

The BD-E Series

EMC-Compliant Brushless Servo Systems

Direct-On-Line Operation with EMC Compliance

With the introduction of the BD-E Series, Parker makes available a high-performance brushless servo system which is CE marked and complies with the European EMC and Low-voltage Directives.

Building on experience gained with the highly-successful BLH Series, Parker has incorporated a large number of improvements to produce a servo system with outstanding flexibility. A major advance is the introduction of direct-on-line operation at 230V AC without the additional size, weight and cost of a separate transformer. All line filter components necessary for EMC compliance are built into the drive—this eliminates all potential problems associated with the mounting and wiring of external filter units.

High-resolution sinusoidal commutation guarantees smooth rotation over the full speed range. The redesigned MD Series motors now have larger shafts with improved dimensional tolerances to aid the fitting of components such as precision gearboxes. All drive configuration is performed using dip switches located on the front panel.

BD-E Series drives have comprehensive built-in monitoring systems to protect both the drive and the motor. An I-t circuit limits the time for which any given motor current can flow before being clamped at the continuous rating of the drive. An additional monitor circuit guards against full drive current being delivered for an extended period at very low speeds. As well as protecting against supply overvoltage or undervoltage, partial supply failure, excess output current and overheating of the drive or motor, the BD-E also checks for overspeed conditions and loss of commutation or position feedback signals. With commutation data being derived from the incremental encoder, there is automatic tach fault protection since loss of the encoder signal will prevent commutation and therefore stop the motor.

The BD-E Series is available with a choice of current ratings and in three versions—an analog-input velocity or torque servo, a step and direction input version, and a complete positioning system incorporating the new X150E controller. As well as being fully EMC-compliant, this controller offers the convenience of configuring entirely by software, without the use of jumper links. The X150E is compatible with almost any type of PLC—both NPN and PNP output drivers are incorporated as standard, selectable by software. Inputs and outputs may be configured to operate at 5V or 24V. The command language is based on Compumotor's popular X-Code, which is user-friendly and extremely versatile. The controller can store up to 64 complete motion programs in its non-volatile memory and offers advanced programming features such as conditional branching and math functions.



CE (EMC and LVD)

BD-E Series Common Features

- Direct operation from 230V AC single-phase supply
- Fully EMC and LVD compliant with all line filter components built in
- Two current levels —3A and 6A continuous
- Peak torques up to 14Nm
- Speeds up to 5,000 rpm
- Commutation, velocity, and position by integral incremental encoder, with separate initialization encoder
- High-efficiency recirculating PWM current control system
- Integral regenerative power dump
- Rugged industrial housing
- All configuration either by switches or software
- Drives fully protected against overheating, short circuits and supply faults

BD-E Features

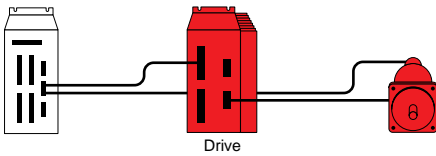
- Velocity or torque mode operation
- Industry-standard differential analog inputs
- Velocity and torque monitor outputs
- Compatible with Parker 6000 Series controllers

BDS-E Features

- TTL-compatible step and direction inputs
- Compatible with Parker 6000 Series indexers
- Velocity and torque monitor outputs

BDHX-E Drive/Controller Features

- Up to 32 drives can be daisy chained or multi-dropped via RS-232C
- Non-volatile memory stores up to 64 motion programs
- 7-segment diagnostic display
- Dedicated inputs for end-of-travel and home position switches
- 10 user-definable inputs, 6 outputs
- Sinking or sourcing outputs; software selectable
- Optional remote panel or thumbwheel input
- High-speed (15 μ S) registration input

