

Soloist™ Linear Series

Position Controller and Servo Amplifier – Linear

Single axis digital servo controller with integral power supply and amplifier

Advanced software architecture shortens customer development time; use .Net, C#, C, and LabVIEW® combined with our full IDE and multitasking operating system

Host-mode operation allows you to send commands with your PC via Ethernet or USB for immediate execution

Ethernet or USB permits networked Soloists for multi-axis sequenced motion and I/O passing

Ideal for simple applications with minimal setup or complex applications that use the full flexibility and scalability

Positioning control for brushless, DC brush-type, or stepping motors

Linear amplifier (HLe/CL/ML) for low noise, ultra-high-performance applications

Allen-Bradley EtherNet/IP™ interface provides full integration with the Soloist; program the Soloist directly from RSLogix™ 5000

Output power range is 10 to 20 A peak with ±10 to ±80 VDC bus

Introduction

Aerotech's Soloist™ linear series are single-axis servo controllers that combine a power supply, amplifier, and position controller in a single package. The Soloist can control up to five tasks simultaneously, as well as handle variables and manage I/O, making it well-suited for demanding production applications. The Soloist has high-speed position latch inputs and advanced data logging



Soloist HLe

Soloist CL

Soloist ML

capabilities, making it ideal for laboratory and test instrument applications. The advanced software architecture shortens customer development time, while including support for C#, VB.Net, C, and LabVIEW®, combined with our full IDE and multitasking operating system. Host-mode operation allows you to send commands with your PC via Ethernet or USB for immediate execution.

The Soloist HLe/CL/ML, with linear power stage, is available for low noise and ultra-high-performance applications. This controller is ideal for high bandwidth requirements and maintains superb linearity and zero crossover distortion. For example, applications that have many motion reversals and that require high position accuracy will benefit from using the Soloist linear series.

The Soloist ML provides a very small package linear power stage for high position-accuracy applications.

Motion Composer, the common integrated development environment for all Aerotech controllers, provides users with Windows®-based software with powerful diagnostic, debug, and analysis tools for OEMs and end users alike.

Allen-Bradley Interface

Combine proven PLC with proven motion control for easier integration, startup, and maintenance of medium- and high-end automation projects. The Aerotech EtherNet/IP™ interface enables AB PLCs (MicroLogix, CompactLogix™, or ControlLogix) to be integrated directly with the Soloist. Motion can be directly programmed in the RSLogix 5000 environment or separate programs can be written on the controller and triggered from the AB PLC. Aerotech has two interfaces: ASCII and Register. Choose the PLC, motion controller, and interface that best fits your application needs.

Soloist DESCRIPTION

Total Solution

The controllers are fully tested and ready to run right out of the box. Aerotech can integrate the Soloist into a complete motion system, removing the burden of parameter setup and axis tuning.

Practical Power

Each series is capable of driving a wide range of motors including brushless, DC servo, and microsteppers. Brushless motors are sinusoidally commutated to minimize torque ripple.

Using a digital servo loop with feedforward, the Soloist tightly tracks velocity and position trajectories with virtually zero error. On-board autotuning and built-in calculators make servo tuning simple.

Variables, Math and More

With variables and math capability, one program can be used to produce a variety of parts by simply prompting the user for new application data.

Application Versatility

The Soloist has other built-in features such as axis calibration and backlash compensation, so you can maximize your machine's accuracy and precision. The "user units" feature makes it easy to customize the Soloist to your specific machine, allowing custom units for both linear and rotary applications.

The controller is equipped with dual encoder inputs, so you can tackle master-slave applications or achieve higher accuracies with dual-loop control. Precise registration-based moves are also possible because of the fast 0.1 microsecond acknowledge time of the Soloist. The Soloist easily handles complex functions such as output-on-the-fly and velocity profiling.

