FLUID POWER FOR AUTOMATION
<table>
<thead>
<tr>
<th>Actuators</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rotary Actuators</strong></td>
<td>Back and Forth Windshield Wiper Motion</td>
</tr>
<tr>
<td></td>
<td>Optional Stops at Multiple Positions in any Sequence</td>
</tr>
<tr>
<td></td>
<td><img src="image1" alt="Image of rotary actuator" /></td>
</tr>
<tr>
<td></td>
<td>A032, A42, A752</td>
</tr>
<tr>
<td><strong>Indexing Actuators</strong></td>
<td>One Way Rotation in Steps to Hard Stops</td>
</tr>
<tr>
<td></td>
<td>Steps 12 to 360 Degrees</td>
</tr>
<tr>
<td></td>
<td>No Accumulating Error</td>
</tr>
<tr>
<td></td>
<td><img src="image2" alt="Image of indexing actuator" /></td>
</tr>
<tr>
<td></td>
<td>X4, X1</td>
</tr>
<tr>
<td><strong>Stepping Actuators</strong></td>
<td>One Way Rotation in Steps Without Hard Stops</td>
</tr>
<tr>
<td></td>
<td>Steps in Any Angle Available</td>
</tr>
<tr>
<td></td>
<td><img src="image3" alt="Image of stepping actuator" /></td>
</tr>
<tr>
<td></td>
<td>S4, S1</td>
</tr>
<tr>
<td><strong>Pick &amp; Place Actuators</strong></td>
<td>Back and Forth Rotation, Extend and Retract</td>
</tr>
<tr>
<td></td>
<td>Independently Driven</td>
</tr>
<tr>
<td></td>
<td>Miniature with Vacuum Through Rod</td>
</tr>
<tr>
<td></td>
<td><img src="image4" alt="Image of pick &amp; place actuator" /></td>
</tr>
<tr>
<td></td>
<td>PBL3, PBM3, PA22</td>
</tr>
<tr>
<td><strong>Options for Actuators</strong></td>
<td>Control Motion</td>
</tr>
<tr>
<td></td>
<td>Special Construction</td>
</tr>
<tr>
<td></td>
<td>Magnetic Switches</td>
</tr>
<tr>
<td></td>
<td>Mount Plates</td>
</tr>
<tr>
<td></td>
<td>Shaft Configuration</td>
</tr>
<tr>
<td></td>
<td><img src="image5" alt="Image of options" /></td>
</tr>
<tr>
<td><strong>Other Products</strong></td>
<td>Shaft Mounting Adapters</td>
</tr>
<tr>
<td></td>
<td>Hydraulic Swing Clamp</td>
</tr>
<tr>
<td></td>
<td><img src="image6" alt="Image of other products" /></td>
</tr>
</tbody>
</table>

2
Don’t live with "one size fits all"

Select a shaft motion

Pick a basic unit

Specify options that serve you best

Get delivery in five days

Pay an off the shelf price

Run reliable production

Optimize your application with multiple choices for most parameters; 150 billion standard combinations!

Specials? Send us your sketch and we will quote you one or one thousand.

On time delivery
**Performance you can count on**

All Rotomation devices except AL7S are of rack and pinion construction to provide a constant torque over entire rotation of their shafts. Their similarities and differences are outlined in the following table.

<table>
<thead>
<tr>
<th>OPERATION</th>
<th>ROTARY ACTUATOR</th>
<th>STEPPING ACTUATOR</th>
<th>INDEXING ACTUATOR</th>
<th>COMPOSITE UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft Rotation</td>
<td>Back and Forth</td>
<td>One Way</td>
<td>One Way</td>
<td>One Way</td>
</tr>
<tr>
<td>Rotation Tolerance</td>
<td>A032, A01</td>
<td>N/A</td>
<td>All: –0.2</td>
<td>Back &amp; Place</td>
</tr>
<tr>
<td></td>
<td>A752, A1, A12</td>
<td></td>
<td>PA01, PA22, PA3</td>
<td>PX2</td>
</tr>
<tr>
<td></td>
<td>A2, A22</td>
<td></td>
<td>PA3, PA32</td>
<td>–0.2</td>
</tr>
<tr>
<td></td>
<td>A3, A32, A4, A42</td>
<td></td>
<td></td>
<td>PX2</td>
</tr>
<tr>
<td>Backlash at end of rotation</td>
<td>ALL DUAL RACK</td>
<td>N/A</td>
<td>All: 0</td>
<td>PX2</td>
</tr>
<tr>
<td></td>
<td>A01</td>
<td></td>
<td>PA01, PA2, PA3</td>
<td>PX2</td>
</tr>
<tr>
<td></td>
<td>A1, A2</td>
<td></td>
<td>PA2, PA32</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>A3, A4</td>
<td></td>
<td>PA22, PA32</td>
<td></td>
</tr>
<tr>
<td>Variable Rotation</td>
<td>Optional</td>
<td>Optional</td>
<td>No</td>
<td>Std. On PBL3 &amp;</td>
</tr>
<tr>
<td></td>
<td>Optional except AL75</td>
<td>Optional</td>
<td>Optional</td>
<td>PBM3 optional on others</td>
</tr>
<tr>
<td>Multiple Angles of Rotation</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional</td>
<td>Optional except PBL3 &amp; PBM3</td>
</tr>
<tr>
<td>Shaft Extension and Retraction</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Breakaway pressure with standard seals</td>
<td>5 psi</td>
<td>5 psi</td>
<td>7 psi</td>
<td>12 psi</td>
</tr>
</tbody>
</table>

LUBRICATION: LITHIUM BASED GREASE WITH PTFE. SEE INSTALLATION AND MAINTENANCE INSTRUCTIONS.
**A032 SUBMINIATURE DUAL RACK ACTUATOR**

**THE MIGHTIEST MINI -- THE MOST TORQUE FOR ITS SIZE**

**NOTE:**
1. The position of the ports and adjusters relative to the shaft can be changed by specifying rear projecting shaft.
2. 10-32 ports will accept MSX.8 fittings.
3. For plumbing and magnetic switch system setup, request guide.

**RATINGS**

| Torque Factor: in. lb./p.s.i. | .115 |
| Max. Working Pressure, p.s.i.: | 130 |
| Max. Torque: Non-shock, in. lb. | 15 |
| Max. Thrust: Non-shock, lb. | 30 |
| Max. Radial Load: Non-shock, lb. | 40 |
| Displacement: in. /deg. | .002 |
| Weight std. unit 90 deg.: lb. | 0.5 |
| Backlash at ends of rotation | 0 |

**PICTURED ACTUAL SIZE**

[Diagram of A032 actuator showing dimensions and ports.]
A032 SUBMINIATURE THREE POSITION ACTUATOR

NOTES:
1. The position of the ports and adjusters relative to the shaft can be changed by specifying rear projecting shaft as shown in photo.
2. 10-32 ports will accept M5X.8 threads.
3. For plumbing and magnetic switch system setup, request guide. Note that (4) magnetic switches are required to sense all (3) positions.

 Torque Factor to center: in. lb./p.s.i.  .057
 Max. Working Pressure: p.s.i.  130
 Max. Torque: Non-shock, in. lb.  15
 Max. Thrust: Non-shock, lb.  30
 Max. Radial Load: Non-shock, lb.  40
 Displacement: in "/deg"  .002
 Weight std. 90 deg. unit: lb. "A" above  .8
 Backlash at ends of rotation  0

RATINGS

1. The position of the ports and adjusters relative to the shaft can be changed by specifying rear projecting shaft as shown in photo.
2. 10-32 ports will accept M5X.8 threads.
3. For plumbing and magnetic switch system setup, request guide. Note that (4) magnetic switches are required to sense all (3) positions.
APPLICATIONS ROTOMATION DOES BETTER
MORE PRECISELY

OVER CENTER LOAD SWING-NO IMPACT
ALL AIR-NO OIL-NO SHOCK ABSORBERS WORKS AT HIGH CYCLE RATES.
Over Center or Other High Inertia Load Control.

RIVET FEED & INSTALL
Operation:
- Extend
- Install rivet
- Full extension
- Stake rivet
- Load rivet from feeder
- Retract
- Rotate 180 deg.
- Extend

Guide pin into bushing

PICK & PLACE PARTS
Construct to operate on retract to mount PA under work table

TENSIONER

FLIP CIRCUIT BOARD FOR COMPONENT INSTALLATION BOTH SIDES

TUBE BENDER
Bending Direction

TUBE BENDER

180 Deg. Rotary Actuator

CARTON ORIENT USING 4 POS. ROTARY ACTUATOR

SORTING
3 Position Rotary Actuator

CONVEYOR STOP USING 90 ROTARY ACTUATOR
**AL75 CONSTRUCTION**

One-piece, double ended piston drives shaft lug.

Shaft torque and angular velocity vary over rotation angle. Torque and velocity both low at ends of stroke to provide gentle start and stop.

Shaft lug shape and piston groove contour held to close tolerance for low friction and long life. Units tested under load beyond 20 million cycles without lubrication and without appreciable wear. Piston configuration is stable in cylinder bore, preventing localized wear.

Maximum rotation is about 95 deg., limited by geometry of drive system.

Piston is of internally lubricated PBT plastic, a stable, low friction, non-absorbent, high impact strength material. Body, including cylinder bore, is aluminum (6061) hardcoat anodized. Shaft is electroless nickel plated steel.

Ideal for food processing or clean room applications. Stainless steel or PET construction available on special order.

Washdown J option has plain bearing of PET instead of standard ball bearing.
**DESIGN YOUR A752 ROTARY ACTUATOR**

**FEATURES**
- High torque: .44P in. lb.
- Ball bearings
- Compact size
- Roller burnished long life cylinder bores
- Mounts on base, front or rear face
- No backlash at ends of rotation

**CALCULATED TORQUE IN INCH-POUNDS**
Deduct 10% for friction

<table>
<thead>
<tr>
<th>OPERATING PRESSURE IN PSI</th>
<th>25</th>
<th>50</th>
<th>60</th>
<th>80</th>
<th>100</th>
<th>200</th>
<th>300 (HP)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11</td>
<td>22</td>
<td>26.6</td>
<td>35.4</td>
<td>44.2</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**OPERATING PRESSURE IN PSI**

**SEAL REPAIR KITS**
- PART NUMBERS FOR SEAL REPAIR KITS
- FILL IN UNIT SERIES, AND ALL RELATED OPTIONS:
- SRK = A752-STD
- SERIES
- CUSHIONS
- ROTATION
- SEALS
- ADJUSTERS

**EXAMPLES:**
- SEAL KIT FOR A752-180-TC-S37-2C1-1Q-2SL-2A-1/8-V = SRK-A752-C-A
- NOTE: IF NO OPTIONS, SPECIFY SRK-A752-STD.

<table>
<thead>
<tr>
<th>EXTENSION CABLES FOR SWITCHES WITH PIGTAIL AND CONNECTOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>ORDER SEPARATELY</td>
</tr>
<tr>
<td>CABLE</td>
</tr>
<tr>
<td>2 METER LENGTH</td>
</tr>
<tr>
<td>5 METER LENGTH</td>
</tr>
</tbody>
</table>

When an option is not required, leave blank.

Write out any special requirements in English or provide a dimensioned sketch. Rotomation can provide units to almost any configuration.

To expedite the order of a duplicate of a prior unit, refer to prior invoice/serial number stamped on the unit body.

Needle valve cannot be on same side as port.

