

# Ndrive QL and QLe

## Digital Panel-Mount Piezo Drive

Real-time distributed control architecture allows synchronized motion control on up to 32 axes of piezo and/or servo motor stages

Deterministic FireWire (IEEE-1394) high-speed serial communication protocol

Single or multi-axis Position Synchronized Output (PSO) for real-time triggering of events

Available with high-precision (to 20-bit) sensor resolution for capacitive sensor feedback

Thermally-stable feedback circuit design option

Configurable analog input (to 18-bit) for external feedback sensor integration or command generation

Advanced control features such as Learning Control, Harmonic Cancellation, and Command Shaping improve tracking error and overall process throughput

Comprehensive software tools for diagnostics, tuning, and programming

Program in RS-274 G-code, AeroBasic™ using Aerotech's IDE or create custom interfaces with Microsoft .NET including C#, VB.NET®, Managed C++, or LabVIEW®

OEM version available

CE approved; follows the 2011/65/EU RoHS 2 Directive

The Ndrive QL/QLe™ is a family of panel-mount nanopositioning piezo drives designed to be used with the Automation 3200 (A3200) motion controller. The A3200 is the controller of choice in many markets such as semiconductor, data storage, medical device manufacturing, laser processing, and metrology. The Ndrive QL and



*The Ndrive QL and QLe provide multi-axis functionality in a discrete single-axis, panel-mount package.*

Ndrive QLe drives enable coordinated motion between piezo stages and servo axes at much higher rates than other controller/drive products.

Featuring a dual-core 456 MHz, double-precision, floating-point DSP, the QL/QLe drives provide extreme processing power in a wide variety of applications including point-to-point motion, linear and circular interpolation, multi-axis error correction, and autofocusing. High-speed interrupts and data logging capabilities provide a real-time link to external systems. The QL/QLe also offers high-speed positioning latching capability and single-axis (QL) or multi-axis (QLe) position synchronized output (PSO) for generation of pulses based on actual position feedback for applications ranging from laser firing to data acquisition system triggering.

### Ultra-Precision Feedback Options

Using the latest technology and high-resolution A/D and D/A converters, the QLe enables sub-nanometer positioning resolution at high bandwidths. The QLe capacitive sensor feedback circuitry provides ultra-low noise performance over the full travel range. In applications that do not require extreme positioning resolution, the QL drive offers lower-resolution ADCs and DACs providing the benefits of high-speed feedback and command generation at a more economical price point. The QLe employs a proprietary capacitive sensor feedback circuit resulting in industry-leading thermal stability and exceptional long-term holding stability. In closed-loop mode, linearity better than 0.01% over the full travel range is achieved with both the QL and QLe.

## Ndrive QL and QLe DESCRIPTION

### I/O Options

In addition to the four optically-isolated digital inputs, two high-speed digital inputs, and four optically-isolated digital outputs, both the Ndrive QL and QLe are equipped with analog inputs and analog outputs (one each for the QL and two each for the QLe). For ultra-precise applications, the QLe offers an 18-bit analog input that can be programmatically configured to accept an external feedback sensor or position command. This analog input also allows the high-voltage power amplifier to be controlled directly by an external low-level analog input. Also, the QLe has one 20-bit analog output that can be programmatically configured for position or voltage monitoring at very high resolutions. The QL drive offers the same analog input/output functionality at 16-bit resolutions.

### Advanced Software and Control Features

The A3200 software uses PID servo loops with advanced feedforward and multiple integrators coupled with eight programmable filters to supply the user with all necessary tools needed to optimize motion performance. Additional software options such as the Dynamic Controls Toolbox and Motion Designer packages make available a host of advanced, yet easy-to-use, tools such as Learning Control, Harmonic Cancellation, Command Shaping, and Cross-

Axis Feedforward to improve tracking errors and provide faster step-and-settle times.

### Powerful Programming Environment

Aerotech's A3200 focuses on ease of use for the programmer, shortens development times compared with other tools, and provides the flexibility to use the tools or controller most familiar to programmers. A complete Integrated Development Environment and a comprehensive .NET motion library provide classes for motion, I/O, status, and diagnostic information. Program in Visual Studio and use the .NET library, or use the Motion Composer (IDE) to develop code with Aerobasic™ commands or G code. A LabVIEW® VI library is available for NI users, while a complete C library is available for those using Visual Basic, C++, or C.

