Rotary Indexer System

Application and Selection Guide

Utilizing Nexen's Roller Pinion technology, the Rotary Indexer System comes complete with a precision-grade, high capacity bearing and drive mechanism in a rigid housing. With high speed, high torque, and Zero Backlash options, Rotary Indexers can be configured to meet the desired specifications.

Nexen's Rotary Indexer systems allow for greater productivity and lower maintenance, are highly efficient, and have a long service life.

Rotary Indexers integrate a precision-grade bearing and drive mechanism in a rigid housing allowing many design options

High Indexing Precision
With an indexing precision of up to ± 11 ArcSec and repeatability of up to ± 1.2 ArcSec, Nexen's Indexers offer unmatched mechanical system capabilities.

Zero Backlash
Unlike other mechanical drive systems, Nexen's Indexer offers zero backlash options from the motor through the driven load.

High Load Capacity
With the precision grade and high load capacity cross-roller bearing, Indexers can handle loads up to 1575 kN.

High Speed
Nexen's Indexers can handle speeds up to 304 RPM and can handle peak torque inputs at any time, allowing for faster indexing times.

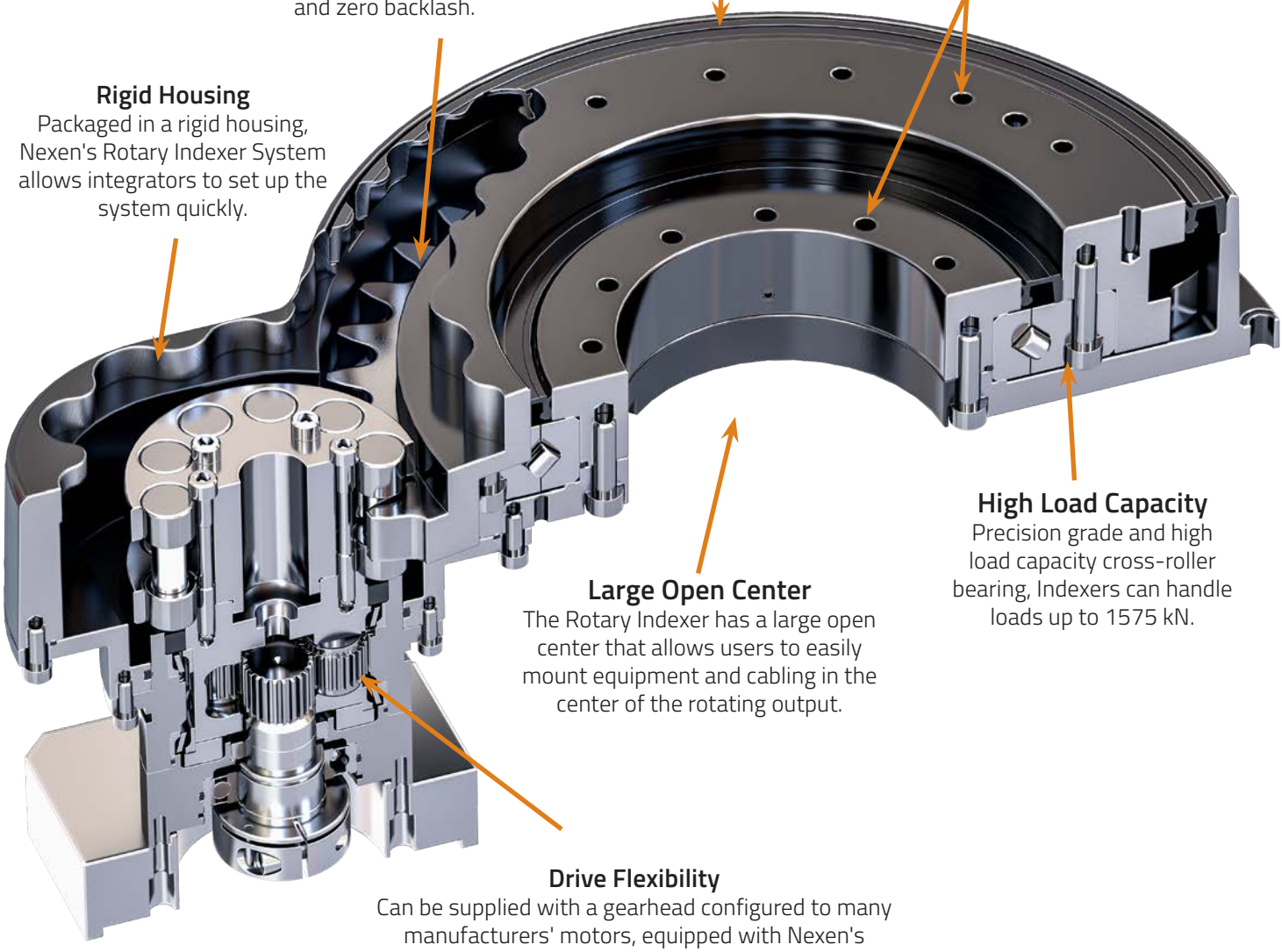
Smooth in Motion
Combining Nexen's Roller Pinion System with a preloaded cross-roller bearing and an integrated motor/precision gearhead gives a rigid, smooth system.

High Output Torque
Rotary Indexers have a maximum acceleration torque of up to 9,141 Nm and a nominal torque of up to 6,897 Nm.

Applications

Food Production	Robotics	Material Handling	Machine Tool	Cutting Systems	Aerospace

Nexen's Indexers open up new design possibilities to next generation of automated machines



IP65 Option
Seals available on CRD models to meet IP65 Ratings.

Mounting Options
With both rotating output and stationary mounting hole options, users have versatility in mounting equipment.

High Precision Gear
Nexen's patented technology allows for accurate positioning and zero backlash.

Rigid Housing
Packaged in a rigid housing, Nexen's Rotary Indexer System allows integrators to set up the system quickly.

High Load Capacity
Precision grade and high load capacity cross-roller bearing, Indexers can handle loads up to 1575 kN.

Large Open Center
The Rotary Indexer has a large open center that allows users to easily mount equipment and cabling in the center of the rotating output.

Drive Flexibility
Can be supplied with a gearhead configured to many manufacturers' motors, equipped with Nexen's Harmonic Gearhead or motor/gearhead ready.

Nexen's Rotary Indexers offer a wide range of design possibilities

Compact Rotary Indexer Systems (CRD)

The CRD system is built on a rigid, sealed cast iron housing that completely encloses the gear and pinion. Numerous options are available, including motor/gearhead ready input, a pre-installed low-backlash Planetary Gearhead, a pre-installed zero-backlash Nexen Harmonic Gearhead, or an integrated motor.

- **Output Plate Bolt Circle Diameters**
  150 mm, 250 mm, 350 mm, 550 mm
- **Peak Output Torque**
  119 Nm to 3528 Nm
- **Positional Accuracy**
  ± 19.4 to ± 59 ArcSec
- **Max Backlash**
  0 to 20.4 ArcSec
- **Input to Output Ratio**
  6.2:1 to 2460:1
- **Sealed Housing Available**
  IP 65 Rated

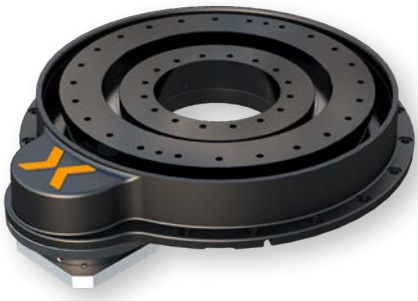
Precision Rotary Indexer Systems (PRD)

The PRD system is built on a precision machined steel plate with a guard that shrouds the gear and pinion. Numerous options are available, including a low-backlash Planetary Gearhead or zero backlash Nexen Harmonic Gearhead to drive pinion.

- **Output Plate Bolt Circle Diameters**
  400 mm, 750 mm, 1100 mm, 1500 mm
- **Peak Output Torque**
  1019 Nm to 9141 Nm
- **Positional Accuracy**
  ± 11 to ± 34.5 ArcSec
- **Max Backlash**
  0 to 12.1 ArcSec
- **Input to Output Ratio**
  25.6:1 to 6600:1

Motor and Gearhead Ready

Motor Ready Sealed (CRD-MRS)
Ready to Accept Motor/Gearhead



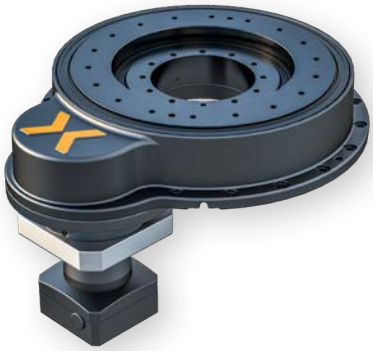
Motor Ready Guarded (CRD-MRG)
Ready to Accept Motor/Gearhead

Motor Ready Open (CRD-MRO)
Ready to Accept Motor/Gearhead

Gearhead Mounted

Planetary Gearhead (CRD-PL)
Flexible Gearhead Ratio

Harmonic Gearhead (CRD-HG)
High Ratio Gearhead



Planetary Gearhead (CRD-MR-PL)
Flexible Gearhead Ratio

Planetary Gearhead (PRD-PL)
Flexible Gearhead Ratio

Harmonic Gearhead (PRD-HG)
High Ratio Gearhead

Planetary Gearhead (PRD-PL No Guard)
Flexible Gearhead Ratio

Motor Mounted

Direct Drive Pinion (CRD-DD)
Integrated Motor, No Gearhead

Nexen's Rotary Indexer Advantage includes:

- High Indexing Precision
- Zero Backlash
- High Load Capacity
- High Output Torque
- High Speed
- Large Open Center
- Smooth in Motion

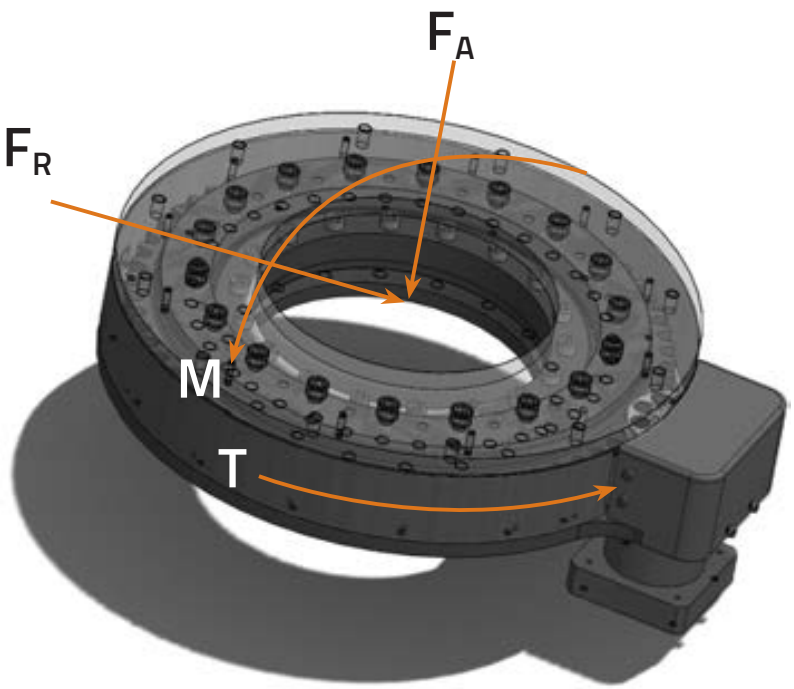
Rotary Indexer Selection Process

Nexen will work with you to select the right Rotary Indexer for your application.

Please use the application data below and perform the calculations on the following page. With this information, Nexen can recommend an Indexer for your application.

Step 1: Gather Application Data

Before you begin calculations, there are key measurements that you will need from your application. Collect the data and record it in the table below. With this data available you can proceed on to the calculations on the following page. (Refer to the diagram to the right when completing the table below.)



Measurements Required for Selection	Customer Data (Record your values below)	Sample Data
Load Inertia (I)	kgm^2	70 kgm^2
Index Time (t_I)	seconds	0.9 seconds
Move Distance (Θ)	°	45°
Maximum Dynamic Axial Load (F_{Amax})	kN	50 kN
Maximum Dynamic Radial Load (F_{Rmax})	kN	0 kN
Maximum Dynamic Moment Load (M_{max})	kNm	1 kNm
Maximum Static Axial Load (F_{A0})	kN	20 kN
Maximum Static Radial Load (F_{R0})	kN	0 kN
Maximum Static Moment Load (M_0)	kNm	0.5 kNm
Drag Torque & Other Applied Torque Loads (T_0) **May include table support friction, cutting or clamping forces, etc.**	Nm	10 Nm
Shock Factor (K) **Circle the value that best reflects the smoothness of your application.**	Shockless Operation 1.0 Normal Operation 1.2 Operation with Impact 1.5 Operation with High Impact 3.0	1.2

Other Key Application Information	
Application Description:	
Environmental Conditions:	☐ Typical Industrial ☐ High Humidity ☐ High Temperature ☐ High Dust
Positional Accuracy Requirements:	
Mounting Orientation:	☐ Vertical (Radial Load) ☐ Horizontal (Applied Load) ☐ Horizontal (Suspended Load)

Step 2: Calculating Rotary Indexer Drive Requirements for simple indexing applications

Rotary Indexer selection is based on the torque requirements of your application. Using the information gathered on the preceding page, perform the following calculations. If your application movement is more complex than basic indexing, evaluate each stage of movement independently and perform separate calculations for each stage.

Acceleration Time:
$t_A = t_I \div 2$

$t_A =$ _____ sec $\div 2$

Acceleration Time	
$t_A =$	sec

Example: $t_A = 0.9$ seconds $\div 2 = 0.45$ seconds

Max Angular Speed:
$\omega = (\theta \div t_I) \bullet (\pi \div 90)$

$\omega = ($ _____ ° $\bullet$ _____ sec $) \bullet (\pi \div 90)$

Max Angular Speed	
$\omega =$	rad/sec

Example: $\omega = (45° \div 0.9$ seconds$) \bullet (\pi \div 90) = 1.75$ rad/sec

Angular Acceleration:
$\alpha = \omega \div t_A$

$\alpha =$ _____ rad/sec $\div$ _____ sec

Angular Acceleration	
$\alpha =$	rad/s²

Example: $\alpha = 1.75$ rad/sec $\div 0.45$ sec $= 3.89$ rad/s²

Application Torque:
$T_{gear} = (I \bullet \alpha) + T_O$

$T_{gear} = ($ _____ kgm² $\bullet$ _____ rad/s² $) +$ _____ Nm

Application Output Torque	
$T_{gear} =$	Nm

Example: $T_{gear} = (70$ kgm² $\bullet$ 3.89 rad/s²$) + 10$ Nm $= 282.3$ Nm

Application Torque with Shock Factor:
$T_T = T_{gear} \bullet K$

$T_T =$ _____ Nm $\bullet$ _____

Application Output Torque with Shock Factor	
$T_T =$	Nm

Example: $T_T = 282.3$ Nm $\bullet 1.2 = 339$ Nm

Step 3: Add Drag Torque to Application Torque

Drag Torque varies based on the load placed on the bearing. Use Page 24-25 (CRD) or Page 38 (PRD) to calculate Total Drag Torque (T_{BD}) for the chosen product and application. Add Total Drag Torque (T_{BD}) to Total Output Torque w/ Shock Factor (T_T) and re-compare to specifications of chosen Rotary Indexer. This will ensure that the Unit has enough Output Torque Capacity to move your load and overcome any drag torque.

Total Drag Torque	
$T_{BD} =$	Nm

Total Required Gear Torque:
$T_{Tgear} = T_T + T_{BD}$

$T_{Tgear} =$ _____ Nm + _____ Nm

Total Output Torque	
$T_{Tgear} =$	Nm

Example: $T_{Tgear} = 339$ Nm $+ 548$ Nm $= 887$ Nm

**Sample data is for a CRD*

Step 4: Evaluate Load Carrying Capacity

Use the data for Maximum Axial Load, Maximum Radial Load, Maximum Moment Load, and Mounting Orientation to evaluate your load carrying needs against the load diagrams on the following pages.

To do this, find the set of charts that represents your mounting orientation, then graph your data in the appropriate charts(s) to ensure that your requirements fall into the shaded area representing load capacity available in that CRD or PRD size and orientation.

(**Note:** The weight of the CRD or PRD is already factored into the load charts.)