**CUSHIONS ROTATION ADJUSTERS**

**SHOCK BUMPER ADJUSTMENT**

**ADJUSTABLE ROTATION**

**CUSHIONS ADJUSTERS**

**SEALS**
- NITRILE (STD.)
- FLUOROCARBON PRETENSIONED
- SEALS, FLUOROCARBON PRETENSIONED
- SEALS, NITRILE (STD.)

**PORT SIZE**

**SHAFT SIZE & OPTION**
- STANDARD S37
- OPTION SYMBOL D37, HS37

**SHAFT KEYWAY MOTION**

**TOP CENTERED**
- CLOCKWISE CW
- COUNTERCLOCKWISE CCW

**SHAFT ROTATION ANGLE**
- PRELOADED KEYWAY: KK
- DIMENSIONS: SEE CATALOG PAGE 43
- S = SINGLE END
- D = DOUBLE END
- HS = HOLLOW SHAFT

**OPTION SYMBOL**

**NEEDLE VALVE POSITION**

**SYMBOL**
- 10.32 or 1/8
- OPTIONAL, NO COST

**OTHER SIZES TO ORDER**
- INDICATE SYMBOL OUTPUT CIRCUIT
  - 1 & 3, 2, 4, 5

**OPERATING PRESSURE IN PSI**
- 25
- 11
- 50
- 22
- 60
- 26.6
- 80
- 35.4
- 100
- 44.2
- 200
- 44.2
- 300 (HP)
- 44.2

**PORT POSITION**
- NO COST
- NOTE: PORT CANNOT BE ON SAME SIDE AS NEEDLE VALVE

**MAGNETIC CONTROL OPTION**
- 1 & 3, 2, 4, 5
- NO SWITCH
- MAG ONLY
- PNP Source
- NPN Sink
- N
- S
- R
- CW
- CCW
- BOTH
**A752 COMPACT, HIGH TORQUE DUAL RACK ACTUATOR**

**RATINGS**

<table>
<thead>
<tr>
<th>Torque Factor: in. lb./p.s.i.</th>
<th>.44</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Working Pressure, p.s.i.</td>
<td>Air 150</td>
</tr>
<tr>
<td>Oil 150</td>
<td></td>
</tr>
<tr>
<td>Max. Torque: Non-shock, in. lb.</td>
<td>70</td>
</tr>
<tr>
<td>Max. Thrust: Non-shock, lb.</td>
<td>40</td>
</tr>
<tr>
<td>Max. Radial Load: Non-shock, lb.</td>
<td>40</td>
</tr>
<tr>
<td>Displacement: in °deg.</td>
<td>.0078</td>
</tr>
<tr>
<td>Weight 180 deg. std. unit: lb.</td>
<td>1.9</td>
</tr>
</tbody>
</table>

**NOTE:**
Unit should not be subjected to torque impacts, as those from a high momentum load, without external stops.
When an option is not required, leave blank.

Write out any special requirements in English or provide a dimensioned sketch. Rotamotion can provide units to almost any configuration.

To expedite the order of a duplicate of a prior unit, refer to prior invoice/serial number stamped on the unit body.

Flow control and cushion cannot be installed in same end cap. Flow control in A01, A1, A12 10.32 port only.

Needle valve cannot be on same side as port.

Flow control and cushion cannot be installed in same end cap. Flow control in A01, A1, A12 10.32 port only.

To expedite the order of a duplicate of a prior unit, refer to prior invoice/serial number stamped on the unit body.

Flow control and cushion cannot be installed in same end cap. Flow control in A01, A1, A12 10.32 port only.

Needle valve cannot be on same side as port.
A01 ROTARY ACTUATOR

(3) 10-32 X .19 DP
TYP. FRONT & REAR

(2) 10-32 X .19 DP
BOTTOM ONLY

FRONT VIEW

END VIEW

DOUBLE END
SHAFT OPTION

BOTTOM VIEW

ROTATION

C DIMENSION

ADD TO 'C' DIM. PER SIDE

<table>
<thead>
<tr>
<th>ROTATION</th>
<th>'C' DIMENSION</th>
<th>ADD TO 'C' DIM. PER SIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 DEG.</td>
<td>1.36</td>
<td>.06</td>
</tr>
<tr>
<td>45</td>
<td>1.49</td>
<td>.13</td>
</tr>
<tr>
<td>60</td>
<td>1.62</td>
<td>.06</td>
</tr>
<tr>
<td>90</td>
<td>1.89</td>
<td>.13</td>
</tr>
<tr>
<td>100</td>
<td>1.97</td>
<td>.06</td>
</tr>
<tr>
<td>120</td>
<td>2.15</td>
<td>.13</td>
</tr>
<tr>
<td>180</td>
<td>2.67</td>
<td>.06</td>
</tr>
<tr>
<td>190</td>
<td>2.76</td>
<td>.13</td>
</tr>
<tr>
<td>270</td>
<td>3.46</td>
<td>.06</td>
</tr>
<tr>
<td>360</td>
<td>4.24</td>
<td>.13</td>
</tr>
<tr>
<td>370</td>
<td>4.33</td>
<td>.06</td>
</tr>
<tr>
<td>540</td>
<td>5.81</td>
<td>.13</td>
</tr>
<tr>
<td>550</td>
<td>5.90</td>
<td>.06</td>
</tr>
<tr>
<td>720</td>
<td>7.38</td>
<td>.13</td>
</tr>
<tr>
<td>730</td>
<td>7.47</td>
<td>.06</td>
</tr>
</tbody>
</table>

'Q' OPTION

(10-32 PORT ONLY)

'Q' & 'A' OPTION

(10-32 PORT ONLY)

DISPLACEMENT:

3

180 std. unit: lb.

.0013

.5

.13

RATINGS

Torque Factor: in. lb./p.s.i.
Max. Working Pressure, p.s.i.: Ar 105
Oil 105
Max. Torque: Non-shock, in. lb.
Max. Thrust: Non-shock, lb.
Displacement: in./deg.
Weight 180 std. unit: lb.

.077

105

8

8

.0013

0.5

NOTES:
1. Switch mounts by strap to cylinder; place as required for access and signal phasing. R (Sink) or S (Source) switches only.

www.rotomation.com
A1 & A12 ROTARY ACTUATORS

FRONT VIEW

BOTTOM VIEW

<table>
<thead>
<tr>
<th>C DIMENSION</th>
<th>ADD TO C DIM. PER SIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>A12</td>
</tr>
<tr>
<td>ROTATION</td>
<td>R OR 'S' OPT.</td>
</tr>
<tr>
<td>30 DEG.</td>
<td>2.06</td>
</tr>
<tr>
<td>45</td>
<td>2.06</td>
</tr>
<tr>
<td>60</td>
<td>2.28</td>
</tr>
<tr>
<td>90</td>
<td>2.81</td>
</tr>
<tr>
<td>100</td>
<td>2.98</td>
</tr>
<tr>
<td>120</td>
<td>3.33</td>
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<tr>
<td>180</td>
<td>4.38</td>
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<td>190</td>
<td>4.55</td>
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<td>270</td>
<td>5.95</td>
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<td>360</td>
<td>7.52</td>
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<td>370</td>
<td>7.69</td>
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<td>540</td>
<td>10.65</td>
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<tr>
<td>550</td>
<td>10.83</td>
</tr>
<tr>
<td>720</td>
<td>13.80</td>
</tr>
<tr>
<td>730</td>
<td>13.98</td>
</tr>
</tbody>
</table>

RATINGS

A1          A12

Torque Factor in lb.in./p.s.i.: .153      .306
Max. Working Pressure, p.s.i.: Air        150      150
Oil         300      300
Max. Thrust: Non-shock, lb.               40       40
Max. Radial Load: Non-shock, lb.           40       40
Displacement: in/deg.                     .0026     .0052
Weight 180 std. unit: lb.                  1.0       1.6

NOTES:
1. Switch mounts by strap to cylinder; place as required for access and signal phasing. R (Sink) or S (Source) switches only.
BUILT FOR OEM - RIGHT MOTION - RIGHT SIZE

DO IT IN THREES

The "LOCK STEP ACTUATOR" drives three shafts in spooky synchronism. A42-360 triple shown.

SAVE SPACE WITH HYBRID STEPPING ACTUATOR

Crammed for space (note necked down tie rods) but need lots of torque. In washdown package. S3 drive cylinder, S2 reset cylinder. Symbol: written description

DOUBLE TORQUE, DOUBLE UNITS

High torque in small package. Symbol: 44 S44-360-CW-S10-3C2-1/4-1,3 shown A special that has become popular.

DOUBLE TORQUE - FIVE POSITIONS

A44-90/45-0-90/45-HS75-1/4-1,3 SHOWN

CAPABLE AND TOUGH

Three position A12: exposed parts electroless nickel plated or solid stainless steel.

CONCENTRIC SHAFT ACTUATORS

Two actuators on same centerline. Concentric shafts independently driven. A2 and A4 shown.

THREE POSITION - GENTLY

Moves fragile product to any of three positions. Smooth motion, progressive cushions with fine adjustment, shaft to fit load. A22 shown.

OEM SPECIALS

With just a few custom parts, units uniquely suited to process functions provide low cost means to efficient, reliable productions systems.
Locating Dowel Pin Sockets-Tie Rod Units

Initial and replacement unit installations can be made precisely using locating dowel pin sockets in Rotomation units. Socket locations and dimensions are listed below for tie rod units. Note that sockets on unit top are in machine finished groove under Rotomation label.

### Calculated Torque in Inch-Pounds

- Deduct 10% for friction
- Operating Pressure in PSI
- High pressure option (HP) should be used for pressures exceeding 250 psi.

#### Design Your 1” to 2” Bore Tie Rod Rotary Actuator

- Needle valve cannot be on same side as port.
- Bore cannot be on same side as port.
- Shaft keyway motion:
  - A22 - 100 - TO - S5KK - 1F1 - 2C1 - 1Q - 2A - 2SL - V - 1/8 - 2 - N -
- Shafts and Keyway Angles
  - Optional angles: 30, 45, 60, 90, 120, 180, 270, 360, 720, etc.
- Multi-Position A22, A32, A42
- 3 POS: A-P-B/C, A-P-B, A-P-B/C
- 5 POS:
- See Catalog Page 39

#### Shaft Motion Symbol
- Top Centered Clockwise: TC CW
- Counter Clockwise: S CW

#### Flow Control
- 1F 2F 3F
- 1C 2C 3C
- 1Q 2Q 3Q

#### Cushion
- Needle Valve Position
- 1A 2A 3A

#### Adjustable Rotation
- Seals, Nitrile (STD.)
- Seals, Fluorocarbon
- Seals, Pre-Tensioned
- Seals, Fluorocarbon, Pre-Tensioned

#### Dimensions
- See Catalog Page 38
- Shaft Dimensions: A, B, C, D
- Motion Symbol:
  - A-P-B/C
  - A-P-B

#### Magnetic Control
- Option
- CW
- CCW
- BOTH

#### Port Position
- High Pressure Hydraulic: A or K
- Heavy Duty: J

#### Extension Cables for Switches with Pigtail and Connector
- Order Separately: Cable Code: C22

#### Seal Repair Kits
- Part Numbers for Seal Repair Kits

#### Locating Dowel Pin Sockets-Tie Rod Units

When an option is not required, leave blank.

Write out any special requirements in English or provide a dimensioned sketch. Rotomation can provide units to almost any configuration.

To expedite the order of a duplicate of a prior unit, refer to prior invoice/serial number stamped on the unit body.

Needle valve cannot be on same side as port.
A2 & A22 ROTARY ACTUATORS

**NOTES:**
1. For oil pressures exceeding approximately 250 psi recommend option HP which adds 1" to 'C' dimension.
2. Switch bracket mounts to tie rod; place as required for access and signal phasing.