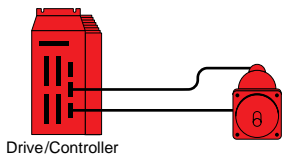


Specifications – BD-E and BDS-E Servos

Parameter	Value	
Performance	BD75E	BD150E
Continuous current, A rms	3	6
Peak current, A rms	6	12
DC bus voltage at nominal input, V	325	325
Power dump current, A (@ 400V DC)	12	12
Max continuous dump power, W	96	96
Peak dump power, kW	4.5	4.5
Current control	10 kHz recirculating PWM	
Current limit	Switch-selectable to 40% of peak	
Bandwidth	Torque amplifier > 2.5 kHz	
Speed/torque	Curves located on page B52	
Encoder	Maximum frequency pre-quadrature 100KHz (from motor encoder)	
Current control	Re-circulating PWM, at 20KHz	
AC Power Input		
Voltage	230VAC, single phase ±10%	
Frequency	50-60Hz	
Voltage Ranges		
Absolute Min	207VAC	
Absolute Max	264VAC	
Nominal	230VAC	
Inputs		
Connector	15 pin D-type socket (user I/O)	
Analog command (BD-E)	±10V differential analog input. Input impedance 30K	
Step and Direction (BDS-E)	Differential TTL levels, min. pulse width = 1µs, max frequency = 350 kHz	
Reset/disable	Jumper configurable for normally closed contact to +15V, or normally open contact to GND	
	High >10V, Low ≤0.9V, drive is disabled by low input	
Outputs		
Connector	15 pin D-type socket (user I/O)	
Drive fault	Active low. NPN open collector. Emitter coupled to GND. Maximum off-state voltage 40V. Maximum current sink 80mA. On state voltage of 0.2V at 80mA.	
Encoder	See encoder output specifications	
±15V	±15V auxiliary power supply at 5mA max	
Encoder Outputs		
Type	Buffered from motor encoder, available for use with servo controller	
Connector	15 pin D-type socket (user I/O)	
Electrical	Pre-quadrature A, B with Z channel. Differential TTL line driver. 100KHz maximum frequency.	
Diagnostics		
LED	Over-temperature, drive fault and current limit	
Output	See drive fault specifications	
Environmental		
Drive		
Storage	-40°F to 185°F (-40°C to 85°C)	
Operation	32°F to 122°F (0°C to 50°C)	
Humidity	0-95% non-condensing	
Weight	14.3 lbs (6.5 kb)	

Specifications – BDHX-E Positioning Servo

Parameter	Value	
Communications		
Type	RS232C serial link, 3-wire implementation (Tx, Rx, GND). Minimum voltage swing on Rx line is $\pm 3V$	
Parameters	9600 baud, 8 data bits, 1 stop bit, no parity	
Configuration	Up to 32 BDHXs may be controlled from a single host RS232C port	
Language	X-code commands, with preceding device address	
Operator Interface Function	RP240 allows entry of user variables, LCD displays operator messages, LEDs display machine status	
Power	Supplied by the BDHX drive	
Performance		
	BDHX75E	BDHX150E
Continuous current, A rms	3	6
Peak current, A rms	6	12
DC bus voltage at nominal input, V	325	325
Power dump current, A (@ 400V DC)	12	12
Max continuous dump power, W	96	96
Peak dump power, kW	4.5	4.5
Current control	10 kHz recirculating PWM	
Current limit	Switch-selectable to 40% of peak	
Position range	± 1 to $\pm 268,435,455$ steps	
Velocity range	0.0001 to 200 rev/sec (motor limited)	
Acceleration range	0.06 to 999,999 rev/sec/sec	
Speed/torque	See curves located on page B52	
Encoder	Maximum frequency pre-quadrature 100KHz (from motor encoder)	
Indexer update	2 milliseconds	
Servo Loop		
Tuning	Fully digital PIVF or PID options, configured through serial port	
Update time	500 microseconds	
Servo tuning	Values stored in battery backed RAM	
AC Power Input		
Voltage	230VAC, single phase $\pm 10\%$	
Frequency	50-60Hz	
Voltage Ranges		
Absolute Min	207VAC	
Absolute Max	264VAC	
Nominal	230VAC	
Inputs		
Number	10 user-definable inputs and five dedicated inputs. User-definable inputs can be assigned special functions such as trigger, motion kill, pause/continue, go direction, jog, data strobe, reset and motor shutdown. The dedicated input functions are home, end-of-travel limits, stop and auxiliary-in.	
Electrical	Optically isolated, Inputs can be configured for 5V or 24V operation. Groups of inputs can be configured for either sinking or sourcing. In 5V mode, the input levels are low $< 2.5V$, high $> 3.0V$. In 24V mode, the input levels are low $< 5.7V$, High $> 9.0V$. Hysteresis on each input improves noise immunity.	