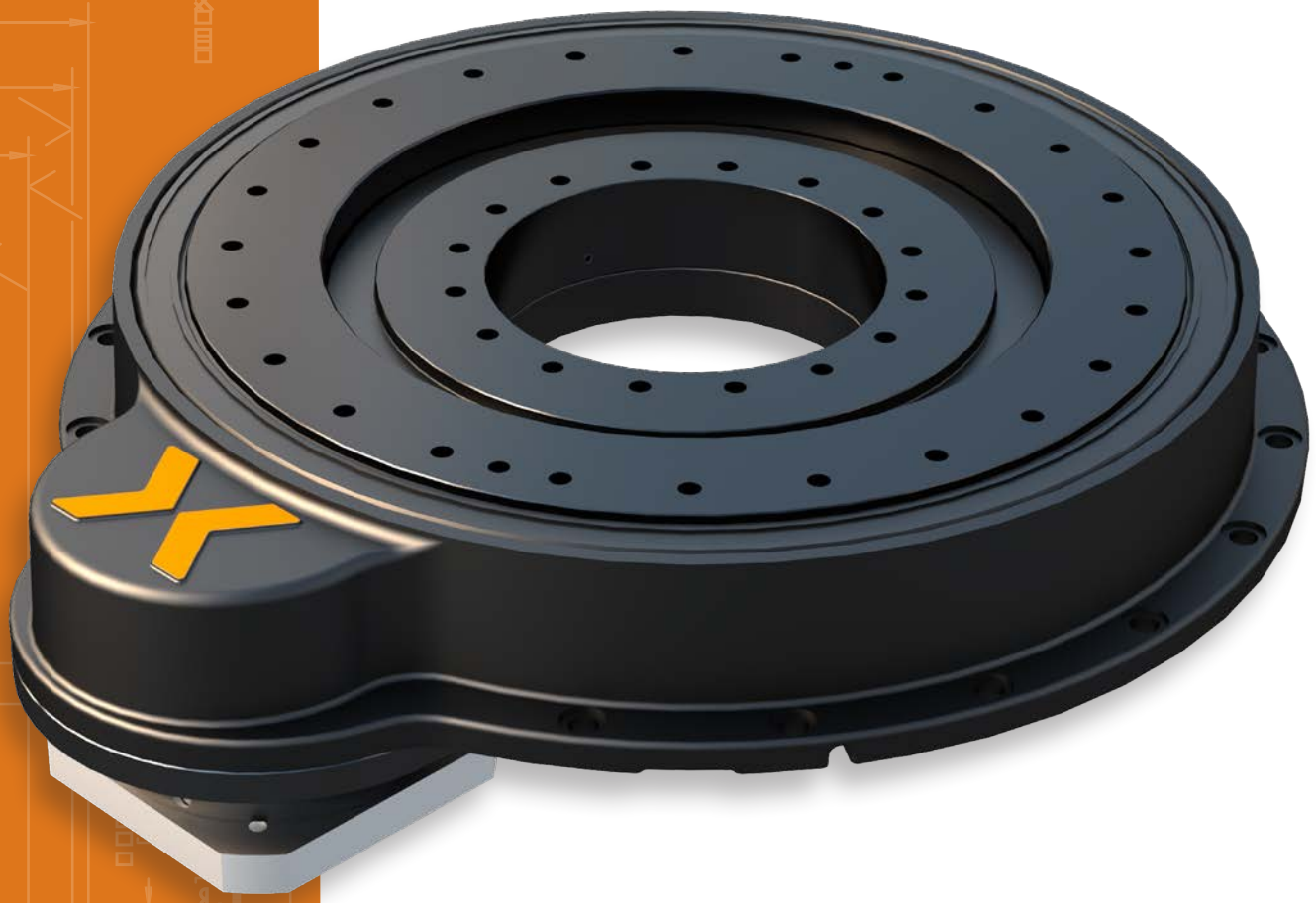
Step 5: Rotary Indexer Sizing

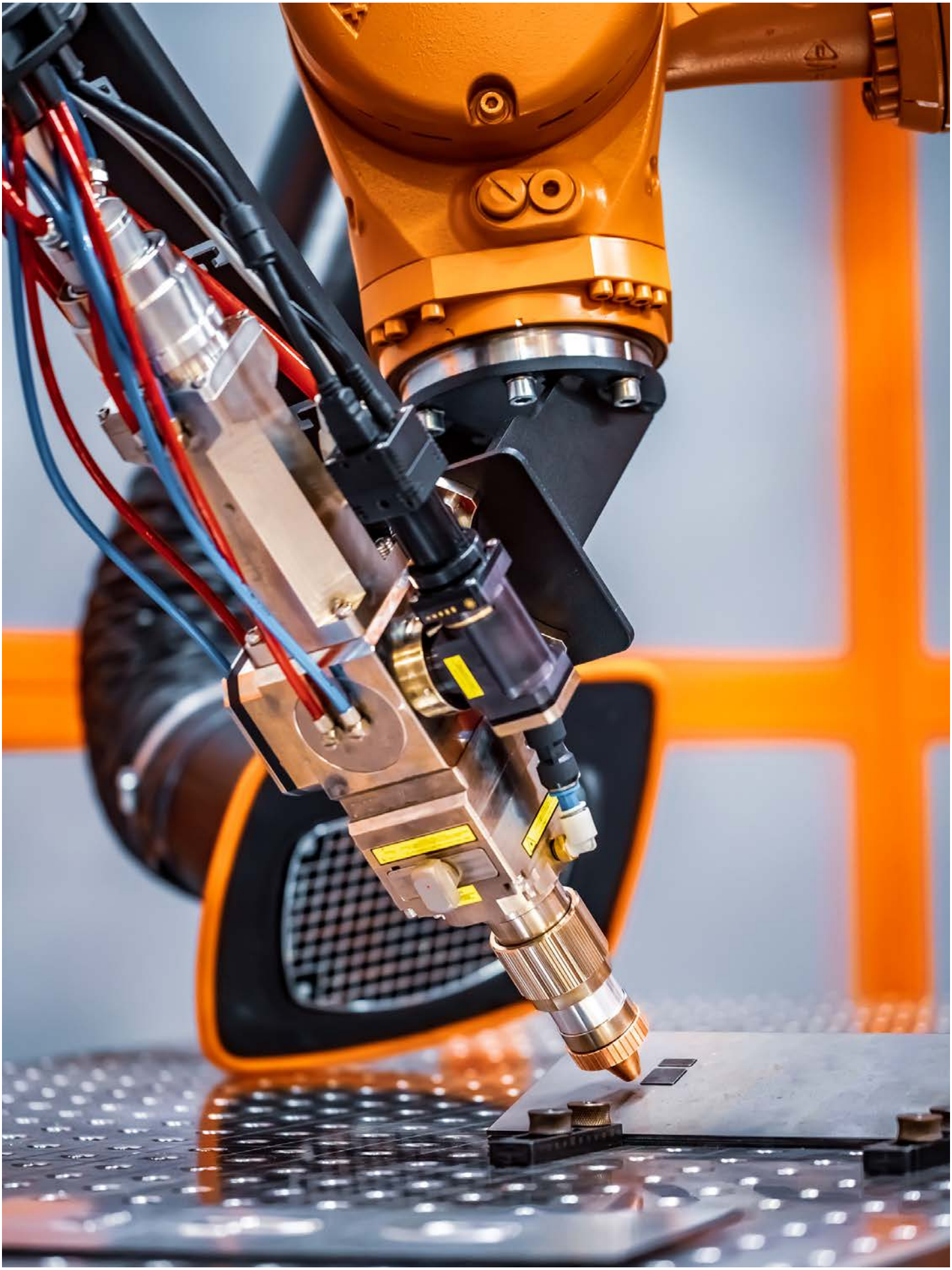
Use the Total Output Torque (T_{Tgear}) calculated in Step 3 and the load evaluation from Step 4 to select the Rotary Indexer size that best fits your application. Review CRD and PRD Specifications to ensure the selected size meets all of your application requirements.

Selected CRD or PRD Size

Compact Rotary Indexer (CRD)

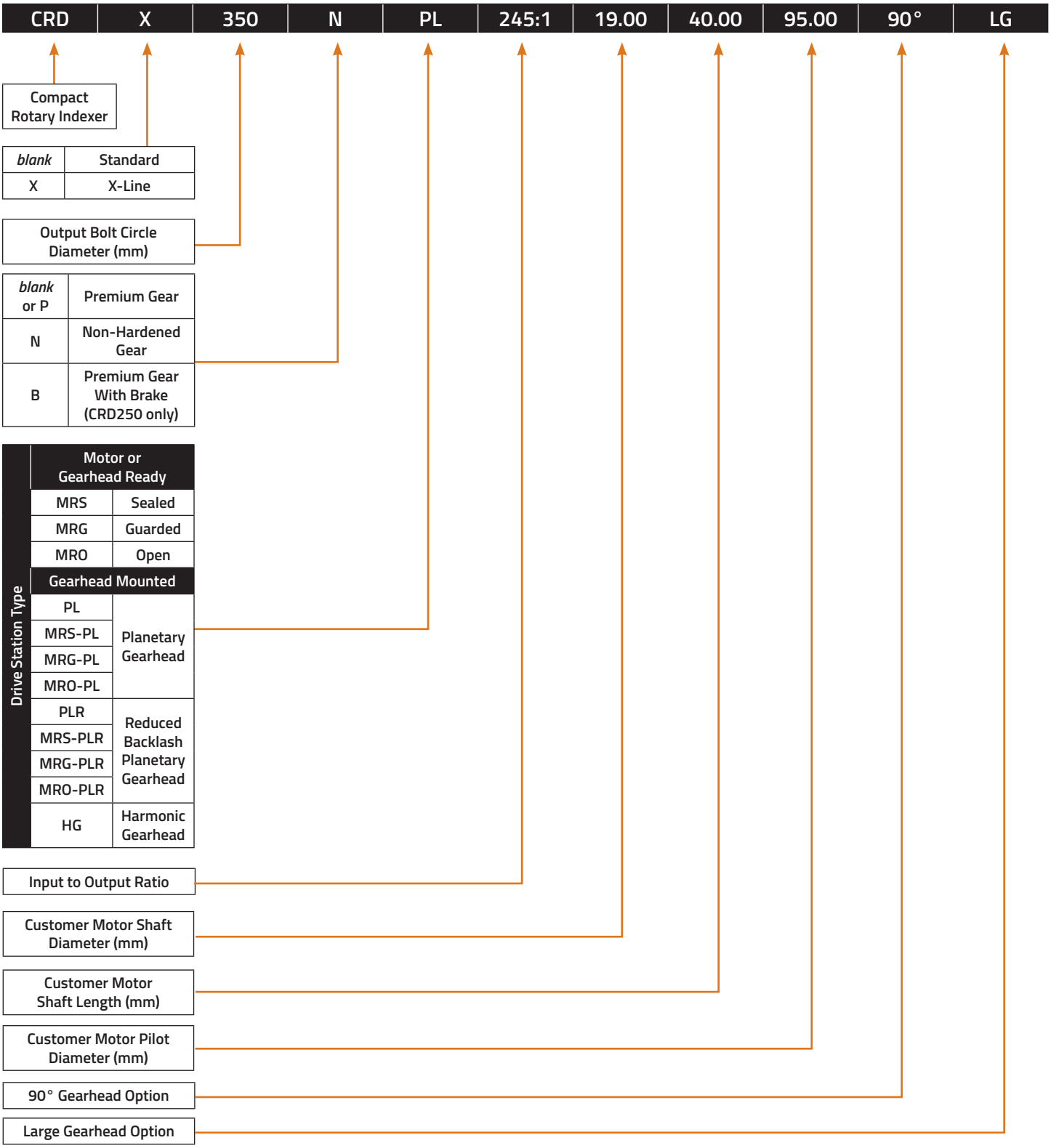
Based on Nexen's innovative Roller Pinion technology, the CRD system comes complete with a precision-grade bearing and drive mechanism in a sealed housing. Freely programmable, the drive design configurations allow the CRD to be optimized for high speed, high torque or both depending on the application. With a 150, 250, 350 or 550 mm output bolt circle diameter and a large open center, users can optimize performance in a small space.





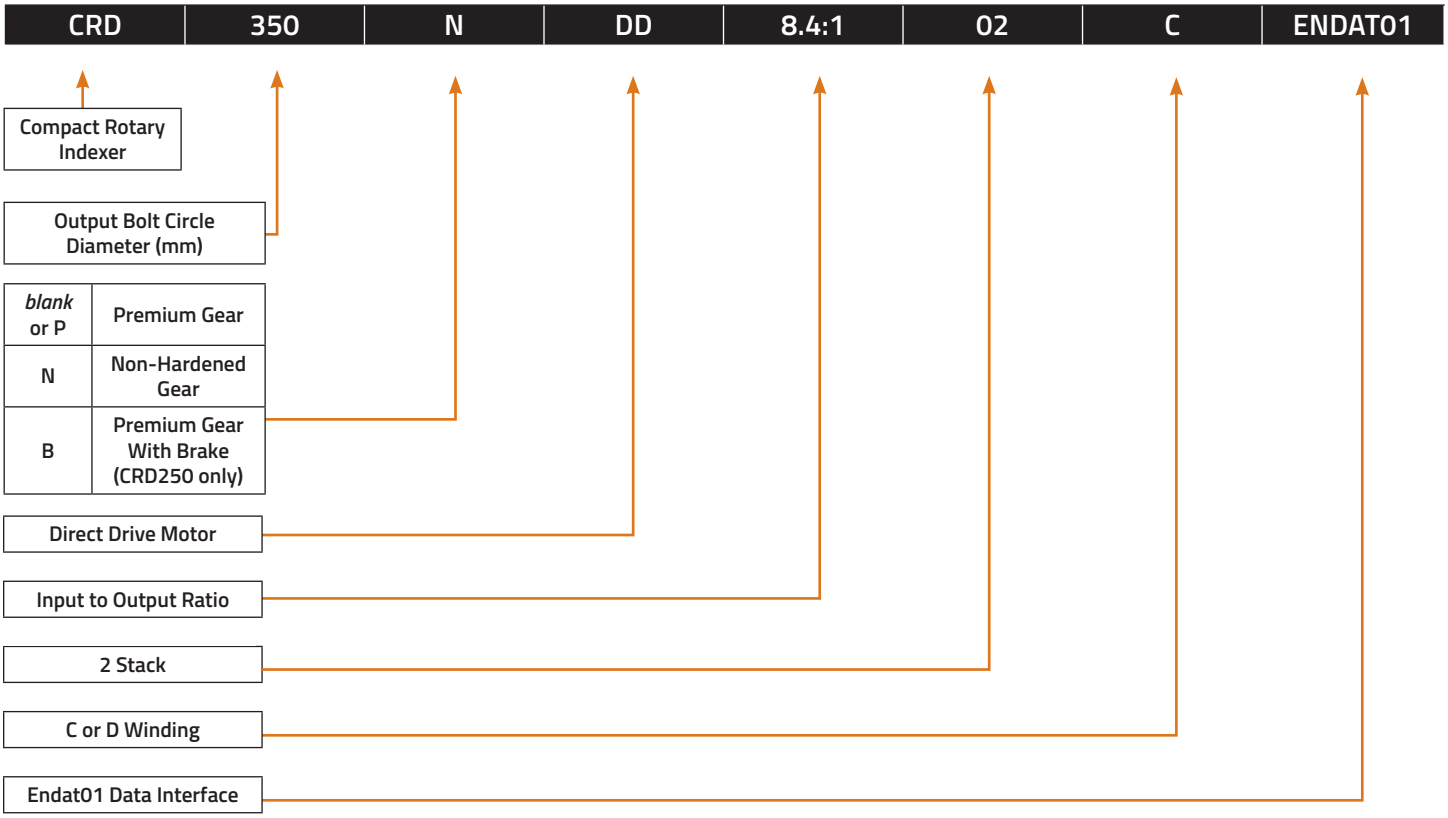
Rotary Indexer: Product Nomenclature

The diagram below represents the model number for a Compact Rotary Indexer with Gearhead and Motor/Gearhead Ready configurations.



Rotary Indexer: Product Nomenclature

The diagram below represents the model number for a Compact Rotary Indexer with a Direct Drive Motor configuration.



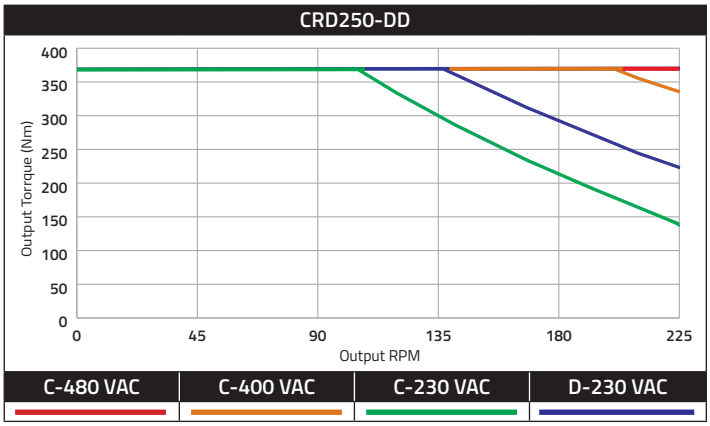
CRD Specifications

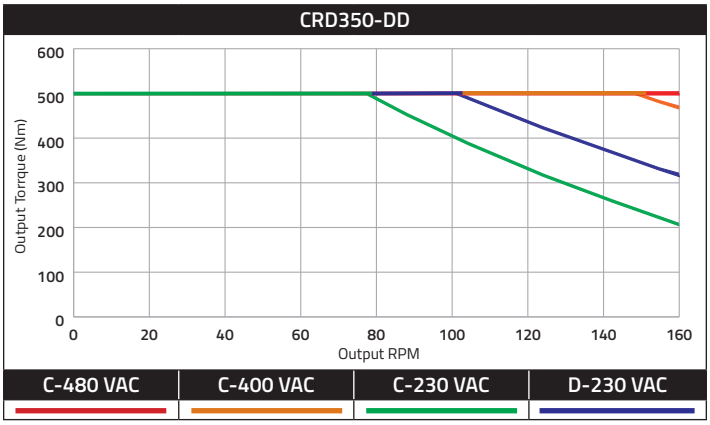
		Performance Specifications														
		Maximum Velocity	Max Continuous Velocity	One-Way Positional Accuracy[5]	One-Way Repeatability[5]	Max Backlash	Max Acceleration Torque	Continuous Stall Torque	Nominal Torque	Gear to Pinion Ratio	Input to Output Ratio	Sealed Housing IP65 Rated	Unloaded Drag Torque (U_{Ldrag})	Max Load Inertia	Output Inertia	Total Reflected Inertia to Gearhead Output
		RPM	RPM	±ArcSec	±ArcSec	ArcSec	Nm	Nm	Nm				Nm	kgm²	kgm²	kgm²
PL[2]	CRD250-PL	225	171	58.3[1]	7.1	20.3[1]	605	N/A	340	3.8:1	15.2:1	yes	30	N/A	0.227	0.0182
	CRD350-PL	161	125	42.5[1]	5.2	14.8[1]	828		465	5.2:1	20.8:1	yes	80		0.782	0.0314
	CRD550-PL	120	79	27.2[1]	3.3	9.4[1]	1305		734	8.2:1	32.8:1	yes	135		4.6	0.0709
X-PL[2]	CRDX350-PL	161	136	47.7[1]	5.1	20.4[1]	2245	N/A	1283	3.5:1	14:1	yes	80	N/A	1.113	0.1077
	CRDX550-PL	120	86	30.4[1]	3.2	13[1]	3528		2016	5.5:1	22:1	yes	135		6.604	0.2351
HG[3]	CRD250-HG	25	18	43	7.1	0	532	N/A	380	3.8:1	190:1	yes	30	N/A	0.227	0.0157
	CRD350-HG	18	13	31	5.2		728		520	5.2:1	260:1	yes	80		0.782	0.0289
	CRD550-HG	11	8	20	3.3		1148		820	8.2:1	410:1	yes	135		4.6	0.0684
X-HG[4]	CRDX350-HG	12.5	8.9	30.6	5.1	0	2245	N/A	1694	3.5:1	280:1	yes	80	N/A	1.113	0.0909
	CRDX550-HG	8	5.7	19.4	3.2		3528		2662	5.5:1	440:1	yes	135		6.604	0.2183
DD	CRD250-DD	See Charts	See Charts	41	6.9	0	367	100	N/A	6.2:1	6.2:1	yes	30	50	0.219	0.00864[6]
	CRD350-DD			30	5.1		497	136		8.4:1	8.4:1	yes	80		0.761	0.0138[6]
	CRD550-DD			20	3.2		770	210		13:1	13:1	yes	135		4.48	0.0294[6]
MRS	CRD150P-MRS	304	222	57	9.5	0	288	N/A	158	9:1	9:1	yes	10	N/A	0.048	0.00091
	CRD250P-MRS	225	160	41	6.9		400		220	12.5:1	12.5:1	yes	30		0.194	0.00156
	CRD350P-MRS	161	117	31	5.1		544		299	17:1	17:1	yes	80		0.669	0.00263
MRG	CRD150P-MRG	304	222	57	9.5	0	288	N/A	158	9:1	9:1	no	3	N/A	0.048	0.00091
	CRD250P-MRG	225	160	41	6.9		400		220	12.5:1	12.5:1	no	10		0.194	0.00156
	CRD350P-MRG	161	117	31	51		544		299	17:1	17:1	no	15		0.669	0.00263
MRO	CRD150N-MRO	304	222	59	9.8	0	119	N/A	119	9:1	9:1	no	3	N/A	0.048	0.00091
	CRD250N-MRO	225	160	41	6.9		165		165	12.5:1	12.5:1	no	10		0.194	0.00156
	CRD350N-MRO	161	117	31	5.1		224		224	17:1	17:1	no	15		0.669	0.00263

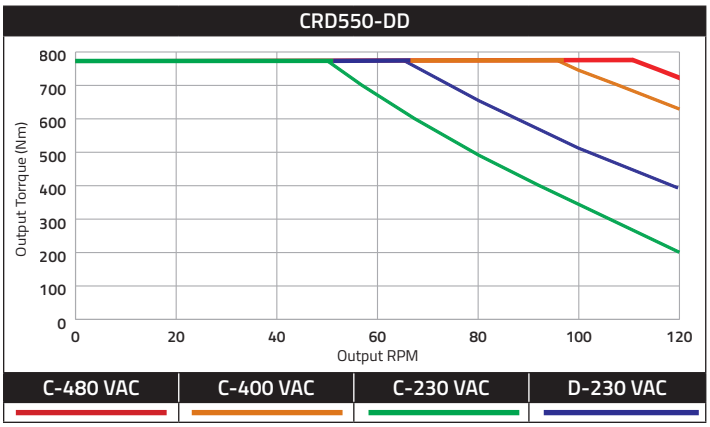
(1) Includes Gearhead Backlash
(2) Assumes Planetary Gearhead Ratio of 4:1*
(3) Assumes Harmonic Gearhead Ratio of 50:1*
(4) Assumes Harmonic Gearhead Ratio of 80:1*
(5) Contact Nexen for higher precision options
(6) Total Reflected Rotary Inertia, including Motor Inertia
*Other Ratio Options Available

CRD Direct Drive Specifications

Peak Speed Torque Curves at Output







Note: For non-cyclic continuous operation, contact Nexen.
Other winding options available, contact Nexen.