---

**RATINGS**

<table>
<thead>
<tr>
<th></th>
<th>A2</th>
<th>A22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque Factor: in. lb./p.s.i.</td>
<td>.49</td>
<td>.88</td>
</tr>
<tr>
<td>Max. Working Pressure, p.s.i.:   Air</td>
<td>250</td>
<td>250</td>
</tr>
<tr>
<td></td>
<td>Oil</td>
<td>750</td>
</tr>
<tr>
<td>Max. Thrust: Non-shock, lb.</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Max. Radial Load: Non-shock, lb.</td>
<td>85</td>
<td>85</td>
</tr>
<tr>
<td>Displacement: in./deg.</td>
<td>.0086</td>
<td>.0172</td>
</tr>
<tr>
<td>Weight 180 std. unit: lb.</td>
<td>2.3</td>
<td>3.6</td>
</tr>
</tbody>
</table>

---

**A2 & A22 ROTARY ACTUATORS**

**C' DIMENSION**

<table>
<thead>
<tr>
<th>ROTATION</th>
<th>A2</th>
<th>A22</th>
<th>ADD TO 'C' DIM. PER SIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 DEG.</td>
<td>3.30</td>
<td>6.05</td>
<td>3.36</td>
</tr>
<tr>
<td>45</td>
<td>3.62</td>
<td>6.22</td>
<td>3.68</td>
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<td>60</td>
<td>3.95</td>
<td>6.38</td>
<td>4.01</td>
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<tr>
<td>90</td>
<td>4.60</td>
<td>6.36</td>
<td>4.66</td>
</tr>
<tr>
<td>120</td>
<td>5.26</td>
<td>6.38</td>
<td>5.32</td>
</tr>
<tr>
<td>180</td>
<td>6.57</td>
<td>7.57</td>
<td>6.63</td>
</tr>
<tr>
<td>190</td>
<td>6.79</td>
<td>7.79</td>
<td>6.85</td>
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<tr>
<td>270</td>
<td>8.53</td>
<td>9.53</td>
<td>8.59</td>
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<td>360</td>
<td>10.50</td>
<td>11.50</td>
<td>10.56</td>
</tr>
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<td>370</td>
<td>10.71</td>
<td>11.71</td>
<td>10.77</td>
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<tr>
<td>540</td>
<td>14.42</td>
<td>15.42</td>
<td>14.48</td>
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<tr>
<td>550</td>
<td>14.64</td>
<td>15.64</td>
<td>14.70</td>
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<tr>
<td>720</td>
<td>18.35</td>
<td>19.35</td>
<td>18.41</td>
</tr>
<tr>
<td>730</td>
<td>18.57</td>
<td>19.57</td>
<td>18.63</td>
</tr>
</tbody>
</table>

---

**Ratings Diagram**

- **C' OPTION**
- **Q' & 'A' OPTION**
- **'C' & 'A' OPTION**
- **'Q' & 'A' OPTION**
- **'A' OR 'F' & 'A' OPTION**
- **DUAL RACK UNIT IN PHANTOM**

---

**Diagrams**

- Front View
- Bottom View
- 'G', 'R' OR 'S' OPT.
A3 & A32 ROTARY ACTUATORS

**C DIMENSION**

<table>
<thead>
<tr>
<th>ROTATION</th>
<th>A3</th>
<th>A32</th>
<th>ADD TO 'C' DIM. PER SIDE</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 DEG.</td>
<td>4.44</td>
<td>6.63</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
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<td>45</td>
<td>4.96</td>
<td>6.90</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
<tr>
<td>60</td>
<td>5.49</td>
<td>7.16</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
<tr>
<td>90</td>
<td>6.53</td>
<td>7.53</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
<tr>
<td>100</td>
<td>6.88</td>
<td>7.88</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
<tr>
<td>120</td>
<td>7.58</td>
<td>8.58</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
<tr>
<td>180</td>
<td>9.68</td>
<td>10.68</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
<tr>
<td>190</td>
<td>10.03</td>
<td>11.03</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
<tr>
<td>270</td>
<td>12.82</td>
<td>13.82</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
<tr>
<td>360</td>
<td>15.96</td>
<td>16.96</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
<tr>
<td>370</td>
<td>16.31</td>
<td>17.31</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
<tr>
<td>540</td>
<td>22.24</td>
<td>23.24</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
<tr>
<td>550</td>
<td>22.59</td>
<td>23.59</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
</tr>
<tr>
<td>720</td>
<td>28.53</td>
<td>29.53</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
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<tr>
<td>730</td>
<td>28.87</td>
<td>29.87</td>
<td>Std. 'G', 'R' or 'S' Opt.</td>
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**RATINGS**

<table>
<thead>
<tr>
<th></th>
<th>A3</th>
<th>A32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque Factor, in. lb./p.s.i.</td>
<td>1.49</td>
<td>2.98</td>
</tr>
<tr>
<td>Max. Working Pressure, p.s.i.:</td>
<td>Air 250</td>
<td>250</td>
</tr>
<tr>
<td>Oil</td>
<td>750</td>
<td>750</td>
</tr>
<tr>
<td>Max. Thrust: Non-shock, lb.</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Max. Radial Load: Non-shock, lb.</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Displacement: in. deg.</td>
<td>.026</td>
<td>.052</td>
</tr>
<tr>
<td>Weight 180 std. unit, lb.</td>
<td>6.1</td>
<td>6.8</td>
</tr>
</tbody>
</table>

**NOTES:**
1. For oil pressures exceeding approximately 250 psi recommend option HP which adds 1" to 'C' dimension.
2. Switch mounts by strap to cylinder; place as required for access and signal phasing.
A4 & A42 ROTARY ACTUATORS

NOTES:
1. For oil pressures exceeding approximately 250 psi recommend option HP which adds 2” to ‘C’ dimension.
2. Switch bracket mounts to tie rod; place as required for access and signal phasing.

RATINGS

<table>
<thead>
<tr>
<th>Rotation</th>
<th>A4</th>
<th>A42</th>
</tr>
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<tbody>
<tr>
<td>30 DEG.</td>
<td>6.81</td>
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</tr>
<tr>
<td>45</td>
<td>7.39</td>
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<tr>
<td>90</td>
<td>9.12</td>
<td>9.18</td>
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<tr>
<td>120</td>
<td>10.27</td>
<td>10.33</td>
</tr>
<tr>
<td>180</td>
<td>12.57</td>
<td>12.63</td>
</tr>
<tr>
<td>270</td>
<td>16.03</td>
<td>16.09</td>
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<tr>
<td>360</td>
<td>19.48</td>
<td>19.54</td>
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<tr>
<td>450</td>
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<td>550</td>
<td>28.78</td>
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<tr>
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<td>33.37</td>
</tr>
<tr>
<td>730</td>
<td>33.69</td>
<td>33.75</td>
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</table>

ADD TO ‘C’ DIM. PER SIDE

<table>
<thead>
<tr>
<th>Rotation</th>
<th>A4</th>
<th>A42</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 DEG.</td>
<td>.06</td>
<td>.06</td>
</tr>
<tr>
<td>45</td>
<td>.29</td>
<td>.29</td>
</tr>
<tr>
<td>60</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>90</td>
<td>1.00</td>
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<tr>
<td>120</td>
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<tr>
<td>180</td>
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<td>1.00</td>
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<td>270</td>
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<tr>
<td>360</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>450</td>
<td>1.00</td>
<td>1.00</td>
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<tr>
<td>550</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>720</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>730</td>
<td>1.00</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Ratings:

- Torque Factor: in. lb./p.s.i.
  - A4: 3.46
  - A42: 6.92

- Max. Working Pressure, p.s.i.: Air 250

- Oil: 750

- Max. Thrust: Non-shock, lb.
  - A4: 300
  - A42: 300

  - A4: 300
  - A42: 300

- Displacement: in. / deg.
  - A4: .060
  - A42: .121

- Weight 180 std. unit lb.
  - A4: 9.3
  - A42: 14.3
Construction and external size similar to rack and pinion actuator, but pinion drives shaft one way through overrunning clutch.

Four way valve controls full cycle
- **Drive**: Rack drives pinion, pinion drives shaft through overrunning clutch until pawl stops and locks ratchet.
- **Lock**: Pawl prevents forward motion, rack force and non-return clutch prevent reverse motion.
- **Reset**: Rack reverses, drives pinion backward to start point, cam lifts pawl; shaft remains stationary held by non-return clutch. Each shaft step controlled by accurately cut ratchet.

Sensors and system signals
- Extended pawl shaft moves 7 deg. at index and reset; use proximity detector, low force sensitive switch or pilot valve
- Magnetic pistons and switches

Shaft Motion
- **Angular step accuracy**: 0.2 degree
- **No cumulative error**
- **Shaft locked in both directions in index position at end of drive stroke**
- **Stop at end of drive stroke is abrupt**: Avoid shock by flow control of exhausting cylinder to limit velocity
- **Drive is through overrunning clutch**: Cushion on drive cylinder ineffective without friction in load
- **Shaft movable in forward direction by outside torque in reset**
- **No reverse shaft motion**: Non-return clutch
- **Reset operation quick**: Moves only pistons, rack, pinion, cam pawl. Silence with cushion if desired.

---

**CONSTRUCTION AND OPERATION**

**SHAFT**: HARD TREATED ALLOY STEEL, INTERNAL CLUTCH BEARING  
**GEAR**: HARD TREATED ALLOY STEEL, INTERNAL CLUTCH BEARING  
**CAM**: HARDENED STEEL  
**CYLINDER**: HARD ANODIZED ALUMINUM. X2 AND LARGER UNITS: OPTIONAL STEEL, CHROME PLATED HONED I.D. AND EPOXY COATED O.D.  
**BALL BEARING**: SEALED, HIGH RADIAL AND THRUST CAPABILITY  
**PISTON**: CORROSION RESISTANT ALUMINUM ALLOY, FLOATING IN X2 AND LARGER UNITS. CAN BE EQUIPPED WITH MAGNET. X1 AND X12 HAVE CAPTIVE PISTON.  
**PISTON SEAL**: PRESSURE ENERGIZED, LOW BREAKAWAY, NITRILE, FKM OR OTHER AS REQUIRED.  
**END CAPS**: ANODIZED, HEAT TREATED ALUMINUM ALLOY, O-RING SEALS, METAL TO METAL CONTACT WITH CYLINDER.  

---

**LUBRICATION**: LITHIUM BASED GREASE WITH PTFE. SEE INSTALLATION AND MAINTENANCE INSTRUCTIONS.
APPLICATIONS - POSSIBLE ONLY WITH ROTOMATION
INDEXING ACTUATORS

INDEXING SPRAY SYSTEM

CUSTOM RATCHET PRESENTS FACES OF ODD PART SHAPE

ROBOT PAINT SPRAY

7 STATION INDEXING CONVEYOR

INDEXING ACTUATOR DRIVES SPROCKET IN STEPS TO POSITION WORK PIECES FOR PROCESSING.

INDEXING WALKING BEAM

FEED CHUTE

120 deg. Indexer

TIME 90 DEG. INDEX TOSSES BISCUITS TO CONVEYOR TRAY

CONVEYOR

INDEXING ACTUATOR DRIVES SPROCKET IN STEPS TO POSITION WORK PIECES FOR PROCESSING.

INDEXING WALKING BEAM

TIMING BELT

360 DEG. INDEXER

FLETCHING ARROWS

120 deg. Indexer

Align Fletch and Glue

120 deg. Index Motion

Arrow

Arrow Support

MATERIAL DISPENSER

COMPACT MATERIAL

ADD MATERIAL

PURGE MATERIAL

INDEXING ACTUATOR

ROTARY KNIFE

INDEXING ACTUATOR

MATERIAL DISPENSER

ROTARY KNIFE

TESTING USING MULTIPLE REAGENTS

LOAD

INDEXING ACTUATOR

INDEXING ACTUATOR

UNLOAD

DISPENSE ADHESIVE

INSIDE SEALANT RING

www.rotomation.com

RotoCAD

DWG/DXF Drawing Files & Part No. Description

www.rotomation.com
When an option is not required, leave blank.

Write out any special requirements in English or provide a dimensioned sketch. Rotomation can provide units to almost any configuration.

To expedite the order of a duplicate of a prior unit, refer to prior invoice/serial number stamped on the unit body.

INDEX SIGNALING - EXTENDED PAWL SHAFT

Mechanical signal of index and reset. Sense with switch, pilot valve or proximity detector.

Pawl and shaft move 7° at index and reset; cam driven at reset, spring driven at index. Use a 1" arm, proximity detector or sensitive switch.

Shaft projects 3/4" from back of body.

See page 41.

Symbol: E
X3-120-CCW-S75-1F12C1-2E shown.

