Compact Ring Drive
Product Family:

PL - Planetary Gearbox
HG - Harmonic Gearhead
DD - Direct Drive
MRS - Motor Ready Sealed
MRG - Motor Ready Guarded
MRO - Motor Ready Open
In accordance with Nexen’s established policy of constant product improvement, the specifications contained in this manual are subject to change without notice. Technical data listed in this manual are based on the latest information available at the time of printing and are also subject to change without notice.

Technical Support: 800-843-7445
(651) 484-5900

www.nexengroup.com

DANGER
Read this manual carefully before installation and operation. Follow Nexen’s instructions and integrate this unit into your system with care. This unit should be installed, operated and maintained by qualified personnel ONLY. Improper installation can damage your system, cause injury or death. Comply with all applicable codes.

This document is the original, non-translated, version.

Conformity Declaration: In accordance with Appendix II B of CE Machinery Directive (2006/42/EC):

A Declaration of Incorporation of Partly Completed Machinery evaluation for the applicable EU directives was carried out for this product in accordance with the Machinery Directive. The declaration of incorporation is set out in writing in a separate document and can be requested if required.

This machinery is incomplete and must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the applicable provisions of the Directive.

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Vadnais Heights, Minnesota 55127

ISO 9001 Certified

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# Table of Contents

- General Safety Precautions ................................................................. 4
- System Design Overview ...................................................................... 5
- Mounting Surface Details .................................................................... 6
- Installation Instructions ....................................................................... 7
- Installation Instructions: Optional Brake ............................................. 9
- Maintenance .......................................................................................... 10
- Direct Drive Electrical Connections .................................................. 11
- Direct Drive Motor Specifications ....................................................... 12
- Direct Drive Troubleshooting .............................................................. 13
- Warranty ............................................................................................... 14
GENERAL SAFETY PRECAUTIONS

**WARNING**
Failure to properly support the load before disengaging the RPG system could cause serious harm to operators or equipment.

**CAUTION**
Use lifting aids and proper lifting techniques when installing, removing, or placing this product in service.

**WARNING**
Ensure proper guarding of the product is used. Nexen recommends the machine builder design guarding in compliance with OSHA 29 CFR 1910 "Occupational Safety and Health Hazards".

**WARNING**
Use appropriate guarding for rotating components. Failure to guard could result in serious bodily injury.

**CAUTION (CRD Brake Only)**
Do not attempt to disassemble this product. Product components are spring-loaded and can cause serious injury.

**WARNING**
This product has moving parts that can crush or cut appendages. Provide adequate spacing or guarding from any operating product.

**CAUTION**
Watch for sharp features when interacting with this product. The parts have complex shapes and machined edges.

**WARNING**
Deadly voltages can occur. Risk of electric shock. Check that all live connection points are safe against accidental contact.

**WARNING**
Always make sure that the motors are de-energized during assembly and wiring. Risk of electric shock.

**WARNING**
Never undo the electrical connections to the motor when it is live. A residual charge in the drive can produce dangerous voltages up to 10 minutes after switch-off of the mains supply. Risk of electric shock.

**WARNING**
Ensure that the motor housing is safely earthed to the PE (protective earth) busbar in the switch cabinet. Risk of electric shock.

**CAUTION**
Surface temperature may exceed safe handling limits during operation. Do not touch.
**SYSTEM DESIGN OVERVIEW**

**GENERAL SYSTEM REQUIREMENTS**

- Make sure the machine design is rigid enough to avoid deflection that could affect the ring drive system.

- Large temperature swings can affect performance of the CRD; ideal ambient temperature range is -5°C to 40°C (23°F to 104°F)

- Exposed surfaces of the CRD are treated with hot black oxide, therefore will have moderate corrosion resistance. Review surface treatment product specifications for corrosion resistance performance, and determine whether the CRD system is suitable for your application based on your familiarity with the corrosion resistant surface treatment or thorough testing. Nexen makes no claims for CRD corrosion resistance in any application.

- When an unsealed CRD is used, take precautions to prevent debris and contaminants from collecting on the ring gear and pinion since it could interfere with pinion meshing. In such environments, Nexen recommends the ring gear and pinion be shielded.