CRD Direct Drive Motor Specifications

Rotary Indexer Size and Motor Winding Selection		CRD250-DD		CRD350-DD		CRD550-DD	
		C	D	C	D	C	D
Peak Current (Ip) [1]	**Arms**	39.2	49.5	39.2	49.5	39.2	49.5
Continuous Stall Current (Ic) [2]	**Arms**	7.9	9.8	7.9	9.8	7.9	9.8
Torque Sensitivity (Kt) [3]	**Nm/Arms**	12.7	10.2	17.2	13.7	26.65	21.3
Back EMF Constant (Kb) [3]	**Vrms/kRPM**	769	613	1040	830	1612	1286
Resistance (Line to Line) (Rm)	**Ohms**	1.80	1.14	1.80	1.14	1.80	1.14
Inductance (Lm)	**mH**	15	9.3	15	9.3	15	9.3
Motor Poles		10	10	10	10	10	10

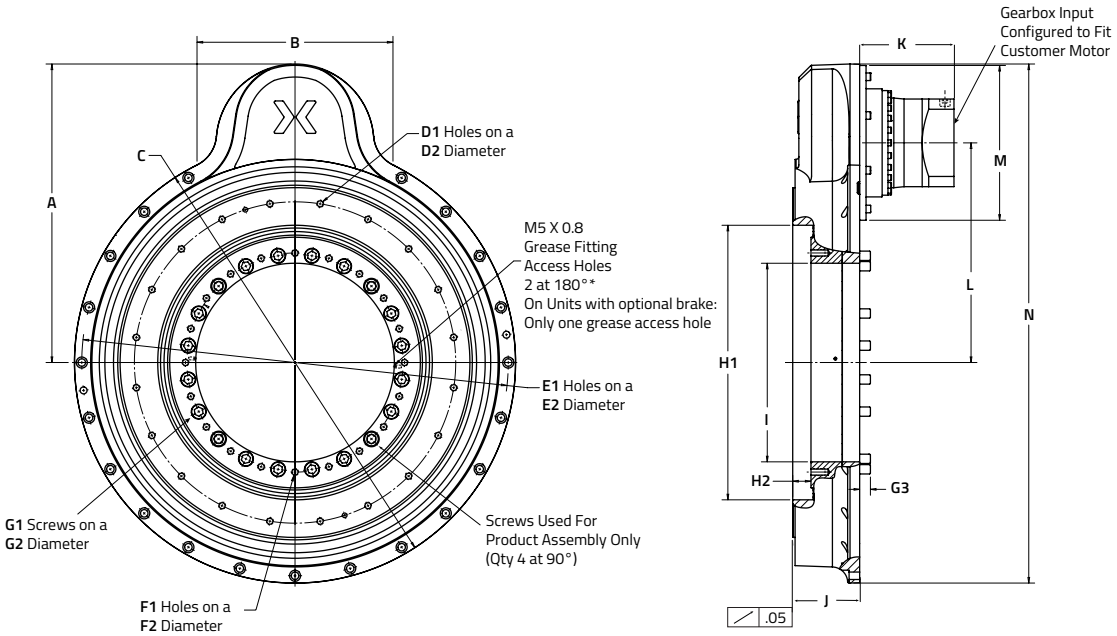
(1) @ 25°C winding temperature
(2) Winding temperature = 145°C @ continuous stall, 25°C ambient (3) System Equivalent Values

Motor Feedback

CRD Feedback	ENDAT01
Output Interface	Endat 2.1 Multi-turn
Device Resolution (Cycles or Lines/Rev)	2,048
Resolution after AKD Interpolation (Counts)	134,217,728
Input Voltage (VDC ±5%)	5
Current Consumption (mA Max)	250
Plug and Play Motor ID *	Yes

**These feedback devices include electronic motor nameplate data allowing plug-and-play commissioning, eliminating the need for drive parameter set-up and servo loop tuning in most applications.*

CRD Dimensions

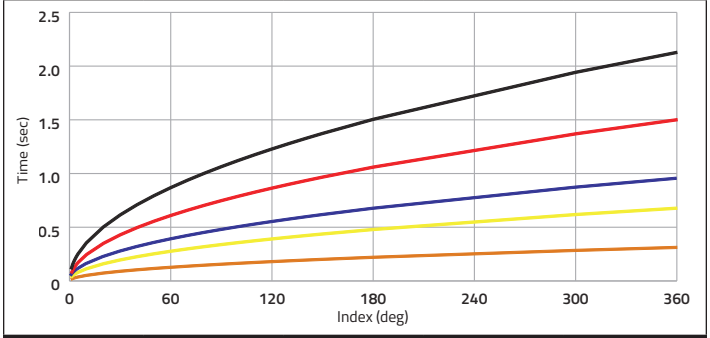


			CRD150	CRD250	CRD350	CRDX350	CRD550	CRDX550
A	Drive Station Envelope to Center Distance (mm)		212.5	275.5	329.5	395	441.5	511
B	Drive Station Envelope Width (mm)		184.9	182.8	184.3	332	179.8	335.4
C	Outer Diameter (mm)		285	370	488	507.9	721.6	754.9
D1	Output Mounting Holes	Thread	M8 X 1.25	M8 X 1.25	M10 X 1.50	M10 X 1.50	M12 X 1.75	M12 X 1.75
		Quantity	12	18	24	24	20	20
D2	Output Bolt Circle Diameter (mm)		150	250	350	350	550	550
E1	Base Mounting Holes for Customer Supplied Screws	Fastener	M8	M8	M10	M12	M10	M12
		Quantity	12	17	17	19	28	21
		Pattern	22.5°	18°	18°	15°	12°	15°
E2	Outer Base Mounting Hole Circle Diameter (mm)		265	350	465	485	698	730
F1	Stationary Mounting Holes	Thread	M8 X 1.25	M8 X 1.25	M10 X 1.50	M10 X 1.50	M12 X 1.75	M12 X 1.75
		Quantity	8	12	16	16	20	20
F2	Stationary Bolt Circle Diameter* (mm)		70	132.5	180	180	375	375
G1	Inner Base Mounting Screws Supplied with Unit	Fastener	-	-	-	M12	-	M16
		Quantity	-	-	-	12	-	16
		Pattern	-	-	-	22.5°	-	18°
G2	Inner Base Mounting Hole Circle Diameter (mm)		-	-	-	180	-	370
G3	Base Mounting Screw Length (mm)		-	-	-	17.1	-	18.5
H1	Output Inner Diameter (H7) (mm)		120	200	280	280	470	470
H2	Depth to Stationary Ring (mm)		33.8	16.8	10	32.3	7.5	31.2
I	Inner Diameter (mm)	without Brake	45	115	155	155	350	340
		with Brake	N/A	31.7	N/A	N/A	N/A	N/A
J	Unit Height (mm)		73.5	73.5	73.5	103	84.5	114.5
K	Drive Station Depth (mm)	PL	N/A	130	130	161.5	130	161.5
		HG	N/A	58.5	58.5	95.25	58.5	95.25
		DD	N/A	191	191	N/A	191	N/A
		MRS, MRG, MRO	59.5	59.5	59.5	N/A	N/A	N/A
L	Drive Station Center to CRD Center (mm)	PL, HG	N/A	184	238	260	350	376
		DD	N/A	174	228	N/A	340	N/A
		MRS, MRG, MRO	120	162	215	N/A	N/A	N/A
M	Drive Station & Adapter Width (mm)	PL, HG	N/A	183	183	265	183	265
		DD	N/A	193	193	N/A	193	N/A
		MRS, MRG, MRO	185	185	185	N/A	N/A	N/A
N	Overall Length (mm)		355	457.2	573.4	649	800.5	888.5

*Not present on units with optional brake

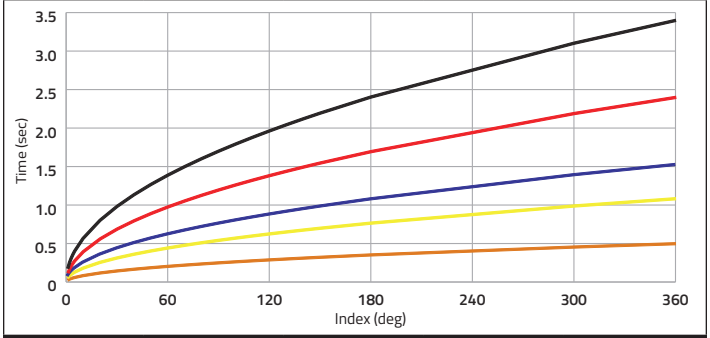
CRD150 Timing Diagrams

CRD150P-MR (MRS, MRG, MRO) Timing Diagram



Output Load Inertia				
1 kgm²	5 kgm²	10 kgm²	25 kgm²	50 kgm²

CRD150N-MR (MRS, MRG, MRO) Timing Diagram

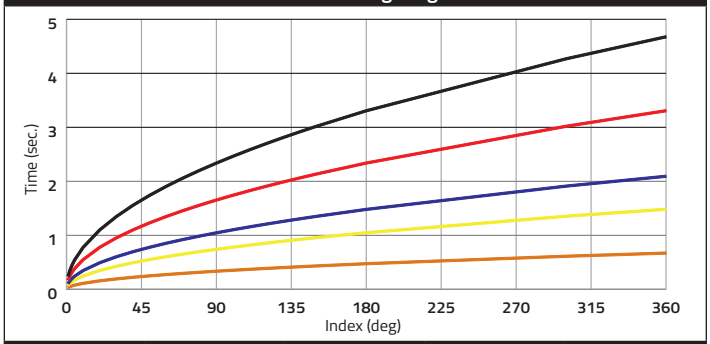


Output Load Inertia				
1 kgm²	5 kgm²	10 kgm²	25 kgm²	50 kgm²

Note: Curves assume no external forces such as additional table support friction, cutting forces, etc. Timing diagrams are developed assuming minimum drag torque, use for reference only.

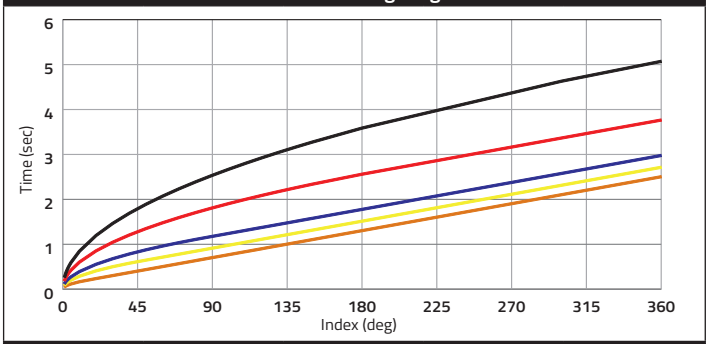
CRD250 Timing Diagrams

CRD250-PL Timing Diagram (1)



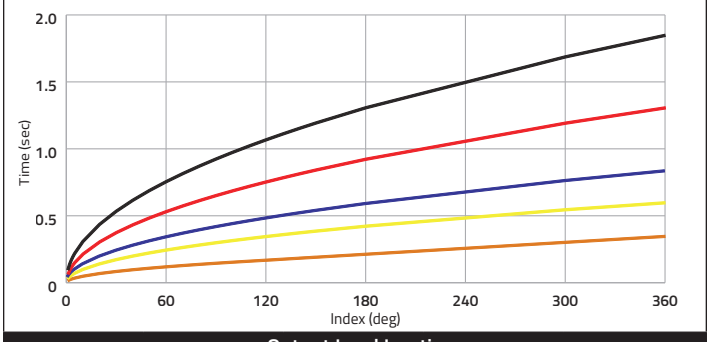
Output Load Inertia				
10 kgm²	50 kgm²	100 kgm²	250 kgm²	500 kgm²

CRD250-HG Timing Diagram(2)



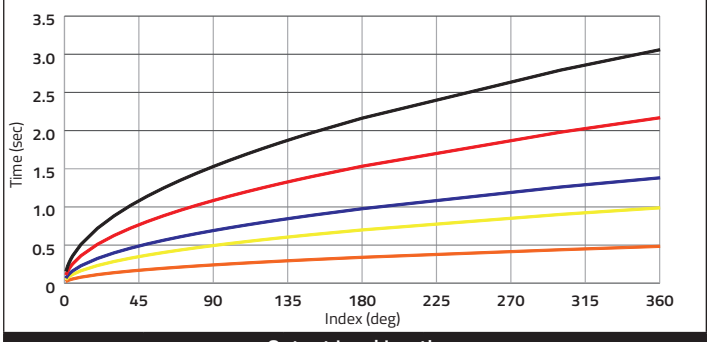
Output Load Inertia				
10 kgm²	50 kgm²	100 kgm²	250 kgm²	500 kgm²

CRD250P-MR (MRS, MRG, MRO) Timing Diagram



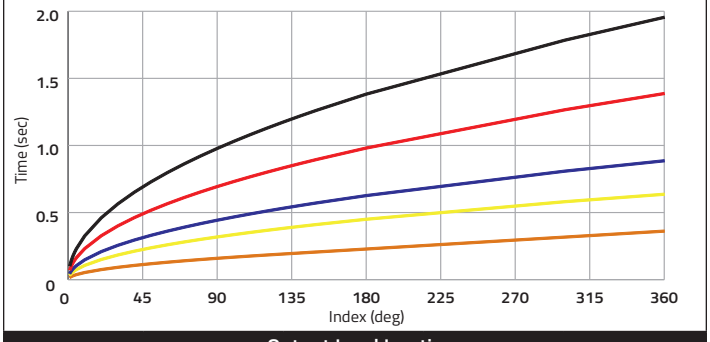
Output Load Inertia				
1 kgm²	5 kgm²	10 kgm²	25 kgm²	50 kgm²

CRD250N-MR (MRS, MRG, MRO) Timing Diagram



Output Load Inertia				
1 kgm²	5 kgm²	10 kgm²	25 kgm²	50 kgm²

CRD250-DD Timing Diagram



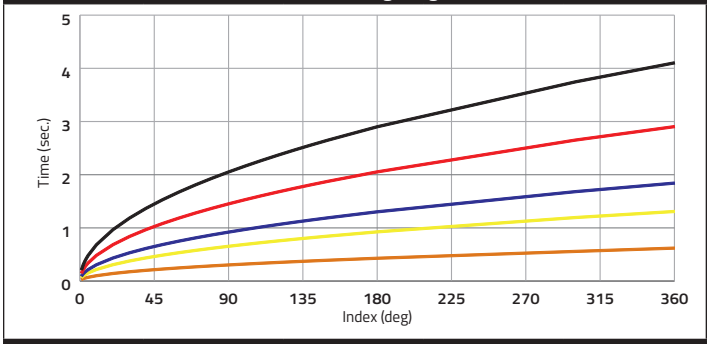
Output Load Inertia				
1 kgm²	5 kgm²	10 kgm²	25 kgm²	50 kgm²

Note: Curves assume no external forces such as additional table support friction, cutting forces, etc. Timing diagrams are developed assuming minimum drag torque, use for reference only.

(1) Assumes Planetary Gearhead Ratio of 4:1
(2) Assumes Harmonic Gearhead Ratio of 50:1
Other ratio options are available upon request

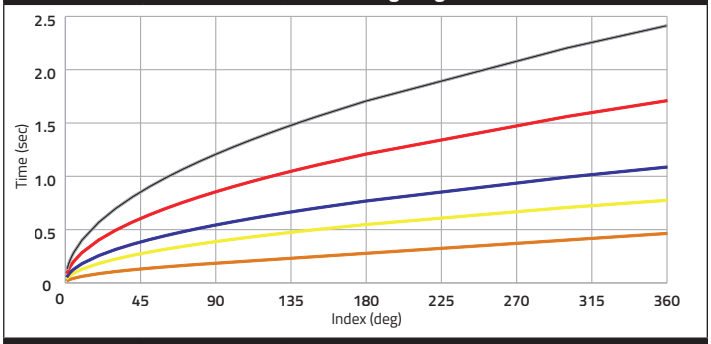
CRD350 Timing Diagrams

CRD350-PL Timing Diagram[1]



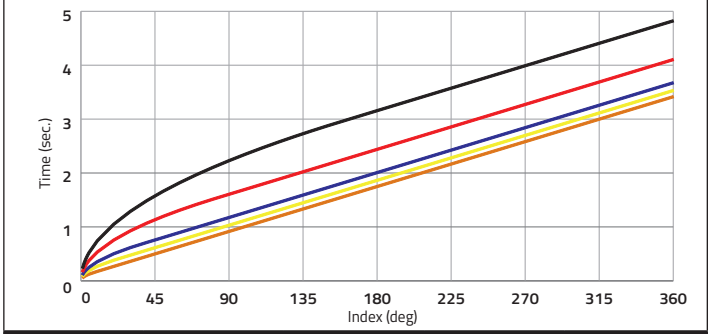
Output Load Inertia				
10 kgm²	50 kgm²	100 kgm²	250 kgm²	500 kgm²

CRDX350-PL Timing Diagram[1]



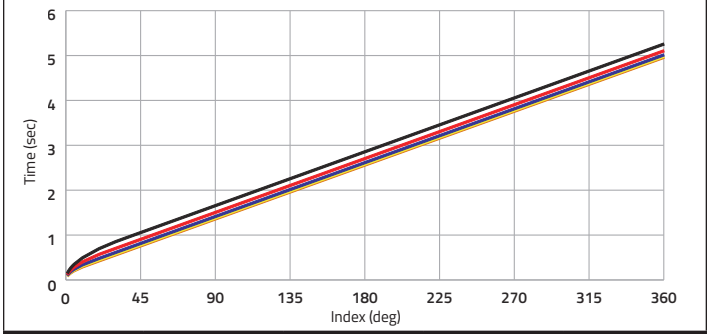
Output Load Inertia				
10 kgm²	50 kgm²	100 kgm²	250 kgm²	500 kgm²

CRD350-HG Timing Diagram[2]



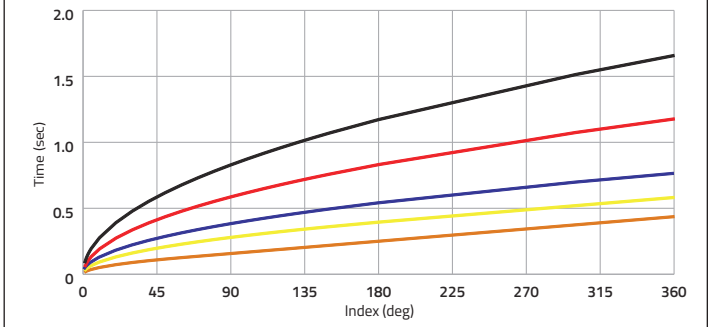
Output Load Inertia				
10 kgm²	50 kgm²	100 kgm²	250 kgm²	500 kgm²

CRDX350-HG Timing Diagram[3]



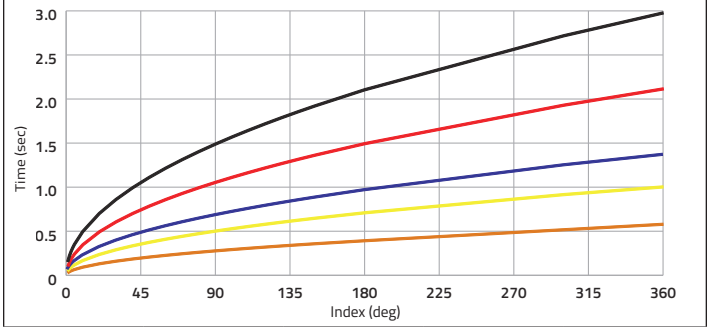
Output Load Inertia				
10 kgm²	50 kgm²	100 kgm²	250 kgm²	500 kgm²

CRD350P-MR (MRS, MRG, MRO) Timing Diagram



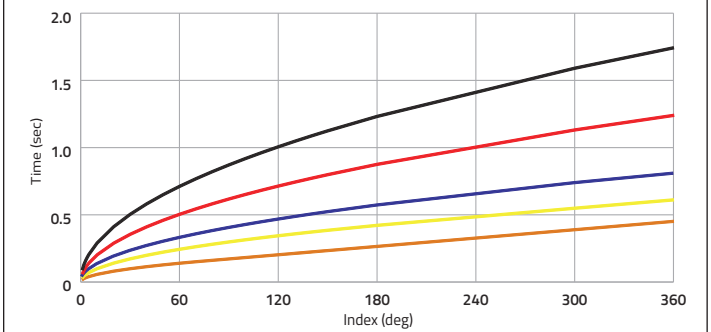
Output Load Inertia				
1 kgm²	5 kgm²	10 kgm²	25 kgm²	50 kgm²

CRD350N-MR (MRS, MRG, MRO) Timing Diagram



Output Load Inertia				
1 kgm²	5 kgm²	10 kgm²	25 kgm²	50 kgm²

CRD350-DD Timing Diagram



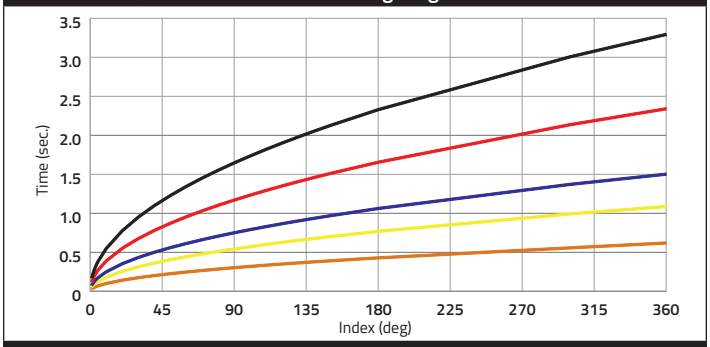
Output Load Inertia				
1 kgm²	5 kgm²	10 kgm²	25 kgm²	50 kgm²

Note: Curves assume no external forces such as additional table support friction, cutting forces, etc. Timing diagrams are developed assuming minimum drag torque, use for reference only.