Soloist Series COMPARISON



Soloist HLe
Width: 206.9 mm
Height: 234.3 mm



Soloist CL
Width: 103.7 mm
Height: 265.2 mm



Soloist ML
Width: 41.1 mm
Height: 141.2 mm

Soloist Comparison Chart	Soloist HLe	Soloist CL	Soloist ML
PC Interface	Ethernet TCP/IP or USB	Ethernet TCP/IP or USB	Ethernet TCP/IP
Current Output, Peak ⁽¹⁾	10-20 A ⁽²⁾	10 A ⁽²⁾	10 A ⁽²⁾
Current Output, Continuous ⁽¹⁾	5-10 A ⁽²⁾	5 A ⁽²⁾	5 A ⁽²⁾
Bus Voltage	±40-80 VDC ⁽³⁾	±40 VDC ⁽³⁾	±40 VDC ⁽³⁾
Amplifier Type	Linear	Linear	Linear
Motor Supply Voltage	2 Phase AC	2 Phase AC ⁽⁴⁾	DC
Standard I/O ⁽⁵⁾	4-DO/6-DI 1-AO/1-AI	4-DO/6-DI 1-AO/1-AI	1-AI
Expansion I/O ⁽⁵⁾ (Additional to Base I/O)	16-DO/16-DI 3-AO/3-AI	16-DO/16-DI 1-AO/1-AI	8-DO/8-DI 1-AO/1-AI
Single Axis PSO ⁽⁶⁾	Yes	Yes	Yes
Dual Axis PSO ⁽⁶⁾	Yes	No	No
Triple Axis PSO ⁽⁶⁾	Yes	No	No
Ethernet Capable for Third-Party I/O	Yes	No	No

Notes:

1. Peak value of the sine wave; rms current for AC motors is $0.707 * A_{pk}$.
2. Load dependent.
3. Output voltage is load dependent.
4. External transformer required.
5. DO = Digital Output; DI = Digital Input; AO = Analog Output; AI = Analog Input.
6. PSO not available on Soloist CL/ML when using integral MXU.

Soloist HLe SPECIFICATIONS

Soloist HLe	Units	10-40	20-40	10-80
Motor Style		Brush, Brushless, Stepper, Voice Coil		
Motor Supply	VAC	115/230; 50/60 Hz; Factory Configured		
Control Supply ⁽¹⁾	VAC	85-240; 50/60 Hz		
Bus Voltage ⁽²⁾	VDC	±40	±40	±80
Peak Output Current (1 sec) ^(3,4)	A _{pk}	10	20	10
Continuous Output Current ^(3,4)	A _{pk}	5	10	5
Digital Inputs	—	6 Optically-Isolated (2 High Speed)		
Digital Outputs	—	4 Optically-Isolated		
Analog Inputs	—	One 16-bit Differential; ±10 V		
Analog Outputs	—	One 16-bit Single-Ended		
Dedicated Axis I/O on Feedback Connector		Three Limit Inputs (CW, CCW, Home); Three Hall Effect Inputs (A, B, C); Three High-Speed differential Inputs (sin, cos, mkr for encoder); Motor Over-Temperature Input		
Dedicated I/O on Auxiliary Feedback Connector		sin, cos, mkr for Aux Enc; Aux Enc can be used for PSO Output		
I/O Expansion Board ⁽⁵⁾	—	16/16 Digital Opto-Isolated; 3 Analog In (±10 V, 16-bit Differential); 3 Analog out (±10 V, 16-bit)		
High Speed Data Capture		Yes (50 ns Latency)		
Automatic Brake Control	—	Standard; 24 V @ 1 A		
Emergency Stop Sense Input (ESTOP) ⁽⁶⁾	—	Standard; 24 V Opto-Isolated		
Position Synchronized Output (PSO)	—	Single Axis Standard, Two/Three Axis Optional		
Can Output Multiplied Encoder		Yes		
Can Output Square Wave Encoder		Yes		
Primary Encoder Input Frequency		32 MHz Square Wave Standard; 500 kHz Sine Wave (MXH)		
Secondary Encoder Input Frequency		32 MHz Square Wave		
Encoder Multiplication	—	Up to x65536 with Quadrature Output (MXH)		
Absolute Encoder		Renishaw Resolute BiSS; EnDat 2.1; EnDat 2.2		
Resolver Interface	—	Optional; 1 or 2 Channel; 16-bit		
Internal Shunt Resistor		N/A		
External Shunt		N/A		
Ethernet	—	Optional		
USB		No		
RS-232		Yes		
FireWire		No		
Fieldbus		Modbus TCP; Ethernet/IP		
Current Loop Update Rate	kHz	20		
Servo Loop Update Rate	kHz	10		
Power Amplifier Bandwidth	kHz	Selectable Through Software		
Minimum Load Inductance	mH	0		
Operating Temperature	°C	0 to 50		
Storage Temperature	°C	-30 to 85		
Weight	kg (lb)	10.36 (22.8)		

Notes:

1. "Keep Alive" supply.
2. Output voltage is load dependent.
3. Peak value of the sine wave; rms current for AC motors is $0.707 * A_{pk}$.
4. Load dependent.
5. Requires IO option.
6. Requires external relay to remove motor supply power.