NOTE that magnetic pistons and switches may also be used on the indexers.
**X1 & X12 INDEXING ACTUATORS**

---

**3/32 X 3/64**

**X1 & X12 INDEXING ACTUATORS**

**Weight 180 std. unit: lb.-oz.**

**Displacement: in / deg.**

**Max. Radial Load: Non-shock, lb.**

**Max. Thrust: Non-shock, lb.**

**Max. Torque: Non-shock, in. lb.**

**Max. Working Pressure, p.s.i.:**

- Air
- Oil

**Torque Factor: in. lb./p.s.i.**

---

**NOTES:**

1. An uncontrolled reset stroke can cause some bounce of the rack and a small forward impulse to the shaft. It will be apparent only if the shaft load is small, with low friction. It can be reduced by a bumper (usable on reset cylinder only) or more by a correctly adjusted cushion.

2. Switch mounts by strap to cylinder; place as required for access and signal phasing; R (Sink) or S (Source) switches only.

---

**RATINGS**

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<tr>
<td>Torque Factor:</td>
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<td>0.306</td>
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<tr>
<td>Max. Working</td>
<td>150</td>
<td>150</td>
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<tr>
<td>Pressure: Oil</td>
<td>300</td>
<td>150</td>
</tr>
<tr>
<td>Max. Energy:</td>
<td>2.1</td>
<td>2.1</td>
</tr>
<tr>
<td>Max. Torque: Non-</td>
<td>45</td>
<td>45</td>
</tr>
<tr>
<td>Max. Reverse</td>
<td>23</td>
<td>23</td>
</tr>
<tr>
<td>Max. Thrust:</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Max. Radial Load</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Displacement:</td>
<td>0.0026</td>
<td>0.0052</td>
</tr>
<tr>
<td>Weight 180 std.</td>
<td>1.11</td>
<td>2.2</td>
</tr>
</tbody>
</table>

---

**INDEXING ACCURACY –0.2 deg.**

**SHAFT KEYWAY POSITION**

- Reference (start) position of shaft keyway:
  - 30¡ index: 11:30
  - 60¡ index: 9:00
  - 120¡ index: 6:00
  - All others: 12:00

- (Angles measured with respect to bottom of body.)

- Accuracy of reference position: –2¡

- Optional high accuracy reference position:
  - (not available on 15, 18 and 22.5 deg. units) –0.2¡

- Symbol: KL

---

**INDEXING ACCURACY –0.2 deg.**

**SHAFT KEYWAY POSITION**

- Reference (start) position of shaft keyway:
  - 30¡ index: 11:30
  - 60¡ index: 9:00
  - 120¡ index: 6:00
  - All others: 12:00

- (Angles measured with respect to bottom of body.)

- Accuracy of reference position: –2¡

- Optional high accuracy reference position:
  - (not available on 15, 18 and 22.5 deg. units) –0.2¡

- Symbol: KL

---

**NOTES:**

1. An uncontrolled reset stroke can cause some bounce of the rack and a small forward impulse to the shaft. It will be apparent only if the shaft load is small, with low friction. It can be reduced by a bumper (usable on reset cylinder only) or more by a correctly adjusted cushion.

2. Switch mounts by strap to cylinder; place as required for access and signal phasing; R (Sink) or S (Source) switches only.
X2 & X22 INDEXING ACTUATORS

(4) 10-32 X .50 DP
TYP. FRONT & REAR

1.000 .500
2.438
.500 DIA.

FRONT VIEW

(4) 10-32 X .50 DP
BOTTOM ONLY

.28
.88
.78
.23

BOTTOM VIEW

NOTES:
1. An uncontrolled reset stroke can cause some bounce of the rack and a small forward impulse to the shaft. It will be apparent only if the shaft load is small, with low friction. It can be reduced by a bumper (usable on the reset cylinder only) or more by a correctly adjusted cushion.
2. Switch bracket mounts to tie rod; place as required for access and signal phasing.

INDEXING ACCURACY –0.2 deg.

SHAFT KEYWAY POSITION

Reference (start) position of shaft keyway:
30¡ indexer 11:30 345¡
60¡ indexer 9:00 270¡
120¡ indexer 6:00 180¡
All others 12:00 0¡

(Angles measured with respect to bottom of body.)

Accuracy of reference position
Optional high accuracy reference position
(not available on 15, 18 and 22.5 deg. units)
Symbol: KL

11.30 345¡
9:00 270¡
6:00 180¡
12:00 0¡

Symbol: KL

** - Thrust inward, front to rear only. Do not apply thrust in opposite direction.

Torque Factor: in. lb./p.s.i.
Max. Working Pressure, p.s.i.: Air
Max. Impact Energy: in. lb. Front
Max. Torque: Non-shock, in. lb.
Max. Reverse Torque: Non-shock, in. lb.
Max. Thrust: Non-shock, lb.
Displacement: in /deg.
Weight 180 deg. std. unit: lb.-oz.

RATINGS

<table>
<thead>
<tr>
<th></th>
<th>X2</th>
<th>X22</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque Factor</td>
<td>.49</td>
<td>.98</td>
</tr>
<tr>
<td>Max. Working Pressure, p.s.i.:</td>
<td>150</td>
<td>75</td>
</tr>
<tr>
<td>Oil</td>
<td>150</td>
<td>75</td>
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<tr>
<td>Max. Impact Energy: in. lb. Front</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Rear</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Max. Torque: Non-shock, in. lb.</td>
<td>73</td>
<td>73</td>
</tr>
<tr>
<td>Max. Reverse Torque: Non-shock, in. lb.</td>
<td>37</td>
<td>37</td>
</tr>
<tr>
<td>Max. Thrust: Non-shock, lb.</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Max. Radial Load: Non-shock, lb.</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Displacement: in /deg.</td>
<td>.0086</td>
<td>.0172</td>
</tr>
<tr>
<td>Weight 180 deg. std. unit: lb.-oz.</td>
<td>2-15</td>
<td>4-6</td>
</tr>
</tbody>
</table>

SHOWN WITH OPTIONAL MOUNT PLATE
**X3 & X32 INDEXING ACTUATORS**

*(4) 1/4-20 X .50 DP.
FRONT ONLY (NOTE 3)*

**3/16 X 3/32**

1/4 NPT PORT

-(Thrust inward, front to rear only. Do not apply thrust in opposite direction.)

ADD TO 'C' RESET SIDE

**BOTTOM VIEW**

Front: 8.9
Rear: 4

80

Max. Thrust: Non-shock, lb.
150

Max. Reverse Torque: Non-shock, in. lb.
80

Displacement: in /deg.
.526
.052

Weight 180 deg. std. unit: lb.-oz.
7.9
9.9

- Thrust inward, front to rear only. Do not apply thrust in opposite direction.

**RATINGS**

<table>
<thead>
<tr>
<th></th>
<th>X3</th>
<th>X32</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque Factor: in. lb./p.s.i.</td>
<td>1.49</td>
<td>2.96</td>
</tr>
<tr>
<td>Max. Working Pressure, p.s.i.:</td>
<td>Air</td>
<td>120</td>
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<tr>
<td>Oil</td>
<td>120</td>
<td>60</td>
</tr>
<tr>
<td>Max. Impact Energy: in. lb.</td>
<td>Front</td>
<td>8.9</td>
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<tr>
<td>Rear</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Max. Torque: Non-shock, in. lb.</td>
<td>196</td>
<td>196</td>
</tr>
<tr>
<td>Max. Reverse Torque: Non-shock, in. lb.</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>Max. Thrust: Non-shock, lb.</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Max. Radial Load: Non-shock, lb.</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Displacement: in /deg.</td>
<td>.526</td>
<td>.052</td>
</tr>
<tr>
<td>Weight 180 deg. std. unit: lb.-oz.</td>
<td>7.9</td>
<td>9.9</td>
</tr>
</tbody>
</table>

**INDEXING ACCURACY -0.2 deg.**

**SHAFT KEYWAY POSITION**

Reference (start) position of shaft keyway:
30° indexer 11:30 345°
60° indexer 9:00 270°
120° indexer 6:00 180°
All others 12:00 0°

(Angles measured with respect to bottom of body.)

Accuracy of reference position ~2°
Optional high accuracy reference position (not available on 15, 18 and 22.5 deg. units) ~0.2°

Symbol: KL

**NOTES:**
1. An uncontrolled reset stroke can cause some bounce of the rack and a small forward impulse to the shaft. It will be apparent only if the shaft load is small, with low friction. It can be reduced by a bumper (usable on the reset cylinder only) or more by a correctly adjusted cushion.
2. Switch mounts by strap to cylinder; place as required for access and signal phasing.
3. For rear mount, order rear mount construction to reverse body and provide rear mount holes. Note reduced impact energy capacity, page 29.

**C’ DIMENSION**

<table>
<thead>
<tr>
<th></th>
<th>X3</th>
<th>X32</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROTATION</td>
<td>STD.</td>
<td>G, R OR ‘S’ OPT.</td>
</tr>
<tr>
<td>12 DEG.</td>
<td>4.31</td>
<td>6.32</td>
</tr>
<tr>
<td>15</td>
<td>4.41</td>
<td>6.37</td>
</tr>
<tr>
<td>18</td>
<td>4.52</td>
<td>6.42</td>
</tr>
<tr>
<td>22.5</td>
<td>4.68</td>
<td>6.50</td>
</tr>
<tr>
<td>30</td>
<td>4.94</td>
<td>6.63</td>
</tr>
<tr>
<td>36</td>
<td>5.15</td>
<td>6.74</td>
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<tr>
<td>45</td>
<td>5.46</td>
<td>6.90</td>
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<tr>
<td>60</td>
<td>5.99</td>
<td>7.16</td>
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<td>72</td>
<td>6.49</td>
<td>7.40</td>
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<tr>
<td>90</td>
<td>7.03</td>
<td>8.03</td>
</tr>
<tr>
<td>120</td>
<td>8.08</td>
<td>9.08</td>
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<tr>
<td>180</td>
<td>10.17</td>
<td>11.17</td>
</tr>
<tr>
<td>360</td>
<td>16.46</td>
<td>17.46</td>
</tr>
</tbody>
</table>

1.000

**ADD TO ‘C’ SIDE**

1.49

**PORT POSITIONS**

2.00 SQ.

DUAL RACK UNIT
IN PHANTOM

1/4 NPT PORT

1.3/4

2.98

3.72

2.125

.750 DIA.

.43

2.125

.06

1.000

BOTTOM VIEW

(4) 1/4-20 X .50 DP.
BOTTOM ONLY

.026

.052

.06

(4) 1/4-20 X .50 DP.
FRONT ONLY (NOTE 3)

.052
X4 & X42 INDEXING ACTUATORS

Torque Factor: in lb./p.s.i.  
X4  3.46  6.92  
X42  3.46  6.92

Max. Working Pressure, p.s.i.:  
Air  120  60  
Oil  120  60

Front  17.4  17.4

180  180

Max. Thrust: Non-shock, lb.  
180  180

Max. Torque: Non-shock, in. lb.  
180  180

Max. Reverse Torque: Non-shock, in. lb.  
90  90

Displacement: in /deg.  
.06  .06

Weight 180 deg. std. unit: lb.-oz.  
10-13  15-15

NOTES:
1. An uncontrolled reset stroke can cause some bounce of the rack and a small forward impulse to the shaft. It will be apparent only if the shaft load is small, with low friction. It can be reduced by a bumper (usable on the reset cylinder only) or more by a correctly adjusted cushion.
2. Switch bracket mounts to tie rod; place as required for access and signal phasing.
3. For rear mount, order rear mount construction to reverse body and provide rear mount holes. Note reduced impact energy capacity, page 29.

INDEXING ACCURACY –0.2 deg.

