ZETA Series Microstepping Systems

ZETA4 Microstepping Drive

UL Recognized

Compumotor's ZETA Drive is a stand-alone, packaged microstepping drive that incorporates breakthrough techniques known as Active Damping and Electronic Viscosity (patents pending). The result is higher throughput in a smaller package system—and at a reduced cost.

Designed for reliability, the ZETA Drive offers premier performance while being easy to use and apply.

Features

Performance

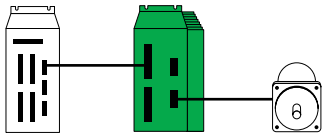
- Standard step-and-direction input or CW/CCW input
- Torque from 65–382 oz-in (0.46–2.80 Nm)
- Active Damping (patent pending) benefits:
  - Damping ratios of up to 0.5
  - Higher acceleration than conventional step systems
  - Decrease motor vibration
  - Increase shaft power
  - Higher performance
- Electronic Viscosity (patent pending) benefits:
  - Reduce settling time
  - Increase slow-speed smoothness (reduce velocity ripple)
  - Reduce audible noise
- Anti-resonance eliminates mid-range instability and provides damping ratios of up to 0.2.

Protection Circuit

- Motor short circuits (phase-to-phase and phase-to-ground)
- Overtemperature
- Overvoltage
- Power dump (dissipates excess voltage caused by load regeneration)

Physical

- Six motors with 10 ft motor cables. Available in 23 and 34 frame sizes
- Drive status indicators: power, step input, under voltage, over voltage and motor fault
- 120 VAC (170 VDC bus voltage)
- Removable connectors for easy installation
- Selectable damping for optimized performance



Specifications

Parameter	Value
Power Input	90-130VAC 50/60Hz
Performance	
Accuracy	±5 arc min (0.0833°) typical. Unloaded-bidirectional with Compumotor supplied motors. Other motors may exhibit different absolute accuracy. ±1 arc min (0.0167°) Loaded-in addition to unloaded accuracy, per each frictional load equal to 1% rated torque.
Repeatability	±5 arc sec (0.0014°) typical. Unloaded-one revolution returning to start point from same direction.
Hysteresis	Less than 2 arc min (0.0334°) unloaded-bidirectional.
Resolution	16 selectable choices: 200, 400, 1000, 2000, 5000, 10000, 12800, 18000, 20000, 21600, 25000, 25400, 25600, 36000, 50000, 50800
Waveform	Selectable. Allows waveform shaping for optimum smoothness or relative accuracy. Pure sine; -4%, -6%, -10% 3rd harmonic.
Speed/Torque	Refer to speed-torque curves on page 7.
Motors	
Type	2-phase hybrid permanent magnet, 1.8 degree.
Breakdown voltage (HIPOT)	750VAC minimum
Number of leads	4, 6 or 8
Accuracy Grade	3%
Inductance	0.5 mH minimum; 5.0 to 50.0 mH recommended range; 80.0 mH max
Dimensions	Refer to dimensional drawings on page 8.
Amplifier	
Type	20 kHz fixed frequency, variable duty cycle PWM (pulse width modulated). Current controlled, bipolar type. MOSFET construction.
Number of phases	2
Dimensions	Refer to dimensional drawings on inside back cover of this brochure.
Protection*	
Short Circuit	Phase-to-phase, phase-to-ground.
Brownout	If AC supply drops below 85VAC.
Overtemperature	If internal air temperature exceeds 158°F (70°C).
Auto standby	If selected, motor current ramps to 50% of preset value if no step pulses are received for 1 second. Rated current levels are resumed upon receipt of next step pulse.
Automatic Test Function	This feature (used primarily for testing and verification of correct wiring) rotates the motor at approximately 1 rps in the negative (CCW) direction (if the motor is wired correctly).
Step Input	High-going pulse, 200 nsec min. width; max. pulse rate is 2 mHz.
Direction Input	Logic High = positive (CW) rotation. Logic Low = negative (CCW) rotation. Direction input may change polarity, coincident with first step pulse.
CW/CCW input	Dip switch selectable. High-going pulse, 200 nsec min width; max pulse rate is 2 mHz.
Shutdown Input	Logic High = amplifier disable. Logic Low = normal operation.
Reset Input	Logic High = drive held in reset. Logic Low = normal operation.
Fault Output	Conducting = normal operation. Not Conducting = drive fault.
Environmental	
Operating	32°F to 122°F (0°C to 50°C)
Drive	Maximum allowable ambient temperature is 122°F (50°C). Fan cooling may be required if airflow restricted.
Motor	212°F (100°C) maximum motor case temperature. Actual temperature rise duty cycle dependent.
Storage	-40°F to 185°F (-40°C to 85°C)
Humidity	0-95%, non-condensing

* Drive shuts down in conditions listed. Power must be cycled or drive reset to resume operations.

