Direct Drive Brushless Servo Systems

Each Dynaserv system consists of a brushless servo motor, microprocessor based drive, power supply and a brushless resolver or encoder for position feedback. The primary benefit of the Dynaserv System is high accuracy and torque without speed reducers. Additional advantages include:

- Faster settling time than a traditional servo motor and speed reducer system
- Smooth rotation at slow speeds
- A flat speed/torque curve for high controllability
- Ability to operate in a position, speed or torque control mode
- Built-in test mode simplifies optimum tuning
- Can be prepared to operate in class 10 clean room applications

DR Series

- Brushless resolver feedback
- 13 models; 150, 200 or 250mm diameter
- Resolutions to 819,200 steps/rev
- Torques to 400Nm
- Repeatability of ±5 arc seconds
- Speeds to 2 rps

DR5000 Series

- Brushless resolver feedback
- 4 models, 150 or 250mm diameter
- Resolutions to 425,984 steps/rev
- Torques to 500 Nm
- Repeatability of ±5 arc seconds
- Speeds to 4 rps

DM Series

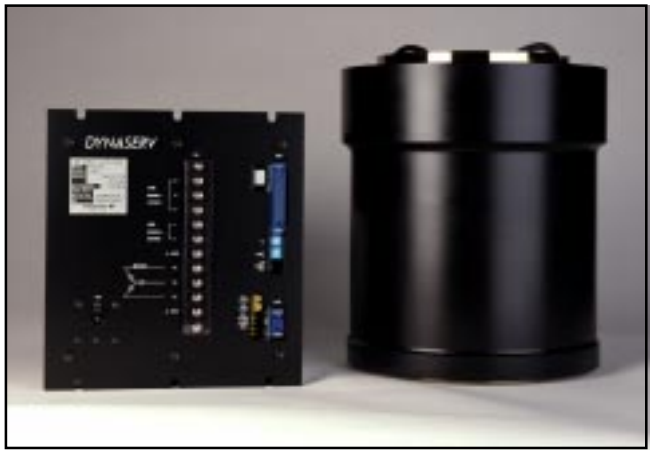
- Incremental encoder feedback
- 7 models; 150 or 250mm diameter
- Resolutions to 1,024,000 steps/rev
- Torques to 200 Nm
- Repeatability of ±2 arc seconds
- Speeds to 2 rps

Multiple control modes

The Dynaserv System allows the user to operate in one of three modes of control:

Position control – up to 1,024,000 steps/rev
Speed control – ±10V velocity command input
Torque control – stable response at ±8V input

This type of flexibility combined with a high torque/weight ratio, high accuracy, faster settling times, high torque at high speed, smooth rotation, optimum tuning and clean operation all add up to a cost effective high-performance alternative to traditional motor and speed reducer combinations.



Model Types

When selecting the model type, the decision comes down to a trade-off between resolution, accuracy, speed and cost. This table can be used to match specific application requirements to the correct direct drive motor. Bear in mind that these ratings are relative, i.e. the lowest accuracy Dynaserv is still very accurate by normal motor standards.

	DM Series	*DR Series*	*DR5000 Series*
Power	Lowest	Medium	Highest
Accuracy	Highest	Medium	Lowest
Motor Weight	Lowest	Medium	Highest
Resolution	Highest	Medium	Lowest
Cost	Medium	Lowest	Highest
Speed	Lowest	Medium	Highest

Inertia Matching

When selecting the right Dynaserv for your application, the inertia match between the motor and load is the critical factor. The specifications listed in this section are for a 30:1 load to rotor inertia ratio. The following table lists the maximum recommended ratios for specific application types.

Application Type	*Max inertia ratio* (J_{load}/J_{motor})
High throughput applications (printing machines, chip mounting)	5-10
General high speed applications (SCARA robot, transfer arms)	20-30
High speed but balanced load applications (Rotary Index, Rotary Tables)	50-100
High accuracy, slow speed applications (measuring equipment)	100-200

Dynaserv applications

Assembly

- Base machine
- Pick and place
- Inserter/mounter

Robots

- Handling
- Clean room
- Universal

Transport

- Turn table
- Belt conveyor
- Three dimensional warehouse

Inspection and Measuring

- 3Dmeasuring
- Goniometer
- Non-destructive x-ray

Work

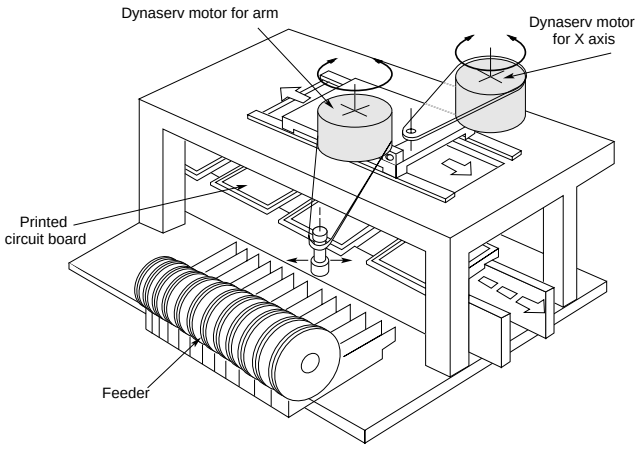
- Machining centre work table
- Press roll feed
- Grinder table

Commercial

- Printing machines
- Medical equipment
- Follow-up equipment

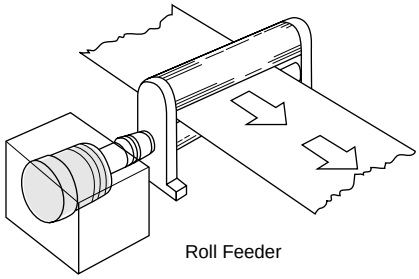
Material Handling

By attaching a small arm or linkage to the Dynaserv, very high velocities an be attained. This type of design has been used on a wide variety of equipment, such as a chip mounting machine. On this machine accuracies of 30 arc-sec are maintained with very high arm speed.