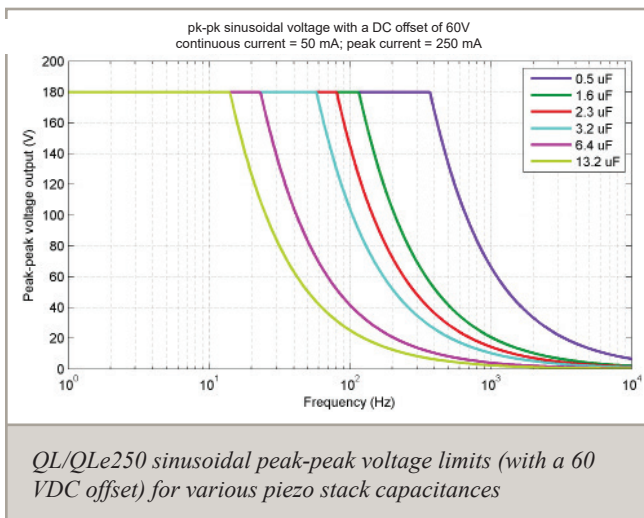
### Automatic Parameter Configuration

Aerotech's piezo stages all include a "FlashConfig" feature that stores all of the parametric information required to operate the stage. The stage is automatically identified and all operational parameters including axis calibration data are uploaded into the Ndrive QL/QLe, ensuring safe, accurate, and true "plug-and-play" operation.



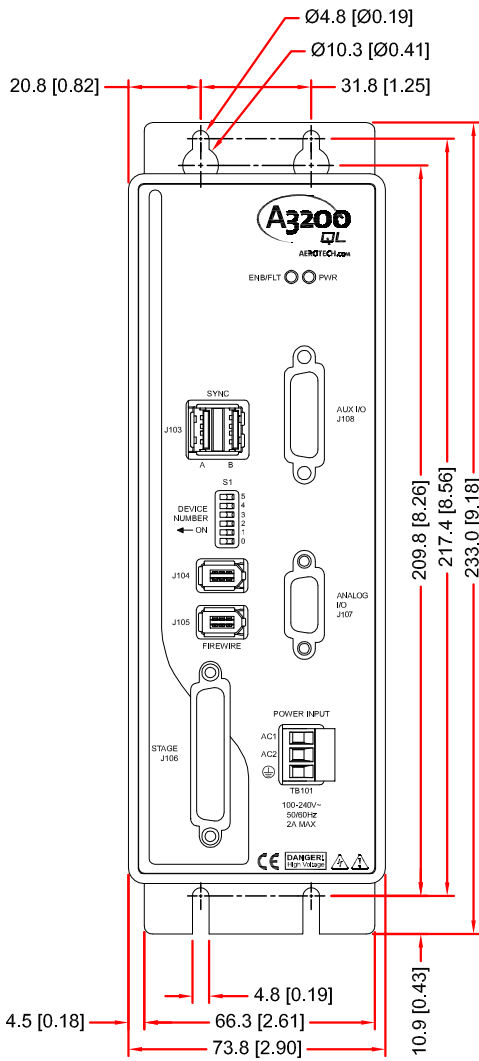
## Ndrive QL and QLe SPECIFICATIONS

Feature	QL250	QL500	QLe250	QLe500
Package Type	Panel-Mount			
Processor	Dual-Core 456 MHz, Double-Precision, Floating Point DSP			
Power Supply	100-240 VAC; 50/60 Hz			
Voltage Output	-30 to +150 V			
Sensor Type	Capacitive Sensor			
Sensor Resolution	17-bit		20-bit	
Cont. Power Output	10 Watts			
Peak Current Output	250 mA	500 mA	250 mA	500 mA
Cont. Current Output	50 mA	130 mA	50 mA	130 mA
Digital Inputs	(4) Optically Isolated, (2) High Speed, and (1) ESTOP			
Digital Outputs	(4) Optically Isolated			
Analog Inputs	Qty. 1, 16-bit $\pm 10$ V differential		2 Total, $\pm 10$ V Differential (1) 16-bit General Purpose, (1) 18-bit High-Resolution Configurable for External Feedback or External Command Input	
Analog Outputs	Qty. 1, 16-bit $\pm 10$ V Single-Ended		2 Total, $\pm 10$ V Single-Ended (1) 16-bit General Purpose, (1) 20-bit High-Resolution Configurable for Position or Voltage Monitoring	
High-Speed Data Capture	Yes (50 ns Latency)			
Thermal Stability	Standard		Enhanced	
Position Synchronized Output (PSO)	Single-Axis		Two-Axis	
Communication Interfaces	Firewire (IEEE-1394)			
Servo Loop Update	20 kHz			
Programming Environment	Multi-Tasking AeroBasic, G-Code/RS-274			
Weight	1.4 kg (3.0 lbs)			
Standards	CE approved, NRTL safety certification, EU 2015/863 RoHS 3 directive			