ZETA Series Microstepping Systems

ZETA6104 Packaged Drive/Indexer System

UL Recognized

Compumotor's ZETA6104 is a stand-alone, single-axis drive/indexer system. The ZETA6104 packs all the power and reliability of the 6000 family of controllers and ZETA drives into one convenient package. All of the I/O points, RS-232C/RS422/RS485 control, operator interface options and following capabilities for single-axis applications are included. The following package can perform phase shifts, electronic gearbox, and flying cutoff functionality with ease.

The ZETA6104 package was made for easy and reliable installation. The connections are on removable screw terminals and a standard 50-pin header allowing simple installation and cable routing without having to cut off and reattach a connector.

The ZETA6104 is designed to solve single-axis applications cleanly and completely. For multiple-axis applications, up to 99 ZETA6104s can be daisy chained (32 ZETA6104s can be multi-dropped using RS-422/RS-485) to work together.

In order to speed your application development, the ZETA6104 comes standard with Motion Architect, a Microsoft Windows-based development packages. Motion Architect contains many tools which allow you to easily create and implement motion programs. The ZETA6104 is also compatible with Motion Toolbox™, DDE6000 Server, and Motion Builder software packages.

The ZETA6104 uses the 6000 Series command language. This popular language is powerful enough to implement complex motion control applications and simple enough to not overwhelm the novice programmer. The ZETA6104 is your single-axis solution.

Features

Performance

- One axis package drive/indexer
- Active Damping (patent pending) benefits:
  - Damping ratios of up to 0.5
  - Higher acceleration than conventional step systems
  - Decrease motor vibration
  - Increase shaft power
  - Higher performance
- Electronic Viscosity (patent pending) benefits:
  - Reduce settling time
  - Increase slower speed smoothness (reduce velocity ripple)
  - Reduce audible noise
- Anti-resonance eliminates mid-range instability and provides damping ratios of up to 0.2.

Protection Circuit

- Motor short circuits (phase-to-phase and phase-to-ground)
- Overtemperature of internal drives and power supply
- Overvoltage (protects against overvoltage from regeneration)
- Power dump (dissipates excess voltage caused by load regeneration)

I/O

- Encoder channels configurable as hardware up/down counters
- Incremental encoder input
- All inputs and outputs are optically isolated
- POS and NEG end-of-travel limit inputs
- Home limit input
- Two fast (trigger) inputs for position capture, registration, etc.
- 16 programmable inputs (Opto-22 compatible)
- Eight programmable outputs (Opto-22 compatible)
- One auxiliary programmable output

Language

- 40,000 bytes of non-volatile memory for storing programs and paths (expandable to 150 Kbytes)
- Interrupts program execution on error conditions
- Encoder and motor position capture (using the trigger inputs)
- Registration (using the trigger inputs)
- Selectable damping (programmable) to optimize performance for changing loads
- Variable storage, conditional branching and math capability
- Program debug tools – single-step and trace modes, breakpoints, error messages and simulation of I/O

Software Provided

- Motion Architect, Microsoft Windows-based application development software
- DOS®-based program editor and terminal emulator software
- Dynamic Link Library (DLL) provided for use with Microsoft Windows and Microsoft Windows NT software development kits

Optional Software

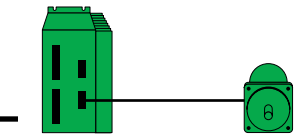
- Motion Toolbox library of LabVIEW® virtual instruments (VIs) for icon-based programming of Compumotor's 6000 Series controllers
- Dynamic Data Exchange (DDE) server available allowing data exchange between different Windows software applications
- Motion Builder provides a visual-development environment for graphical icon-based programming of the 6000 Series product

Interface Capabilities

- Direct interface to RP240 Remote Operator Panel
- Operates stand-alone or interfaces to PCs, PLCs and thumbwheels
- Communication with PC or dumb terminal via 3-wire RS-232C interface
- One RS-232C communication port
- One RS232C/422/485 configurable port

Physical

- Stand-alone indexer/drive package
- Status/fault LEDs to confirm proper operation (four diagnostic LEDs)
- Removable connectors for easy installation
- 120 VAC (170 VDC bus voltage)



