

# 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.

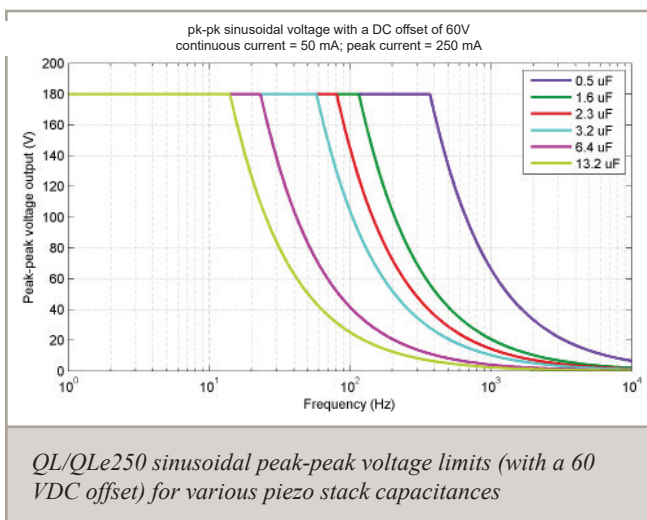
### Automatic Parameter Configuration

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.



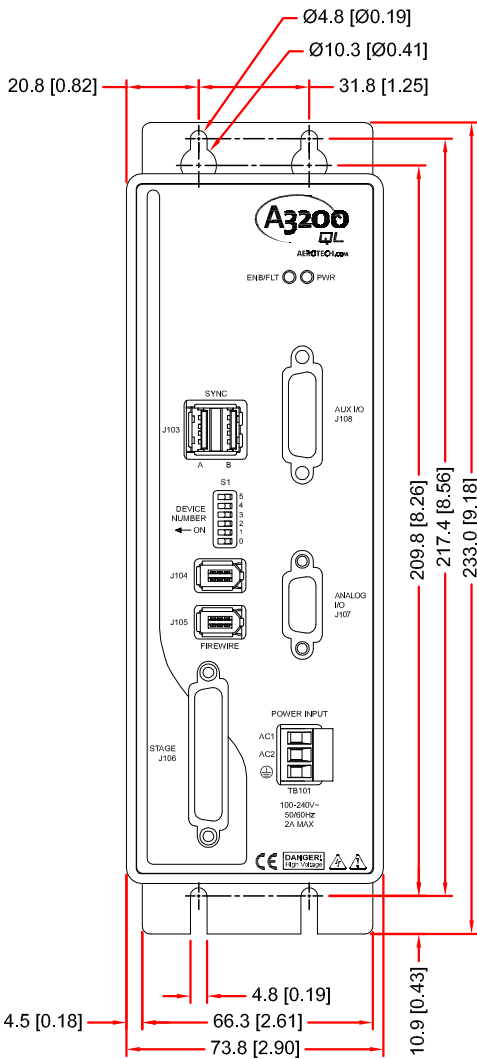
## Ndrive QL and QLe SPECIFICATIONS

| 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<br>(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<br>(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 |        |   |        |



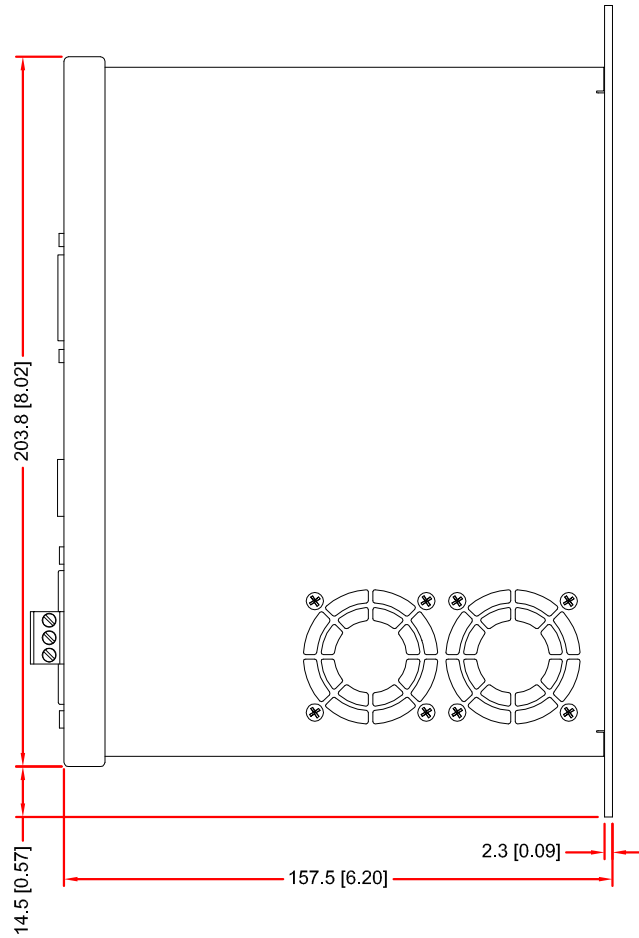
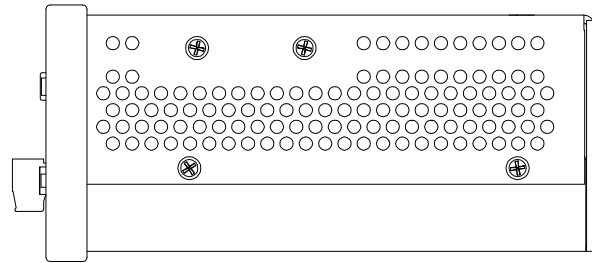
# Ndrive QL250 DIMENSIONS