Soloist CL SPECIFICATIONS

Soloist CL	Units	
Motor Style		Brush, Brushless, Stepper, Voice Coil
Motor Supply	VAC	56 (center tapped transformer; two 28 VAC windings); Max
Control Supply ⁽¹⁾	VAC	85-240; 50/60 Hz
Bus Voltage ⁽²⁾	VDC	±40
Peak Output Current (1 sec) ^(3,4)	A _{pk}	10
Continuous Output Current ^(3,4)	A _{pk}	5
Digital Inputs	—	6 Optically-Isolated (2 High Speed)
Digital Outputs	—	4 Optically-Isolated
Analog Inputs	—	One 16-bit Differential; ±10 V
Analog Outputs	—	One 16-bit Single-Ended
Dedicated Axis I/O on Feedback Connector		Three Limit Inputs (CW, CCW, Home); Three Hall Effect Inputs (A, B, C); Three High-Speed differential Inputs (sin, cos, mkr for encoder); Motor Over-Temperature Input
Dedicated I/O on Auxiliary Feedback Connector		sin, cos, mkr for Aux Enc; Aux Enc can be used for PSO Output
I/O Expansion Board ⁽⁵⁾	—	16/16 Digital Opto-Isolated; 1 Analog In (±10 V, 12-bit Differential); 1 Analog Out (±10 V, 12-bit)
High Speed Data Capture		Yes (50 ns Latency)
Automatic Brake Control	—	Optional
Emergency Stop Sense Input (ESTOP) ⁽⁶⁾	—	Standard; 24 V Opto-Isolated
Position Synchronized Output (PSO)	—	Single Axis Only
Can Output Multiplied Encoder		No
Can Output Square Wave Encoder		Yes
Primary Encoder Input Frequency		32 MHz Square Wave Standard; 400 kHz Sine Wave (MXU)
Secondary Encoder Input Frequency		32 MHz Square Wave
Encoder Multiplication	—	Up to x65536 (MXU)
Resolver Interface	—	N/A
Internal Shunt Resistor		N/A
External Shunt		N/A
Ethernet	—	N/A
USB		No
RS-232		Yes
FireWire		No
Fieldbus		Modbus TCP; Ethernet/IP
Current Loop Update Rate	kHz	20
Servo Loop Update Rate	kHz	10
Power Amplifier Bandwidth	kHz	Selectable Through Software
Minimum Load Inductance	mH	0
Operating Temperature	°C	0 to 50
Storage Temperature	°C	-30 to 85
Weight	kg (lb)	3.54 (7.8)

Notes:

1. "Keep Alive" supply.
2. Output voltage is load dependent.
3. Peak value of the sine wave; rms current for AC motors is $0.707 * A_{pk}$.
4. Load dependent.
5. Requires IO option.
6. Requires external relay to remove motor supply power.