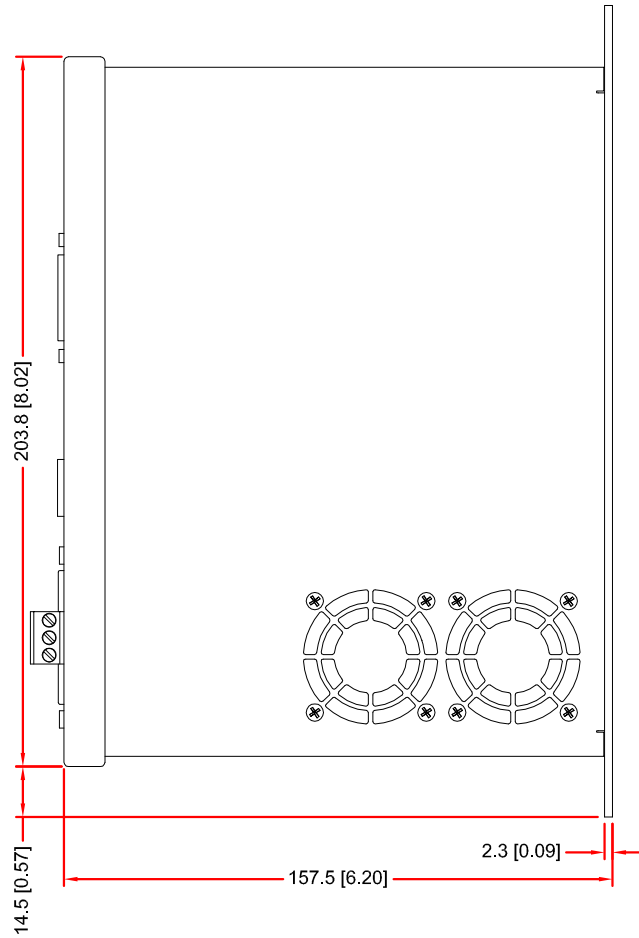
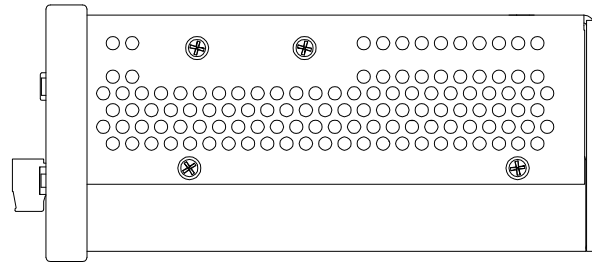
# Ndrive QL250 DIMENSIONS