Specifications – BDHX-E Positioning Servo

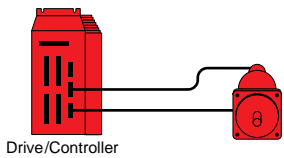
Parameter	Value
Outputs	
Number	6 user-definable outputs. Outputs can be assigned special functions such as in-position, moving/not moving, program running, data strobe and fault.
Electrical	Opto-isolated. Sinking (NPN) or sourcing (PNP) operation (software selectable). NPN: Max. OFF state voltage 30V, Max. current sink 300mA, ON state voltage of 2.5V at 300mA. PNP: Max. OFF state voltage 30V. Max. current source 300mA. ON state voltage of 2.5V at 300mA. [Note: BDHX supplies 160 mA (max). External 24VDC supply required to source more than 160 mA, up to 1.0A max]
Encoder Outputs	
Type	Buffered from motor encoder
Electrical	Quadrature A, B with Z channel. Differential TTL line driver. 100KHz maximum frequency.
Encoder Feedback Input	
Configuration	Factory default uses motor encoder. Jumper configurable for load-mounted encoder
Electrical	Opto-isolated differential input. TTL signals high >3.5VDC, low <0.8VDC. Current sink minimum 15mA, maximum 20mA.
Diagnostics	
RS232C	X-Code commands offer detailed status reports
LED	Over-temperature, drive fault, current limit and power
Status	Seven-segment LED indicates positioner status
Outputs	Drive fault and positioner fault
Motion Programs	
Storage	8000 characters of battery backed RAM
Program length	Variable up to memory limit
Number	64 programs
Execution	a) Command from serial port, b) Sequence selection inputs, c) Automatic execution at power-up, selected by XP command, d) RP240, e) TM8 Thumbwheel
Environmental	
Drive	
Storage	-40°F to 185°F (-40°C to 85°C)
Operation	32°F to 122°F (0°C to 50°C)
Humidity	0-95% non-condensing
Weight	15.4 lbs (7 kg)

