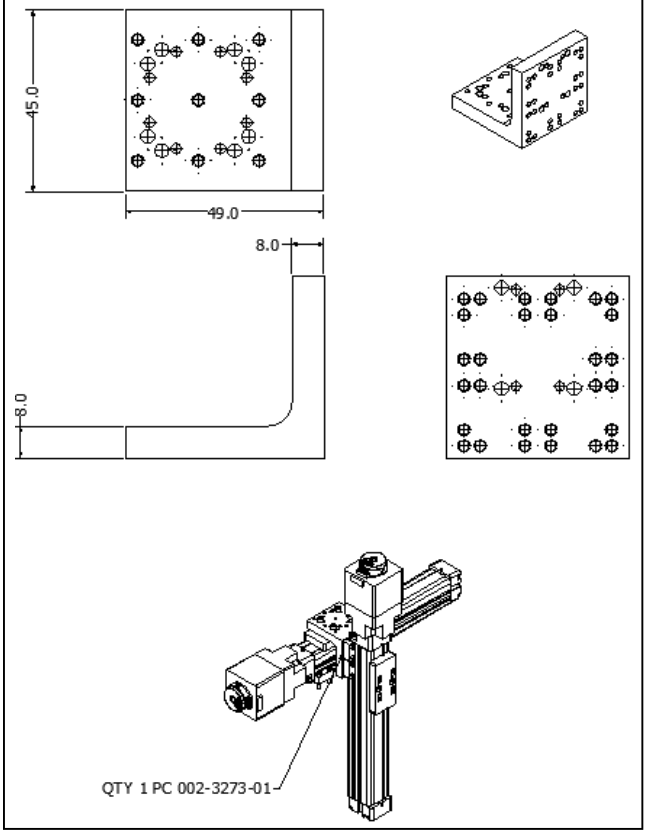
## P/N 002-3272-01

XY BRACKET LCR22/30 SCREW DRIVES
(INCLUDES 4 TOE CLAMPS AND FASTENERS)



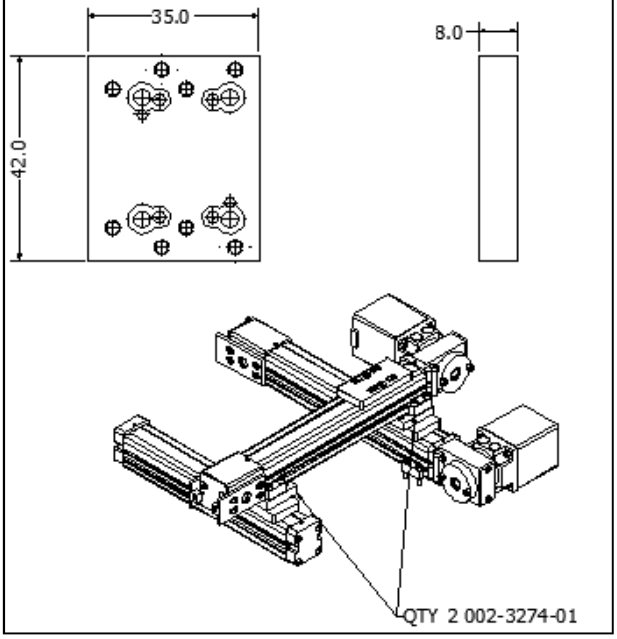

## P/N 002-3273-01

X-Z BRACKET LCR22/30
(INCUDES 4 TOE CLAMPS AND FASTENERS)




## P/N 002-3274-01

XY BRACKET LCR22/30 BELT DRIVES
(INCLUDES 2 TOECLAMPS AND FASTENERS)



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## Notes

# EM Sales Offices

## Australia

**Parker Hannifin (Australia) Pty Ltd.**
9 Carrington Road
Castle Hill NSW 2154
Australia
Tel: +61 (0) 2 9634-7777
Fax: +61 (0) 2 9634 3749

## Brazil

**Parker Hannifin Ind. Com Ltda.**
Av. Lucas Nogueira Garcez 2181
Esperança
12325-900 Jacareí, SP
Tel: 12 3954 5100
Fax: 12 3954 5262
Email: automation.brazil@parker.com

## Canada

**Parker Hannifin (Canada) Inc.**
160 Chisholm Dr
Milton, Ontario L9T 3G9
Tel: 905-693-3000
Fax: 905-876-1958
Email: miltoncustservice@parker.com

## China

**Parker Hannifin Motion & Control**
(Shanghai) Co., Ltd
280 Yunqiao Rd. Jin Qiao Export
Processing Zone
Shanghai 201206, China
Tel: (86-21) 50312525
Fax: (86-21) 64459717

## France

**Parker SSD Parvex**
8 avenue du Lac
B.P. 249
F-21007 Dijon Cedex
Tel: +33 (0) 3 80 42 41 40
Fax: +33 (0) 3 80 42 41 23

## Germany

**Electromechanical Europe**
**Parker Hannifin GmbH & Co KG**
Robert-Bosch-Strasse 22
D-77656 Offenburg
Germany
Tel: +49 (0) 781 509 0
Fax: +49 (0) 781 509 98176

## India

**Parker Hannifin India Pvt. Ltd**
**Automation Group-SSD Drives Div.**
133 & 151 Developed Plots Estate
Perungudi, Chennai 600 096
Tel: 044-4391-0799
Fax: 044-4391-0700

## Italy

**Parker Hannifin SpA**
Via Gounod 1
20092 Cinsello Balsamo
Milano, Italy
Tel: +39 02 361081
Fax: +39 02 36108400

## Korea

Parker Hannifin Korea
9th Floor KAMCO Yangjae Tower
949-3 Dogok 1-dong Gangnam-gu
Seoul 135-860, Korea
Tel: 82-2-559-0454
Fax: 82-2-556-8187

## Mexico

**Parker Hannifin de Mexico**
Eje uno Norte No.100
Parque Industrial Toluca 2000
Toluca, CP 50100 México
Tel: 52-722-275-4200
Fax: 52-722-279-0316

## Singapore

**Parker Hannifin Singapore Pte Ltd**
11, Fourth Chin Bee Road
Singapore 619702
Tel: (65) 6887 6300
Fax: (65) 6265 5125/6261 4929

## Taiwan

**Parker Hannifin Taiwan Co., Ltd**
No. 40, Wuchiuan 3rd Road
Wuku Industrial Park
Taipei County, Taiwan 248
ROC
Tel: 886 2 2298 8987
Fax: 886 2 2298 8982

## Thailand

**Parker Hannifin (Thailand) Co., Ltd.**
1023, 3rd Floor, TPS Building,
Pattanakarn Road,
Suanluang, Bangkok 10250
Thailand
Tel: (66) 02717 8140
Fax: (66) 02717 8148

## UK

**Parker Hannifin Ltd.**
Tachbrook Park Drive
Tachbrook Park
Warwick CV34 6TU
Tel: +44 (0) 1926 317970
Fax: +44 (0) 1926 317980

## USA

**Parker Hannifin Electromechanical Automation Division Main Office/ Compumotor/CTC**
5500 Business Park Drive
Rohnert Park, CA 94928 USA
Tel: 707-584-7558
800-358-9070
Fax: 707-584-8015
Email: emn_support@parker.com

**Parker Hannifin Electromechanical Automation Division/Daedal**
1140 Sandy Hill Road
Irwin, PA 15642
Tel: 724-861-8200
800-245-6903
Fax: 724-861-3330
Email: ddlcat@parker.com