ZETA Drive/Indexer

Specifications – ZETA6104

Parameter	Value
Input Power	
ZETA6104	90-132VAC, 50/60Hz
Performance	
Position range	±2,147,483,648 steps
Velocity range	1 to 2,000,000 steps/sec
Acceleration range	1 to 24,999,975 steps/sec^2
	Stepping Accuracy ±0 steps from preset total
	Velocity Accuracy ±0.02% of maximum rate
	Velocity Repeatability ±0.02% of set rate
	Motion Algorithm Update Rate 2 ms
RS-232C Interface	
Connections	3-wire (Rx, Tx, and GND) connection to the COM1 and/or COM2 connectors.
Max number of daisy chained ZETA6104s	Up to 99 units
Address settings	Selectable (see optional DIP switch & jumper setting and ADDR command).
Communication parameters	9,600 baud (auto-band option)—see optional DIP switch & jumper settings); 8 data bits, 1 stop bit, no parity bit, full duplex.
RS-485 Interface	
Connections	4-wire (Rx+, Rx-, Tx+, Tx-) connection to the COM2 connector (COM2 needs to be configured to RS-485 Interface).
Max number of multi-dropped ZETA6104s	Up to 32 units
Address settings	Selectable (see optional DIP switch & jumper setting and ADDR command).
Communication parameters	9,600 baud, 8 data bits, 1 stop bit, no parity bit, full duplex.
Protection	
Short Circuit	Phase-to-phase, phase-to-ground
Brownout	AC supply drops below 85 VAC
Overtemperature	If internal air temperature exceeds 158°F (70°C)
Inputs (see also I/O pinouts & circuit drawing)	All inputs are optically isolated.
Encoder	Differential comparator accepts two phase quadrature incremental encoders with differential (recommended) or single ended outputs. Max voltage = 5 VDC. Switching levels (TTL-compatible); Low ≤ 0.4V, High ≥ 2.4V. Maximum frequency = 1.9 MHz. Minimum time between transitions = 625 ns.
16 Programmable	HCMOS* compatible with internal 6.8 KΩ pull-up (connect IN-P to +5–24V to source current or connect IN-P to GND to sink current). Voltage range = 0–24V. 50-pin plug is compatible with OPTO-22™ signal conditioning equipment. Controllable with the 6000 Series programming language.
Trigger Inputs	ZETA6104 has two high-speed inputs for encoder capture and registration. HCMOS* compatible with internal 6.8 KΩ pull-up to AUX-P (wired to +5V at factory). Voltage range=0V-24V. Connect AUX-P to voltage to source current or connect AUX-P to GND to sink current. Voltage range = 0–24V.
Home, Pos/Neg Limits Pulse Cut Off	HCMOS* compatible; internally 6.8 K pull-ups to AUX-P (wired to +5V at factory). Voltage Range = 0V-24V. Connect AUX-P to voltage to source current or connect AUX-P to GND to sink current.
Outputs	
9 Programmable (includes OUT-A)	Optically isolated, HCMOS* compatible, open collector output with 4.7 kΩ pull ups. Can be pulled up by connecting OUT-P to +5V on the auxiliary board, or to user-supplied voltage of up to 24V. Max voltage in OFF state (not sinking current) = 24V, max current in ON state (sinking) = 30mA. 50-pin plug is compatible with OPTO-22™ signal conditioning equipment. Controllable with the 6000 Series programming language. Includes the 8 general purpose outputs on the Programmable I/O connector, and the OUT-A terminal on the I/O connector.
Environmental	
Operating temperature	32° to 122°F (0° to 50°C)
Storage temperature	-22° to 185°F (-30° to 85°C)
Humidity	0% to 95% noncondensing
Diagnostic LEDs	Power/drive on, step pulses, drive overtemperature, and motor short circuit

* HCMOS-compatible voltage levels: low ≤ 1.67V, high ≥ 3.3V
TTL-compatible voltage levels: low ≤ 0.4V; high ≥ 2.4V

Command Language (partial command list)

The ZETA6104 is easily programmed with the 6000 Series language. Each command is an ASCII character mneumonic with numeric parameters for both axes following the command.

The following command example sets acceleration for the ZETA6104:A10

Conditionals

Command	Description
IF( )	If statement
REPEAT	Repeat statement
WAIT( )	Wait for a specific condition
WHILE( )	While a condition is true

Display [RP240]

Command	Description
DCLEAR	Clear display
DLED	Display LEDs
DREAD	Read display entry
DVAR	Display variable
DWRITE" "	Write string to display

Drive Configuration

Command	Description
DACTDP	Active damping
DAUTOS	Auto current standby
DELVIS	Electronic viscosity
DMTIND	Motor inductance
DMTSTT	Motor static torque
DWAVE	Waveform

Encoder

Command	Description
ENC	Encoder/motor step mode
EPM	Position maintenance mode enable
EPMDB	Position maintenance deadband
ERES	Encoder resolution
ESDB	Encoder backlash stall deadband
ESTALL	Stall detect enable