(1) Assumes Planetary Gearhead Ratio of 4:1
(2) Assumes Harmonic Gearhead Ratio of 50:1
(3) Assumes Harmonic Gearhead Ratio of 80:1
Other ratio options are available upon request

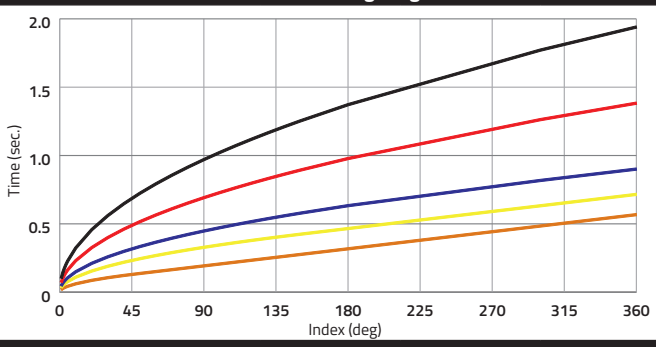
CRD550 Timing Diagrams

CRD550-PL Timing Diagram(1)



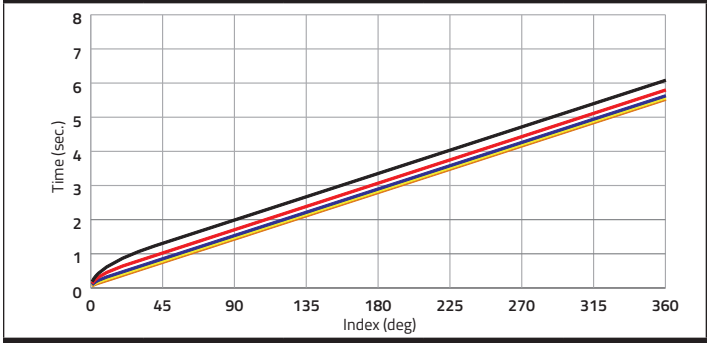
Output Load Inertia				
10 kgm²	50 kgm²	100 kgm²	250 kgm²	500 kgm²

CRDX550-PL Timing Diagram(1)



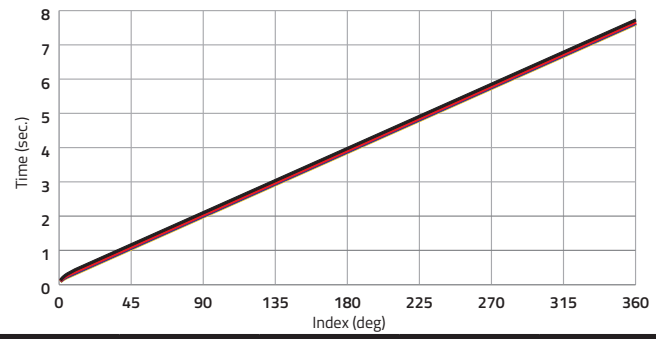
Output Load Inertia				
10 kgm²	50 kgm²	100 kgm²	250 kgm²	500 kgm²

CRD550-HG Timing Diagram(2)



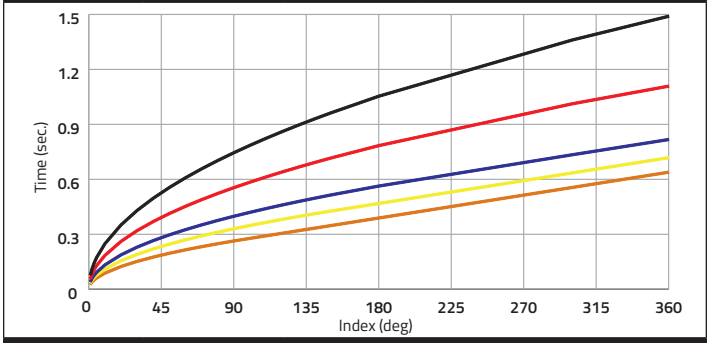
Output Load Inertia				
10 kgm²	50 kgm²	100 kgm²	250 kgm²	500 kgm²

CRDX550-HG Timing Diagram(3)



Output Load Inertia				
10 kgm²	50 kgm²	100 kgm²	250 kgm²	500 kgm²

CRD550-DD Timing Diagram

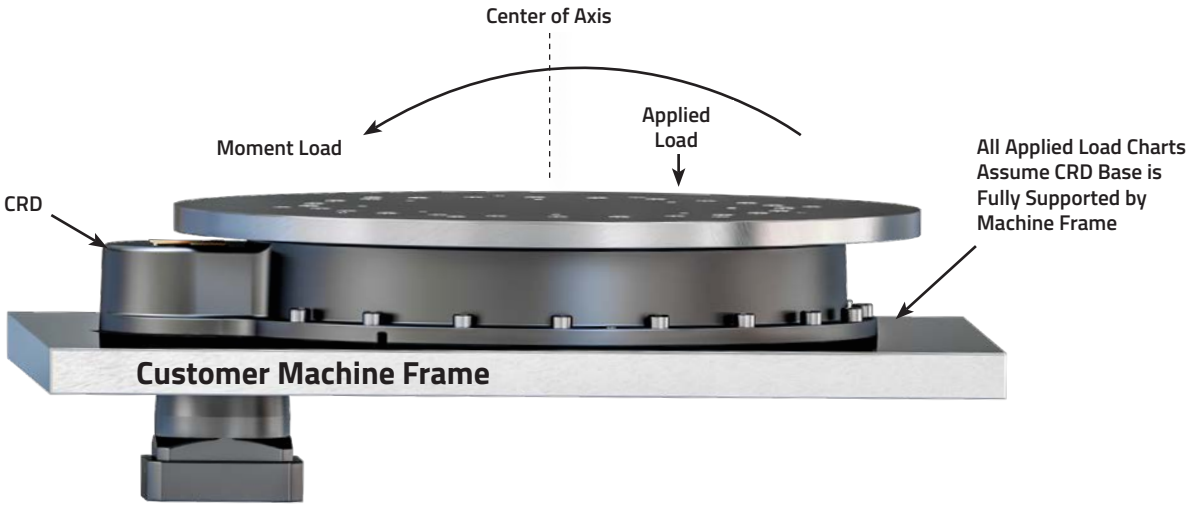


Output Load Inertia				
1 kgm²	5 kgm²	10 kgm²	25 kgm²	50 kgm²

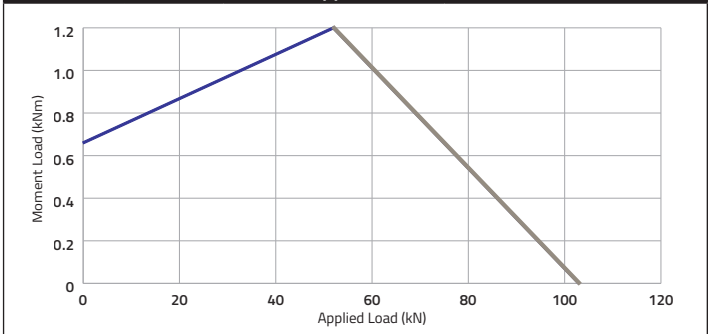
Note: Curves assume no external forces such as additional table support friction, cutting forces, etc. Timing diagrams are developed assuming minimum drag torque, use for reference only.

(1) Assumes Planetary Gearhead Ratio of 4:1
(2) Assumes Harmonic Gearhead Ratio of 50:1
(3) Assumes Harmonic Gearhead Ratio of 80:1
Other ratio options are available upon request

CRD Load Diagrams (Applied Load)

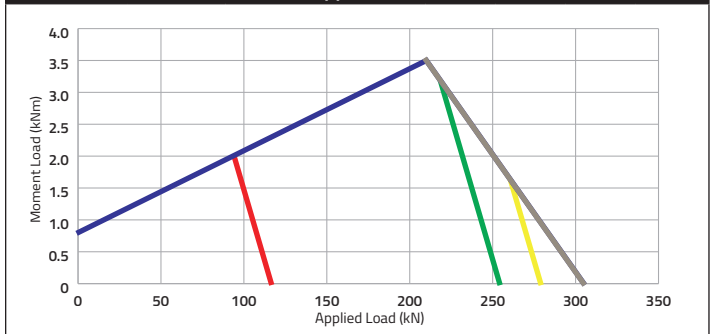


CRD150 Applied Load Chart



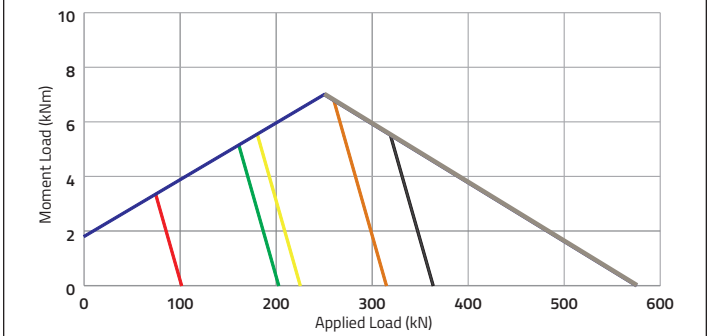
Static Load Limited		Dynamic Load Limit by Drag Torque	
Bolted Joint Capacity	Bearing Capacity	Non-Hardened Gear	Premium Gear
		N-MR	P-MR
		NA*	NA*

CRD250 Applied Load Chart



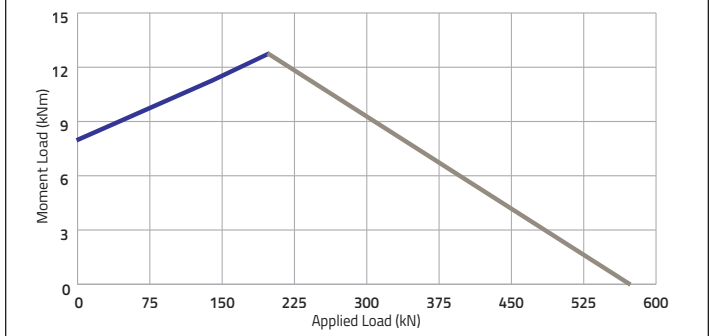
Static Load Limited		Dynamic Load Limit by Drag Torque				
Bolted Joint Capacity	Bearing Capacity	Non-Hardened Gear	Premium Gear			
		N-MR	HG	PL	DD	P-MR
			NA*	NA*		

CRD350 Applied Load Chart



Static Load Limited		Dynamic Load Limit by Drag Torque				
Bolted Joint Capacity	Bearing Capacity	Non-Hardened Gear	Premium Gear			
		N-MR	HG	PL	DD	P-MR

CRDX350 Applied Load Chart

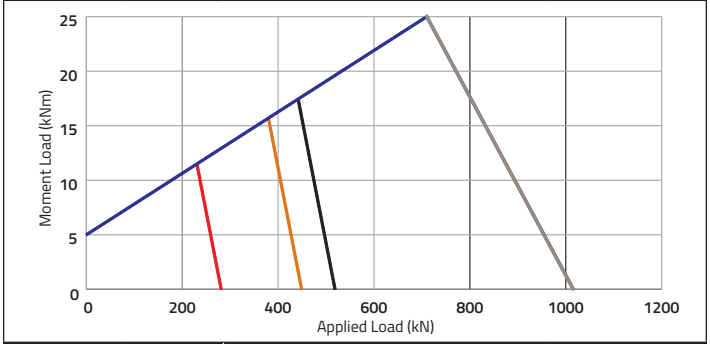


Static Load Limited		Dynamic Load Limit by Drag Torque	
Bolted Joint Capacity	Bearing Capacity	Premium Gear	
		HG	PL
		NA*	NA*

Contact Nexen Group for bearing life in this orientation
*Use Static Load Limit

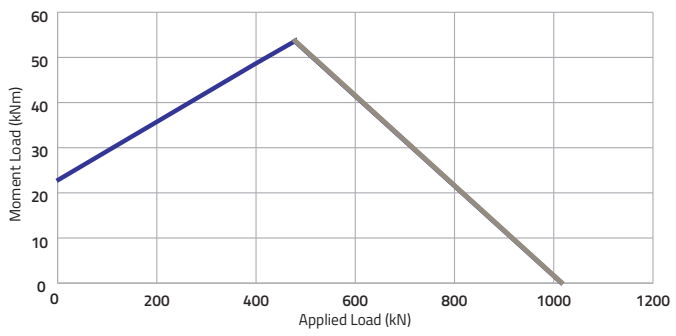
CRD Load Diagrams (Applied Load)

CRD550 Applied Load Chart



Static Load Limited		Dynamic Load Limit by Drag Torque		
Bolted Joint Capacity	Bearing Capacity	Premium Gears		
		HG	PL	DD

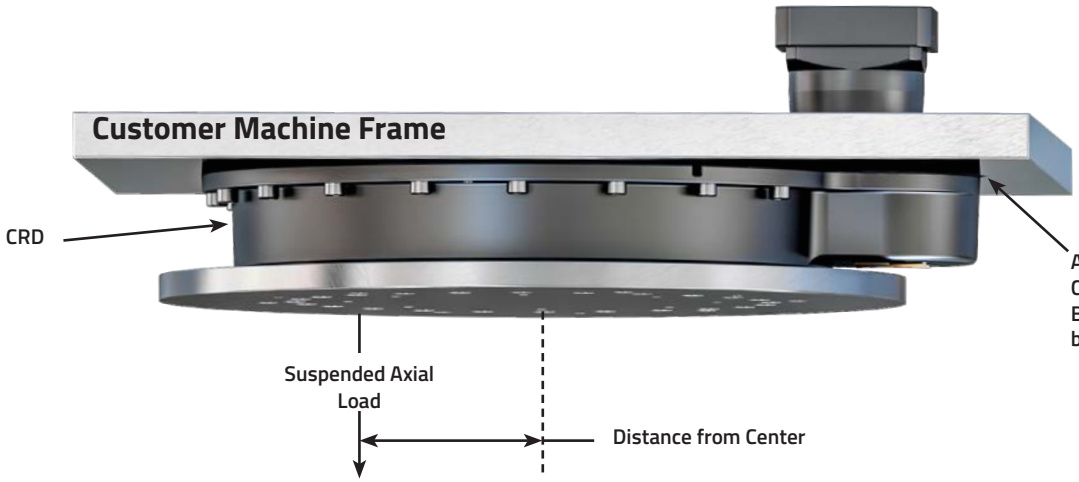
CRDX550 Applied Load Chart

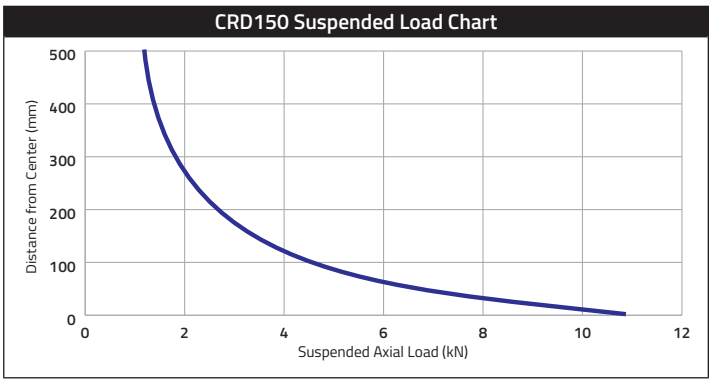


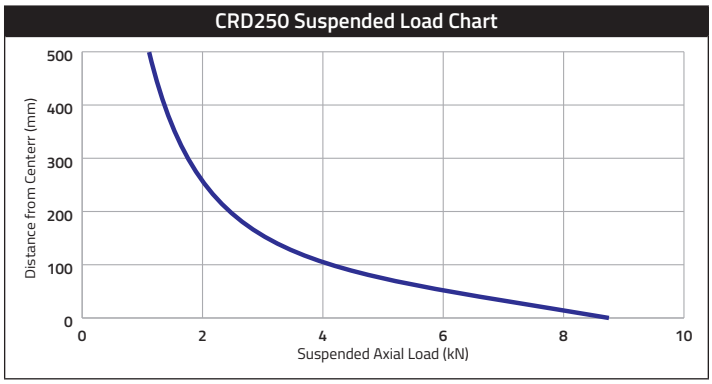
Static Load Limited		Dynamic Load Limit by Drag Torque	
Bolted Joint Capacity	Bearing Capacity	Premium Gear	
		HG	PL
		NA*	NA*

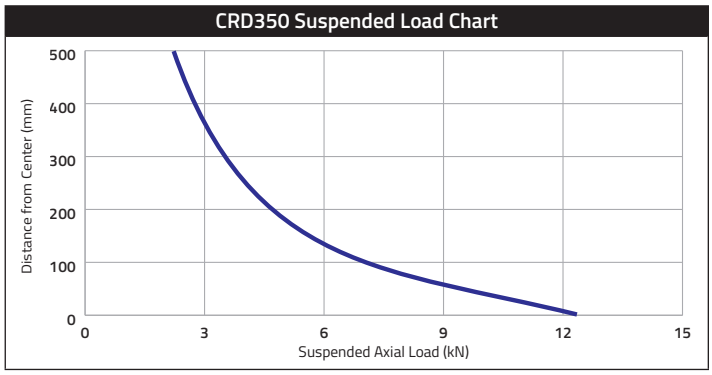
Contact Nexen for bearing life in this orientation
*Use Static Load Limit

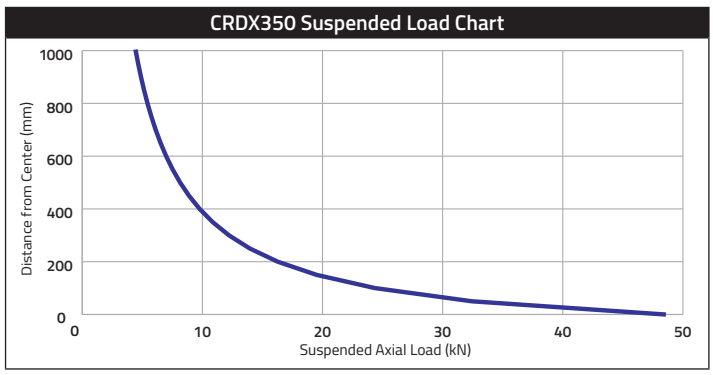
CRD Load Diagrams (Suspended Load)

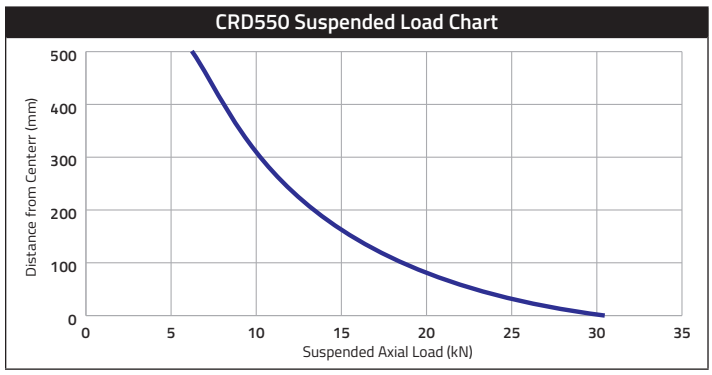


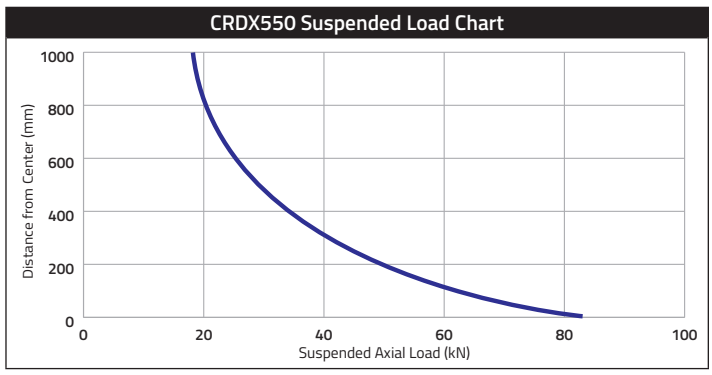






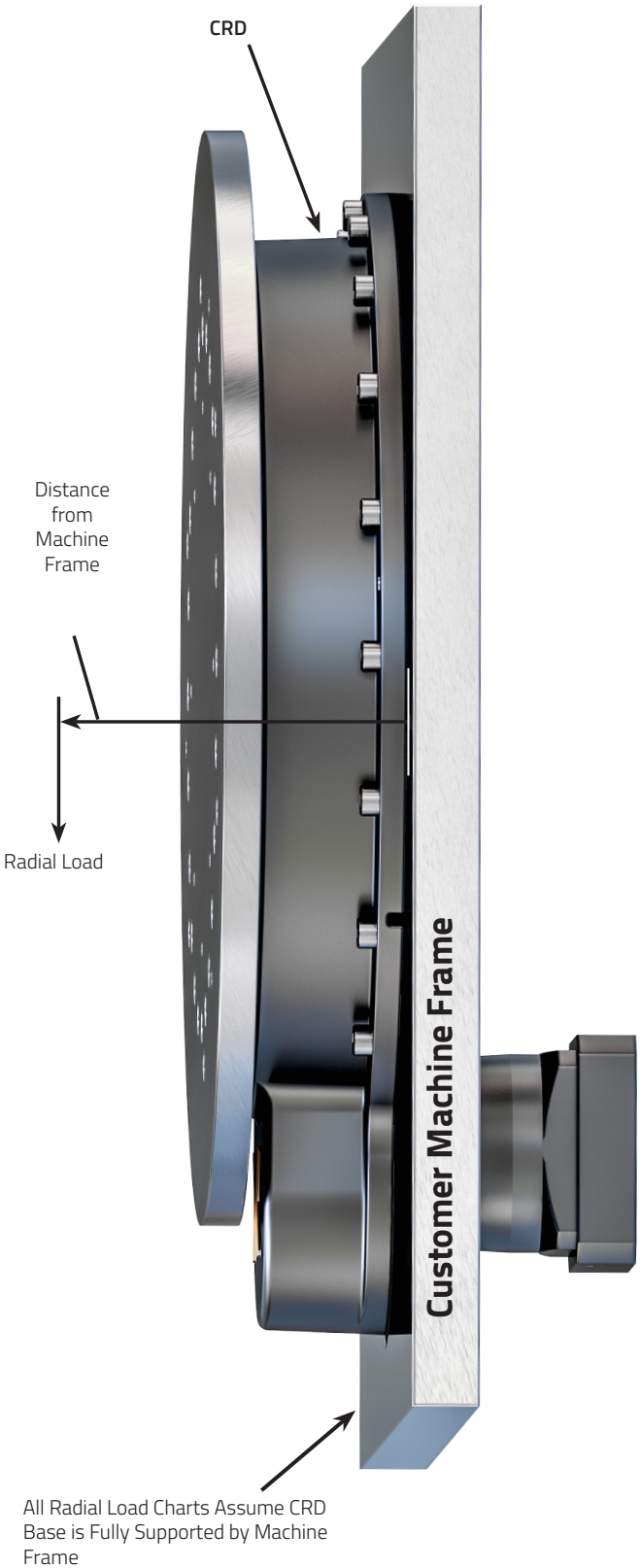




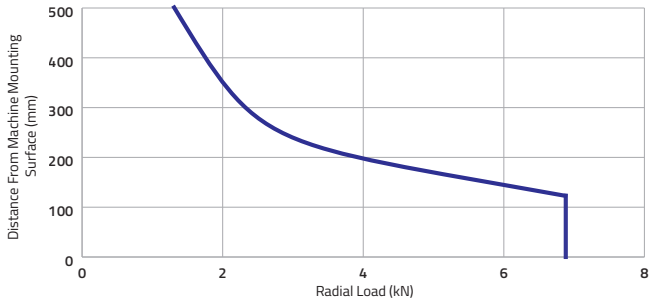


Note: There are no 'Dynamic Load Limit by Drag Torque' ratings for Suspended Loads..