BDHX-E Alphabetical Command Listing

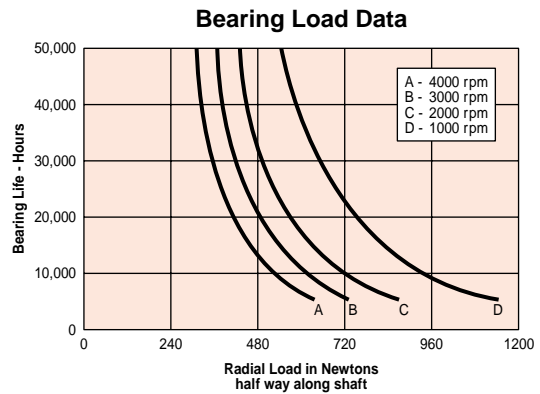
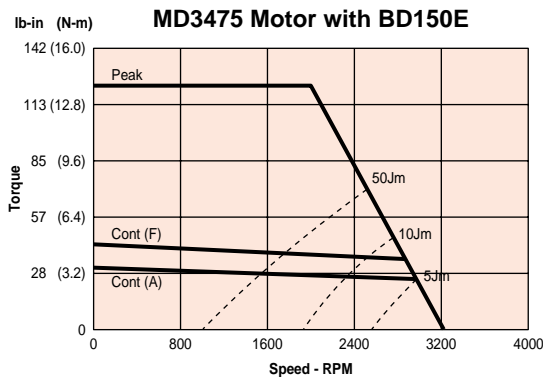
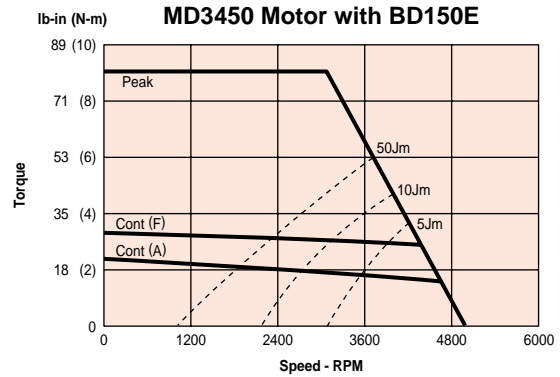
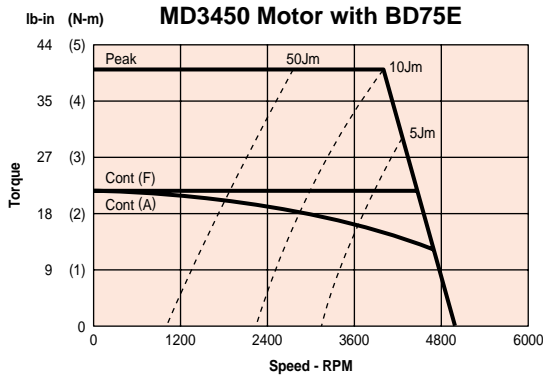
#	Step sequence	DVA	Display Velocity	OSM	Integral Action	TRMP	Trigger on positive
;	Comment		Actual		Sensitivity		motor distance
A	Acceleration Rate	DVO	Display variable	OSO	Suppress Units	TRN	Trigger On Input
B	Buffer Status		data on RP240	OUT	Define output		Not Equal
	Request		display		functions	TRR	Registration Mode
BS	Buffer Size	DVS	Display Velocity	P	Position	TUNE	Show Tuning
	Request		Setpoint	PIC	Picture		Settings
C	Continue	E	Enable	PR	Position Report	TUNET	Self-Tune Servo
CAG	Configure		Communications	PS	Pause		(Torque Amplifier)
	Acceleration Gain	ELSE	Else	PZ	Position Zero	TUNEV	Self-Tune Servo
CCP	Configure Current	EX	Set	QS	Transmit An		(Velocity Amplifier)
	Clamp		Communication		Identifier	U	Pause
CCS	Configure		Style	R	Report Control	UNTIL	Until
	Command Source	F	Disable		Module Status	V	Velocity
CDG	Configure		Communications	RA	Report A – Limit	VAR	Variables
	Derivative Gain	FOL	Following Percent		Status Request	WARD	Read variable from
CEW	Configure In-	FRD	Read following	RAT	Set Rate Multiplier		parallel I/O
	Position Window		ratio from parallel I/		Value	VARn=FUN	Enable and read
CFG	Configure		O	RB	Report B –		function keys
	Feedforward Gain	G	Go		Miscellaneous	VARn=NUM	numeric keys
CIG	Configure Integral	GA	Go Home	RE	Status Request		(RP240)
	Gain		Acceleration		Drive Status		numeric keys
CIT	Configure In-	GH	Go Home	REPEAT	Request	VRD	(RP240)
	Position Time	GHF	Go Home Final		Repeat		Read velocity value
CIW	Configure Integral	GOSUB	GOSUB sequence	RFS	Return Servo to	WHEN	from parallel I/O
	Action Window	GOTO	GOTO sequence		Factory Settings		Set WHEN
CIX	Configure Index	H	Change Direction	RG	Report Go Home	WHILE	condition
	Resolution	^H	Backspace		Status		Set WHILE
CJL	Enter Motor +	H+	Set Direction	RIFS	Return Indexer to	XBS	condition
	Load Inertia	H-	Set Direction		Factory Settings		Sequence memory
CMR	Configure Motor	HALT	Halt	RPO	Report Power-On	XC	available
	Resolution	HELP	Produce Help		Time	XD	Checksum
COFF	Configure Amplifier		Screens	RS	Report Sequence		Sequence
	Offset	ID	Immediate		Status	XE	Download
CPE	Configure Position		Distance	RSE	Report Servo	XG	Sequence Delete
	Error	IF	If		Errors	XP	GOTO sequence