Homing

Command	Description
HOM	Go home
HOMA	Home acceleration
HOMAD	Home deceleration
HOMBAC	Home backup enable
HOMDF	Home direction final
HOMEDG	Home reference edge
HOMLVL	Home active level
HOMV	Home velocity
HOMVF	Home velocity final
HOMZ	Home to Z-channel enable

Following

Command	Description
FOLEN	Enable following
FOLMAS	Define master axes
FOLMD	Define master move distance
FOLRN	Set maximum following ratio numerator
FOLRD	Set maximum following ratio denominator
FSHFD	Initiate preset phase shift
FSHFC	Initiate continuous shift

Limits

Command	Description
LH	Hard limit enable
LHAD	Hard limit deceleration
LHLVL	Hard limit active level
LS	Soft limit enable
LSAD	Soft limit decelration
LSNEG	Soft limit NEG range
LSPOS	Soft limit POS range

Mathmatical

Command	Description
+	Addition
-	Subtration
*	Multiplication
/	Division
&	Boolean and
|	Boolean or
SIN	Sine
COS	Cosine
TAN	Tangent
ATAN	Arc tangent
SQRT	Square root

Miscellaneous

Command	Description
;	Comment
DRIVE	Drive enable
ERRORP	Error program
L	Loop
MA	Absolute/incremental mode enable
MC	Preset/continuous mode enable
PSET	Define position counter
READ	Read a value from terminal
TIMST	Reset and start timer
STEP	Single step mode enable
WRITE" "	Transmit a string to terminal

Motion

Command	Description
A	Acceleration
AD	Deceleration
D	Distance
GO	Initiate motion
S	Stop
V	Velocity

Registration

Command	Description
RE	Registration enable
REG	Registration distance
REGLOD	Registration lock-out distance
REGSS	Registration single shot

Scaling

Command	Description
SCALE	Enabling scaling
SCLA	Accel/decel scale factor
SCLD	Distance scale factor
SCLV	Velocity scale factor

Subroutines

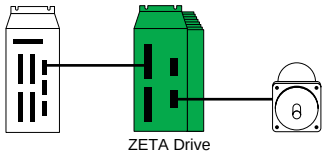
Command	Description
DEF	Define a subroutine
GOSUB	Execute a subroutine with return
GOTO	Execute a subroutine without return

Target Zone

Command	Description
STRGTE	Enable target zone settling mode
STRGTD	Target distance zone
STRGTT	Target settling timeout period
STRGTV	Target velocity zone
TSTLT	Transfer settling time

Transfer Information

Command	Description
TAS	Transfer axis status
TANV	Transfer analog input value
TCMDER	Transfer command that caused an error
TCNT	Transfer counter
TIN	Transfer input status
TLIM	Transfer limit status
TOUT	Transfer output state
TPE	Transfer position of encoder
TPM	Transfer position of motor



The ZETA6104 in Action

Compumotor's new microstepper solution delivers high-performance results

Application Type: Flying Cutoff

Motion: Linear

The Application:

Metal tubing feeds off a spool and needs to be cut into predetermined lengths. A rotary blade mechanism cuts the tube, and the blade mechanism must spin around the tube many times to complete the cut. Throughput of this mechanism must be maximized, so the tube needs to be indexed quickly and be in position with minimal settling time before the cut is made. Current microstepping drive technology could only obtain a maximum speed of 10 rps without stalling. The application was correctly sized for 20 rps with a 50% safety margin. The current drive technology speed limitation of 10 rps is due to the mid-frequency resonance that causes the motor to stall.

Machine Requirements:

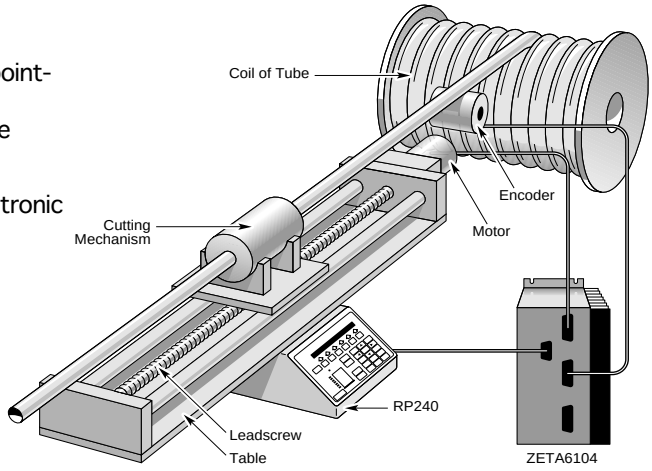
- Higher throughput
- Variable length
- Stationary cut