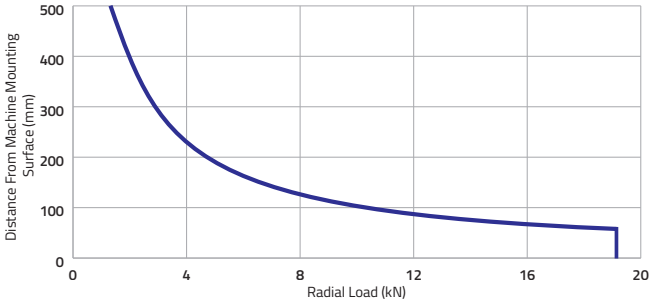
CRD Load Diagrams (Radial Load)



CRD150 Radial Load Chart



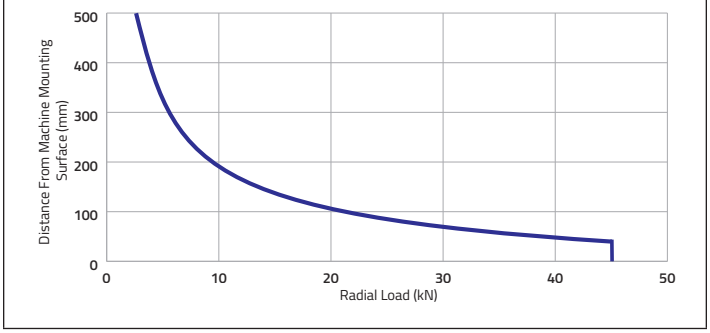
CRD250 Radial Load Chart



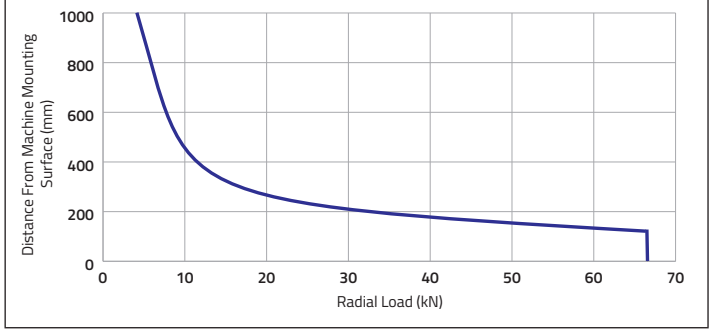
Note: There are no "Dynamic Load Limit by Drag Torque" ratings for Radial Loads.

CRD Load Diagrams (Radial Load)

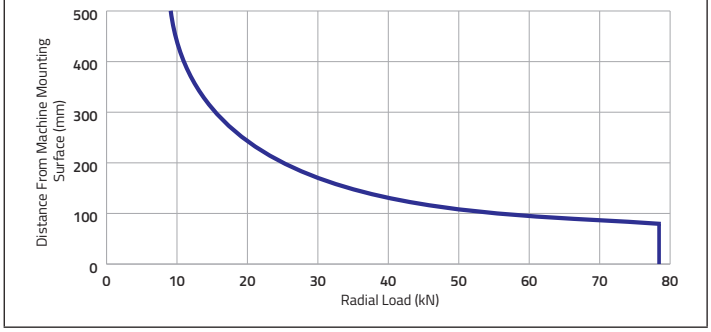
CRD350 Radial Load Chart



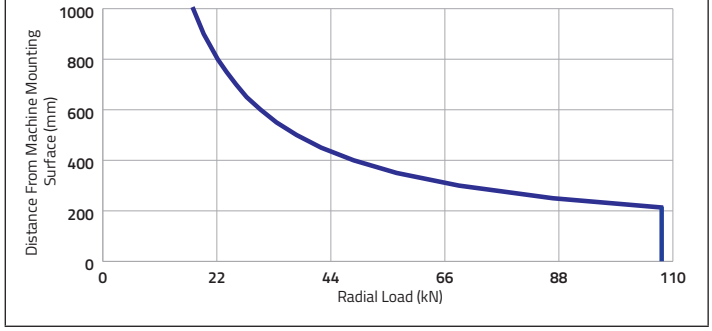
CRDX350 Radial Load Chart



CRD550 Radial Load Chart



CRDX550 Radial Load Chart



Note: There are no "Dynamic Load Limit by Drag Torque" ratings for Radial Loads.

CRD Drag Torque Calculations

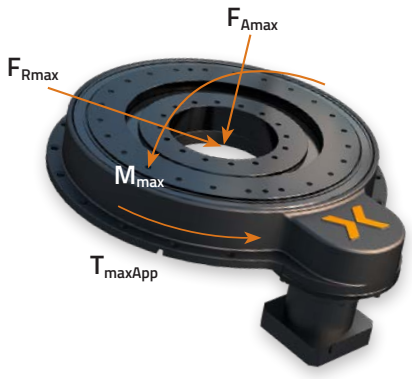
Drag Torque varies based on the load placed on the bearing. Use the calculations below to find the Drag Torque for your application.

Step 1: Gather Application Data

Before you begin calculations, there are several key measurements that you will need from your application in order to calculate drag torque. Collect the data and record it in the space provided.

Measurements for Bearing Calculations	Customer Data (record your values below)	Sample Data*
Maximum Dynamic Gear Torque of Application (T_{maxApp})	Nm	339 Nm
Maximum Dynamic Radial Load (F_{Rmax})	N	0 N
Maximum Dynamic Axial Load (F_{Amax})	N	200,000 N
Maximum Dynamic Moment Load (M_{max})	Nm	500 Nm
Unloaded Drag Torque of CRD (U_{Ldrag}) (From CRD Specs)	Nm	135 Nm

*Sample data is for a CRD550-PL (load data was based on a specific application)



Bearing Race Specific Data

Bearing Size			CRD150	CRD250	CRD350/ CRDX350	CRD550/ CRDX550
Basic Dynamic Load Rating (C)		N	31,400	80,300	151,000	206,000
Basic Static Load Rating (C_0)		N	45,300	135,000	252,000	447,000
Rolling Diameter of Cross Roller (dp)		m	0.108	0.178	0.248	0.453
RPS Generated Load Factor (K_{rps})	RPS16 [CRD-DD]	m^{-1}	N/A	7.88	5.34	3.67
	RPS25 [CRD-PL & CRD-HG]	m^{-1}	N/A	7.19	5.81	3.63
	RPS1306 [CRD-MRS, CRD-MRG and CRD-MRO]	m^{-1}	11.25	8.30	6.21	N/A
	RPS32 [CRDX-PL & CRDX-HG]	m^{-1}	N/A	N/A	5.49	3.47

Step 2: Calculate The Maximum Dynamic Equivalent Radial Load

Perform the following calculations using the data from the Table above and your application data from STEP 1.

Loading Distribution	If:	Then: X	Then: Y
$\frac{F_{Amax}}{F_{Rmax} + \frac{2 \bullet M_{max}}{dp} + T_{maxApp} \bullet K_{rps}}$	≤ 1.5	1	0.45
$\frac{F_{Amax}}{F_{Rmax} + \frac{2 \bullet M_{max}}{dp} + T_{maxApp} \bullet K_{rps}}$	>1.5	0.67	0.67

Maximum Dynamic Equivalent Radial Load

$$P_{Cmax} = X \bullet \left(F_{Rmax} + \left(\frac{2 \bullet M_{max}}{dp}\right) + \left(T_{maxApp} \bullet K_{rps}\right)\right) + (Y \bullet F_{Amax})$$

P_{Cmax} = ( ) • (N + $\frac{2 \bullet \text{Nm}}{\text{m}}$ + (Nm • m^{-1})) + (• N)

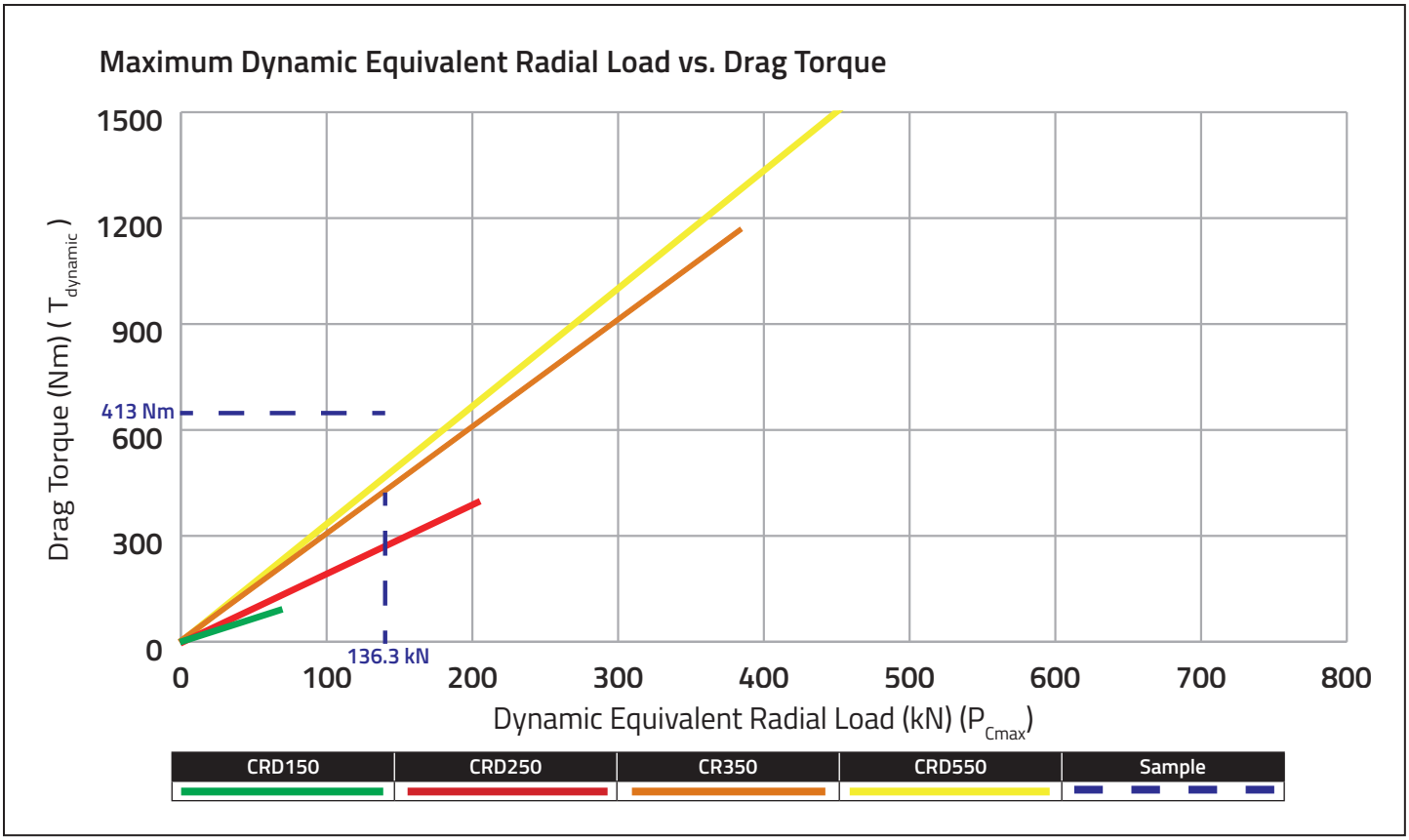
Maximum Dynamic Equivalent Radial Load	
P_{Cmax} =	N

Example: $P_{Cmax} = 0.67 \bullet \left(0\,\text{N} + \frac{2 \bullet 500\,\text{Nm}}{0.453\,\text{m}} + (339\,\text{Nm} \bullet 3.63\,m^{-1})\right) + (0.67 \bullet 200{,}000\,\text{N}) = 136{,}303\,\text{N}$

CRD Drag Torque Calculations

Step 3: Determine Bearing Drag Torque

The bearing drag torque can be estimated based on the dynamic equivalent radial load. Use the following charts to determine your approximate bearing drag torque.



CRD Total Drag Torque

$T_{BD} = T_{Dynamic} + U_{Ldrag}$

T_{BD} = _____ Nm + _____ Nm T_{BD} = **CRD Total Drag Torque** _____ Nm

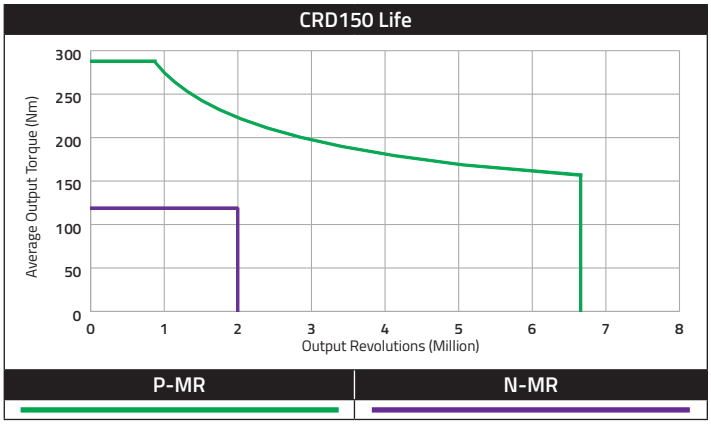
Example: T_{BD} = 413 Nm + 135 Nm = 548 Nm

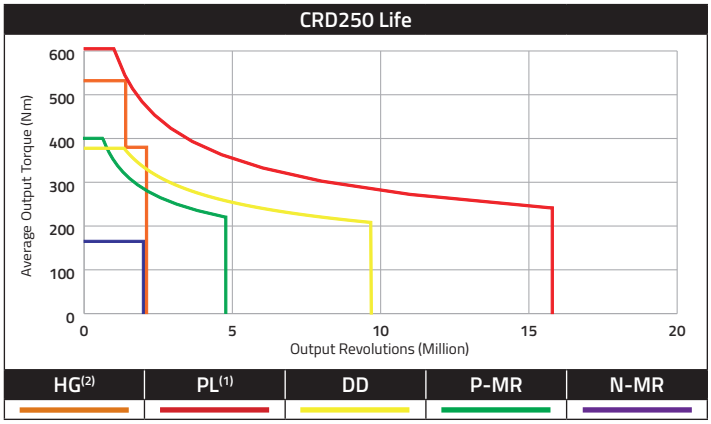
Step 4: Complete Output Torque Calculations

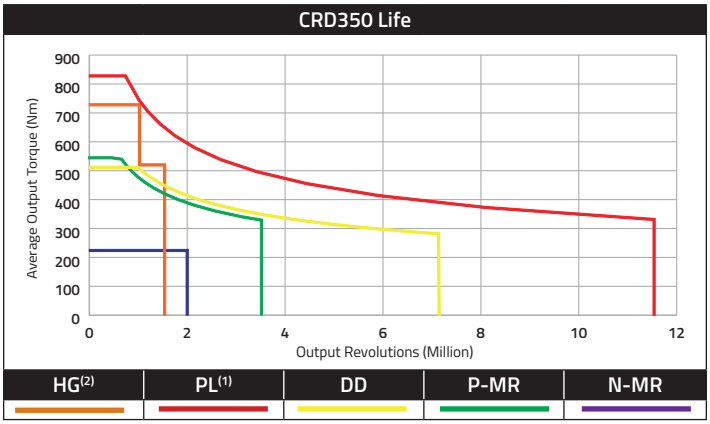
Refer to the worksheet on Page 7 to calculate the Total Output Torque required for the application.

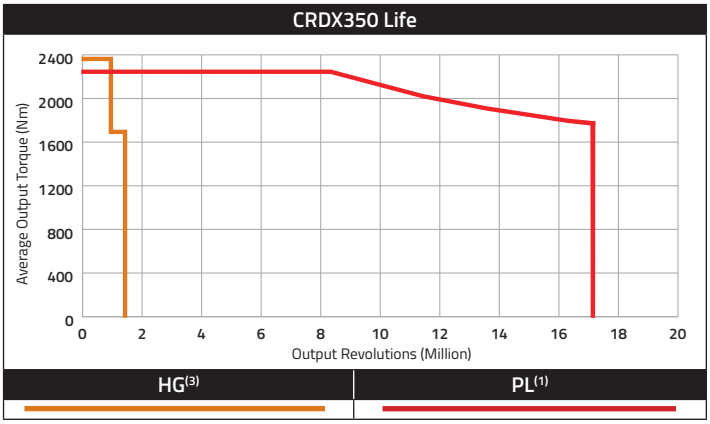
CRD System Life

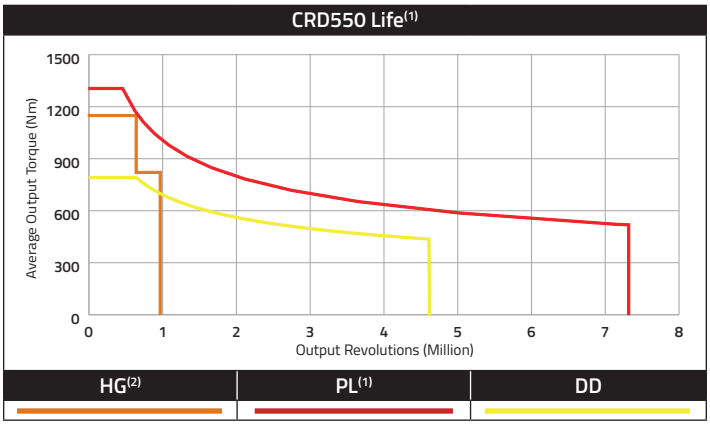
CRD life is based on average output torque and drive station options.