Feed-to-Length

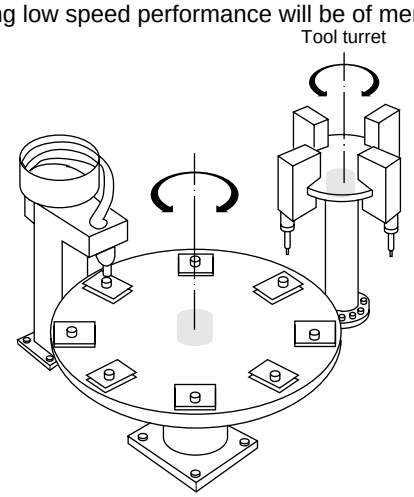
The Dynaserv system eliminates the need for gear reduction and allows for direct control of the nip roll in most feed-to-length applications. The ability to effectively control loads up to 100 times its own rotor inertia allows the Dynaserv to be applied in a variety of machines. The net result of specifying a Dynaserv system is increased repeatability of the feed material.



Roll Feeder

Indexing/Rotary Positioning

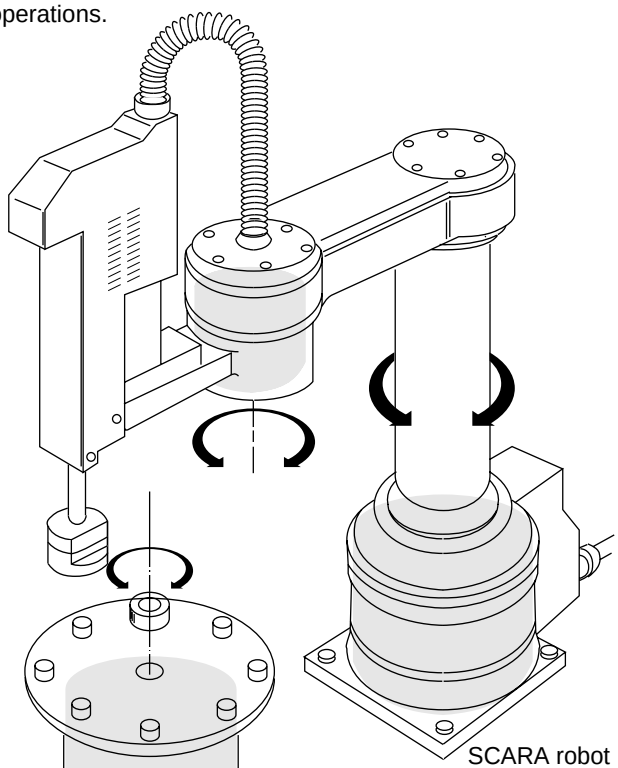
The Dynaserv has high accelerations lending itself to high speed point-to-point positioning applications requiring low cycle time. In scanning and inspection applications the outstanding low speed performance will be of merit.



Rotary table for assembly

Robotics

Dynaserv direct drive motors were first developed to drive SCARA (Selective Compliance Assembly Robot Arm) in applications requiring repetitive and physically taxing operations.



SCARA robot for assembly

Peripherals for robot

DR Direct Drive Brushless Servo System

The Dynaserv DR Series provides the user with a high performance direct drive servo system with resolver feedback. Each model includes a direct drive motor, integral resolver, microprocessor based drive and a 3 metre motor-to-drive cable.

The DR Series motor is brushless and without gears allowing for long, maintenance-free operation. The cross roller bearing design can support up to 4 tonnes of compression load and 400 Nm of overhung load. The centre hole in the motor is up to 150mm in diameter and can be used to simplify system wiring.

The user can elect to operate the DR Series in either a position, velocity or torque mode. In the position mode, the drive accepts step and direction input from a Compumotor Indexer or user supplied pulse source. Operating in the velocity or torque mode requires a ±10 volt input.

High performance closed loop operation is obtained with a sophisticated I-PD digital and analogue control algorithm. The analogue velocity loop provides high bandwidth for excellent system response. The digital position loop simplifies position control and optimizes system accuracy. A built-in test mode and position/velocity monitors allow for convenient and efficient tuning.

The DR Drive is fully protected against open and short circuits, overcurrent, overvoltage and overtemperature. A seven segment LED indicator provide the user with the status and diagnostic information from the front panel.

Features

- Brushless direct drive motor with 3 metre cable
- 13 models available in 150 or 250mm diameters
- Resolver feedback
- Torques to 400 Nm
- Resolutions to 819,200 steps/rev
- Supports 4 tonnes of compression load
- Microprocessor control of I-PD control algorithm
- Analogue velocity loop/digital position loop
- Built-in test mode for easy tuning
- Diagnostic LED display
- Step and direction input/position control
- ±10V input/torque or velocity control
- Gain settings can be changed “on the fly”
- Easily prepared for class 10 clean room standards
- Configurable position accuracy to reduce system settling time
- Complete system, ready for operation

Accessories

- Parker Compumotor Controllers

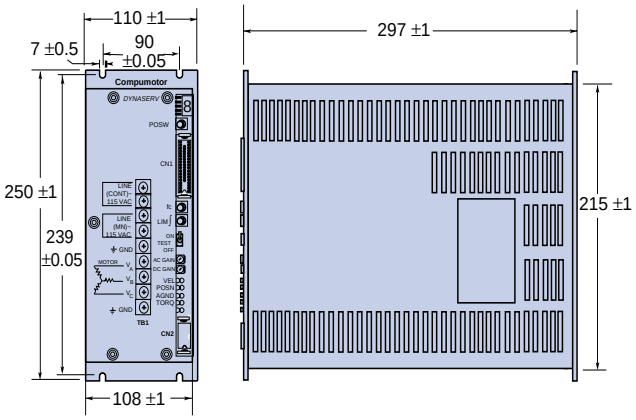
  The Dynaserv is compatible with all Compumotor Indexers and Servo Controllers.
- Bases

  Mounting bases to simplify mounting to a flat surface (DR-B Series only except DR1008B).
- Dynamic Braking

  Capacitor type or Speed-switching type for each motor size.
- Precision Machining

  Axial and radial run-out of .01, .02 or .005 mm is available on most Dynaserv models. Standard axial and radial run-out for all motors is 0.1 mm.
- Mechanical Braking

  Most motors can be ordered with mechanical brakes for power down or emergency use.