Motion Control Requirements:

- Increase acceleration and velocity
- Speed of 20 rps
- Decrease time for point-to-point moves
- Minimal settling time

The ZETA Solution

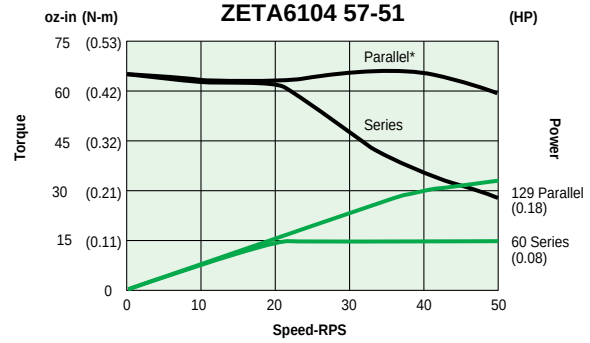
The ZETA Drive's electronic damping allowed the system to achieve a velocity of 30 rps and eliminated motor vibration, allowing the full speed-torque curve to be used. Although the former micro-stepping drive was sized correctly, the 50% safety margin did not provide sufficient torque to overcome the vibration and make the move. The ZETA Drive's electronic viscosity reduced settling time at the end of the move, enabling the system to obtain higher throughput.



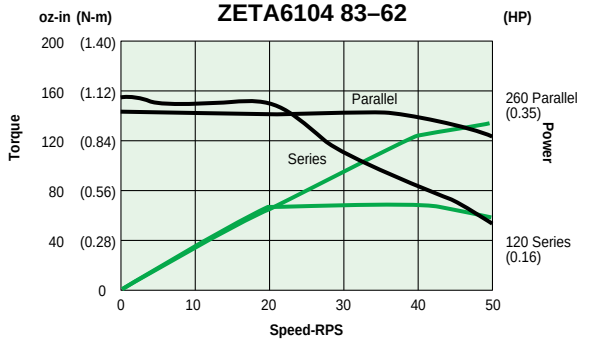
Speed-Torque Curves

(Power curve is shown in the second color)