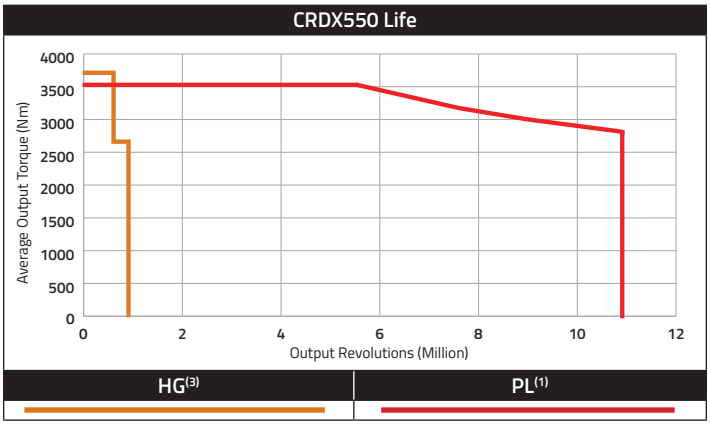










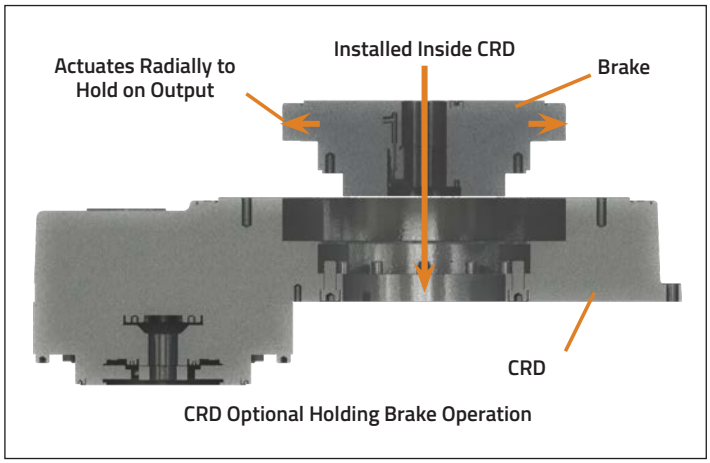


(1) Assumes Planetary Gearhead Ratio of 4:1
(2) Assumes Harmonic Gearhead Ratio of 50:1
(3) Assumes Harmonic Gearhead Ratio of 80:1
Other ratio options are available upon request

CRD Accessories: Brake

Optional Holding Brake for CRD250

Nexen offers an optional holding brake that acts directly on the CRD driven output. With spring engaged/air released braking action, the brake's compact design does not increase the CRD footprint and maintains an open center. For brake E-Stop capabilities, contact Nexen.



CRD Optional Holding Brake Operation

Brake Specifications	CRD250, Brake
Holding Torque (Nm)	800
Release Pressure (psi)	60
Brake Life (cycles)	1 million
Brake Torsional Rigidity (Nm/rad)	8.65 million

Note: Brake can be manually released by inserting screws into holes on its bottom side.

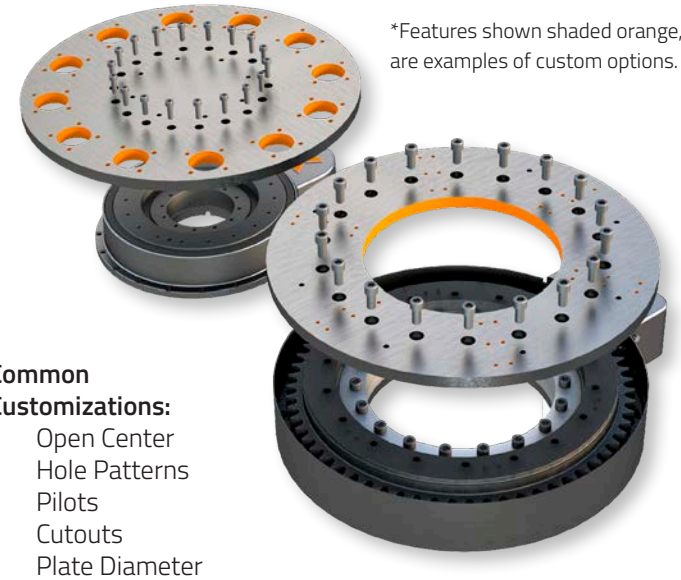
Brake is fully sealed and IP 65 rated.

CRD Accessories: Dial Plates

Optional Dial Plates

Nexen offers custom dial plates that precisely pilot on the output of the Rotary Indexer. Contact Nexen to customize a Dial Plate to the application.

	Standard Dial Plate Thickness	Standard Dial Plate Outer Diameter		
		550 mm	900 mm	1350 mm
CRD150	19.05 mm	967900	967901	N/A
CRD250		967903	967904	967905
CRD350/ CRDX350		967906	967907	967908
CRD550/ CRDX550		N/A	967909	967910



*Features shown shaded orange, are examples of custom options.

Common Customizations:

- Open Center
- Hole Patterns
- Pilots
- Cutouts
- Plate Diameter

Precision Rotary Indexer (PRD)

The PRD system offers all the features of Nexen's RPS technology, opening up new design possibilities for next-generation machines.

Nexen's PRD is supported by a high-capacity crossroller bearing rated for high axial loads. Peak torque inputs at any time allow for faster indexing times.

PRD Product Descriptions

The diagram below represents the model number for a Precision Rotary Indexer configuration.

PRD	X	750	PL	120:1	32.00	80.00	130.00	90°	LG

Precision Rotary Indexer

blank	Standard
X	X-Line

Output Bolt Circle Diameter (mm)

Drive Station Type	
PL	Planetary Gearhead
PLR	Reduced Backlash Planetary Gearhead
HG	Harmonic Gearhead

Input to Output Ratio

Customer Motor Shaft Diameter (mm)

Customer Motor Shaft Length (mm)

Customer Motor Pilot Diameter (mm)

90° Gearhead Option

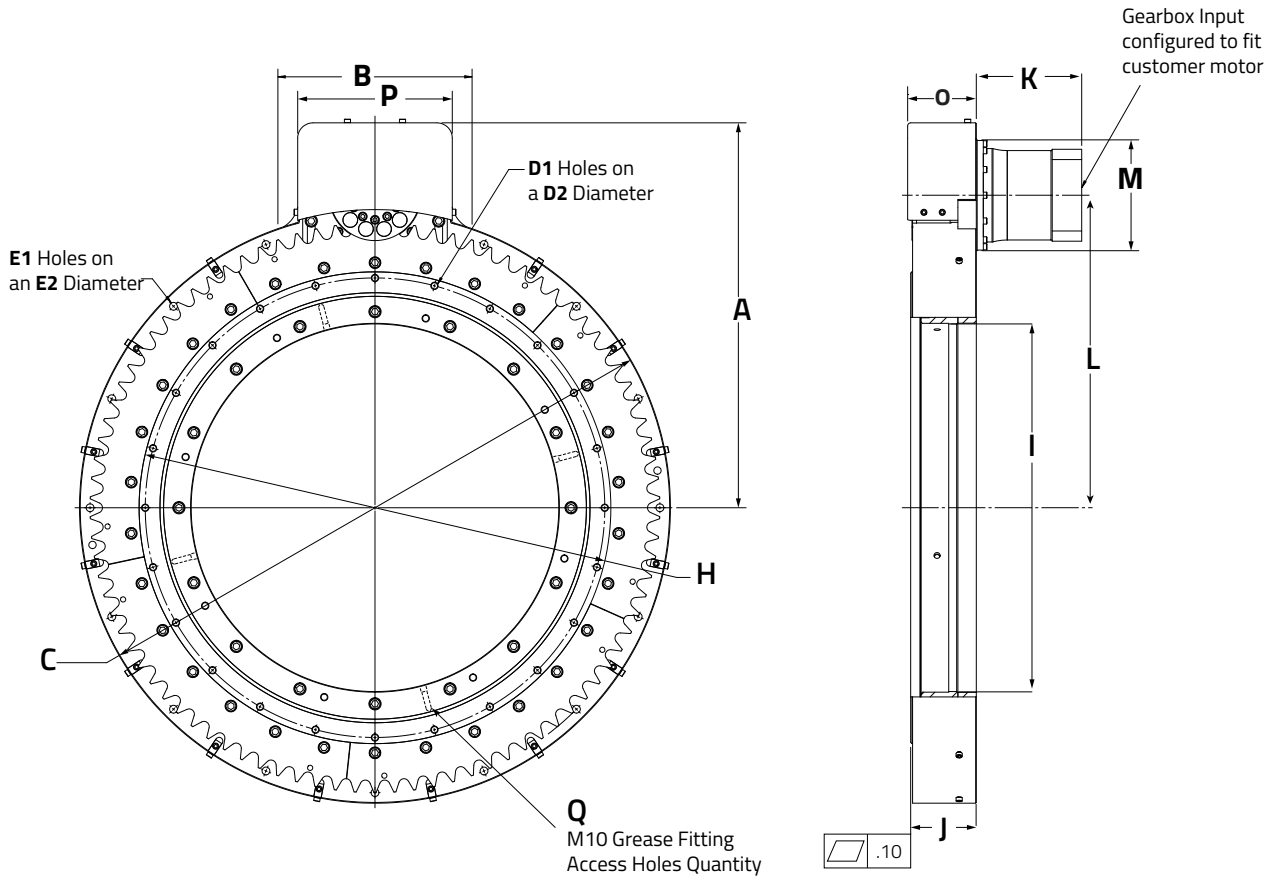
Large Gearhead Option

PRD Specifications

		Maximum Velocity	Positional Accuracy (1)(5)	One Way Repeatability(5)	Max Backlash(1)	Max Acceleration Torque	Nominal Torque	Gear to Pinion Ratio	Input to Output Ratio	Min Drag Torque (no load) (U_{Ldrag})	Output Inertia	Total Reflected Inertia to Gearhead Output
		RPM	±ArcSec	±ArcSec	ArcSec	Nm	Nm			Nm	kgm^2	kgm^2
PL(2)	PRD400-PL	94	34.5	4.2	12.1	1019	573	6.4:1	25.6:1	40	1.39	0.036
	PRD750-PL	54	20.1	2.4	7	1751	985	11:1	44:1	100	8.83	0.075
	PRD1100-PL	35	13	1.6	4.5	2706	1522	17:1	68:1	150	48.97	0.172
	PRD1500-PL	27	11	1.2	3.5	3502	1969	22:1	88:1	200	112.95	0.236
X-PL(2)	PRDX750-PL	54	21.8	2.3	9.5	4811	2750	7.5:1	30:1	100	12.19	0.236
	PRDX1100-PL	35	15	1.6	6.5	7057	4033	11:1	44:1	150	55.52	0.476
	PRDX1500-PL	27	11.6	1.2	5	9141	5224	14.25:1	57:1	200	120.49	0.610
HG(3)	PRD400-HG	17.5	34.5	4.2	0	461	326	6.4:1	320:1	40	1.39	0.034
	PRD750-HG	10.2	20.1	2.4	0	792	561	11:1	550:1	100	8.83	0.073
	PRD1100-HG	6.6	13	1.6	0	1224	867	17:1	850:1	150	48.97	0.169
	PRD1500-HG	5.1	11	1.2	0	1584	1122	22:1	1100:1	200	112.95	0.233
X-HG(4)	PRDX750-HG	5.8	21.8	2.3	0	4811	3630	7.5:1	600:1	100	12.19	0.217
	PRDX1100-HG	4	15	1.6	0	7057	5324	11:1	880:1	150	55.52	0.459
	PRDX1500-HG	3.1	11.6	1.2	0	9141	6897	14.25:1	1140:1	200	120.49	0.593

(1) Includes Gearhead Backlash
(2) Assumes Planetary Gearhead Ratio of 4:1
(3) Assumes Harmonic Gearhead Ratio of 50:1
(4) Assumes Harmonic Gearhead Ratio of 80:1
(5) Contact Nexen for Higher Precision Options
Other ratio options are available upon request

PRD Dimensions



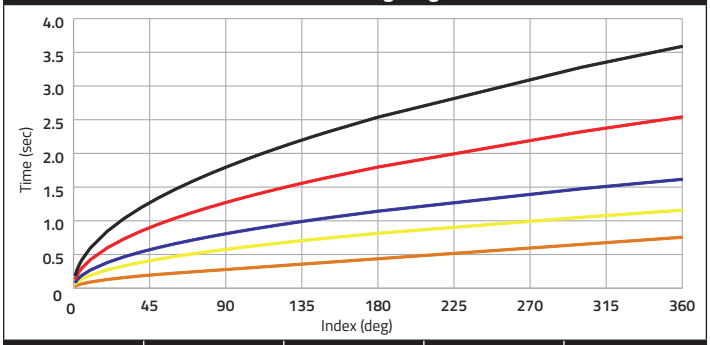
Note: Basic dimensions shown for selection purposes only and subject to change. Visit www.nexengroup.com for detailed drawings and CAD models for designing a system.

			PRD400	PRD750	PRDX750	PRD1100	PRDX1100	PRD1500	PRDX1500
A	Drive Station Envelope to Center Distance (mm)		361.2	541.2	628.2*	771.2	826.2*	971.2	1028.8*
B	Drive Station Envelope Width (mm)		232.7	250	317*	250	317*	260	317*
C	Guard Outer Diameter (mm)		550	900	964.4	1350	1352.4	1750	1750
D1	Output Mounting Holes	Thread	M12 X 1.75	M12 X 1.75	M12 X 1.75	M12 X 1.75	M12 X 1.75	M12 X 1.75	M12 X 1.75
		Quantity	18	24	24	24	24	30	30
D2	Output Bolt Pattern Circle Diameter (mm)		396	750	750	1100	1100	1500	1500
E1	Base Mounting Holes for Customer Supplied Screws	Fastener	M12	M12	M12	M12	M12	M12	M12
		Quantity	15	15	15	23	23	31	31
		Pattern	22.5°	22.5°	22.5°	15°	15°	11.25°	11.25°
E2	Base Mounting Hole Circle Diameter (mm)		500	870	930	1325	1320	1715	1715
H	Ring Drive Pilot Diameter (mm)		460	770	770	1150	1150	1525	1525
I	Inner Diameter (mm)		280	600	600	950	950	1330	1330
J	Platform Height (mm)		93.5	93	107	93	114	93	127
K	Drive Station Depth (mm)	PL	98	98	124.5	98	124.5	98	124.5
		HG	19.3	19.3	58.3	19.3	58.3	19.3	58.3
L	Indexer Center to Pinion Center (mm)		285	462	510	692	708	885	896
M	Gearhead Flange Diameter (mm)		118	118	181	118	181	118	181
O	Pinion Guard Height (mm)		96	96	112	96	119	96	132
P	Pinion Guard Width (mm)		177.4	177.4	252.4*	177.4	252.4*	177.4	252.4*
Q	Grease Fitting Access Holes Quantity (mm)		2	4	4	4	4	5	5

*PRDX-HG dimensions A, B, and P differ from the PRDX-PL dimensions listed. Contact Nexen for more information

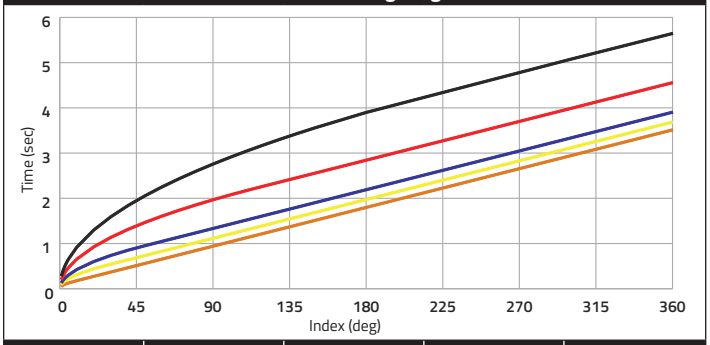
PRD Timing Diagrams

PRD400-PL Timing Diagram(1)



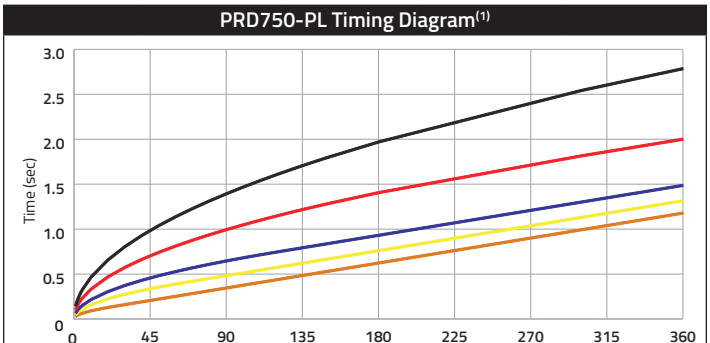
10 kgm² | 50 kgm² | 100 kgm² | 250 kgm² | 500 kgm²

PRD400-HG Timing Diagram(2)



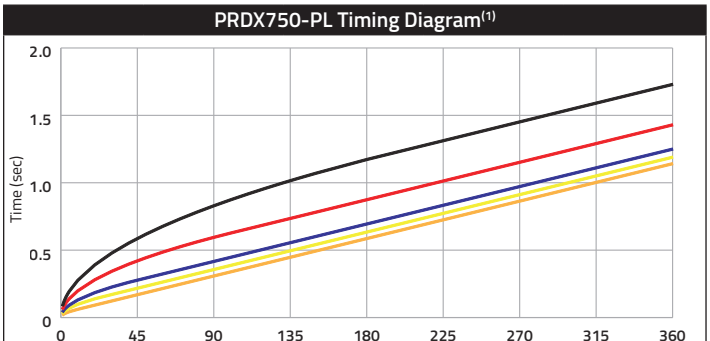
10 kgm² | 50 kgm² | 100 kgm² | 250 kgm² | 500 kgm²

PRD750-PL Timing Diagram(1)



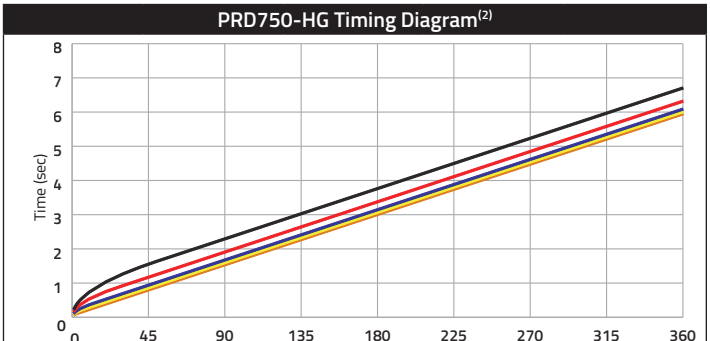
10 kgm² | 50 kgm² | 100 kgm² | 250 kgm² | 500 kgm²

PRDX750-PL Timing Diagram(1)



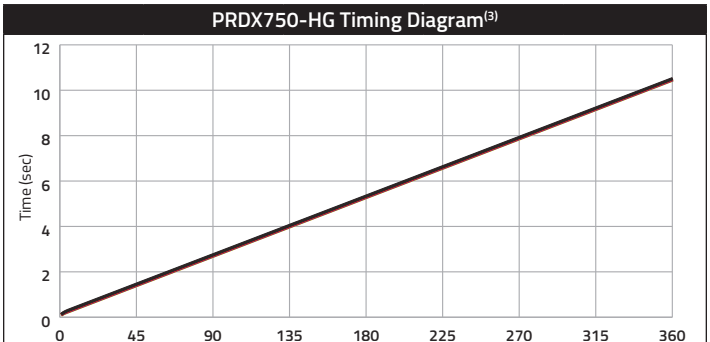
10 kgm² | 50 kgm² | 100 kgm² | 250 kgm² | 500 kgm²

PRD750-HG Timing Diagram(2)



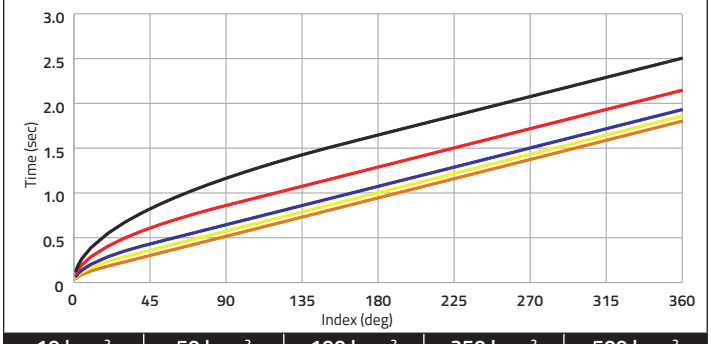
10 kgm² | 50 kgm² | 100 kgm² | 250 kgm² | 500 kgm²

PRDX750-HG Timing Diagram(3)