DR series drive

Parameter	Value		
Performance			
Repeatability	±5 arc-sec (0.00139°)		
Accuracy	±30 arc-sec (0.0083°) DRA Series, ±45 arc-sec (0.0125°) DRB DRE Series		
Max stepping rate	1,600,000 steps/sec		
Power			
Volts	230VAC 1-phase, or 115VAC 1-phase		
Range	+10% to -15%		
Current	20 amps max		
Inputs			
Command interface			
Step input	Low going low , 150 nanoseconds minimum pulse width		
Direction	Logic high = CW rotation Logic low = CCW rotation		
Analogue input	±10V command signal		
Outputs			
Encoder output	A/B encoder output 750 kHz max		
Environmental	**Driver**	**Motor**	
Weight	6 kg	See Table Below	
Operating	0° to 50°C	0° to 45°C	
Storage	-20° to 85°C	-20° to 85°C	
Humidity	20 to 90% noncondensing	20 to 85% noncondensing	
No corrosive gases. Dust free atmosphere. The Dynaserv is not waterproof, oil proof or dust proof.			

DR Series Motor Data	Model 1008B	Model 1015B	Model 1030B	Model 1045B	Model 1060B	Model 1070E	Model 1100E	Model 1130E	Model 1160E
Peak torque Nm	8	15	30	45	60	70	100	130	160
Rated speed (230/115VAC) rps	2.0/2.0	2.0/2.0	2.0/1.5	2.0/1.0	1.5/1.0	2.0/1.5	1.5/1.0	1.0/0.5	1.0/0.5
Maximum power (230/115VAC) consumption kVA	0.8/0.4	1.2/0.6	2.0/1.0	2.0/1.0	2.0/1.0	2.4/1.2	2.6/1.3	2.8/1.4	3.2/1.6
Rotor inertia kg-m^2 x 10^{-3}	15	21	24	26	33	85	100	125	140
Max resolution	507,904	507,904	507,904	507,904	507,904	614,400	614,400	614,400	614,400
Motor weight* kg	6	9	11	13	16	22	26	32	36
Maximum axial load**									
Compression kN	30	30	30	30	30	40	40	40	40
Tension kN	10	10	10	10	10	20	20	20	20
Maximum overhung load** Nm	200	200	200	200	200	400	400	400	400

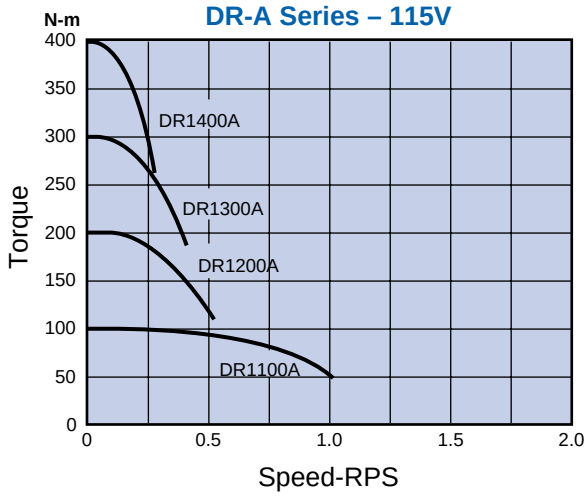
DR Series Motor Data	Model 1100A	Model 1200A	Model 1300A	Model 1400A
Peak torque Nm	100	200	300	400
Rated speed (230/115VAC) rps	1.0/1.0	1.0/0.5	0.5/0.25	0.5/0.25
Maximum power consumption kVA (230/115VAC)	2.9/1.4	3.5/1.7	3.7/1.8	3.7/1.8
Rotor inertia kg-m^2 x 10^{-3}	200	285	340	400
Maximum resolution	819,200	819,200	819,200	819,200
Motor weight* kg	31	46	57	68
Maximum axial load**				
Compression kN	40	40	40	40
Tension kN	20	20	20	20
Maximum overhung load** Nm	400	400	400	400

* Drive weight is 6 kg ** For alternating loads, multiply these values by 0.3

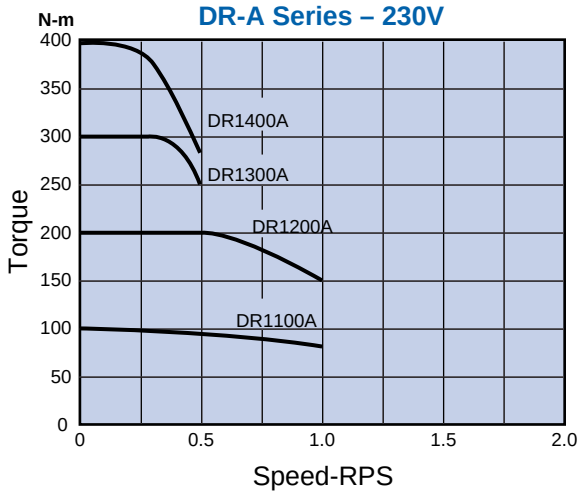
Torque/Speed Curves

The torque/speed curves represent peak torque available, continuous torques are approximately two thirds of the peak value.