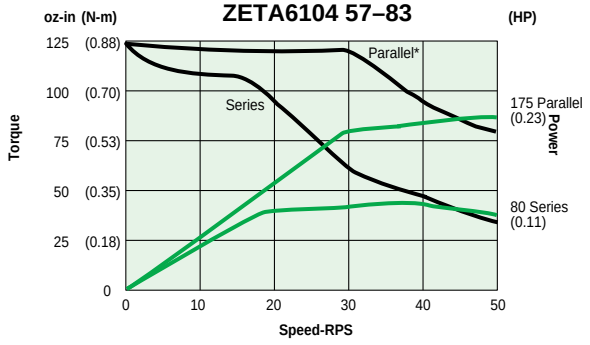
ZETA 57–51
ZETA6104 57-51



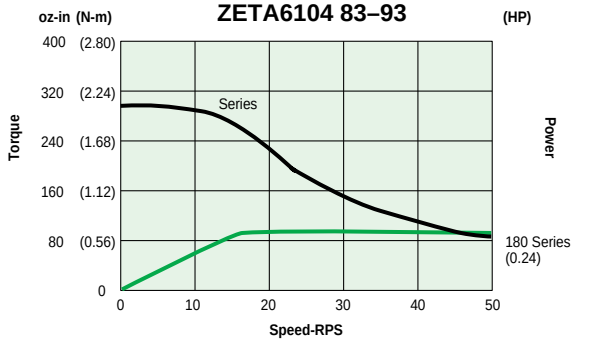
ZETA 83–62
ZETA6104 83–62



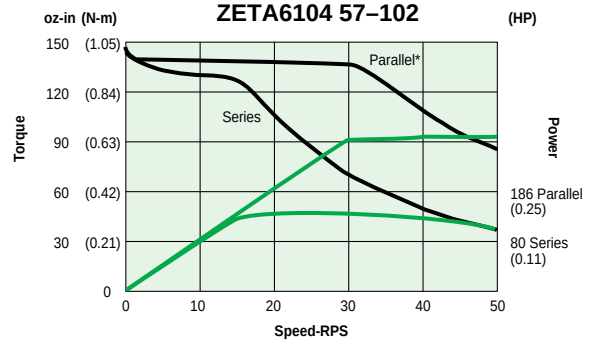
ZETA 57–83
ZETA6104 57–83



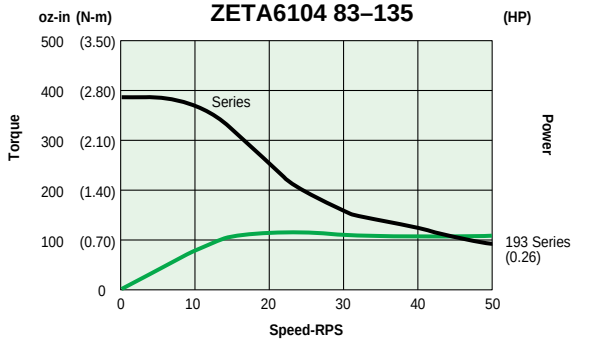
ZETA 83–93
ZETA6104 83–93



ZETA 57–102
ZETA6104 57–102



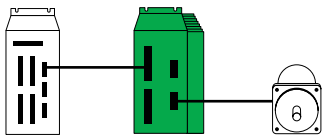
ZETA 83–135
ZETA6104 83–135



Parallel connected motors are limited to 50% duty cycle when operated above 5 rps. For greater than 50% duty cycle above 5 rps, you must connect the motor in series.

Fan cooling the motor will increase duty cycles above 15 rps.

Viscous damper is not required to achieve speed-torque curves.

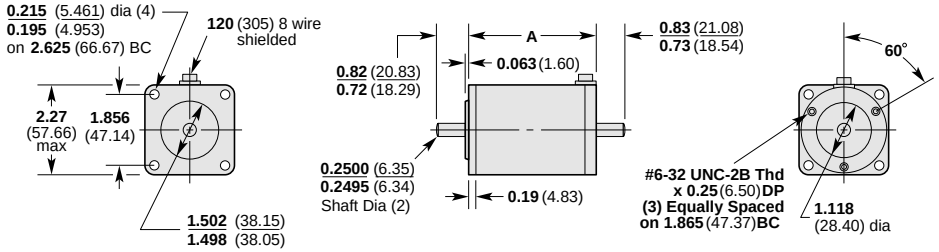


Motor Data

		Size 23 Frame			Size 34 Frame		
		ZETA 57-51 ZETA6104 57-51	ZETA 57-83 ZETA6104 57-83	ZETA 57-102 ZETA6104 57-102	ZETA 83-62 ZETA6104 83-62	ZETA 83-93 ZETA6104 83-93	ZETA 83-135 ZETA6104 83-135
Static torque							
oz-in		65	125	148	141	292	382
(Nm)		(0.46)	(0.88)	(1.05)	(1.00)	(2.106)	(2.70)
Rotor inertia							
oz-in^2		0.546	1.10	1.69	3.47	6.76	10.47
(kg-cm^2)		(0.100)	(0.201)	(0.309)	(0.635)	(1.24)	(1.92)
Bearings							
Thrust load	lb	25	25	25	50	50	50
	(kg)	(11.3)	(11.3)	(11.3)	(22.6)	(22.6)	(22.6)
Radial load	lb	15	15	15	25	25	25
	(kg)	(6.8)	(6.8)	(6.8)	(11.3)	(11.3)	(11.3)
End play	in	0.005	0.005	0.005	0.005	0.005	0.005
Reversing load	(cm)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Equal to 1 lb							
Radial play	in	0.0008	0.0008	0.0008	0.0008	0.0008	0.0008
Per 0.5 lb load	(cm)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Weight (net)							
Motor+Cable							
+Connector	lb	1.6	2.4	3.2	3.8	5.1	8.3
	(kg)	(0.7)	(1.1)	(1.5)	(1.7)	(2.3)	(3.8)
Total Shipping Weight (net)							
Motor/Drive							
Cables	lb	7.4	8.1	9.0	9.7	10.9	14.1
Container	(kg)	(3.4)	(3.7)	(4.0)	(4.4)	(4.9)	(6.4)
Motor Cable							
Wire size	AWG	24	24	24	22	22	22
	(mm)^2	(0.25)	(0.25)	(0.25)	(0.34)	(0.34)	(0.34)
All motors:	Cable length = 10 ft (3 m); attached connector is prewired for series current.						