- The Compact Ring Drive (CRD) requires periodic lubrication and should use the grease offered on Nexen’s website as an accessory to the RPS/RPG products or equivalent lubrication described in the lubrication section.

- The Compact Ring Drive (CRD) Brake is intended for static holding, for E-Stop capabilities contact Nexen.
MOUNTING SURFACE DETAILS

The surface used to mount the CRD should be machined to a flatness of .050 mm as shown to ensure proper alignment. See Figure 2.

All provided provisions for fasteners should be utilized.

Make sure there is proper clearance around the drive station and air line/cable slots (if being utilized) as shown in Figures 1 & 2. NOTE: MRO units do not have air line/cable slots.

Figure 1

Figure 2
RING DRIVE MOUNTING

1. Position the ring drive on the customer supplied mounting surface. The CRD can be lifted using the stationary threaded holes or stationary mounting holes. If equipped with a brake the driven output threaded holes can be used. See Figure 3.

2. Once the ring drive is in location, install the mounting bolts to secure to the mounting surface. Tighten the bolts in a star pattern to ensure even distribution of load. Nexen recommends using class 12.9 bolts for any application, although it is the customer’s responsibility to ensure the mounting is suitable for the system loads.

MOTOR MOUNTING (PL, HG)

The motor mounting depends on the motor/gearbox combination being used; please refer to the motor/gearbox manufacturer’s mounting instructions. (Instructions included with unit)

MOTOR/GEARBOX MOUNTING (MRS, MRG, MRO)

Reference Figure 4.

1. Before installing the motor/gearbox into the CRD-MRS, MRG or MRO:
   a. Wipe the motor/gearbox shaft, pilot, and mounting face clean. Wipe the internal pilot and motor mounting face of the CRD clean.
   b. Remove clamp collar screw access plug.
   c. Insert the long blade of a hex bit (included) through the clamp collar screw access hole in the drive station and engage with the clamp collar screw head.

2. Apply a serviceable thread locking compound to the threads of the motor/gearbox face mounting screws.

3. Slowly and gently guide the motor/gearbox into the input of the CRD. During this part of the procedure, the weight of the motor/gearbox should be adequately supported. Never allow the motor/gearbox to be suspended from CRD until the motor/gearbox mounting screws are installed.

4. Once the motor/gearbox shaft and pilot are fully seated within the CRD input, tighten the motor/gearbox face mounting screws according to the motor/gearbox installation literature. After the motor/gearbox face screws are tightened the clamp collar screw can be tightened to the specification in Table 1.

   NOTE: Once the motor/gearbox has been fully assembled to the CRD remove the hex bit from the clamp collar access hole and save for future disassembly needs.

5. Reinstall clamp collar screw access plug.

<table>
<thead>
<tr>
<th>CRD Model</th>
<th>Input Clamp Collar Screw Tightening Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>PL</td>
<td>See Included Gearbox Literature</td>
</tr>
<tr>
<td>HG</td>
<td>See Included Gearbox Literature</td>
</tr>
<tr>
<td>MRS, MRG, MRO</td>
<td>9.5 Nm [84 in-lbf]</td>
</tr>
</tbody>
</table>

Table 1
**Component Mounting to CRD Output**

Customer components should be mounted using all available holes. Tighten in a star pattern to ensure even load distribution. It is the responsibility of the customer to ensure the bolt grade and qty is sufficient for the application.

**Dial Plate Mounting**

The dial plate is designed to be piloted by a series of dowel pins installed in the plate that straddle the output pilot on the ring drive. Drawings showing this method of piloting are available for each specific size.

The dial plates should be mounted using all available holes and supplied fasteners. It is the customer’s responsibility to ensure capacity of the dial plate is sufficient for the application.

1. Wipe face of CRD output and mounting face of dial plate clean.
2. Install dial plate onto CRD output.
3. Apply serviceable thread locking compound to the threads of supplied fasteners. Tighten fasteners in star pattern to torques shown in Table 2.

**Bearing Grease Fittings**

The customer is responsible for the installation of grease fittings on the I.D. of the CRD (see Maintenance section). Sealing this threaded connection is necessary to obtain the product’s ingress protection (IP) rating.