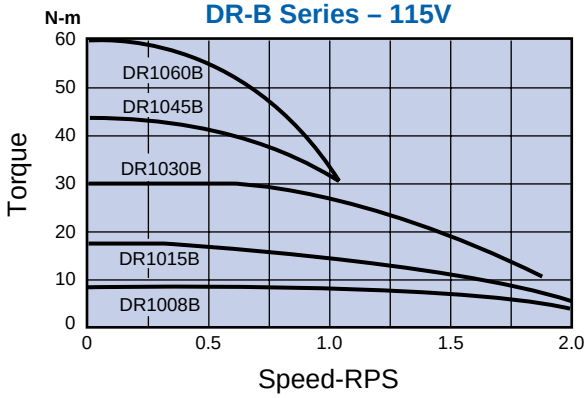
DR-A Series – 115V



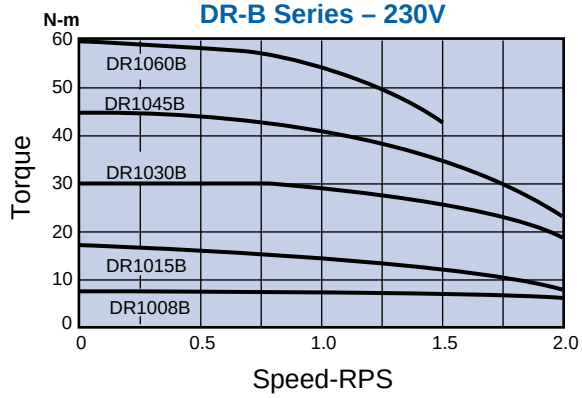
DR-A Series – 230V



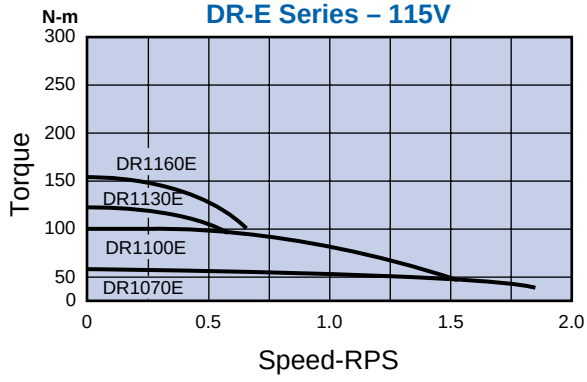
DR-B Series – 115V



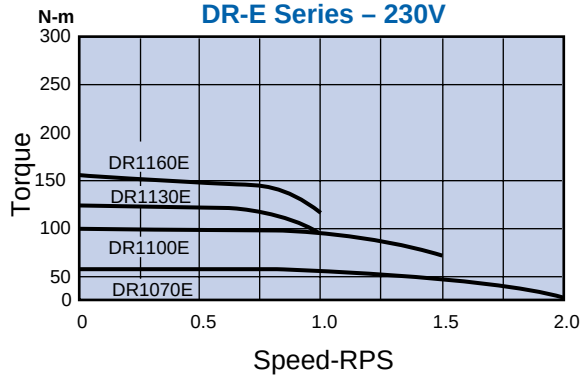
DR-B Series – 230V



DR-E Series – 115V

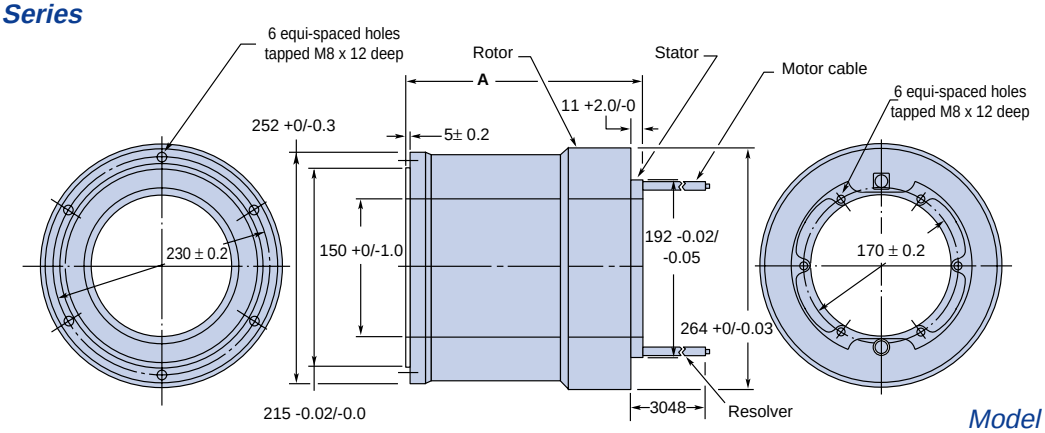


DR-E Series – 230V



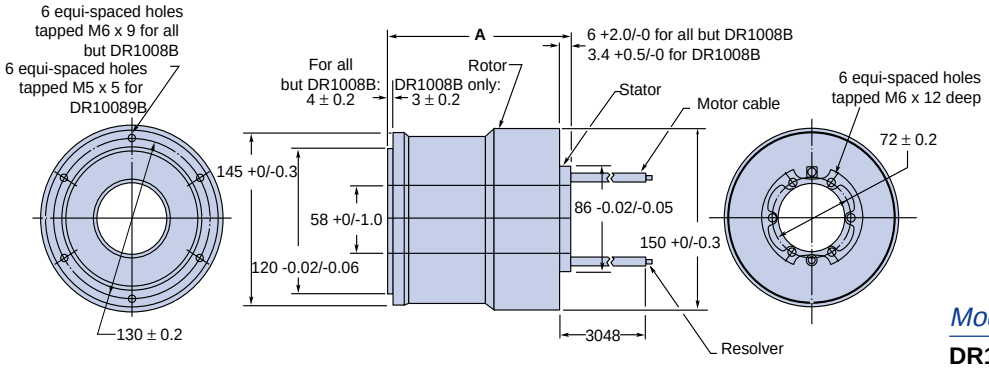
DR Series Motor Dimensions

DR-A Series



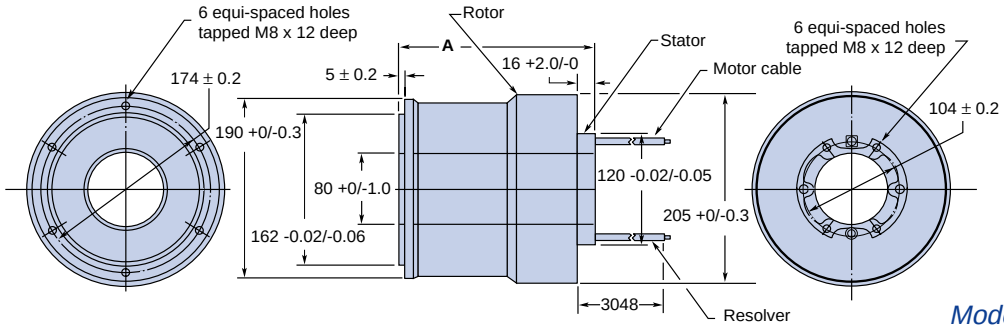
Model	**A**
DR1100A	185 ± 1
DR1200A	250 ± 1
DR1300A	304 ± 1
DR1400A	358 ± 1

DR-B Series



Model	**A**
DR1008B	85 ± 1
DR1015B	123 ± 1
DR1030B	151 ± 1
DR1045B	179 ± 1
DR1060B	207 ± 1

DR-E Series



Model	**A**
DR1070E	183 ± 1
DR1100E	210 ± 1
DR1130E	243 ± 1
DR1160E	271 ± 1

DR5000 Direct Drive Brushless Servo System

The Dynaserv DR5000 Series is a high power direct drive system that is based on the design of the DR Series. The DR5000 Series is capable of approximately 2-3 times the speed of the DR series while delivering comparable torque. Each DR5000 System comes complete with motor, integral resolver, and a microprocessor based drive.