## Ndrive QL250



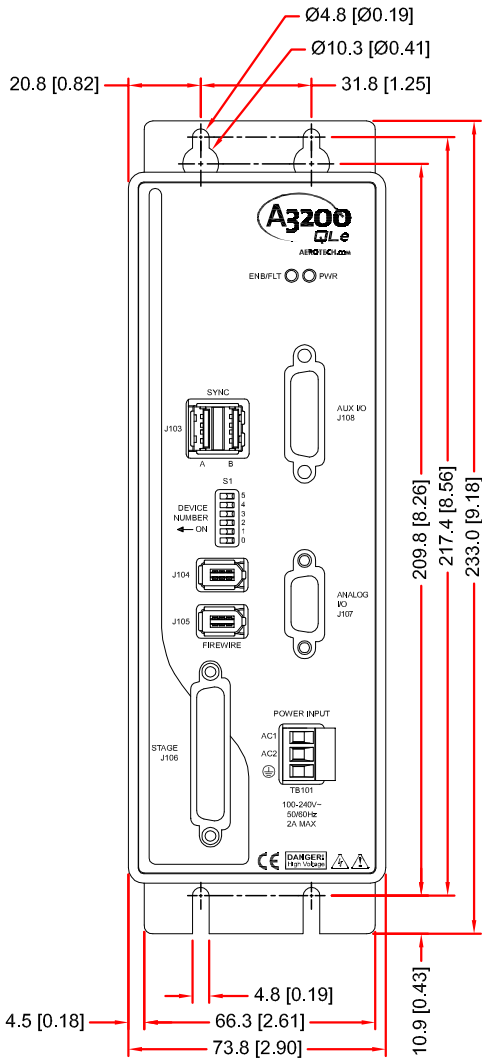
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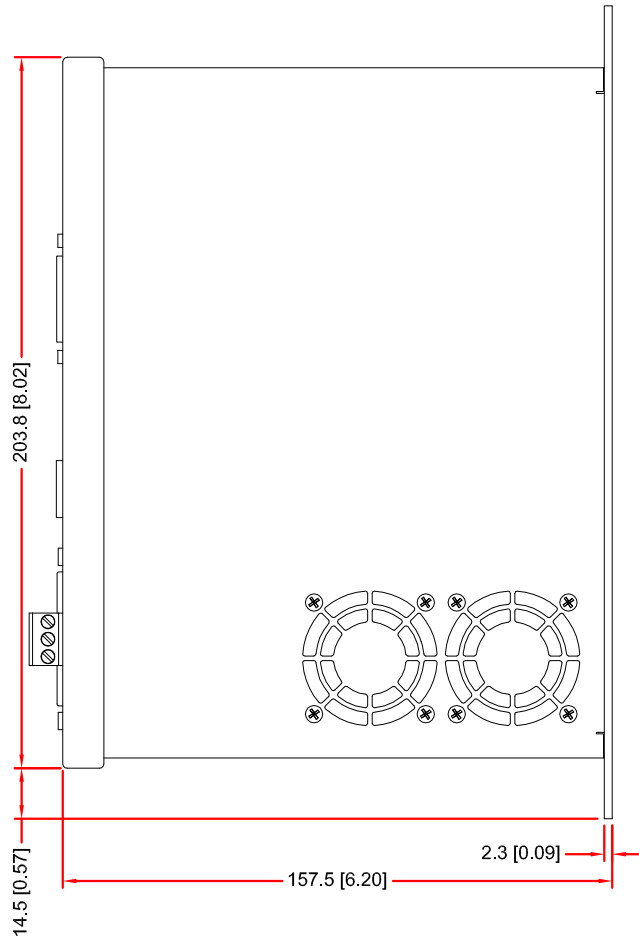
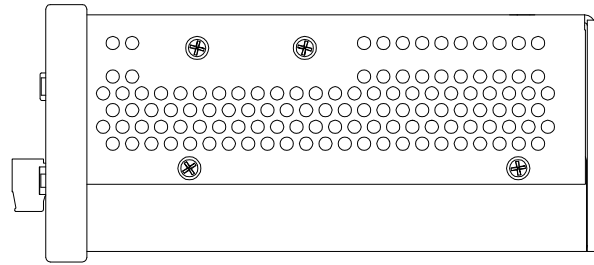
## Ndrive QLe250 DIMENSIONS

### Ndrive QLe250



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## Ndrive QL and QLe ORDERING INFORMATION

### Ndrive QL and QLe Panel-Mount Piezo Drive

Ndrive QL250-C	<p>Cost-effective, discrete panel-mount piezo drive with capacitive sensor feedback, 250 mA peak current, 50 mA continuous current, -30 to +150 V output. Features include:</p> <ul style="list-style-type: none"> <li>• Configurable input/outputs; 4 opto-isolated inputs, two high-speed digital inputs, 4 opto-isolated outputs, one 16-bit analog input, and one 16-bit analog output.</li> <li>• Single-axis Position Synchronized Output (PSO) standard</li> <li>• Motion Designer software is used to graphically generate and edit motion profiles that execute on the controller, providing the ability to import, run and evaluate motion profiles (trajectories). Included in the Motion Designer software is learning control that reduces tracking errors by as much as 1000 times.</li> </ul>
Ndrive QLe250-C	<p>High-performance, discrete panel-mount piezo drive with capacitive sensor feedback, 250 mA peak current, 50 mA continuous current, -30 to +150 V output. Features include:</p> <ul style="list-style-type: none"> <li>• High-precision 20-bit sensor resolution for cap sensor feedback in closed-loop.</li> <li>• Configurable input/outputs; 4 opto-isolated inputs, two high-speed digital inputs, 4 opto-isolated outputs, two analog inputs (1 18-bit, 1 16-bit), and two analog outputs (1 20-bit, 1 16-bit).</li> <li>• 2-axis Position Synchronized Output (PSO) standard</li> <li>• Motion Designer software is used to graphically generate and edit motion profiles that execute on the controller, providing the ability to import, run and evaluate motion profiles (trajectories). Included in the Motion Designer software is learning control that reduces tracking errors by as much as 1000 times.</li> </ul>

### A3200 Software Options

-DYNAMIC CONTROLS TOOLBOX	The Dynamic Controls Toolbox provides control algorithms that increase system performance such as settle time, accuracy, in-position stability and/or velocity stability.
-LABVIEW	LabVIEW® VI samples
-MATLAB	Includes MATLAB® library for motion, parameters, and data collection.