CPG	Configure	IN	Define input	RST	Freeze Torque	XR	Power-On
	Proportional Gain		functions		Demand	XRD	Sequence Number
CTG	Configure Filter	IO	Immediate Output	RV	Revision		Run Sequence
	Time Constant	IS	Input Status	S	Stop	XRP	read sequence
CTQ	Enter Motor	IV	Immediate Velocity	SAVE	SAVE Parameters		from parallel I/O
	Torque	JA	Jog Acceleration	SB	Stop Buffered	XRT	Run/Pause
CUR	Configure User	JV	Jog Velocity	SIM	Set Indexer/		Sequence
	Resolution	K	Kill		Following Mode	XSD	Return From
CVG	Configure Velocity	KILL	Kill Motion	SKE	Skip On 'Equals'		Sequence
	Gain	L	Loop	SKN	Skip On 'Not	XSR	Sequence
CVT	Configure Velocity	LA	Limit Deceleration		Equal'		Download Status
	Trip	LD	Limit Disable	SP	Set current		Report
D	Distance	LS	Limit Switch Fast		position to value	XSS	Sequence Run
DCLR	Clear RP240		Stop	SS	Set Switches	XT	Status Report
	display	MC	Mode Continuous	SSA	RS232C Echo	XTR	X Sequence Status
DCNT	Enable/Disable the	MN	Mode Normal		Control	XU	Sequence
	RP240 Pause/	MPA	Mode Position	SSD	Set Output 1 as	XWHEN	Terminator
	Continue keys		Absolute		Composite Fault		Set trace mode
DFX	Display Flags	MPI	Mode Position	SSG	Signal		Sequence Upload
	Indexer		Incremental		Save Command		Set WHEN
DIC	Display Indexer	MQ	Speed Change		Buffer		sequence
	Counter		Mode	SSH	On Limit		Reset Power-Up
DLED	Turn RP240 LEDs	N	End Loop		Save Command		Sequence Mode
	on/off	NIF	End of IF	SSI	Buffer		Terminate Loop
DPA	Display Position	NWHILE	End of WHILE		On Stop		Reset
	Actual	O	Programmable	ST	Sequence Select		
DPC	Position cursor on	OFF	Output		Inputs		
	RP240 display	ON	De-Energize Drive	STOP	Energize/De-		
DPE	Display Position	OS	Energize Drive	SV	Energize Drive		
	Error	OSA	Other Switches	T	Stop Motion		
DPS	Display Position		Home @ Index	TMRD	Save		
	Setpoint	OSB	Pulse		Time Delay		
DR	Display Report		Integral Action	TRD	Read timer value		
DRD	Read distance	OSC	Selection		from parallel I/O		
	from parallel I/O		Monitor Command	TRE	Trigger On Input		
DS	Display Signal	OSE	Reporting		Distance		
DSTP	Enable/Disable the	OSF	Jog Enable	TRIP	Trigger On Input		
	RP240 Stop key		Initialization on		Equal		
DTA	Set Dither	OSJ	Limit	TRMN	Trigger On In		
	Amplitude		RAT 16/24 Bit		Position		
DTF	Set Dither	OSK	select		Trigger on		
	Frequency		Encoder Integrity		negative motor		
DTXT	Display text data		Check		distance		
	on RP240 display						