The DR5000 Series can be operated in position, velocity or torque mode. In position mode the DR5000 accepts Step and Direction Input, making it compatible with Compumotor Indexers. For operation with a servo controller the drive accepts a ±10V signal representing velocity or torque. A pseudo-encoder output is available from the drive, eliminating the need for additional feedback devices.

The DR5000 series motor is brushless and gearless, allowing for a long, maintenance free life. The cross roller bearing design can support up to 4 tonnes of compression load and 400Nm of overhung load. The hole in motor centre is up to 150mm in diameter, simplifying system cabling.

The DR5000 incorporates an I-PD algorithm that delivers high performance closed loop control. The velocity loop is analogue for a very high bandwidth. The digital position loop simplifies position control and maximizes system accuracy. A built-in test mode is available for convenient and efficient tuning.

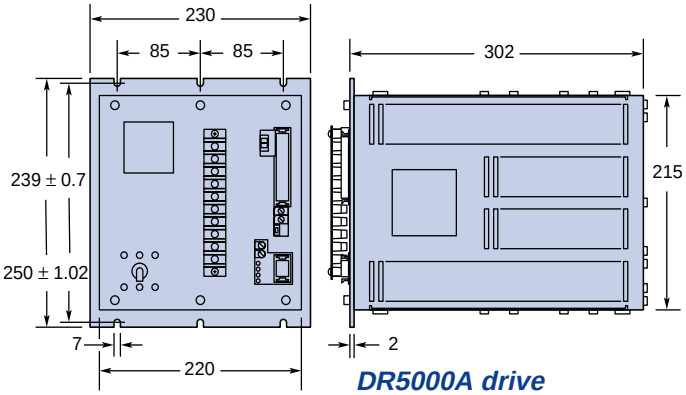
The DR5000 drive is fully protected against open and short circuits, overcurrent, overvoltage, and overtemperature. A single character front panel display puts status and diagnostic information at your fingertips.

Features

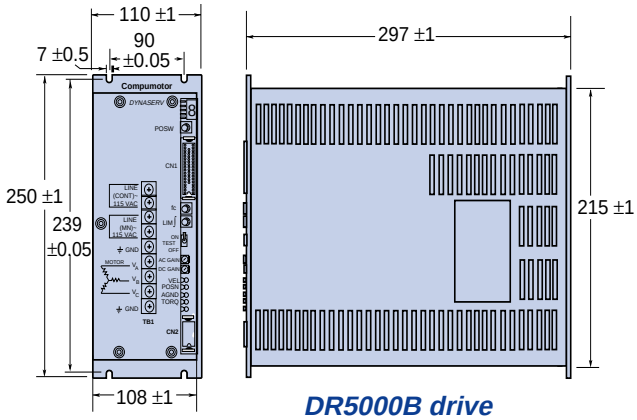
- Brushless direct drive motor
- Up to 3 kW output
- 4 models available in 150 or 250mm diameter
- Resolver feedback
- Torques to 500Nm
- Resolutions to 425,984 steps/rev
- Supports 4 tonnes compression load
- Microprocessor control of I-PD Algorithm
- Analogue velocity loop/digital position loop
- Built-in test mode for easy tuning
- Diagnostic display
- Step and direction input for position control
- ±10V input for velocity control
- Gain settings can be changed on the fly
- Can be prepared for Class 10 clean room operation

Accessories

- Compumotor Controllers - the Dynaserv is compatible with all Compumotor Indexers and Servo Controllers.
- Bases - mounting bases to simplify mounting to a flat surface (DR-B Series only).
- Dynamic Braking - capacitor type or Speed-switching type for each motor size.
- Precision Machining - axial and radial run-out of .01, .02 or .005 mm is available on most Dynaserv models. Standard axial and radial run-out for all motors is 0.1mm.
- Mechanical Braking - most motors can be ordered with mechanical brakes for power down, or emergency use.



DR5000A drive



DR5000B drive

Parker Hannifin
Electromechanical Division
Offenburg, Germany & Poole, UK

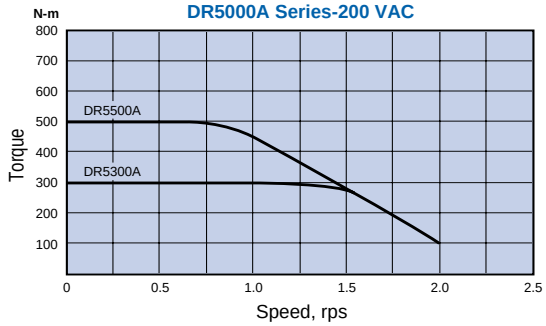
Parameter	Value	
Performance	**DR5000 "A" 250mm**	**DR5000 "B" 150mm**
Repeatability	±5 arc-sec	±10 arc-sec
Accuracy	±45 arc-sec	±90 arc-sec
Max stepping rate	1,600,000 steps/sec	1,400,000 steps/sec
Power		
Volts	200 VAC, 3 Phase, 50/60 Hz	230 VAC, 1 Phase, 50/60 Hz
Range	+5% to -15%	+5% to -15%
Current	20 Amps	20 Amps
Inputs (all models)		
Command interface	Step and direction–Position control ±10V DC–Velocity control	
Step input	low going pulse, 150 nanosecond minimum pulse width	
Direction	Logic high = CW rotation	
	Logic low = CCW rotation	
Analogue input	±10V DC max	
Other inputs	5 to 24 volts pullup	
(gain selection, servo on, etc.)		
Outputs (all models)		
Encoder output	A, B Quadrature signal (400kHz max)	
	Z Channel–"A": 104 pulses/rev–"B": 68 pulses/rev	
Other outputs (in position, alarm, etc.)	TTL	
Environmental	**Driver**	**Motor**
Weight		
DR5000A	11 kg	See Table below
DR5000B	6 kg	See Table below
Operating		
Temperature	0 to 50°C	0 to 45°C
Humidity	20 to 90% Non-condensing	20 to 85% Non-condensing
Storage		
Temperature	-20 to 85°C	-20 to 85°C
Humidity	20 to 90% Non-condensing	20 to 85% Non-condensing
Environment	No corrosive gases. Dust free atmosphere. The Dynaserv is not waterproof, oil proof or dust proof.	