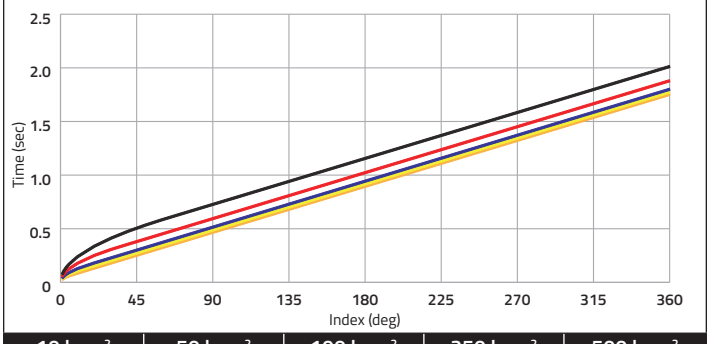
10 kgm² | 50 kgm² | 100 kgm² | 250 kgm² | 500 kgm²

PRD1100-PL Timing Diagram(1)



10 kgm² | 50 kgm² | 100 kgm² | 250 kgm² | 500 kgm²

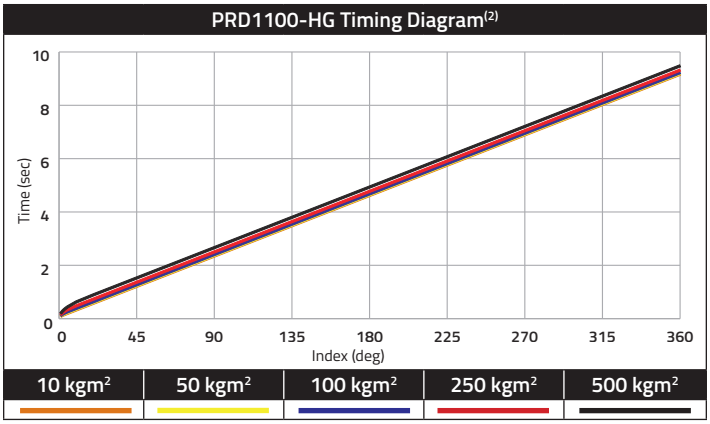
PRDX1100-PL Timing Diagram(1)

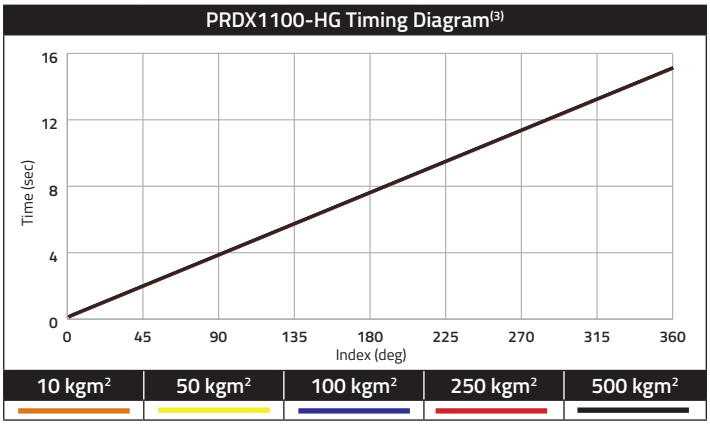


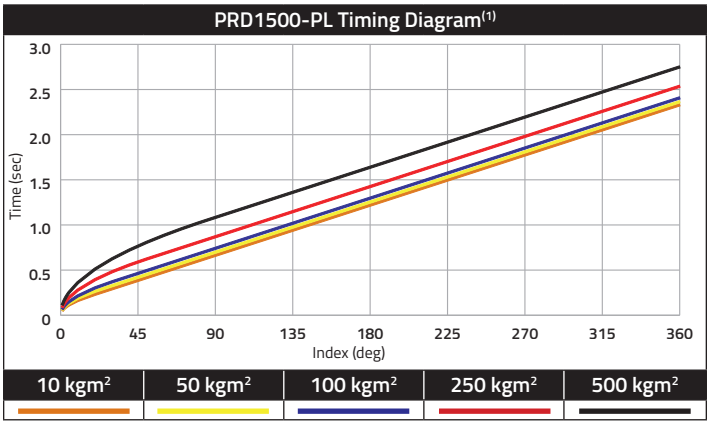
10 kgm² | 50 kgm² | 100 kgm² | 250 kgm² | 500 kgm²

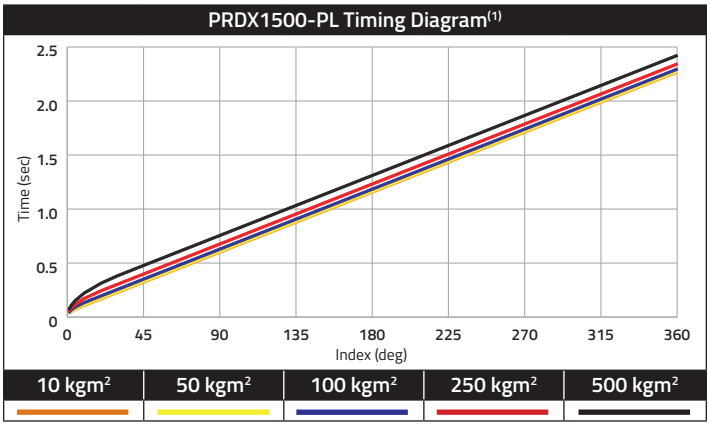
Note: Curves assume no external forces such as additional table support friction, cutting forces, etc. Timing diagrams are developed assuming minimum drag torque, use for reference only. (1) Assumes Planetary Gearbox Ratio of 4:1, (2) Assumes Harmonic Gearhead Ratio of 50:1,
(3) Assumes Harmonic Gearhead Ratio of 80:1, Other ratio options are available upon request

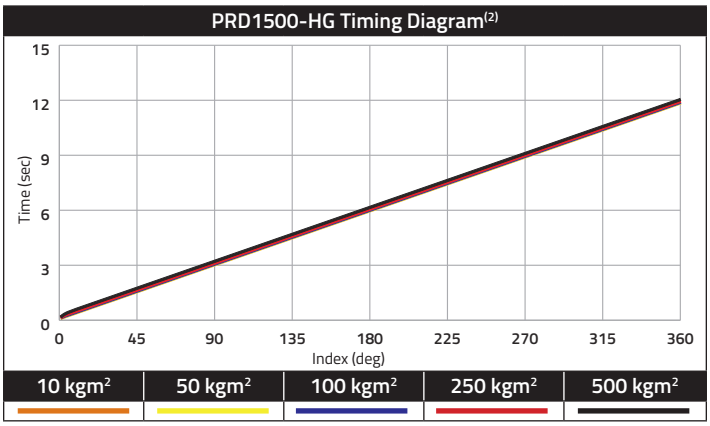
PRD Timing Diagrams

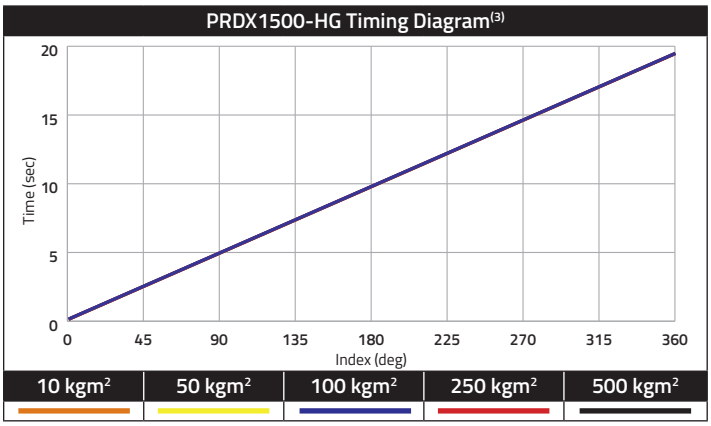








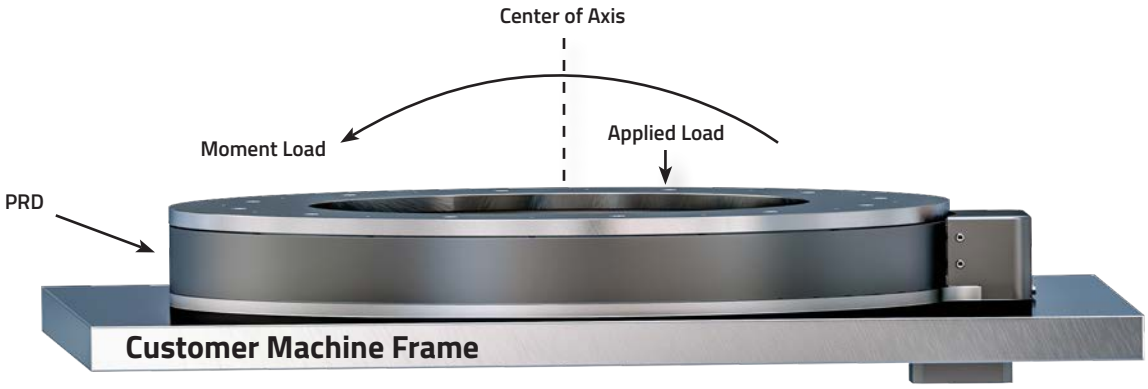




Note: Curves assume no external forces such as additional table support friction, cutting forces, etc. Timing diagrams are developed assuming minimum drag torque, use for reference only.

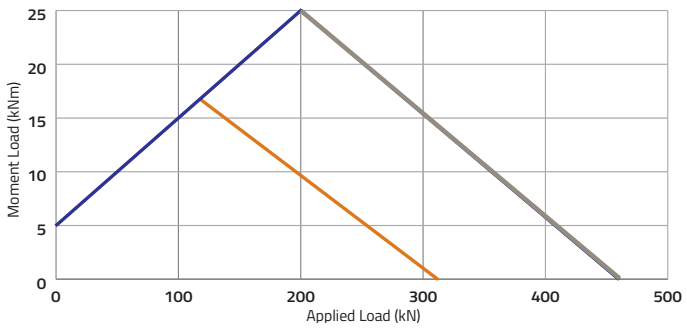
(1) Assumes Planetary Gearbox Ratio of 4:1*
(2) Assumes Harmonic Gearhead Ratio of 50:1*
(3) Assumes Harmonic Gearhead Ratio of 80:1*
* Other ratio options available

PRD Load Diagrams (Applied Load)



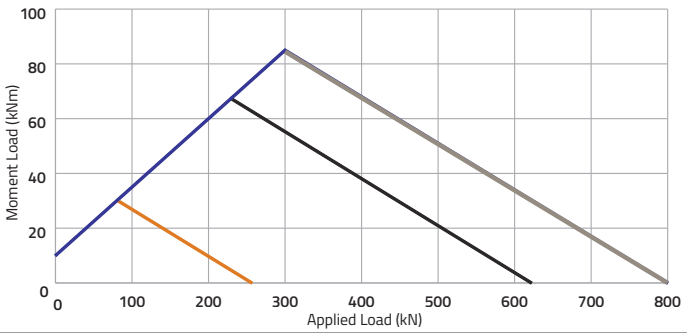
All Applied Load Charts Assume PRD Base is Fully Supported by Machine Frame

PRD400 Applied Load Chart



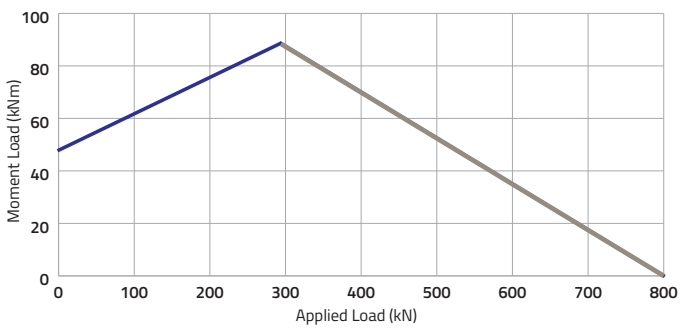
Static Load Limited		Dynamic Load Limit by Drag Torque	
Bolted Joint Capacity	Bearing Capacity	HG	PL
			NA*

PRD750 Applied Load Chart



Static Load Limited		Dynamic Load Limit by Drag Torque	
Bolted Joint Capacity	Bearing Capacity	HG	PL

PRDX750 Applied Load Chart

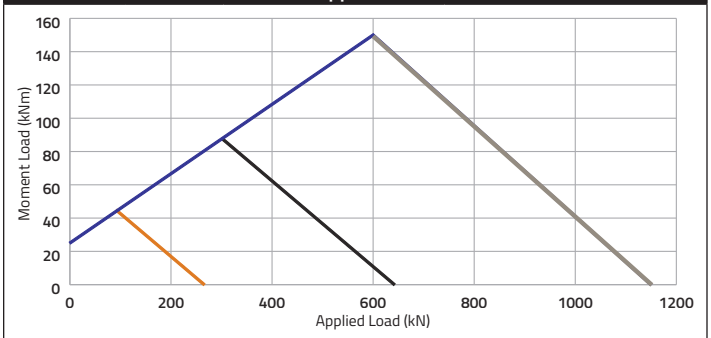


Static Load Limited		Dynamic Load Limit by Drag Torque	
Bolted Joint Capacity	Bearing Capacity	HG	PL
		NA*	NA*

*Use Static Load Limit

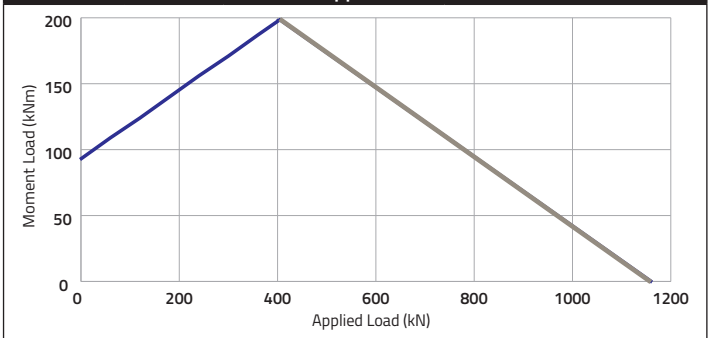
PRD Load Diagrams (Applied Load)

PRD1100 Applied Load Chart



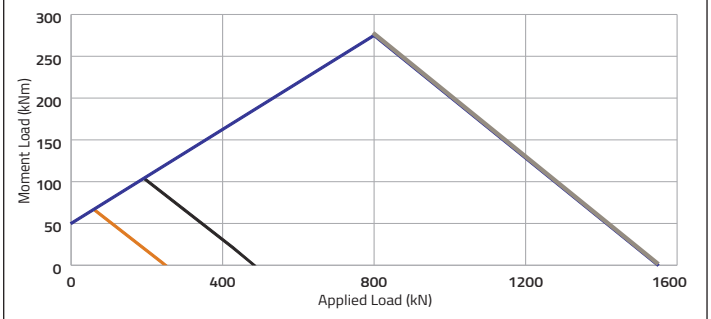
Static Load Limited		Dynamic Load Limit by Drag Torque	
Bolted Joint Capacity	Bearing Capacity	HG	PL

PRDX1100 Applied Load Chart



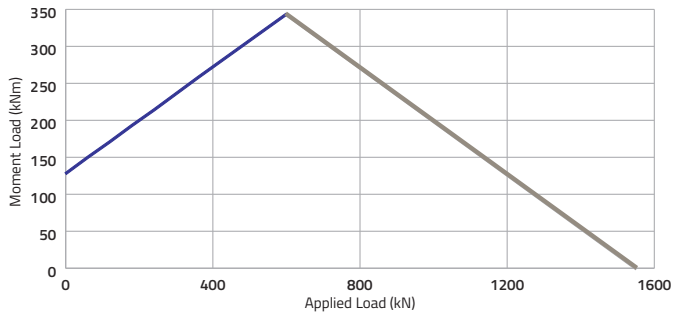
Static Load Limited		Dynamic Load Limit by Drag Torque	
Bolted Joint Capacity	Bearing Capacity	HG	PL
		NA*	NA*

PRD1500 Applied Load Chart



Static Load Limited		Dynamic Load Limit by Drag Torque	
Bolted Joint Capacity	Bearing Capacity	HG	PL

PRDX1500 Applied Load Chart

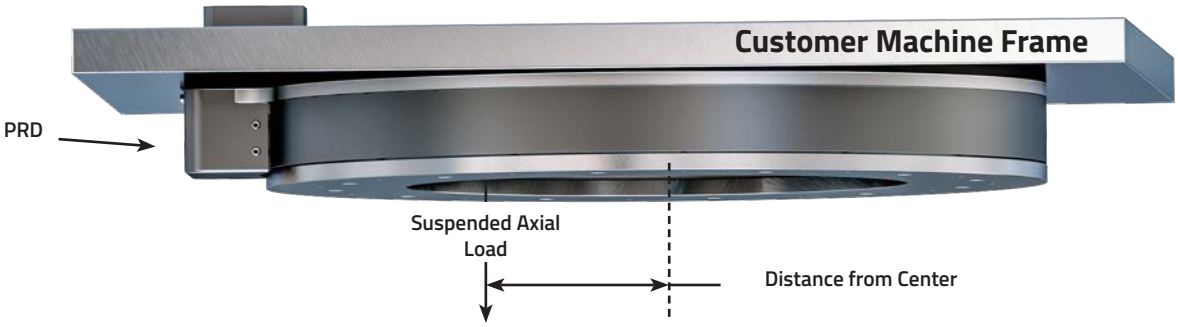


Static Load Limited		Dynamic Load Limit by Drag Torque	
Bolted Joint Capacity	Bearing Capacity	HG	PL
		NA*	NA*

Note: The PRDX Indexers do not have a "Dynamic Load Limit by Drag Torque" rating for Applied Loads because it exceeds the Static Load Limit rating.

*Use Static Load Limit

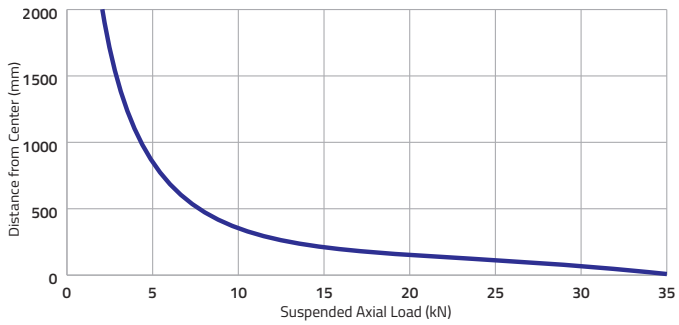
PRD Load Diagrams (Suspended Load)



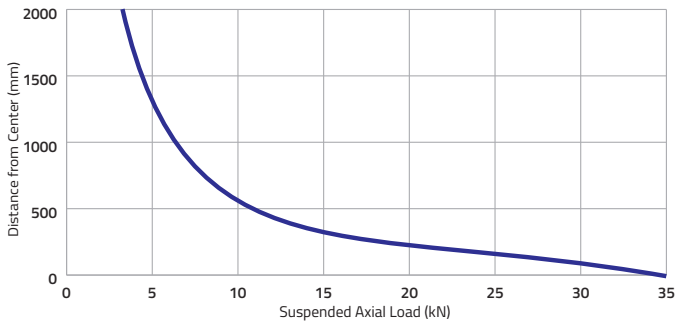
All Suspended Load Charts Assume PRD Base is Fully Supported by Machine Frame

Note: The weight of the PRD is already factored into these charts. There are no "Dynamic Load Limit by Drag Torque" ratings for Suspended Loads.