SHAFT KEYWAY POSITION
Reference (start) position of shaft keyway:
30 deg. 11:30  345;
60 deg. 6:00  270;
120 deg. 6:00  180;
All others 12:00  0

Accuracy of reference position
Optional high accuracy reference position
(not available on 15, 18 and 22.5 deg. units) –0.2;
Symbol: K4.

www.rotomation.com

NOTES:
1. An uncontrolled reset stroke can cause some bounce of the rack and a small forward impulse to the shaft. It will be apparent only if the shaft load is small, with low friction. It can be reduced by a bumper (usable on the reset cylinder only) or more by a correctly adjusted cushion.
2. Switch bracket mounts to tie rod; place as required for access and signal phasing.
3. For rear mount, order rear mount construction to reverse body and provide rear mount holes. Note reduced impact energy capacity, page 29.
INDEXING SIMPLIFIED: CALCULATE IMPACT EASILY

Impact can displace work pieces, damage fixtures or the indexing actuator itself by breaking its shaft or ratchet key.

Avoid these effects by limiting rotational speed with a flow control; use the maximum available time consistent with cycle requirements.

CALCULATE MOMENT OF INERTIA

- **DISC:**
  \[ J = \frac{D^4 \pi H D}{12365} \text{ in lb sec}^2 \]
  or \[ J = \frac{MD^2}{3091} \]

- **CONCENTRATED LOAD:**
  \[ J = \frac{MR^2}{386.4} \text{ in lb sec}^2 \]

- **PLATE ON AXIS:**
  \[ J = \frac{MA^2}{4637} \text{ in lb sec}^2 \]
  or \[ J = \frac{L x H x D x A^2}{4637} \]

- **RECTANGULAR PLATE:**
  \[ J = \frac{ML^2 + A^2}{4637} \text{ in lb sec}^2 \]
  or \[ J = \frac{AHLD (L^2 + A^2)}{4637} \]

- **THIN ROD AROUND ONE END:**
  \[ J = \frac{ML^2}{1159} \text{ in lb sec}^2 \]

- **THIN ROD AROUND CENTER:**
  \[ J = \frac{ML^2}{4637} \text{ in lb sec}^2 \]

CALCULATE IMPACT IN ROTARY MOTION

- \( \theta \) = angle of motion in radians, 1 radian = 57.3 degrees
- \( w \) = angular velocity in radians/second
- \( t \) = time duration of motion in seconds

For many pneumatic systems

\[ w = 2.3 \times \theta/t \] gives a reasonable estimate of maximum angular velocity

Impact energy:

\[ W = \text{impact energy in in lb} \]
\[ J = \text{total moment of inertia of entire shaft load in in lb sec}^2 \]
\[ = J \text{ of workpiece} + J \text{ of fixtures} + J \text{ of supports member(s)} \]
\[ W = 1/2Jw^2 \]

UNIT SELECTION

The following are maximum practical values of \( W \) for production use. They are based upon shaft tests to failure and provide a factor of safety of about 4 for shaft fracture. Though safe for the shaft, this impact may dislodge product or have other inertia effects.

<table>
<thead>
<tr>
<th>UNIT</th>
<th>FRONT SHAFT</th>
<th>REAR SHAFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1 &amp; X12</td>
<td>2.1 in lb</td>
<td>.4 in lb</td>
</tr>
<tr>
<td>X2 &amp; X22</td>
<td>4</td>
<td>1.2</td>
</tr>
<tr>
<td>X3 &amp; X32</td>
<td>8.9</td>
<td>4</td>
</tr>
<tr>
<td>X4 &amp; X42</td>
<td>17.4</td>
<td>6.4</td>
</tr>
</tbody>
</table>

www.rotomation.com  
DWG/DXF Drawing Files & Part No. Description
HINTS ON USING A STEPPING ACTUATOR

The stepping actuator provides torque while rotating through its specified angle, always in one direction. It has no ability to slow or stop its load, so it will stop at a point determined by load inertia, friction, or external stops. The shaft can freewheel in the forward direction without restriction, so it has no fixed reference position. A one way clutch in the body prevents rotation in the reverse direction. Optional rotation adjusters can be used to set the stroke, and multiple stroke lengths can be obtained from a multi-angle actuator. The actuator can be stalled continuously by an external stop without problems.

Natural applications for the stepping actuator include:
- Indexing applications where there is a high drag/inertia ratio and where error does not accumulate, such as driving a pinch roller to pull stock from a spool incrementally to be cut into lengths.
- Driving detented items such as rotary switches, cam sequences, etc.
- Those needing one-direction rotary motion with no position accuracy requirement, such as waste conveyors.

Torque Ratings
The maximum torque is limited by the roller clutches used to drive the shaft and to prevent reverse rotation. Exceeding the maximum working pressure specified may overload the clutch, reducing life and/or causing immediate failure. Dual rack actuators are intended for use in applications where the maximum torque rating of the clutch cannot be utilized on normal shop air. Please note that normal shop air may overload the clutch on a dual rack actuator.

Reverse torque from an external source can also damage the actuator if it exceeds the maximum torque rating.

PRECISE POSITIONING/INDEXING
The stepping actuator can index even a high inertia load very precisely with a shot pin or other detent mechanism. The precision of the angle and load position is that of the detent system. This offers a number of advantages:
- The stop positions can be adjusted by adjustment of the detent position.
- Irregular, custom angle sequences are possible.
- The detent can be placed at a large radius to handle high inertia loads.

LOAD POSITION STABILITY
The shaft and load are prevented from rearward motion by the drive clutch and by a similar non-return clutch installed between the shaft and body. However, the clutches offer no resistance to forward motion, so torques in that direction will displace the shaft and load. unwanted forward motion can be prevented by a controlled clutch/brake. Such a device can be installed on the rear projection of a double ended shaft.

---

**STEPPING ACTUATOR RATINGS**

<table>
<thead>
<tr>
<th></th>
<th>S1</th>
<th>S2</th>
<th>S22</th>
<th>S3</th>
<th>S32</th>
<th>S4</th>
<th>S42</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torque Factor: in. lb./p.s.i.</td>
<td>.153</td>
<td>.49</td>
<td>.98</td>
<td>1.49</td>
<td>2.98</td>
<td>3.46</td>
<td>6.92</td>
</tr>
<tr>
<td>Max. Working Pressure, p.s.i.</td>
<td>150</td>
<td>150</td>
<td>75</td>
<td>130</td>
<td>65</td>
<td>120</td>
<td>60</td>
</tr>
<tr>
<td>Oil</td>
<td>300</td>
<td>150</td>
<td>75</td>
<td>130</td>
<td>65</td>
<td>120</td>
<td>60</td>
</tr>
<tr>
<td>Max. Torque: Non-shock, in. lb.</td>
<td>45</td>
<td>73</td>
<td>73</td>
<td>196</td>
<td>196</td>
<td>412</td>
<td>412</td>
</tr>
<tr>
<td>Max. Reverse Torque: Non-shock, in. lb.</td>
<td>23</td>
<td>37</td>
<td>37</td>
<td>98</td>
<td>98</td>
<td>206</td>
<td>206</td>
</tr>
<tr>
<td>Max. Thrust: Non-shock, lb.</td>
<td>46</td>
<td>75</td>
<td>75</td>
<td>150</td>
<td>150</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Max. Radial Load: Non-shock, lb.</td>
<td>40</td>
<td>75</td>
<td>75</td>
<td>150</td>
<td>150</td>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td>Displacement: in °deg.</td>
<td>.0026</td>
<td>.0086</td>
<td>.0172</td>
<td>.026</td>
<td>.052</td>
<td>.060</td>
<td>.121</td>
</tr>
<tr>
<td>Weight 180 deg. std. unit: lb.-oz.</td>
<td>1-2</td>
<td>2-7</td>
<td>3-12</td>
<td>6-2</td>
<td>8-12</td>
<td>8-14</td>
<td>13-14</td>
</tr>
</tbody>
</table>
DESIGN YOUR PBL3 PICK & PLACE ACTUATOR

MINIATURE-VACUUM THRU ROD-BUILT IN VACUUM PORT

PORT POSITION

SERIES ROD

STROKE

190 .30 M ZD W

ROD ROTATION ANGLE

RANGE DEG: SYMBOL

10 to 104 104
96 to 190 190

SOLID ROD

NO VACUUM

NO PORT

HOLLOW ROD

VAC. PORT

HOLLOW ROD

VAC. PORT

OPERATION

PORT SYMBOl

#3-56 ALL PORTS

#3-56 ACTIVE PORTS,

OTHERS PLUGGED

1/16" HOSE BARB ACTIVE

PORTS, OTHERS PLUGGED

#3-56 ROTATION PORTS

#3-56 EXTEND PORT

"B" OR "D"

#3-56 VACUUM PORT

"M" OR "N"

ROTATION ADJUSTER

MAXIMUM RATINGS

OPERATION

20 .09 1.0 0.7
40 .18 1.9 1.4
60 .27 2.9 2.2
80 .36 3.9 2.9
100 .45 4.9 3.6

Torque .45 In. Lb.
Rotary Actuator Disp. .008 Cu. In. /94 Deg.
Weight 1.6 Oz.

For Convum PFG-5A to 15A
For Anver PFL-6 to 9
For Anver F10 to F25 & BL1.5-11 etc.

Purchase separately
**SERIES ROD STROKE**

<table>
<thead>
<tr>
<th>SERIES</th>
<th>190</th>
<th>M</th>
<th>3SC</th>
<th>7SC</th>
<th>ZD</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>.10</td>
<td>.20</td>
<td>.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ROD ROTATION ANGLE**

<table>
<thead>
<tr>
<th>RANGE DEG:</th>
<th>SYMBOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 to 104</td>
<td>44</td>
</tr>
<tr>
<td>96 to 190</td>
<td>94</td>
</tr>
</tbody>
</table>

**MAGNETIC CONTROL OPTIONS-LINEAR**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>INDICATES</th>
<th>OUTPUT CIRCUIT</th>
<th>LEAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>LINEAR, 1 SW</td>
<td>NPN Sink</td>
<td>C Connector</td>
</tr>
<tr>
<td>8</td>
<td>LINEAR, 2 SW</td>
<td>PNP Source</td>
<td></td>
</tr>
</tbody>
</table>

**PORT POSITION**

<table>
<thead>
<tr>
<th>PORT</th>
<th>SYMBOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>X or Z</td>
<td>X or Z</td>
</tr>
<tr>
<td>N or B</td>
<td>B or D</td>
</tr>
</tbody>
</table>

**MAGNETIC CONTROL OPTIONS-ROTARY**

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>INDICATES</th>
<th>OUTPUT CIRCUIT</th>
<th>LEAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CCW</td>
<td>NPN Sink</td>
<td>C Connector</td>
</tr>
<tr>
<td>2</td>
<td>CCW BOTH</td>
<td>PNP Source</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>CW</td>
<td></td>
<td></td>
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</tbody>
</table>

**NOTE:** MAGNETIC PISTONS STANDARD

**EXTENSION CABLES FOR SWITCHES WITH PIGTAIL AND CONNECTOR**

<table>
<thead>
<tr>
<th>CABLE</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 METER LENGTH</td>
<td>CC2</td>
</tr>
<tr>
<td>5 METER LENGTH</td>
<td>CC5</td>
</tr>
</tbody>
</table>

**OPERATION**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>.09</td>
<td>1.0</td>
<td>0.7</td>
</tr>
<tr>
<td>40</td>
<td>.18</td>
<td>1.9</td>
<td>1.4</td>
</tr>
<tr>
<td>60</td>
<td>.27</td>
<td>2.9</td>
<td>2.2</td>
</tr>
<tr>
<td>80</td>
<td>.36</td>
<td>3.9</td>
<td>2.9</td>
</tr>
<tr>
<td>100</td>
<td>.45</td>
<td>4.9</td>
<td>3.6</td>
</tr>
</tbody>
</table>

**MAXIMUM RATINGS**

- **Rotary Section Max. Pressure Air:** 100 PSI
- **Linear Section Max. Pressure Air:** 100 PSI
- **Torque:** .45 In. Lb.
- **Rotary Actuator Disp.:** .008 Cu. In. /94 Deg
- **Weight:** 2.0 Oz.