(CRD units with IP rating: PL, HG, DD & MRS)
(CRD units without IP rating: MRO & MRG)

<table>
<thead>
<tr>
<th>CRD Size</th>
<th>Output Bolt Size</th>
<th>Output Screw Tightening Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>M8</td>
<td>31 Nm [275 in-lbf]</td>
</tr>
<tr>
<td>250</td>
<td>M8</td>
<td>31 Nm [275 in-lbf]</td>
</tr>
<tr>
<td>350</td>
<td>M10</td>
<td>68 Nm [602 in-lbf]</td>
</tr>
<tr>
<td>550</td>
<td>M12</td>
<td>120 Nm [1062 in-lbf]</td>
</tr>
</tbody>
</table>

Table 2

---

**Figure 4**

Hex Socket Tool (Included with all CRD units except DD)

Clamp Collar Screw.
Access Plug (Remove to Access Clamp Collar Screw)

Motor Mounting Screws (Qty 4) (Customer Supplied)

Motor Mounting Flange (Customizable to fit Customer Motor/Gearbox)

Motor (Customer Supplied)
**BRAKE (IF EQUIPPED)**
The static holding brake is a factory installed accessory, braking directly on the driven output.

**BRAKE AIR CONNECTIONS**
All Nexen pneumatically actuated devices require clean and dry air, which meet or exceeds ISO 8373.1:2001 Class 4.4.3 quality.

<table>
<thead>
<tr>
<th>Accessories</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Fitting (Installed)</td>
<td>#10-32 to .17” Hose Barb</td>
</tr>
<tr>
<td>Flexible Air Tubing</td>
<td>.17” ID, .25” to .30” OD</td>
</tr>
<tr>
<td><strong>Table 3</strong></td>
<td></td>
</tr>
</tbody>
</table>

The CRD Brake is equipped with the following ports:
Refer to Figure 6.
- Spring Engaged / Air Disengaged:
  Port 1: Air Inlet used to Disengage the Brake.
  Port 2: Vent
Supply clean air to the CRD Brake using soft lines. Machined slots in CRD mounting surface are available for routing air lines. Supply adequate air pressure to ensure complete disengagement. Sealing of air inlet connection is necessary to obtain the product’s ingress protection (IP) rating. (CRD units with IP rating: PL, HG, DD & MRS) (CRD units without IP rating: MRO & MRG)

**NOTE:** MRO units do not have air line/cable slots.

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**CAUTION**
While the lubricated air will keep the seals well lubricated, it may wash away the factory applied lubrication over time. For this reason, once lubricated air is used, it must always be used. Discontinuing use of lubricated air may cause seal failure.
**MAINTENANCE**

**PINION**
The pinion needle bearings are sealed and lubricated for life, and therefore cannot be serviced.

**GEAR - SEALED UNITS (PL, HG, DD, MRS)**
The gear is lubricated for life, and cannot be serviced.

**GEAR - OPEN UNITS (MRG, MRO)**
Nexen recommends lubricating the gear teeth every 2 million pinion revolutions or 6 months, but it may need to be lubricated more frequently based on the application conditions, and observable tooth or roller wear.

THK AFA grease is recommended for gear tooth lubrication. Nexen offers this grease under product number 853901. Greases for special applications such as food grade, vacuum, or others are allowed if they use a synthetic base, a polyurea thickener, and meet the following Kinematic Viscosity Levels: CST@40°C = 25; CST@100°C = 5. Contact Nexen for recommendations on alternative greases.

The CRD gear teeth can be lubricated in two ways:
1. Apply grease to the pinion rollers and roll the pinion back and forth five times over one meter circumference of gear teeth, repeating the process until the entire gear is lubricated.
2. Using a swab apply a very small dab of grease on the middle of each tooth face and rotate the ring gear five times.
3. Wipe excess grease from the sides of the gear and pinion body to prevent grease being thrown off during operation and for general cleanliness.

**OUTPUT BEARING**
The CRD is fitted with grease access locations on the inner race. See Figure 7.

If CRD is equipped with an output brake, the grease access locations are on the I.D. of brake, accessed from the bottom side. See Figure 8.