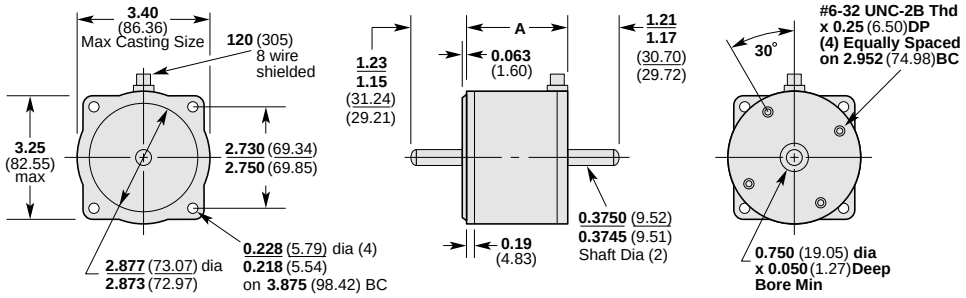
Dimensions

(—) denotes millimeters



Size 23 Frame

Model	A
ZETA57-51	2.0 (50.23)
ZETA57-83	3.1 (75.23)
ZETA57-102	4.0 (101.6)



Size 34 Frame

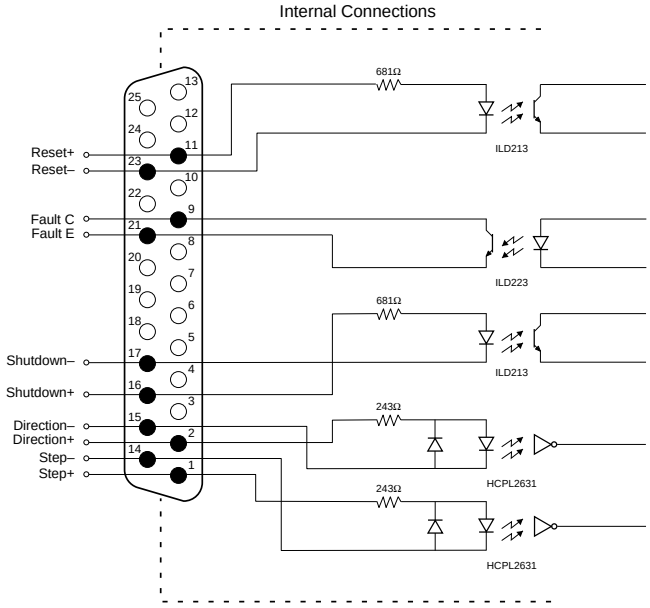
Model	A
ZETA83-62	2.5 (62.0)
ZETA83-93	3.7 (93.98)
ZETA83-135	5.2 (129.0)

Step Motor Systems

Parker Motion & Control

Parker Hannifin Corporation
Daedal Division
Harrison City, Pennsylvania

ZETA Drive Connections



Motor – Screw Pin No.	Terminal Signal
1	Interlock
2	A-CT
3	A+
4	A–
5	Gnd
6	B+
7	B–
8	B-CT
9	Interlock

Ordering Information

Drives

Part No.	Description
ZETA4	Single-axis, packaged 4-amp drive

Motors

Part No.	Description
ZETA57-51-MO	57-51 motor with cable & connector
ZETA57-83-MO	57-83 motor with cable & connector
ZETA57-102-MO	57-102 motor with cable & connector
ZETA83-62-MO	83-62 motor with cable & connector
ZETA83-93-MO	83-93 motor with cable & connector
ZETA83-135-MO	83-135 motor with cable & connector

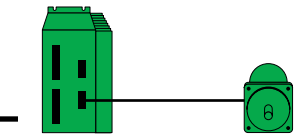
Options

–E	Incremental encoder mounted on motor—page C112
–S	Single-shaft motor

Complete System*

Part No.	Description
ZETA57-51	57-51 motor and drive system
ZETA57-83	57-83 motor and drive system
ZETA57-102	57-102 motor and drive system
ZETA83-62	83-62 motor and drive system
ZETA83-93	83-93 motor and drive system
ZETA83-135	83-135 motor and drive system

* Complete systems are “matched” at the factory.



ZETA Drive/Indexer

ZETA6104 Connections

Pin-Out Lists

COM1
4-Pin Screw Terminal

Pin No	Signal
1	Rx
2	Tx
3	Ground
4	Shield

COM2
5-Pin Screw Terminal

Pin No	Signal
1	+5VDC(out)/Rx+
2	Ground/RX-
3	Rx/Tx+
4	Tx/Tx-
5	Shield/Ground

Encoder
9-Pin Screw Terminal

Pin No	Signal
1	Shield
2	Ground
3	Z-
4	Z+
5	B-
6	B+
7	A-
8	A+
9	+5 VDC(out)

Limits 1/2
4-Pin Screw Terminal

Pin No	Signal
1	Ground
2	Home
3	Neg
4	Pos

I/O
9-Pin Screw Terminal

Pin No	Signal
1	Trigger A
2	Trigger B
3	Output A-
4	Ground
5	Pulse cut-off
6	+5 VDC(out)
7	Output pull-up
8	Input pull-up
9	Auxiliary pull-up