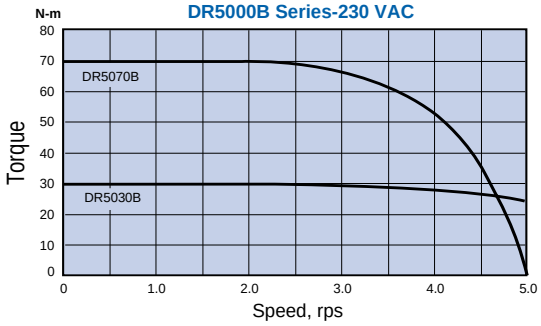
DR5000 Series–Motor Data	5030B	5070B	5300A	5500A
Peak torque Nm	30	70	300	500
Rated speed rps	5	5	1.5	1.5
Rotor inertia (kgm^2)x10^{-3}	27	36	340	460
Resolution Steps/rev	278,528	278,528	425,984	425,984
Motor weight kg	13.5	18	55	75
Maximum axial load*				
Compression kN	30	30	40	40
Tension kn	10	10	20	20
Maximum overhung load* Nm	20	200	400	400
Maximum power consumption kVA	2	4	5.5	7.5

* For alternating loads, multiply these values by 0.3

Torque/Speed Curves

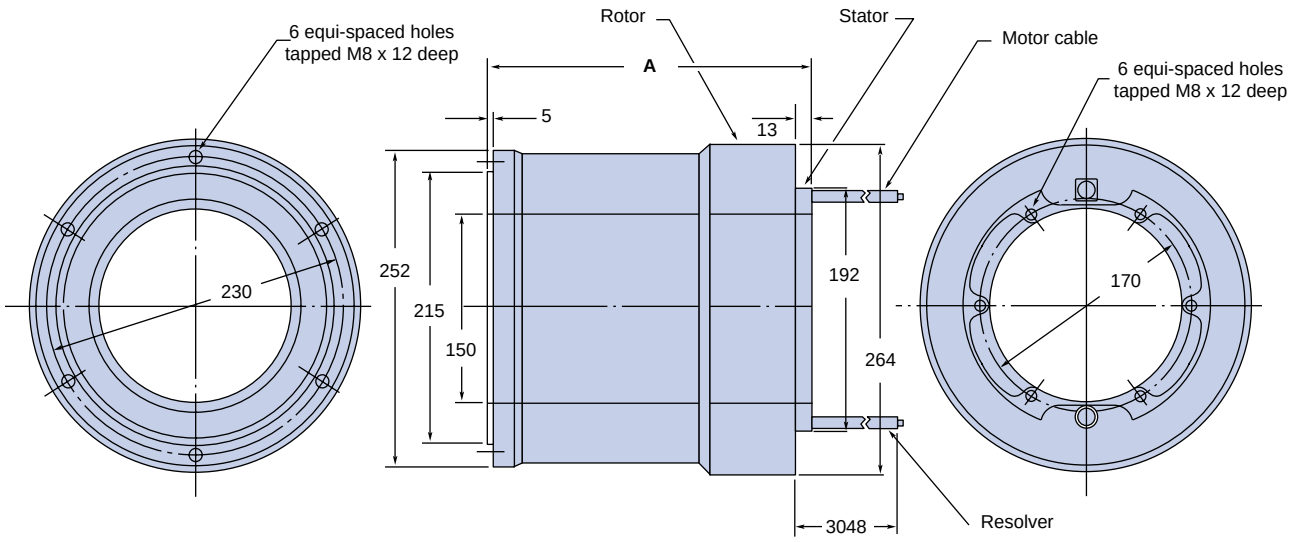
The torque/speed curves represent peak torque available, continuous torques are approximately two-thirds of the peak value.





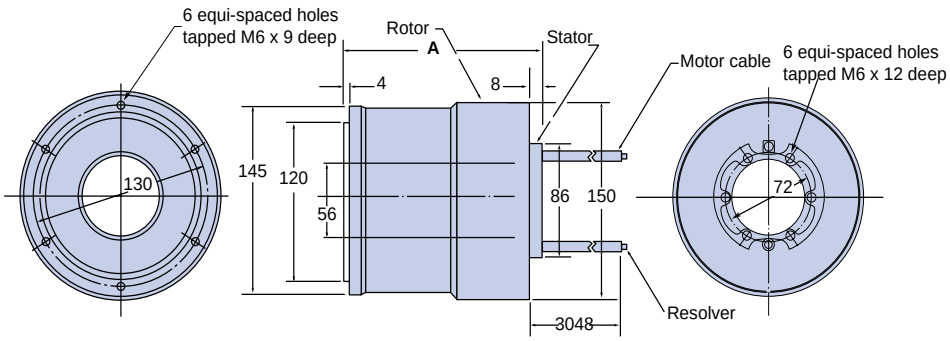
DR5000 Motor Dimensions

DR5000-A Series



Model	***A***
DR5300A	309 ± 1
DR5500A	417 ± 1

DR5000-B Series



Model	*A*
DR5030B	184 ± 1
DR5070B	240 ± 1

DM Direct Drive Brushless Servo System

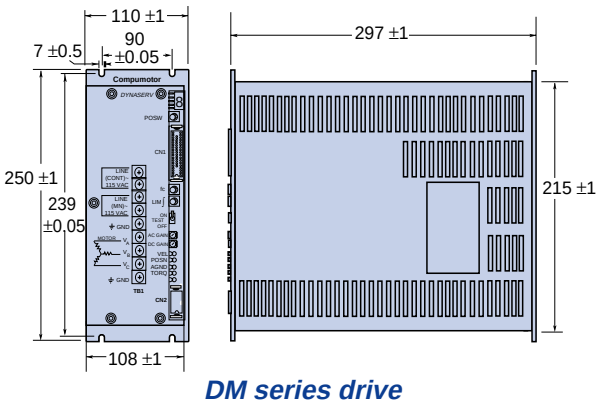
The Dynaserv DM Series is a high performance direct drive servo system with optical encoder feedback. Each DM Model consists of a brushless direct drive motor, integral encoder, microprocessor based drive and a 3 metre motor-to-drive cable.