**VACUUM CUP ADAPTERS**

- For Conum PFG-5A to 15A
- For Anver PFL-6 to 9
- For Anver F10 to F25 & BL1.5-11 etc.

**ORDER SEPARATELY**

- CABLE
- EXTENSION CABLES FOR SWITCHES WITH PIGTAIL AND CONNECTOR

**VACUUM THRU HOLLOW ROD (OPTIONAL)**

**THRU HOLES FOR #4-40 SHCS, #8-32 TAPS (4) PLACES**

**SWITCH GROOVES**

**#3-56 EXTEND PORT 'B OR 'D**

**#3-56 VAC. PORT 'M OR 'N**

**ROTATION ADJUSTER**

**#3-56 RETRACT PORT 'X OR 'Z**

**#4-40 THREAD**

**VACUUM THRU HOLLOW ROD (OPTIONAL)**

**THRU HOLES FOR #4-40 SHCS, #8-32 TAPS (4) PLACES**
DESIGN YOUR PICK & PLACE ACTUATOR

When an option is not required, leave blank.

Write out any special requirements in English or provide a dimensioned sketch. Rotomation can provide units to almost any configuration.

To expedite the order of a duplicate of a prior unit, refer to prior invoice/serial number stamped on the unit body.

NEEDLE VALVE CANNOT BE ON SAME SIDE AS PORT.

When an option is not required, leave blank.

Write out any special requirements in English or provide a dimensioned sketch. Rotomation can provide units to almost any configuration.

DESIGN YOUR NITPICKER (INDEXING PICK & PLACE)

TO PROVIDE AN INDEXING ROTARY MOTION COMBINED WITH A LINEAR MOTION, CONSIDER THE NITPICKER, WHICH COMBINES THE X2 OR X22 ROTARY DRIVE WITH THE LINEAR MOTION FACILITY OF THE PA2 OR PA22.

CONFIGURATION IS SIMILAR TO THE PA2 OR PA22. FOR SPECIFICATION AND ORDERING DETAILS, CONSULT FACTORY; ASK FOR THE NITPICKER DESIGN CHART. FUNCTIONS AND OPTIONS ARE SIMILAR TO THOSE OUTLINED ABOVE BUT HAVE ROTARY CHARACTERISTICS OF THE X2 AND X22.
PA01 MINIATURE PICK & PLACE ACTUATOR
LOTS OF ACTION, TINY SPACE, TINY COST

OPERATION

<table>
<thead>
<tr>
<th>PRESSURE</th>
<th>TORQUE-IN. LB.</th>
<th>PUSH LB.</th>
<th>PULL LB.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PSI</td>
<td>(.07 X PSI)</td>
<td>(.3 X PSI)</td>
<td>(.19 X PSI)</td>
</tr>
<tr>
<td>60</td>
<td>6</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td>80</td>
<td>5</td>
<td>24</td>
<td>15</td>
</tr>
<tr>
<td>100</td>
<td>7</td>
<td>30</td>
<td>19</td>
</tr>
</tbody>
</table>

Above figures are computed; output torques and forces are reduced by internal friction.

UNCONTROLLED IMPACT CAN CAUSE DAMAGE. LIMIT BOTH ROTATIONAL & LINEAR SPEEDS BY USE OF FLOW CONTROL IN EXHAUSTING CYLINDER.

MAGNETIC SWITCH OPTIONS
Solid state switches (R or S) are available on rotary and linear sections of unit. Switches mount to cylinders; place as required for access and phasing. Add 1/2" to cylinder length and unit height for linear switches.

MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>ROTARY</th>
<th>PRESSURE, AIR</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>SECTION</td>
<td>PRESSURE, OIL</td>
<td>100</td>
</tr>
<tr>
<td>LINEAR</td>
<td>PRESSURE, AIR</td>
<td>100</td>
</tr>
<tr>
<td>SECTION</td>
<td>PRESSURE, OIL</td>
<td>100</td>
</tr>
<tr>
<td>TORQUE, NON-SHOCK, IN.-LB.</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Rot. Act. Disp. in &quot;deg.&quot;</td>
<td>.0013</td>
<td></td>
</tr>
<tr>
<td>Weight 180 deg., 2&quot; std. unit lb</td>
<td>0.9</td>
<td></td>
</tr>
</tbody>
</table>

Rotation Tolerance: -0 +10 deg.
Backlash: 6 deg.

NOTES:
1. Rotary options available are the same as A01.
2. Stop tubes are available to stabilize the extended shaft. Standard lengths are 1" and 2"; add to unit height. Sleeves for switch magnets serve the same function.
PA2 & PA22 PICK & PLACE ACTUATORS

Reed (G) and solid state switches (R or S) are available on rotary and linear sections of unit. Switches mount to cylinders; place as required for access and phasing.

LINEAR INSTALLATIONS:
Add 1 1/2" to cylinder length and unit height

MAGNETIC SWITCH OPTIONS

UNCONTROLLED IMPACT CAN CAUSE DAMAGE. LIMIT BOTH ROTATIONAL & LINEAR SPEEDS BY USE OF FLOW CONTROL IN EXHAUSTING CYLINDER.

WWW.ROTOMATION.COM

Rotocad, Inc. Drawing Files & Part No. Description

Above figures are computed; output torques and forces are reduced by internal friction.

NOTES:
1. Stop tubes are available to stabilize the extended shaft. Standard lengths are 1" and 2"; add to unit height. Sleeves for switch magnets serve the same function.
PA3 & PA32 PICK & PLACE ACTUATORS

OPERATION

<table>
<thead>
<tr>
<th>PRESSURE (PSI)</th>
<th>TORQUE IN. LB.</th>
<th>PUSH L.B. (1.48 X PSI)</th>
<th>PULL L.B. (.70 X PSI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60</td>
<td>89</td>
<td>178</td>
<td>89</td>
</tr>
<tr>
<td>80</td>
<td>119</td>
<td>238</td>
<td>118</td>
</tr>
<tr>
<td>100</td>
<td>149</td>
<td>NA</td>
<td>148</td>
</tr>
<tr>
<td>150</td>
<td>223</td>
<td>NA</td>
<td>222</td>
</tr>
<tr>
<td>200</td>
<td>NA</td>
<td>NA</td>
<td>296</td>
</tr>
<tr>
<td>300</td>
<td>NA</td>
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<td>444</td>
</tr>
<tr>
<td>500</td>
<td>NA</td>
<td>NA</td>
<td>740</td>
</tr>
</tbody>
</table>

Above figures are computed; output torques and forces are reduced by internal friction.

UNCONTROLLED IMPACT CAN CAUSE DAMAGE. LIMIT BOTH ROTATIONAL & LINEAR SPEEDS BY USE OF FLOW CONTROL IN EXHAUSTING CYLINDER.

MAGNETIC SWITCH OPTIONS
Reed (G) and solid state switches (R or S) are available on rotary and linear sections of unit. Switches mount to cylinders; place as required for access and phasing.

ROTARY INSTALLATIONS:
Find C dimension in tables on A3 & A32 page.

LINEAR INSTALLATIONS:
Add 1 1/2" to cylinder length and unit height.

MAXIMUM RATINGS

<table>
<thead>
<tr>
<th>PA3</th>
<th>PA32</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROTARY PRESSURE, AIR</td>
<td>165</td>
</tr>
<tr>
<td>SECTION PRESSURE, OIL</td>
<td>165</td>
</tr>
<tr>
<td>LINEAR PRESSURE, AIR</td>
<td>250</td>
</tr>
<tr>
<td>SECTION PRESSURE, OIL</td>
<td>500</td>
</tr>
<tr>
<td>TORQUE, NON-SHOCK, IN.-LB.</td>
<td>250</td>
</tr>
<tr>
<td>Rot. Act. Disp. in .deg.</td>
<td>0.26</td>
</tr>
<tr>
<td>Weight 180 deg., 2&quot; std unit lb.</td>
<td>9.2</td>
</tr>
</tbody>
</table>

Rotation Tolerance: PA3 & PA32 ±0.2 deg.

Backlash: |
| PA3 | 2 deg. |
| PA32 | 1 deg. |

NOTES:
1. Stop tubes are available to stabilize the extended shaft. Standard lengths are 1" and 2"; add to unit height. Sleeves for switch magnets serve the same function.
GENERAL AND MOTION CONTROL OPTIONS

ACTUATOR SHAFT KEYWAY MOTION
Symbols specify orientation of arc of motion looking at front of unit. In Top Center (TC), the keyway passes thru 12:00 o-clock (0 deg.) at the midpoint of rotation; one-half the rotation is on either side of 12:00 o-clock.
Symbol: TC, CW, CCW  No cost option.

INDEXING & STEPPING ACTUATOR SHAFT KEYWAY MOTION
Specify shaft rotation looking at the projecting, load-carrying shaft.
Symbol: CW, CCW  No cost option.
Indexing actuator: steps in specified direction to hard stops.
Stepping actuator: steps in specified direction, no hard stops. Accumulates error.

PORT POSITIONS 1, 2, 3, 4, 5
NEEDLE VALVE POSITIONS 1, 2, 3, 4
(PORT & NEEDLE VALVE CANNOT BE AT SAME POSITION)
Use numbered locations to specify desired position. No port in position 5 with options A, F or C. No port or needle valve between end caps in dual rack units; for positions 90 from shaft, specify 1, 3 (top and bottom).
Symbols: 1, 2, 3, 4, 5  No cost option.

ROTATION ADJUSTER
Adjustable stop controls rotation over 30 deg. range by stroke reduction.
Can be combined with flow control or cushion in single rack actuators or steppers.
Not available for indexers.
Symbol: A

BUMPER
A urethane bumper is fastened to the piston face. It eliminates metal to metal contact and absorbs shock. Requires added cylinder length.
Symbol: Q

ADJUSTER AND BUMPER
Combination of adjuster and bumper. Uses enlarged adjuster face to distribute impact.
Requires added cylinder length.

CUSHION
A reversed U-cup on the auxiliary piston closes the free passage to the port, forces exhaust through the control needle valve over last 30 deg. of rotation. For return, pressure folds U-cup down, allows full pressure and flow to piston.
Not fully effective in drive direction in steppers or indexers because of overrunning clutch.
Symbol: C

ADJUSTER AND CUSHION
Combined adjuster and cushion for single rack actuators or steppers. Installed separately, cushion on top rack, in dual rack units. Stroke reduction also reduces cushion action.

FLOW CONTROL
Forces exhausting air to pass through control needle valve, limits operating speed throughout rotation in one direction. Check valve opens for full flow on return. Requires needle valve access; not available with port position 5.
Intended primarily for air operation. Can be combined with rotation adjustment.
Symbol: F
**MOTION CONTROL OPTIONS**

**THREE POSITION ACTUATOR**

Uses internal stops for optional drive to any of three shaft positions in any sequence. Available in A12, A22, A32 and A42, but drives shaft with only one cylinder at a time; use torque factor for A1, A2, A3 or A4.

Shown: A42-45-045-S11-C2-RR-1/4-1, 3

To specify the positions desired in a 3 position dual rack actuator:

1. Determine central reference position RP at 0° to 360° clockwise from 12:00
2. Determine angle CCW from RP: A
3. Determine angle CW from RP: B

Specify: A-RP-B

Example: 30-45-30

**FOUR OR FIVE POSITION ACTUATORS**

Pairs of auxiliary cylinders and pistons with stop rods added to three position actuators provide additional intermediate stop positions. All positions are accessible in any sequence. Note that intermediate end caps are vented.

Shown: four position A22-30-30-30-S5-1/8-4

**FOUR POSITION:**

To specify the positions desired in a 4 position dual rack actuator with auxiliary cylinders:

1. Determine an inner reference position RP at 0° to 360° clockwise from 12:00
2. Determine angle CCW from RP: A
3. Determine angles CW from RP: B & C

Enclose RP with dashes, separate others with slash.

Specify: A-RP-B/C

Example: 30-0-30/30

**FIVE POSITION:**

To specify the positions desired in a 5 position dual rack actuator with auxiliary cylinders:

1. Determine the central reference position RP at 0° to 360° clockwise from 12:00
2. Determine angles CCW from RP: A & B
3. Determine angles CW from RP: C & D

Enclose RP with dashes, separate others with slash.