Motor
9-Pin Screw Terminal

Pin No	Signal
1	Interlock
2	A- Center tap
3	A+
4	A-
5	Earth
6	B+
7	B-
8	B- Center tap
9	Interlock

Programmable I/O Pin Outs
50-Pin Header

Pin No	I/O Connector		
1	Input#16	27	Input#7
3	Input#15	29	Input#6
5	Input#14	31	Input#5
7	Input#13	33	Output#4
9	Input#12	35	Output#3
11	Input#11	37	Output#2
13	Input#10	39	Output#1
14	Input#9	41	Input#4
17	Output#8	43	Input#3
19	Output#7	45	Input#2
21	Output#6	47	Input#1
23	Output#5	49	+5 VDC
25	Input#8		

Ordering Information

Indexer/Drives

Part No.	Description
ZETA6104	Single-axis, packaged indexer/drive
ZETA6104-M	Single-axis, packaged indexer/drive with expanded memory

Motors

Part No.	Description
ZETA57-51-MO	57-51 motor with cable & connector
ZETA57-83-MO	57-83 motor with cable & connector
ZETA57-102-MO	57-102 motor with cable & connector
ZETA83-62-MO	83-62 motor with cable & connector
ZETA83-93-MO	83-93 motor with cable & connector
ZETA83-135-MO	83-135 motor with cable & connector

Options

-E	Incremental encoder mounted on motor—page C112
-S	Single-shaft motor

Complete Systems*

Part No.	Description
ZETA6104-57-51	57-51 motor and drive/indexer system
ZETA6104-57-83	57-83 motor and drive/indexer system
ZETA6104-57-102	57-102 motor and drive/indexer system
ZETA6104-83-62	83-62 motor and drive/indexer system
ZETA6104-83-93	83-93 motor and drive/indexer system
ZETA6104-83-135	83-135 motor and drive/indexer system

*Complete systems are "matched" at the factory.

Accessories

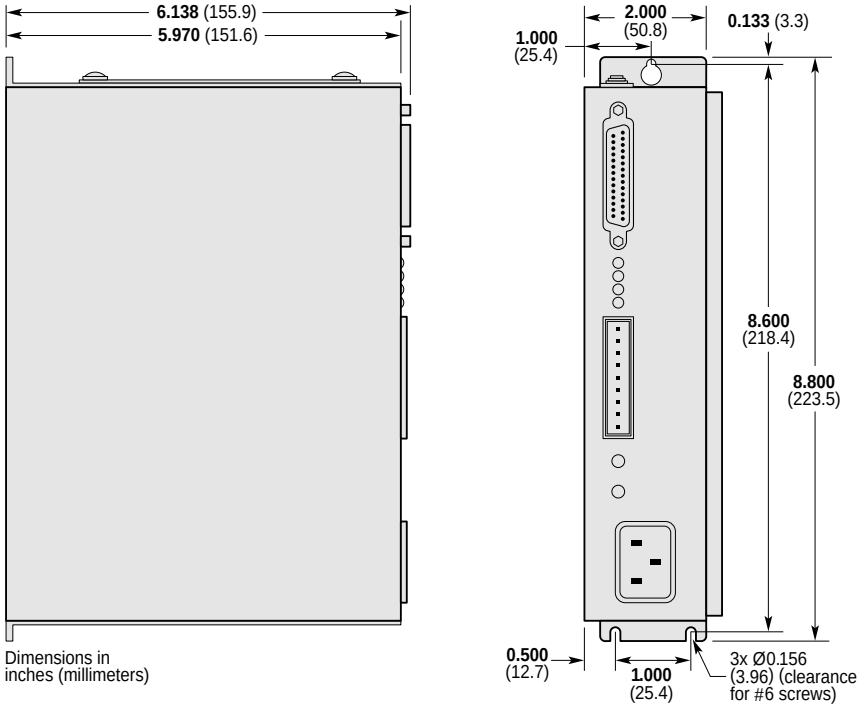
Part No.	Description
VM50	50-pin header-to-srew terminal breakout board for connecting I/O. See page C111 for details.
RP240	Operator interface. See page C108 for details.
RP240-NEMA 4	NEMA 4 rated operator interface. Flat panel mounted. See page C108 for details.
TM8	Thumbwheel module. See page C106 for details.

Software Accessories

Part No.	Description
DDE6000	DDE server for 6000 Series. See page C105.
Motion Toolbox	Library of LabVIEW VIs for Motion Control. See pp C98.
Motion Builder	Graphical icon-based software. See pp C100.

ZETA Series Drive Dimensions

(—denotesmillimeters)



Dimensions in inches (millimeters)

ZETA 6104 Dimensions

(—) denotesmillimeters