**Note:** Sealing these threaded grease connections is necessary to obtain the product’s ingress protection (IP) rating.
(CRD units with IP rating: PL, HG, DD & MRS)
(CRD units without IP rating: MRO & MRG)

The bearing should be greased every three months in normal usage. The bearing manufacturer recommends that the greasing be carried out during rotation at slow speed. Slowly apply 1/4 of the applicable volume shown in Table 4 and complete a minimum of five rotations. Repeat in opposing grease access port. Continue procedure until all grease has been added to the bearing.

Nexen recommends using THK AFB-LF grease or equivalent. Contact Nexen for recommendations on alternative greases for extreme conditions.

**OUTPUT BRAKE (IF EQUIPPED)**
The CRD Brake is sealed, spring loaded and under pressure and therefore cannot be serviced.
DIRECT DRIVE ELECTRICAL CONNECTIONS

POWER CONNECTOR

(View facing front)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>U</td>
</tr>
<tr>
<td>2</td>
<td>PE</td>
</tr>
<tr>
<td>3</td>
<td>W</td>
</tr>
<tr>
<td>4</td>
<td>V</td>
</tr>
<tr>
<td>A</td>
<td>N/C</td>
</tr>
<tr>
<td>B</td>
<td>N/C</td>
</tr>
<tr>
<td>C</td>
<td>N/C</td>
</tr>
<tr>
<td>D</td>
<td>N/C</td>
</tr>
</tbody>
</table>

Suggested Mating Connector

Intercontec
BSTA-108-NN-00-08-0036-000

Figure 9

FEEDBACK CONNECTOR

(View facing front)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B-</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
</tr>
<tr>
<td>3</td>
<td>A-</td>
</tr>
<tr>
<td>4</td>
<td>Vcc (5Vdc)</td>
</tr>
<tr>
<td>5</td>
<td>Data</td>
</tr>
<tr>
<td>6</td>
<td>N/C</td>
</tr>
<tr>
<td>7</td>
<td>Thermal Sensor +</td>
</tr>
<tr>
<td>8</td>
<td>Clock</td>
</tr>
<tr>
<td>9</td>
<td>B+</td>
</tr>
<tr>
<td>10</td>
<td>Un Sense (common)</td>
</tr>
<tr>
<td>11</td>
<td>A+</td>
</tr>
<tr>
<td>12</td>
<td>Up Sense (VCC)</td>
</tr>
<tr>
<td>13</td>
<td>Data</td>
</tr>
<tr>
<td>14</td>
<td>Thermal Sensor -</td>
</tr>
<tr>
<td>15</td>
<td>Clock</td>
</tr>
<tr>
<td>16</td>
<td>N/C</td>
</tr>
<tr>
<td>17</td>
<td>N/C</td>
</tr>
</tbody>
</table>

Suggested Mating Connector

Intercontec
ASTA-035-NN-00-10-0035-000
Motor Specifications

The following are motor-only specifications for use in motor files and drive setup. See “CRD Application & Selection Guide” for system specifications.

<table>
<thead>
<tr>
<th>Motor Specifications</th>
<th>Winding Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage Required at Rated Output (Vac Input)</td>
<td>230V</td>
</tr>
<tr>
<td>Continuous Stall Torque @ 25°C Ambient (Tc)</td>
<td>Nm</td>
</tr>
<tr>
<td>Continuous Stall Current (Io)</td>
<td>Arms</td>
</tr>
<tr>
<td>Peak Stall Torque @25°C Winding Temp (Tp)</td>
<td>Nm</td>
</tr>
<tr>
<td>Peak Current (Ip)</td>
<td>Arms</td>
</tr>
<tr>
<td>Torque Sensitivity (Kt)</td>
<td>Nm/Arms ±10%</td>
</tr>
<tr>
<td>Back EMF Constant (Kb)</td>
<td>Vrms/kRPM ±10%</td>
</tr>
<tr>
<td>Motor Constant (Km)</td>
<td>Nm/Watt ±10%</td>
</tr>
<tr>
<td>Resistance (Line to Line) (Rm)</td>
<td>Ohms ±10%</td>
</tr>
<tr>
<td>Inductance (Lm)</td>
<td>mH</td>
</tr>
<tr>
<td>Thermal Resistance (TPR)</td>
<td>°C/Watt</td>
</tr>
<tr>
<td>Number of Motor Poles (P)</td>
<td></td>
</tr>
</tbody>
</table>

Motor Winding Configuration

When CRD output is rotated CCW, these waveforms result:
Voltage U, Leads V, Leads W
Voltage U-W leads Voltage V-W by 60° electrical.