The DM Series can be operated in either a position, velocity or torque mode. In the position mode the drive accepts step and direction input. Operating in the velocity or torque mode requires a ±10 volt input. Dynaserv systems are compatible with Compumotor indexers and servo controllers.

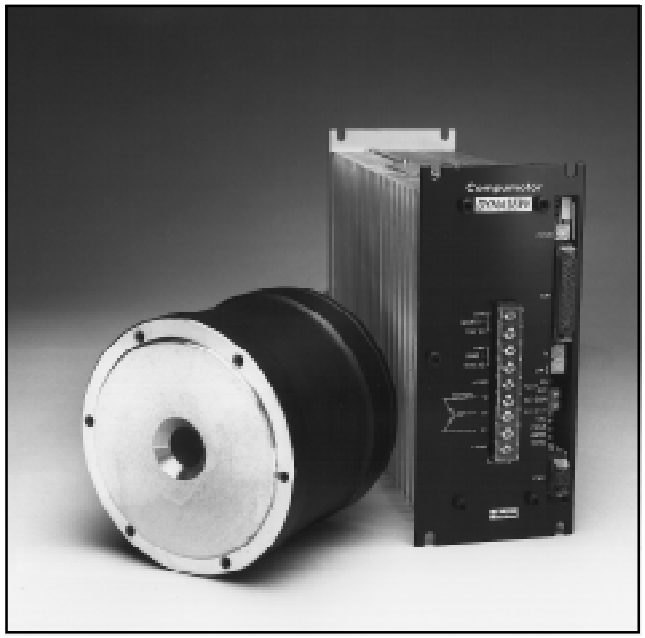
The DM Series motor is brushless and without gears, allowing for long maintenance-free operation. The cross roller bearing design can support up to 4 tonnes of compression load and 400 Nm of overhung load. The centre hole in the motor is up to 58mm in diameter and can be used to simplify system wiring.

The drive is fully protected against open and short circuits, overcurrent, overvoltage and overtemperature. A seven segment LED indicator provides the user with status and diagnostic information from the front panel.

High performance closed loop operation is obtained with a sophisticated I-PD digital and analogue control algorithm. The analogue velocity loop provides high bandwidth for excellent system response. The digital position loop simplifies position control and optimizes system accuracy. A built-in test mode and position/velocity monitors allow for convenient and efficient tuning.



DM series drive



Features

- Brushless direct drive motor with 3 metre cable
- 7 models available in 150 or 250mm diameters
- Incremental encoder feedback
- Torques to 200 Nm
- Resolutions to 1,024,000 steps/rev
- Supports 4 tonnes of compression load
- Microprocessor control of I-PD control algorithm
- Analogue velocity loop/digital position loop
- Built-in test mode for easy tuning
- Diagnostic LED display
- Step and direction input/position control
- ±10V input/torque or velocity control
- Gain settings can be changed "on the fly"
- Easily prepared for class 10 clean room standards
- Configurable position accuracy to reduce system settling time
- Complete system, ready for operation

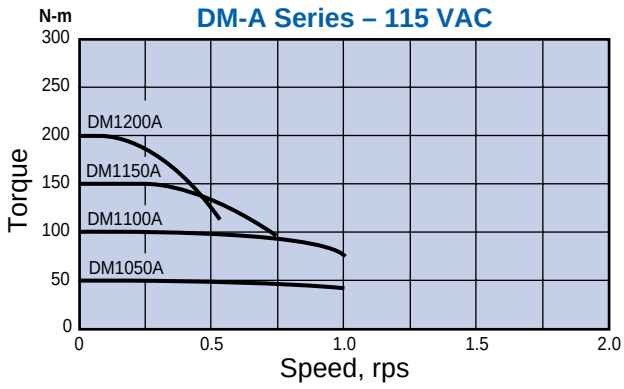
Accessories

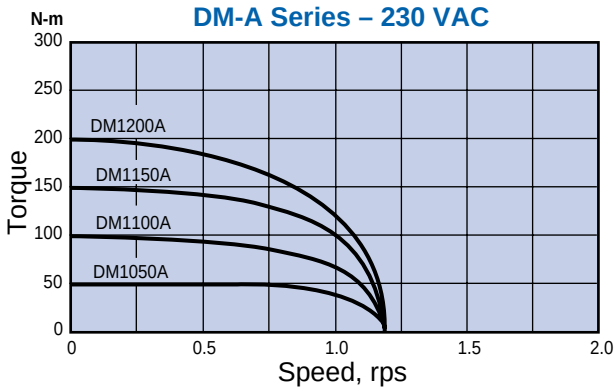
- Compumotor Controllers - the Dynaserv is compatible with all Compumotor Indexers and Servo Controllers.
- Precision Machining - axial and radial run-out of .01, .02 or .005 mm is available on most Dynaserv models. Standard axial and radial run-out for all motors is 0.1mm.
- Mechanical Braking - most motors can be ordered with mechanical brakes for power down or emergency use.
- Dynamic Braking - capacitor type or speed-switching type for each motor size.

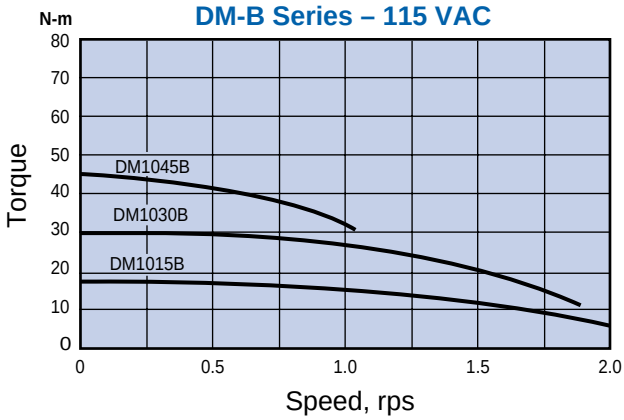
Parameter	*Value*	
Performance		
Repeatability	±2 arc-sec (0.00056°)	
Accuracy	±25 arc-sec (0.0069°)	
Max stepping rate	1,600,000 steps/sec	
Power		
Volts	230 VAC, 1 phase or 115 VAC, 1 phase	
Range	+10% to -15%	
Current	20 Amps max	
Inputs		
Command interface		
Step input	low going low pulse, 150 nanosecond minimum pulse width	
Direction	Logic high = CW rotation, Logic low = CCW rotation	
Analogue input	±10V command signal	
Outputs		
Encoder output	A/B encoder output 393 kHz max	
Environmental	***Driver***	***Motor***
Weight	6kg	See motor data
Operating	0° to 50°C	0° to 45°C
Storage	-20° to 85°C	-20° to 85°C
Humidity	20 to 90% Non-condensing	20 to 85% Non-condensing
Environment	No corrosive gases. Dust free atmosphere. The Dynaserv is not water proof, oil proof or dust proof.	