Specify: A/B-RP-C/D

Example: 30/30-30-30/30

**NOTE: MULTI-POSITION ACTUATORS REQUIRE TWO MAGNETIC SWITCHES TO INDICATE EACH INTERMEDIATE POSITION.**

**AIR DAMPERS**

Auxiliary cylinders and pistons with adjustable pressurization through a relieving regulator give soft deceleration at cycle rates higher than conventional shock absorbers can tolerate.

Consult factory.

---

**CONSTRUCTION OPTIONS**

**FOUR OR FIVE POSITION:**

**CONSTRUCTION OPTIONS**

**FOUR OR FIVE POSITION:**

**WASHDOWN UNITS**

Shaft seals built into body or integral cover plates, cylinders sealed by O-Rings, assembly threads sealed, stainless shafts, anodized body and end caps.

Symbol: J

On order, hard chrome plated shafts, electroless nickel plated body and end caps.

**DUST RESISTANT UNITS**

Units sealed against inward leakage

Pressurization port

Symbol: Written description

**CLEAN ROOM CONSTRUCTION**

Units sealed against outward leakage

Body drain or purge ports

Low vapor pressure lubrication

Dry lubrication or wear rings

Symbol: Written description

**SPECIAL SEALS**

High temperature or aggressive fluids: FKM

Note bearing seal limitations.

Symbol: V

Minimum fluid leakage: Pretensioned seals.

Check fluid compatibility. Note increased breakaway pressure.

Symbol: T

**HIGH PRESSURE CONSTRUCTION**

For pressures to 750 psi. Steel cylinders (no magnetic switches), hydraulic pistons with backup rings or pretensioned seals as required.

Thread inserts on tie rod anchors. Body drain if desired.

Symbol: HP

**HEAVY DUTY, DUST RESISTANT**

A4, A42, X4, X42

Sealed, non-pumping structure-dust stays out.

Pistons: two PTFE wear rings, carboxylated nitrile seals.

Cylinders: hard chrome ID, epoxy OD or aluminum with hard coat ID.

Lube: extra-tacky air cylinder grease.

Symbol: A or K

**REAR MOUNT CONSTRUCTION**

X3, X32, X4, X42

Shaft projects from rear; front mount holes opposite. Specify shaft rotation and options relative to shaft. Note reduced impact capacity page 29.

Symbol: B
Two types of clamps are shown. Tie rod or strap clamps are supplied to fit best on the unit for which they are specified.

Switch position is adjustable along the integral track and locked by a hex socket set screw. Pigtail leads with connectors as shown on the A752 are optional on all switches; the extension cables should be ordered separately.

SET UP AND OPERATION

Adjust switch position along exhausting cylinder to phase signal for desired sequence.

Adjustable range: 30 deg. or 1/2 stroke, whichever is smaller.

Keep magnetic materials away.

Multi-position actuators require two switches to indicate each intermediate position; a single switch will indicate each end position.

Rotomation piston magnets and switches are designed to work together. Magnets or switches may or may not work with components of other manufacture.
MAGNETIC SWITCHES

**SWITCHES FOR TIE ROD UNITS**

<table>
<thead>
<tr>
<th>R</th>
<th>S</th>
<th>G</th>
<th>R</th>
<th>S</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWITCHING VOLTAGE</td>
<td>6-24 VDC</td>
<td>6-24 VDC</td>
<td>5-120 VAC/VDC</td>
<td>6-24 VDC</td>
<td>6-24 VDC</td>
</tr>
<tr>
<td>SWITCHING CURRENT</td>
<td>.5 A Max.</td>
<td>.5 A Max.</td>
<td>.5 A Max., .005 Min.</td>
<td>.20 A Max.</td>
<td>.20 A Max.</td>
</tr>
<tr>
<td>SWITCHING POWER</td>
<td>12 W Max.</td>
<td>12 W Max.</td>
<td>10 W Max.</td>
<td>4.8 W Max</td>
<td>4.8 W Max</td>
</tr>
<tr>
<td>VOLTAGE DROP</td>
<td>.5 V</td>
<td>.5 V</td>
<td>3.5 V</td>
<td>1.0 V Max.</td>
<td>1.0 V Max.</td>
</tr>
</tbody>
</table>

**SWITCHES FOR A032, A752 & AL75**

<table>
<thead>
<tr>
<th>R</th>
<th>S</th>
<th>G</th>
<th>R</th>
<th>S</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWITCHING VOLTAGE</td>
<td>6-24 VDC</td>
<td>6-24 VDC</td>
<td>5-30 VDC</td>
<td>5-30 VDC</td>
<td>6-24 VDC</td>
</tr>
<tr>
<td>SWITCHING CURRENT</td>
<td>.5 A Max.</td>
<td>.5 A Max.</td>
<td>.5 A Max., .005 Min.</td>
<td>.20 A Max.</td>
<td>.20 A Max.</td>
</tr>
<tr>
<td>SWITCHING POWER</td>
<td>12 W Max.</td>
<td>12 W Max.</td>
<td>10 W Max.</td>
<td>4.8 W Max</td>
<td>4.8 W Max</td>
</tr>
<tr>
<td>VOLTAGE DROP</td>
<td>.5 V</td>
<td>.5 V</td>
<td>3.5 V</td>
<td>1.0 V Max.</td>
<td>1.0 V Max.</td>
</tr>
</tbody>
</table>

**SWITCHES FOR PBM**

<table>
<thead>
<tr>
<th>R</th>
<th>S</th>
<th>G</th>
<th>R</th>
<th>S</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td>SWITCHING VOLTAGE</td>
<td>6-24 VDC</td>
<td>6-24 VDC</td>
<td>5-30 VDC</td>
<td>5-30 VDC</td>
<td>6-24 VDC</td>
</tr>
<tr>
<td>SWITCHING CURRENT</td>
<td>.5 A Max.</td>
<td>.5 A Max.</td>
<td>.5 A Max., .005 Min.</td>
<td>.20 A Max.</td>
<td>.20 A Max.</td>
</tr>
<tr>
<td>SWITCHING POWER</td>
<td>12 W Max.</td>
<td>12 W Max.</td>
<td>10 W Max.</td>
<td>4.8 W Max</td>
<td>4.8 W Max</td>
</tr>
<tr>
<td>VOLTAGE DROP</td>
<td>.5 V</td>
<td>.5 V</td>
<td>3.5 V</td>
<td>1.0 V Max.</td>
<td>1.0 V Max.</td>
</tr>
</tbody>
</table>

**R' NPN (Sinking)**

| L: 837-100-034 | BRN SWITCH | GRN LOAD | 6-24 VDC POWER SUPPLY | L: 937-000-035 | BRN SWITCH | 6-24 VDC POWER SUPPLY |
| C: 837-100-134 | WHT SWITCH | BLK LOAD |

**S' PNP (Sourcing)**

| L: 837-100-033 | BRN SWITCH | GRN LOAD | 6-24 VDC POWER SUPPLY | L: 937-100-031 | BRN SWITCH | 6-24 VDC POWER SUPPLY |
| C: 837-100-133 | WHT SWITCH | BLK LOAD |

**'G' Reed**

| L: 837-100-084 | BRN SWITCH | 5-120 V DC or AC POWER SUPPLY | N/A |
| C: 837-100-104 | WHT SWITCH |

**SWITCH LEADS:**

- **Description**
- ** Specify **
  - 9 ft. PVC cable, 3 conductor, color coded.
  - 6 inch. pigtail with 8 mm quick disconnect.

**EXTENSION CABLES - ORDER SEPARATELY**

- Cables have 8mm locking connector to connect to C switches, above. 3 conductors color coded brown, black, blue.

<table>
<thead>
<tr>
<th>Cable length</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 m</td>
<td>CC2</td>
</tr>
<tr>
<td>5 m</td>
<td>CC5</td>
</tr>
</tbody>
</table>

**REPLACEMENT SWITCHES**

- Order by number adjacent to switch block in diagrams above. Switches with leads identified by L, those with pigtail and connector by C. Switches are tested before shipment and are NOT returnable.

**OTHER SIGNAL OPTIONS**

MAXIMUM LOAD TORQUE ON EXTENDED PAWL SHAFT

<table>
<thead>
<tr>
<th>Unit</th>
<th>In. Oz.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1 or X12</td>
<td>1</td>
</tr>
<tr>
<td>X2 or X22</td>
<td>2</td>
</tr>
<tr>
<td>X3 or X32</td>
<td>10</td>
</tr>
<tr>
<td>X4 or X42</td>
<td>17</td>
</tr>
</tbody>
</table>

INDEXING ACTUATOR EXTENDED PAWL SHAFT

Shaft rotates 7 deg. at index and reset. Arm actuates switch, prox detector or pilot valve. Dimensions: see Design Your Indexing Actuator page 24.

LED indicates switch operation.

Standard lead length is 9'; connector is on 6" pigtail.

Observe polarity; reversal will damage switch.

Observe maximum ratings; exceeding them will damage switch.

Reed switch has built-in surge protection; others do not.

Switches and cables resistant to moisture, dust and oil: designed to meet NEMA 4 specification.

For use in explosive or other atmospheres or with air logic controls. Ports provide line pressure signal at ends of rotation to actuate external devices. Fixed position, not adjustable.
MOUNT PLATE OPTIONS

REAR MOUNT PLATE  P

FRONT MOUNT PLATE  N

BOTTOM MOUNT PLATE  M

INDEXING ACTUATORS: Rear plate P fits X1, X12, X2, X22; for X3, X32, X4 & X42 specify BP:
rear mount construction and plate.

STEPPING ACTUATORS: Rear plate P not usable on S2 OR S22; others ok.

PICK AND PLACE ACTUATORS AND NITPICKERS: Mount plate P (perpendicular to rod) same
as listed plate for corresponding actuator or indexer.

DIMENSIONS

For PA01, see pg. 35
MATCH YOUR LOAD WITH SHAFT OPTIONS

DOUBLE END SHAFT
Shaft extends from the rear of the unit as well as the front. Rear projection dimensions same as front.
Symbol: D(SIZE)
A42-180-CCW-D11-3C2-1/4-1.3 shown.

HOLLOW SHAFT
Provides compact coupling to load; dimension table below.
Self aligning if mounted free on driven shaft with turnbuckle to absorb torque.
Symbol: HS(SIZE)
A42-180-TC-HS75-3C2-1/4-1.3 shown.

PRELOADED KEYWAY
SET SCREW LOCKS KEY TIGHT IN KEYWAY

CUSTOMER SYMBOL

UNIT SYMBOL

SHAFT DIAMETER: 3/16 1/4 3/8 3/16 ID 1/2 3/4 3/4 ID 1 1 1/8

UNIT SYMBOL
A032 O O O S O D
A01 S S O
A01 O S O
A1 or A12 O S O O
S1 O S O
X1 or X12 S O
AL7S O S O
A752 S O O
A2 or A22 S O O
S2 or S22 S O
X2 or X22 S O
A3 or A32 S O O
S3 or S32 S O
X3 or X32 S O
A4 or A42 S O O
S4 or S42 S O
X4 or X42 S O

SHAFT SYMBOL

SHAFT I.D.
S18 .125
S25 .156
S25 .156
S37 .188
D37 .250
R37 .250
S37 .250
D37 .250

SHAFT O.D.
.375
.375
.375
.375
.500
.500
.750
.750

STD. BRG.
BRONZE
BALL
BALL
BALL

SET SCREW
8-32
8-32
10-32
10-32

KEYWAY
3/32 X 3/64
3/32 X 3/64
3/16 X 3/32
3/16 X 3/32

Standard and Optional Shaft Configurations

REAR PROJECTING SHAFT
A032
Specify options from front view of unit. Rear projecting shaft operates like rear half of double ended shaft.