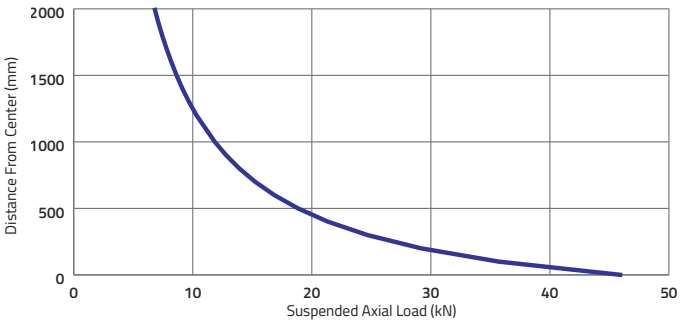
PRD400 Suspended Load Chart



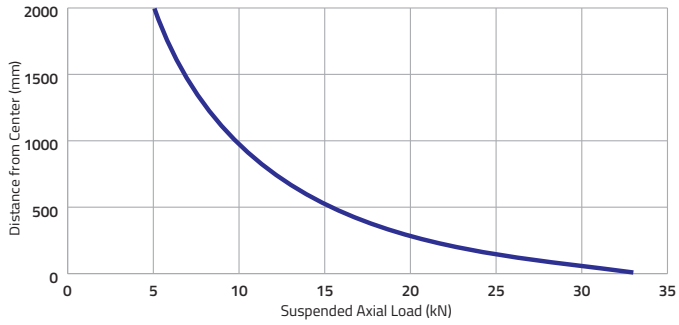
PRD750 Suspended Load Chart



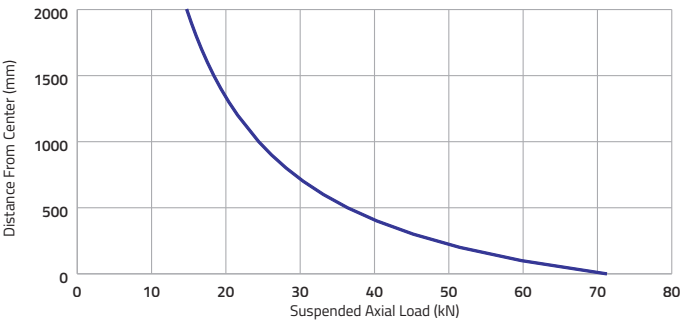
PRDX750 Suspended Load Chart



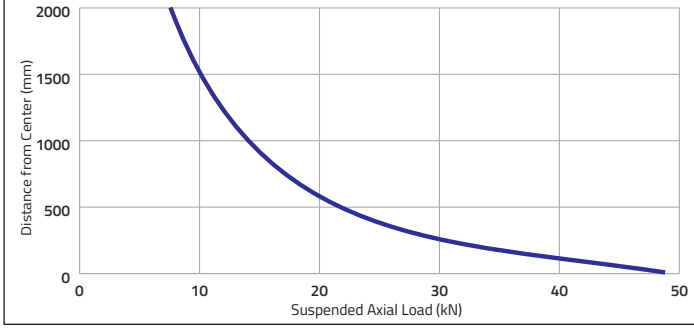
PRD1100 Suspended Load Chart



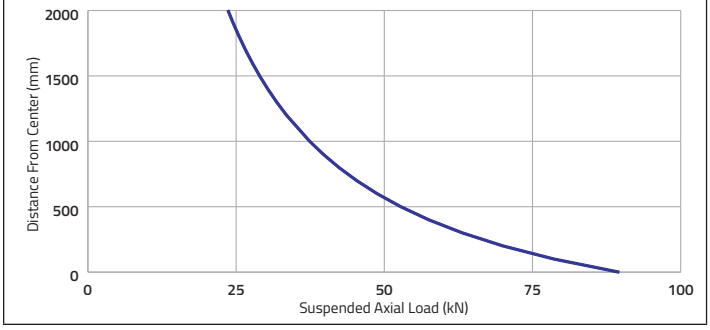
PRDX1100 Suspended Load Chart



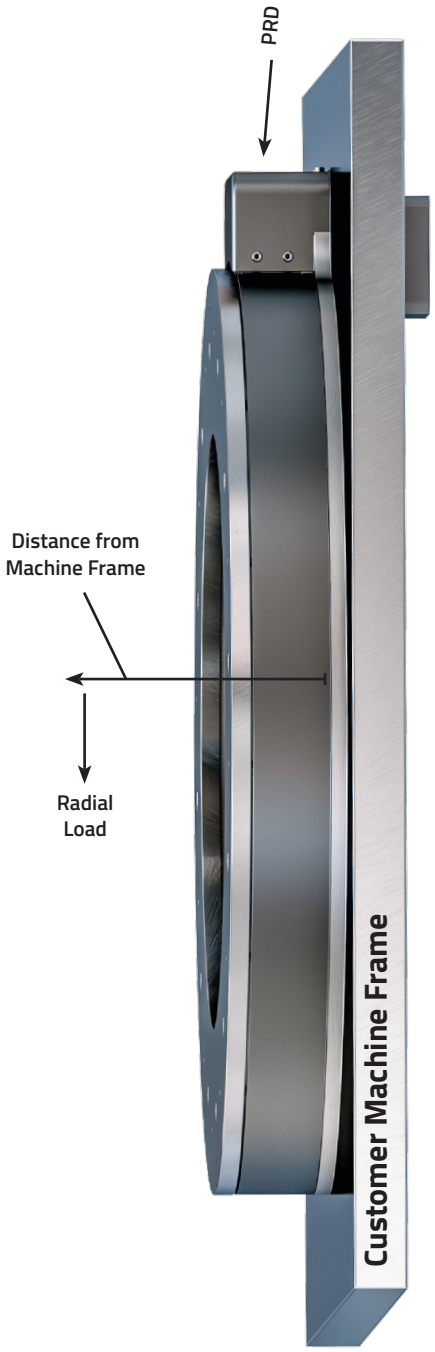
PRD1500 Suspended Load Chart



PRDX1500 Suspended Load Chart



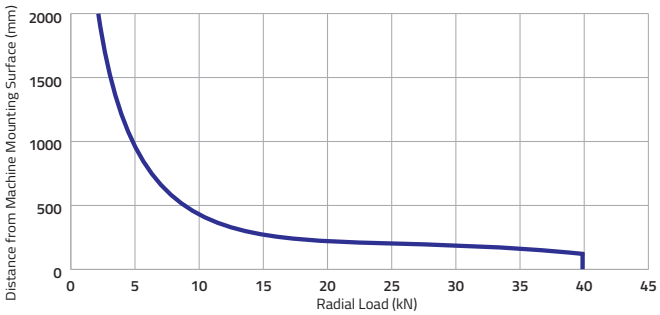
PRD Load Diagrams (Radial Load)



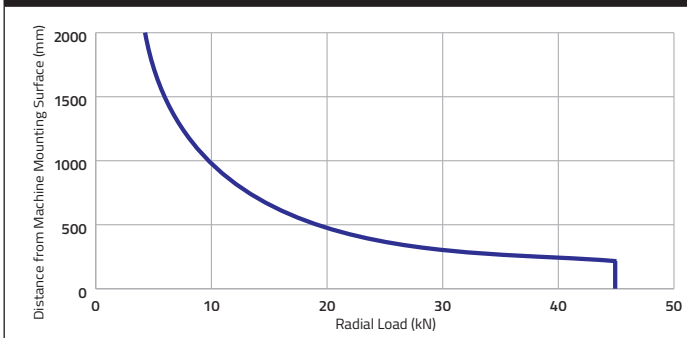
All Radial Load Charts Assume PRD Base is Fully Supported by Machine Frame

Note: The weight of the PRD is already factored into charts. There are no "Dynamic Load Limit by Drag Torque" ratings for Radial Loads.

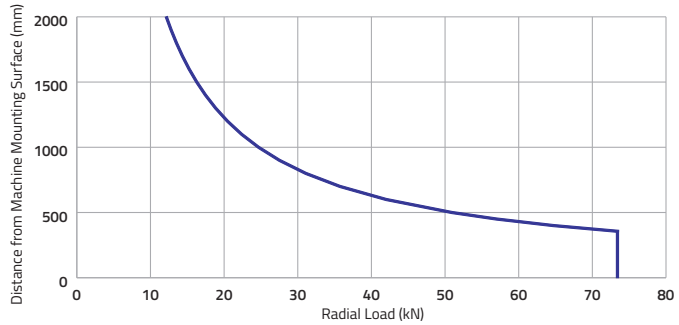
PRD400 Radial Load Chart



PRD750 Radial Load Chart

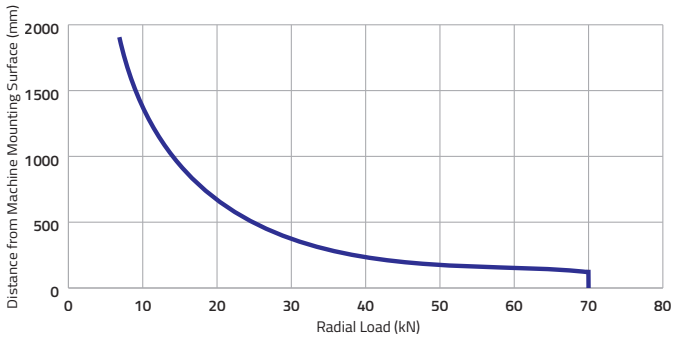


PRDX750 Radial Load Chart

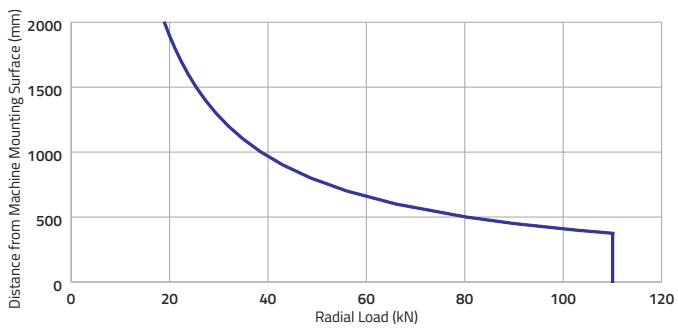


PRD Load Diagrams (Radial Load)

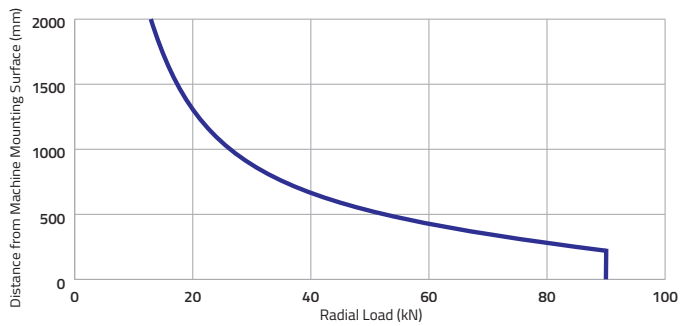
PRD1100 Radial Load Chart



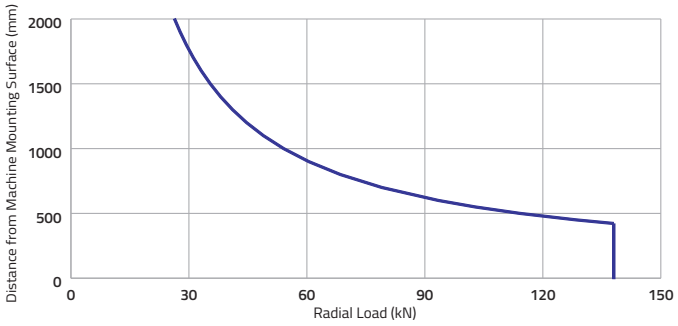
PRDX1100 Radial Load Chart



PRD1500 Radial Load Chart



PRDX1500 Radial Load Chart



PRD Drag Torque Calculations

Drag Torque varies based on the load placed on the bearing. Use the calculations below to find the Bearing Drag Torque for your application.

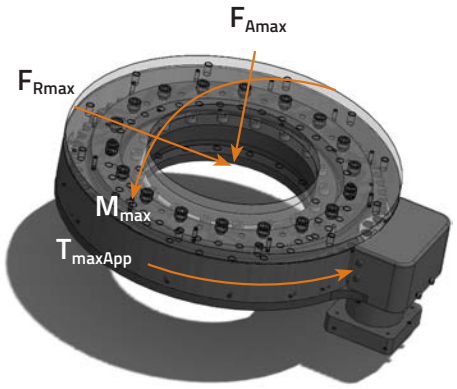
Step 1: Gather Application Data

Before you begin calculations, there are several key measurements that you will need from your application in order to calculate drag torque. Collect the data and record it in the space provided.

Measurements for Bearing Calculations	Customer Data (record your values below)	Sample Data
Unloaded Drag Torque of PRD (U_{Ldrag}) From the PRD Specs	**Nm**	40 Nm
Maximum Dynamic Radial Load (F_{Rmax})	**N**	0 N
Maximum Dynamic Axial Load (F_{Amax})	**N**	54,300 N
Maximum Dynamic Moment Load (M_{max})	**Nm**	500 Nm

Note: The application's output torque **(T_{maxApp})** applies a reaction force and moment to the bearing. Those forces create a negligible amount of drag and are therefore omitted from these calculations.

PRD Size	Bearing Rotation Diameters (dp)
PRD400	0.352 m
PRD750/PRDX750	0.700 m
PRD1100/PRDX1100	1.050 m
PRD1500/PRDX1500	1.440 m



Step 2: Determine Total Drag Torque

$$T_{BD} = \left(\frac{15.3 \bullet M_{max}}{dp} + (3.75 \bullet F_{Amax}) + (8.19 \bullet F_{Rmax}) \right) \bullet dp \bullet 10^{-3} + U_{Ldrag}$$

$$T_{BD} = \left(\frac{15.3 \bullet \quad \text{Nm}}{\text{m}} + (3.75 \bullet \quad \text{N}) + (8.19 \bullet \quad \text{N}) \right) \bullet \quad \text{m} \bullet 10^{-3} + \quad \text{Nm}$$

PRD Total Drag Torque	
T_{BD} =	Nm

Example: $T_{BD} = \left(\frac{15.3 \bullet 500 \text{ Nm}}{0.352 \text{ m}} + (3.75 \bullet 54{,}300 \text{ N}) + (8.19 \bullet 0 \text{ N}) \right) \bullet 0.352 \text{ m} \bullet 10^{-3} + 40 \text{ Nm} = 119 \text{ Nm}$

Step 3: Complete Output Torque Calculations

Refer to the worksheet on Page 7 of the Rotary Indexer Selection Process to calculate the Total Output Torque required for the application.

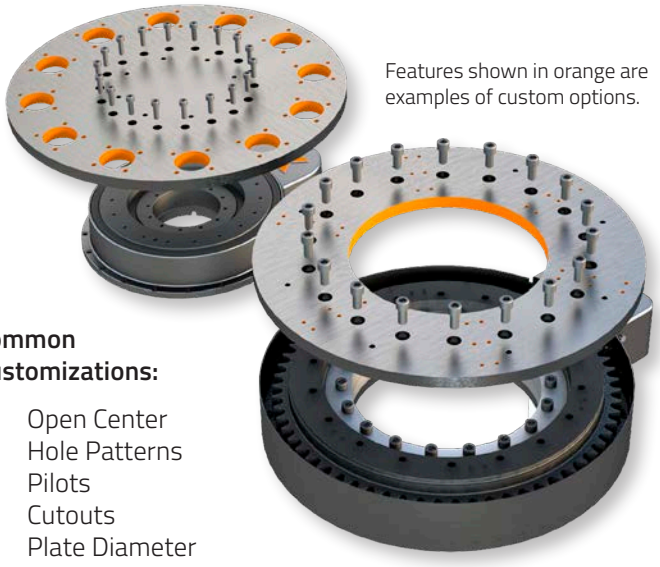
PRD Accessories: Dial Plates

Optional Dial Plates

Nexen offers custom dial plates that precisely pilot on the output of Nexen's Rotary Indexers.

	Standard Dial Plate Thickness	Standard Dial Plate Outer Diameter		
		550 mm	900 mm	1350 mm
PRD400	19.05 mm	967911	967912	967913
PRD750/PRDX750		N/A	967914	967915
PRD1100/PRDX1100		N/A	N/A	967916
PRD1500/PRDX1500		N/A	N/A	N/A

Contact Nexen to customize dial plate.



Features shown in orange are examples of custom options.

Common Customizations:

- Open Center
- Hole Patterns
- Pilots
- Cutouts
- Plate Diameter

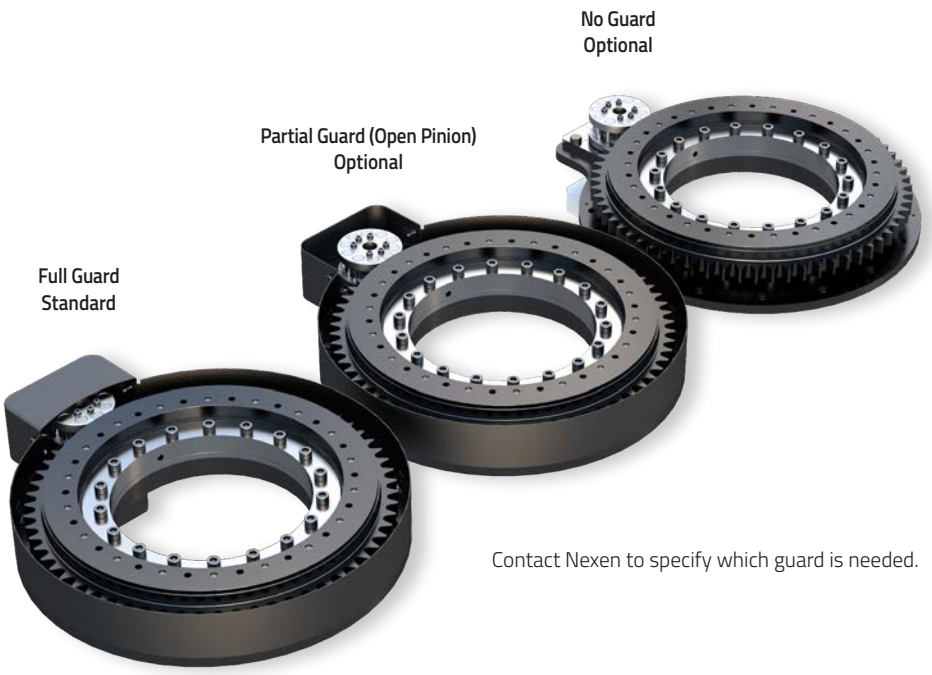
PRD Accessories: Guarding Options

Custom Guard Options

When sizing a dial plate for Precision Rotary Indexer, it is important to note that the outer diameter of the dial plate will necessitate use of different guarding options.

Listed below is the maximum dial plate diameter that can used with the standard Full Guard. If a larger dial plate is desired, request a Partial Guard, or no Guard at all.

	Maximum Dial Plate Outer Diameter for Standard Guard
PRD400	550 mm
PRD750/PRDX750	900 mm
PRD1100/PRDX1100	1350 mm
PRD1500/PRDX1500	1750 mm

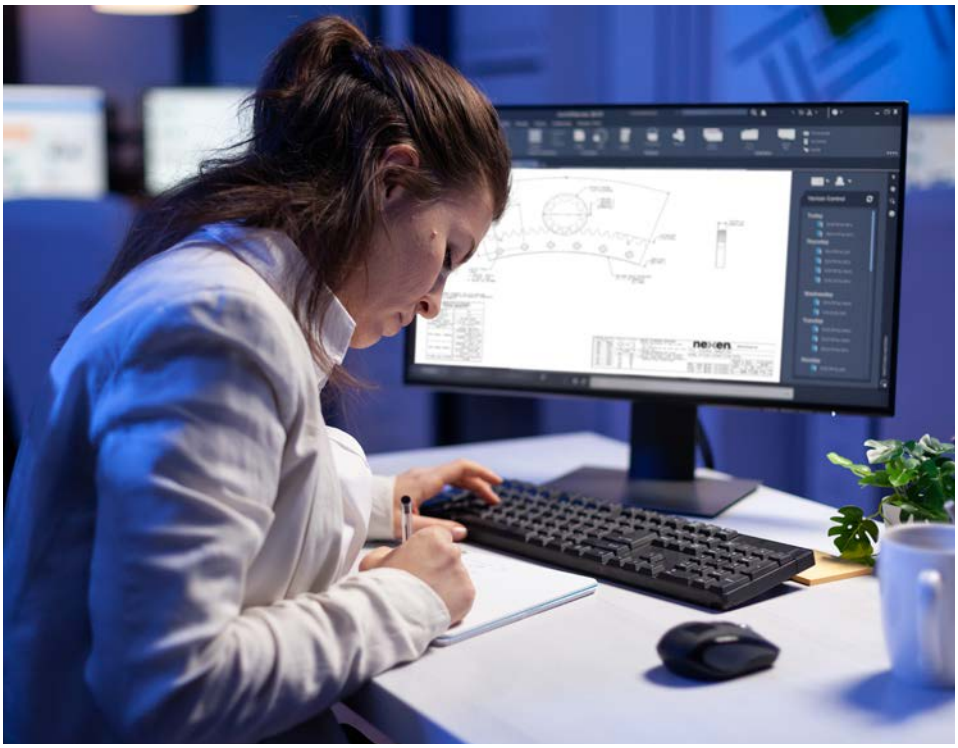


Contact Nexen to specify which guard is needed.

Engineering Support

Nexen Group engineers and manufactures precision motion control for OEM machine designers, system integrators, and maintenance personnel, keeping equipment running trouble-free in the harshest environments.

Contact Nexen Group to see how our engineers can help design the must-have motion control products for your next project.



- CE
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