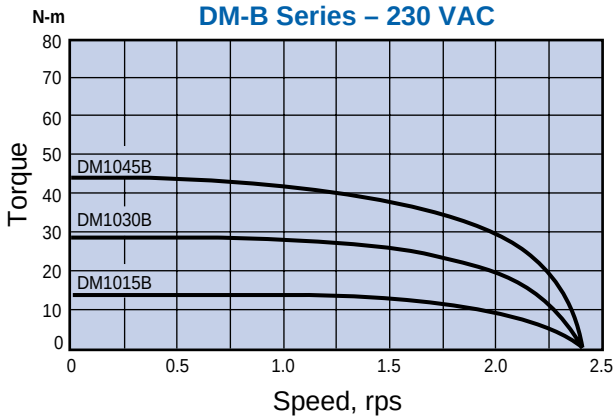
Torque/Speed Curves

The torque/speed curves represent peak torque available, continuous torques are approximately two-thirds of the peak value.









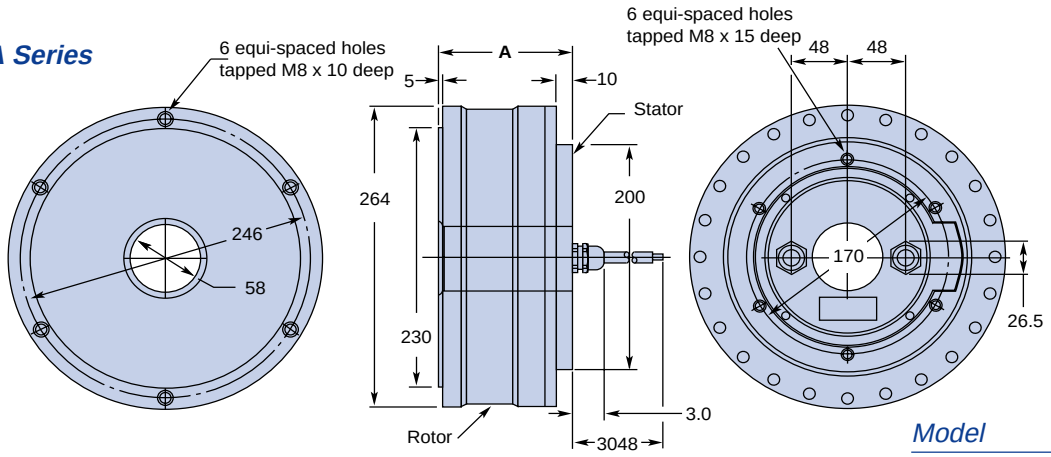
DM Series – Motor Data

	Model 1015B	*Model 1030B*	*Model 1045B*	*Model 1050A*	*Model 1100A*	*Model 1150A*	*Model 1200A*
Peak torque(Nm)	15	30	45	50	100	150	200
Rated speed rps - 230VAC	2.0	2.0	2.0	1.0	1.0	1.0	1.0
- 115VAC	2.0	2.0	1.0	1.0	1.0	0.5	0.5
Rotor inertia $kgm^2 \times 10^{-3}$	12	15	19	96	11	142	167
Maximum steps/rev	655,360	655,360	655,360	1,024,000	1,024,000	1,024,000	1,024,000
Motor weight kg	5.5	7.5	9.5	14.5	19	24	29
Maximum axial load*							
Compression kN	30	30	30	40	40	40	40
Tension kN	10	10	10	20	20	20	20
Maximum overhung load* Nm	200	200	200	400	400	400	400
Power Consumption load							
Max 230/115VAC, kVA	1.8/0.9	2.3/1.2	2.3/1.2	2.8/1.4	3.1/1.6	3.5/1.7	3.5/1.7

* For alternating loads, multiply these values by 0.3

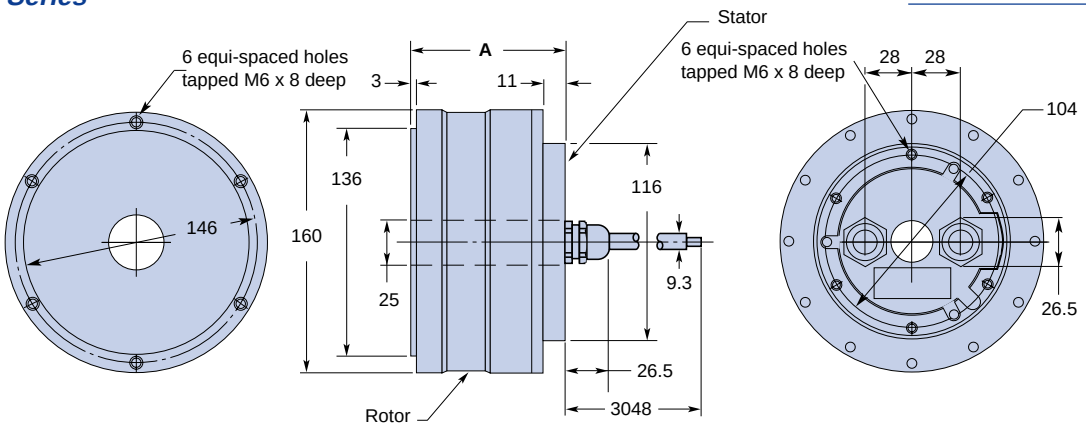
DM Series Motor Dimensions

DM-A Series



Model	*A*
DM1050A	113 ± 1
DM1100A	138 ± 1
DM1050A	163 ± 1
DM1200A	188 ± 1

DM-B Series



Model	*A*
DM1015B	92 ± 1
DM1130B	118 ± 1
DM1045B	143 ± 1