HOLLOW SHAFT

S18 means "single ended shaft .188" (3/16") diameter; others similar.
D18 means "double ended shaft .188" (3/16") diameter; others similar.
R37 means "rear projecting shaft .375" (3/8") diameter; others similar.
HS37 means "hollow shaft .375" (3/8") inside diameter; others similar.
S means "standard".
O means "optional".
* No cost option; all other optional shaft configurations at slight additional cost.

SPECIAL SHAFTS:
Specify or sketch:
Length or projection
Diameter
Keyway
Drill or tap
Retaining ring groove
Bore
Wrench flats
Material
Heat treat
Plating
Most configurations in short time at low cost.
Ask for quotation.
SHAFT MOUNTING ADAPTERS

---

**SHAFT MOUNTING ADAPTERS**

**DRILL PATTERN**

**SXXX FOR SPECIAL**

**1/4 X 1.50 LG.**

**3/16 X 1.38 LG.**

**3/32 X .75 LG.**

**J SOC. HD. CAP SCREW**

---

**-ORDERING INFORMATION-**

**SMA - 50 - W - M.060**

---

**DIMENSIONS**

<table>
<thead>
<tr>
<th>SIZE</th>
<th>SHAFT DIA.</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>P</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>37</td>
<td>.375</td>
<td>2.00</td>
<td>1.063</td>
<td>.313</td>
<td>1.00</td>
<td>.375</td>
<td>.750</td>
<td>3/32 X .75 LG.</td>
<td>6-32</td>
<td>#8-32</td>
<td>1.375</td>
<td>1.22</td>
<td>.219</td>
<td>#10-32</td>
<td>.060</td>
<td>.250</td>
</tr>
<tr>
<td>50</td>
<td>.500</td>
<td>2.50</td>
<td>1.188</td>
<td>.375</td>
<td>1.25</td>
<td>.500</td>
<td>.813</td>
<td>1/8 X .81 LG.</td>
<td>6-32</td>
<td>#10-32</td>
<td>1.750</td>
<td>1.64</td>
<td>.219</td>
<td>#10-32</td>
<td>.060</td>
<td>.250</td>
</tr>
<tr>
<td>75</td>
<td>.750</td>
<td>3.50</td>
<td>1.875</td>
<td>.500</td>
<td>1.63</td>
<td>.750</td>
<td>1.375</td>
<td>3/16 X 1.38 LG.</td>
<td>10-32</td>
<td>1/4-20</td>
<td>2.500</td>
<td>2.25</td>
<td>.281</td>
<td>1/4-20</td>
<td>.060</td>
<td>.313</td>
</tr>
<tr>
<td>10</td>
<td>1.000</td>
<td>4.00</td>
<td>2.125</td>
<td>.625</td>
<td>2.25</td>
<td>1.000</td>
<td>1.500</td>
<td>1/4 X 1.50 LG.</td>
<td>1-4/20</td>
<td>5/16-18</td>
<td>3.000</td>
<td>2.56</td>
<td>.406</td>
<td>3/8-16</td>
<td>.125</td>
<td>.438</td>
</tr>
</tbody>
</table>

---

**NOTES:**

2. User specified holes: Send drawing. Factory will assign number XXX.
3. Adapters are stocked with no holes and with holes as shown. Special hole patterns and pilots are normally added after anodize and will expose bare aluminum.
4. Keyway is aligned with sides of plate. Reference bore ‘R’ is concentric with shaft bore within .001 TIR.
5. Shaft mounting adapters shipped with key, clamp screws & set screws.
6. Pilot diameter tolerance is ±.002.
CONSTRUCTION:
SPECIAL ORDER
Rod: Chrome Plated 303 Stainless Steel
Body: 6061 Aluminum, Electroless Nickel Plated
End Cap: 2024 Aluminum, Black Anodized
Tie Rods & Nuts: 303 Stainless Steel

DESCRIPTION:
Clamp rod and arm extended and retracted by 1.375 bore cylinder with .750 diameter rod. Rod and arm rotated 90 deg. by rack and pinion actuator. Extend/retract and rotation separately plumbed and controlled.

RATINGS
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Working Pressure, p.s.i.:</td>
<td>500</td>
</tr>
<tr>
<td>Maximum Clamping Force, lbs.:</td>
<td>528</td>
</tr>
<tr>
<td>Maximum Extend Force, lbs.:</td>
<td>742</td>
</tr>
<tr>
<td>Clamp Arm Rotation, deg.:</td>
<td>90</td>
</tr>
<tr>
<td>Bore Diameter:</td>
<td>1.375&quot;</td>
</tr>
<tr>
<td>Rod Diameter:</td>
<td>.750&quot;</td>
</tr>
</tbody>
</table>

OPTIONS
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke:</td>
<td>.5&quot; To 8&quot;</td>
</tr>
<tr>
<td>Ports:</td>
<td>1/8&quot; NPT</td>
</tr>
</tbody>
</table>

CONSTRUCTION:
Rod: Chrome Plated 303 Stainless Steel
Body: 6061 Aluminum, Electroless Nickel Plated
End Cap: 2024 Aluminum, Black Anodized
Tie Rods & Nuts: 303 Stainless Steel

SPECIAL ORDER:
Rod End Detail: Send Dimensional Sketch
Port & Mount Hole Size & Location
Materials
Finishes
Improvements are frequent and designs are subject to change without notice; mounting dimensions are kept unaltered for inter-changeability.

User notation of the invoice number or the serial number stamped on the unit body will enable duplication of prior units.

**ACTUATOR AND INDEXER SHOCK LOADS**

In many cases, an actuator or indexer must be sized for the load it will stop rather than the operating torque requirement. Avoid impact loads caused by load momentum; their energy can break the shaft or gear and rack teeth; they are the primary cause for catastrophic failure.

The best way to control impact is to reduce the load inertia as much as feasible and then to limit its angular velocity. Determine the dwell time needed at the work station, then use as much as possible of the remaining time for transport by controlling rotational speed with flow control of the exhausting cylinder.

External stops, with or without shock absorbers, should be used in severe actuator installations. If external stops are not practical, auxiliary cylinders and pistons with an adjustable external air supply can be fitted to absorb load energy. Internal cushions will quiet a light load but will not dissipate a significant amount of load energy.

For an indexer, external shock absorbers can be effective if properly installed to allow full angular travel of the load.

**ACTUATOR ROTATION AND POSITION ACCURACY**

The tolerance of the angle of shaft rotation is shown in the table on page 5. The tolerance on keyway position at the ends of rotation is one-half of the rotation tolerance plus one degree. For example, an A3-90-CW... shaft will rotate through 90 to 92 deg. (-0° +2° tolerance). Its keyway will start between 358° and 0° (1/2 x 2° + 1° tolerance) and will finish rotation between 90° and 92° (1/2 x 2° + 1° tolerance).

**BACKLASH IN ACTUATORS**

Rotomation dual rack actuators are arranged so that at the end of stroke the tooth backlash distance is taken up by one-half the unit torque. Order the dual rack configuration to achieve this position accuracy without external stops.

In single rack actuators there is ordinarily some backlash at the ends of rotation. See table, page 5 for maximum values.

**CONTROL COMBINATIONS**

Not all controls can be combined at one end of a cylinder. Combinations of controls are possible in a two rack unit which provide functional and access advantages. Combination of flow control and cushion or cushion and rotation adjuster can be set up on different racks, can be placed at one end or the other to improve access or installation arrangements.

**PHONE & FAX SUPPORT**

For technical support and additional information, call 386-676-6377 or fax 386-676-6379.
PNEUMATIC OPERATION AND LUBRICATION

With clean air, normal loading and noncorrosive environment, Rotomation actuators will operate for millions of cycles without added lubrication. For maximum life with high cycle rates and/or less clean environment, the heavy duty (A, K or J) options should be specified and/or airline lubrication utilized. Lubricators should be appropriately sized, positioned to allow downward flow to the actuator and kept filled with lubricant compatible with the seals in use.

FLUID MEDIUM AND SEALS

Use a good, clean fluid compatible with the seals in dynamic applications. Seals are of nitrile (Buna) unless specified otherwise; check the fluid in use. If other seals materials have been specified, particular attention is required. Polyurethane, used in pretensioned seals, is not compatible with automatic transmission fluid and a number of widely used petroleum based fluids. Where high temperature or aggressive fluids (as phosphate esters) are encountered, specify fluorocarbon seals. Pretensioned seals and some seal compounds cause increased cylinder friction, raising the breakaway pressure to as much as 25 psi.

OIL LEAKAGE

Hydraulic units will, in general, suffer some leakage. Piston seal leakage will be apparent ultimately as leakage from the body, and will occur in either air/oil or hydraulic installations. The amount is usually small, resulting from the relaxation of the seal when pressure is removed, either during normal cycling or shutdown. This oil can be disposed of by the installation of a drain connection to the body which will be supplied upon request; specify mount orientation for correct location. Pretensioned seals will markedly reduce leakage. However, these seals increase breakaway pressure as much as 25 psi, which is negligible in most hydraulic systems but is not tolerable in some air/oil applications. Multiple seals may be effective in some instances. Consult the factory.

AIR/OIL INSTALLATIONS

Air/oil systems provide close control and smooth motion but operate at relatively low rotation rates unless large passages and valves are provided for high flow rates at low pressure differentials. Conventional air/oil systems use air/oil tank for each direction with a flow control in each air or oil line, depending upon the degree of control required. Slow, uniform motion in one direction and faster motion in the other can be achieved using an air/oil tank and cylinder on one side, and straight air, flow controlled in exhaust, on the other side. Seals and fluid should be carefully selected to achieve desired motion and leak characteristics.

FLOATING PISTONS

Floating pistons provide many operating advantages, they may require special attention during set up when the shaft is moved manually without pressure in the cylinders to keep the pistons against the ends of the rack; the pistons often stick against the end caps, leaving the rack free. The result is that the piston will make a noisy impact against the rack when pressure is applied. In case of a unit with magnetic pistons, the uncertainty of piston location can lead to errors in setting the operating point of magnetic switches; use a low pressure to retain the pistons if manual positioning is required. All Rotomation units except the following have floating pistons: A032, A01, A1, S1, X1, X12, AL75, A752 and PA01; these units have captive pistons.

INTERNAL LUBRICATION

The internal lubrication applied in factory assembly will ordinarily last the life of the unit. Only if the unit is operated at extreme rates or is subject to temperatures high enough to cause displacement of the grease should additional lubrication be required. 1/2 to 1 teaspoon of general purpose lithium based grease may be placed on the rack teeth and cylinders at the time of installation of replacement seals or other repair. The cylinders and seals are lubricated in assembly with a lithium based grease containing suspended PTFE. NOTE: Units manufactured prior to early 1987 had grease fittings or plugs. These have been eliminated to avoid possibility of jamming the unit by excess lubricant.

LOAD COUPLING

The load hub should fit the shaft closely and the key be of correct size and length to make a firm fit using all available keyway length. Tighten the set screw over the key firmly, retaining its position with thread locking adhesive.

ADJUSTABLE LOAD COUPLING

For a hard coupling allowing angular adjustment of the load position, a self-locking coupling (Ringfeder, etc.) can be used directly on the Rotomation and using shafts. Couplers must be carefully installed and tightened; they require wrench clearance and precise shaft alignment.

MOUNTING AND ALIGNMENT

Where possible, provide a compliant coupling between the Rotomation unit and its load. If a hard coupling to a firmly supported shaft is required, provide adjustment of the angle and position of the Rotomation shaft using shims, slotted holes or other means. With mount screws installed and at intended torque, test for free rotation of the shaft and unit. See “Hollow Shaft” below.

HOLLOW SHAFT ACTUATOR INSTALLATION

For a compact, self-aligning installation, place the hollow shaft actuator over the driven shaft, allowing the weight of the actuator to be carried by the shaft and its bearings. Arrange a turnbuckle to take the actuator torque by attaching one end to the actuator by a bracket to mount holes, and the other to the using assembly. The actuator thus remains in alignment with the shaft; adjust the turnbuckle to set the keyway position precisely.
AUTOMATING SINCE 1967

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