Note: The positioner card used in BDHX-E Series Drives is a general-purpose controller used in a range of products. The HELP screens displayed by the positioner include additional commands which are not relevant to the BDHX-E Drive. These are identified in the product user guide.

B Servo Systems



Speed/Torque Curves



Power Dump Dissipation Curves

In addition to torque/speed data, the performance graphs also give an indication of the safe operating area of the power dump circuit in repetitive start-stop operation. The data are based on a "worst case" system performing repeated trapezoidal moves with no dwell in between. The time at maximum speed is as short as the thermal rating of the motor will allow. Under these conditions, for any given load inertia, the power in the ballast resistor depends on the peak torque during deceleration and the maximum speed.

The broken lines represent different load inertias as a ratio of the rotor inertia (Jm). When the application requirements have

been calculated, plot the point representing peak torque and maximum speed on the performance graph. If this point lies to the left of the corresponding inertia line, the resistor rating will not be exceeded. If it lies to the right, there is not necessarily a problem but further calculation is required to establish the dump power more accurately—please consult your supplier. For example, a peak torque of 3 Nm and a maximum speed of 3,000 rpm are acceptable with the MD3450 motor and BD75E drive.

Note that this information is for general guidance purposes only and will not apply to light-duty cycles.

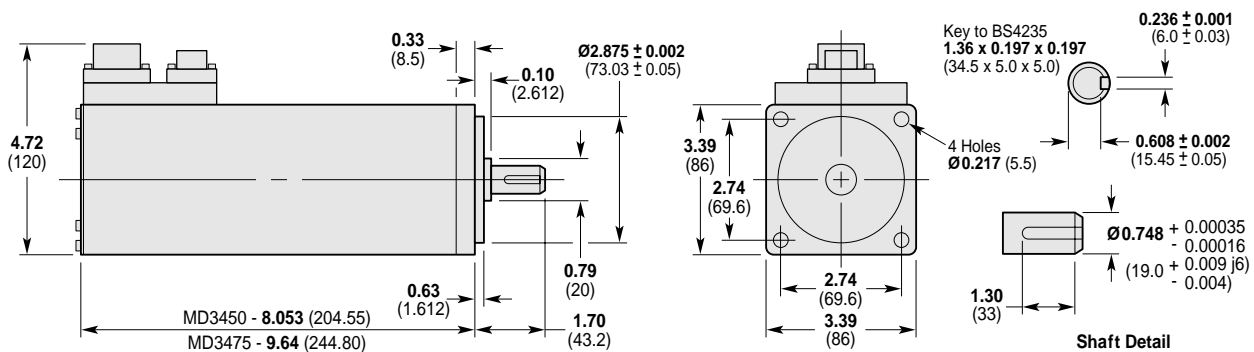
Motor Specifications

	Units	MD3450	MD3475
Stall torque in air	oz-in (N-m)	312 (2.2)	496 (3.5)
Stall torque, flange mounted	oz-in (N-m)	439 (3.1)	609 (4.3)
Rated speed	rpm	5,000	3,250
Rotor inertia	oz-in ² kg-cm ²	8.75 1.6	13.1 2.4
Mechanical time constant	mS	1.5	1.13
Thermal time constant	min	30	40
Torque constant	oz-in/A rms	107.6	164.3
Voltage constant	V/1,000 rpm	65	99.4
Encoder resolution	lines/rev counts/rev	1,024 4,096	1,024 4,096
Weight	lbs kg	10.1 4.6	13.2 6.0
Operating ambient temperature range		0-40°C	
Sealing		IP54	
Terminations		MS Connectors	

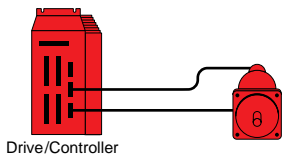
B Servo Systems

Motor Dimensions

(—) denotes millimeters

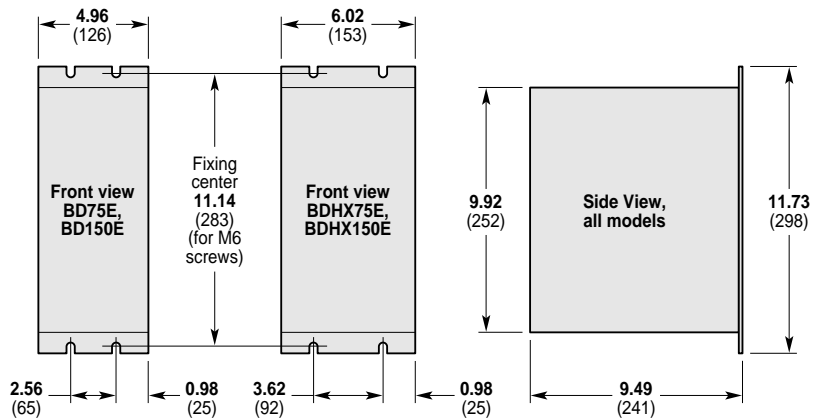


14 mm shaft is available for use with Parker actuators. Call factory for information.



Motor Dimensions

(—) denotes millimeters



Ordering Information

Model No.	Description	CE (EMC and LVD)
Drive:		
BD75E/230V	Analog input drive, 3A continuous, 6A peak	
BD150E/230V	Analog input drive, 6A continuous, 12A peak	
BDS75E/230V	Step and Direction Input Servo Drive, 3A continuous, 6A peak	
BDS150E/230V	Step and Direction Input Servo Drive, 6A continuous, 12A peak	
BDHX75E/230V	Servo Drive/Controller, 3A continuous/6A peak	
BDHX150E/230V	Servo Drive/Controller, 6A continuous/12A peak	
Motors:		
MD3450/230V	3450 motor with encoder (cables not included)	
MD3475/230V	3475 motor with encoder (cables not included)	
Cables:		
BDC-10	10-foot cable set for MD motor	
BDC-25	25-foot cable set for MD motor	
BDC-50	50-foot cable set for MD motor	
BDC-100	100-foot cable set for MD motor	