Embedded Thermistor

PTC thermistor (155°C ± 5°C switching temperature) installed.
Resistance at 25°C ≤ 550 ohms.
Switching Resistance: ≥ 1330 ohms within ± 5°C of switch temperature.
# DIRECT DRIVE TROUBLESHOOTING

Motor and drive problems can occur for a variety of reasons. General troubleshooting guidelines are provided that can help in diagnosing a drive setup issue. Refer to your specific drive manufacturer's literature to verify wiring diagrams, error codes, tuning procedures, and additional troubleshooting and diagnostic features.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Does Not Rotate</td>
<td>Drive not enabled</td>
<td>Apply enable signal</td>
</tr>
<tr>
<td></td>
<td>Motor phases swapped</td>
<td>Swap two motor phase wires</td>
</tr>
<tr>
<td></td>
<td>Brake not released</td>
<td>Check brake control</td>
</tr>
<tr>
<td></td>
<td>Motor pole count set incorrectly</td>
<td>Set drive to 10 pole, or 5 pole pair</td>
</tr>
<tr>
<td></td>
<td>Feedback set up incorrectly</td>
<td>Set correct feedback settings, see “CRD Application &amp; Selection Guide”</td>
</tr>
<tr>
<td>Motor Overheating</td>
<td>Motor operating above it’s rating</td>
<td>Reduce duty cycle</td>
</tr>
<tr>
<td></td>
<td>Insufficient cooling</td>
<td>Increase ventilation or cooling</td>
</tr>
<tr>
<td>Motor Responds Slowly</td>
<td>Proportional gain too low</td>
<td>Increase velocity loop proportional gain</td>
</tr>
<tr>
<td></td>
<td>Integral gain too low</td>
<td>Increase velocity loop integral gain</td>
</tr>
<tr>
<td></td>
<td>Filters too high</td>
<td>Increase filter cutoff frequency</td>
</tr>
<tr>
<td>Motor Runs Roughly</td>
<td>Proportional gain too high</td>
<td>Decrease velocity loop proportional gain</td>
</tr>
<tr>
<td></td>
<td>Integral gain too high</td>
<td>Decrease velocity loop integral gain</td>
</tr>
<tr>
<td></td>
<td>Filters too low</td>
<td>Decrease filter cutoff frequency</td>
</tr>
</tbody>
</table>
WARRANTY

Warranties
Nexen warrants that the Products will (a) be free from any defects in material or workmanship for a period of 12 months from the date of shipment, and (b) will meet and perform in accordance with the specifications in any engineering drawing specifically for the Product that is in Nexen’s current product catalogue, or that is accessible at the Nexen website, or that is attached to this Quotation and that specifically refers to this Quotation by its number, subject in all cases to any limitations and exclusions set out in the drawing. NEXEN MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND ALL IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. This warranty applies only if: (a) the Product has been installed, used and maintained in accordance with any applicable Nexen installation or maintenance manual for the Product; (b) the alleged defect is not attributable to normal wear and tear; (c) the Product has not been altered, misused or used for purposes other than those for which it was intended; and (d) Buyer has given written notice of the alleged defect to Nexen, and delivered the allegedly defective Product to Nexen, within one year of the date of shipment.

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The exclusive remedy for the Buyer for any breach of any warranties provided in connection with this agreement will be, at the election of Nexen: (a) repair or replacement with new, serviceably used, or reconditioned parts or products; or (b) issuance of credit in the amount of the purchase price paid to Nexen by the Buyer for the Products.

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No action, regardless of form, arising out of any transaction to which these terms and conditions are applicable may be brought by the Buyer more than one year after the cause of action has accrued.