## Ndrive QL250



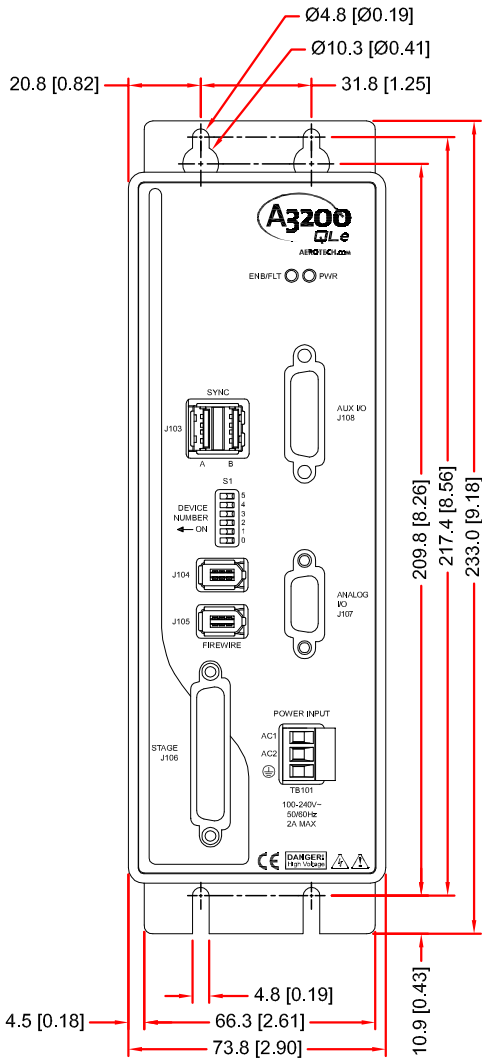
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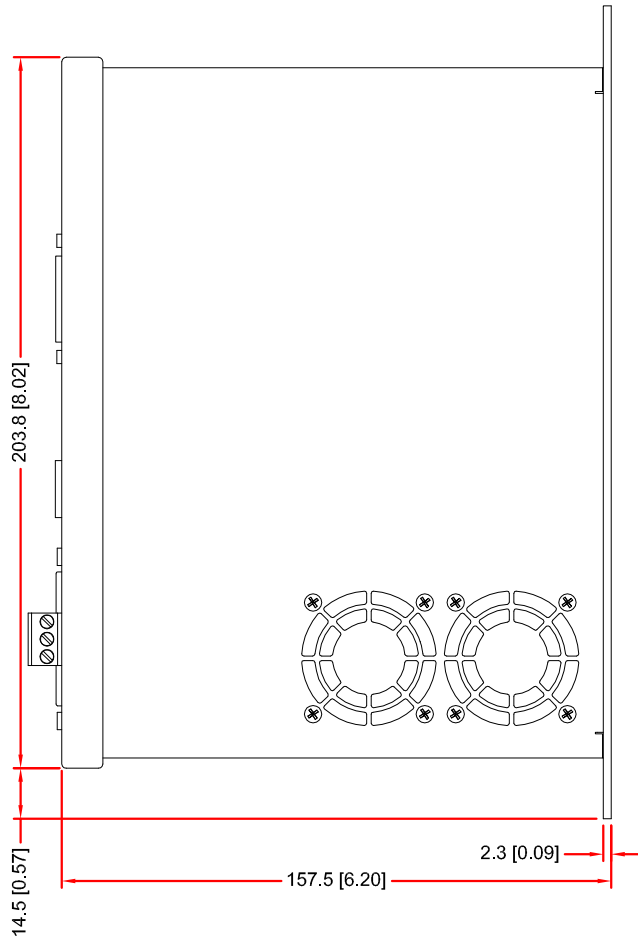
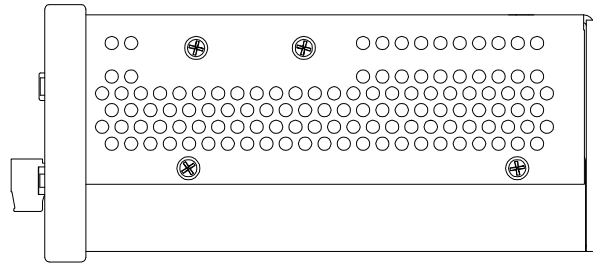


## Ndrive QLe250 DIMENSIONS

### Ndrive QLe250



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## Ndrive QL and QLe ORDERING INFORMATION

### Performance Grade (Required)

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|     |   |
|-----|---|
| QL  | Base Performance, Capacitance Sensor Feedback |
| QLe | High Performance, Capacitance Sensor Feedback |

### Current (Required)

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|-----|--|
| 250 | 250 mA Peak, 50 mA Cont Current, -30 to +150 V Output  |
| 500 | 500 mA Peak, 130 mA Cont Current, -30 to +150 V Output |

### Feedback (Required)

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|    |                    |
|----|--------------------|
| -C | Capacitance Sensor |
|----|--------------------|