Soloist ML SPECIFICATIONS

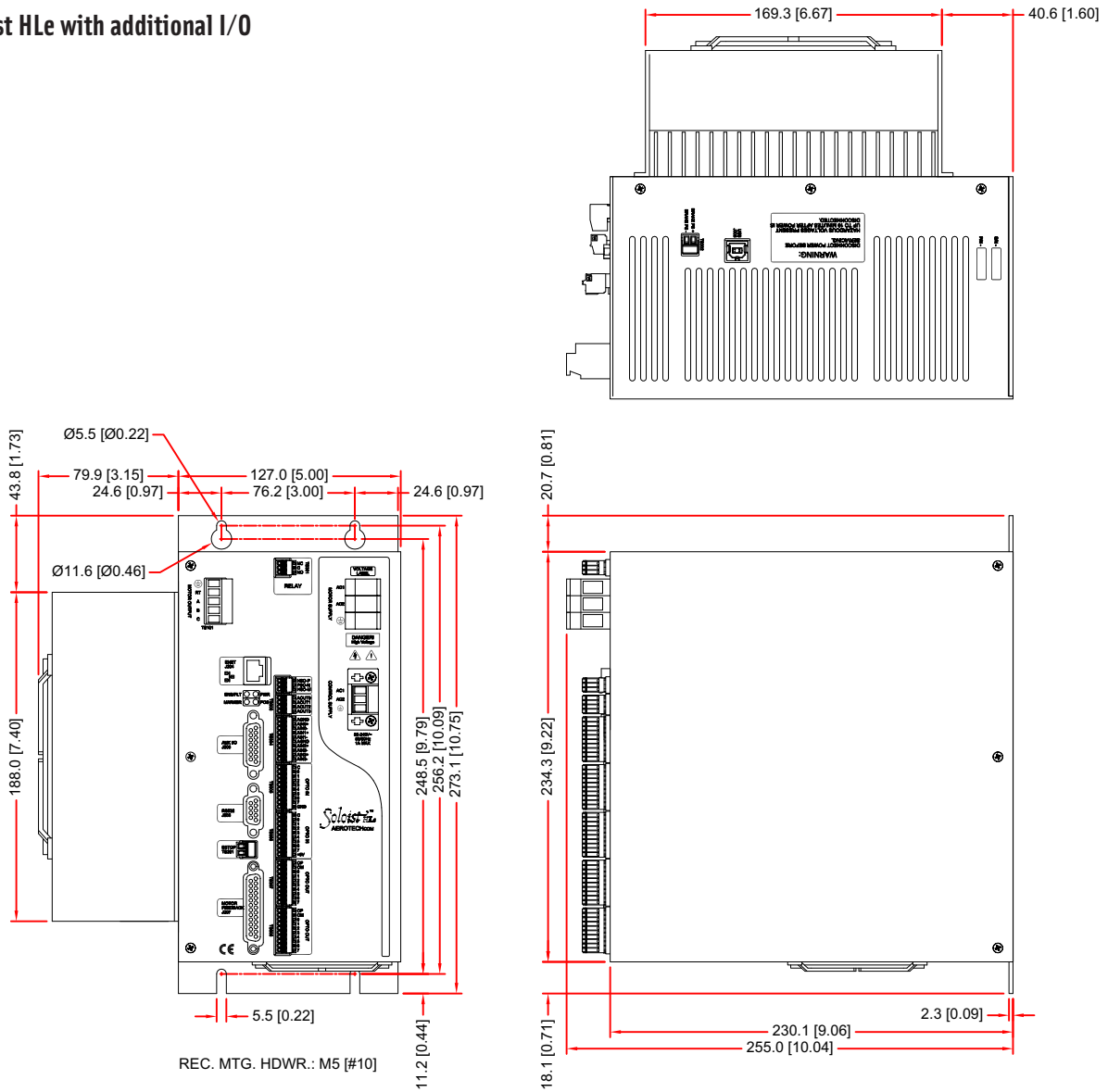
Soloist ML	Units	
Motor Style		Brush, Brushless, Stepper, Voice Coil
Motor Supply	VDC	±40 max
Control Supply ⁽¹⁾	VDC	18-36 VDC
Bus Voltage ⁽²⁾	VDC	±40
Peak Output Current (1 sec) ^(3,4)	A _{pk}	10
Continuous Output Current ^(3,4)	A _{pk}	5
Digital Inputs	—	N/A
Digital Outputs	—	N/A
Analog Inputs	—	One 16-bit Differential; ±10 V
Analog Outputs	—	N/A
Dedicated Axis I/O on Feedback Connector		Three Limit Inputs (CW, CCW, Home); Three Hall Effect Inputs (A, B, C); Three High-Speed differential Inputs (sin, cos, mkr for encoder); Motor Over-Temperature Input
Dedicated I/O on Auxiliary Feedback Connector		sin, cos, mkr for Aux Enc; Aux Enc can be used for PSO Output
I/O Expansion Board ⁽⁵⁾	—	8/8 Digital Opto-Isolated; 1 Analog In (±10 V, 16-bit Differential); 1 Analog Out (±5 V, 16-bit)
High Speed Data Capture		Yes (50 ns Latency)
Automatic Brake Control	—	Optional
Emergency Stop Sense Input (ESTOP) ⁽⁶⁾	—	Standard; 24 V Opto-Isolated
Position Synchronized Output (PSO)	—	Single Axis Only
Can Output Multiplied Encoder		Yes (MXH Only)
Can Output Square Wave Encoder		Yes
Primary Encoder Input Frequency		32 MHz Square Wave Standard; 2 MHz Sine Wave (MXU or MXH)
Secondary Encoder Input Frequency		32 MHz Square Wave
Encoder Multiplication	—	Up to x4096 (MXU); Up to x65536 with Quadrature Output (MXH)
Resolver Interface	—	N/A
Internal Shunt Resistor		N/A
External Shunt		N/A
Ethernet	—	N/A
USB		No
RS-232		Yes
FireWire		No
Fieldbus		Modbus TCP; Ethernet/IP
Current Loop Update Rate	kHz	20
Servo Loop Update Rate	kHz	10
Power Amplifier Bandwidth	kHz	Selectable Through Software
Minimum Load Inductance	mH	0
Operating Temperature	°C	0 to 50
Storage Temperature	°C	-30 to 85
Weight	kg (lb)	0.45 (1.0)

Notes:

1. "Keep Alive" supply.
2. Output voltage is load dependent.
3. Peak value of the sine wave; rms current for AC motors is $0.707 * A_{pk}$.
4. Load dependent.
5. Requires IO option.
6. Requires external relay to remove motor supply power.

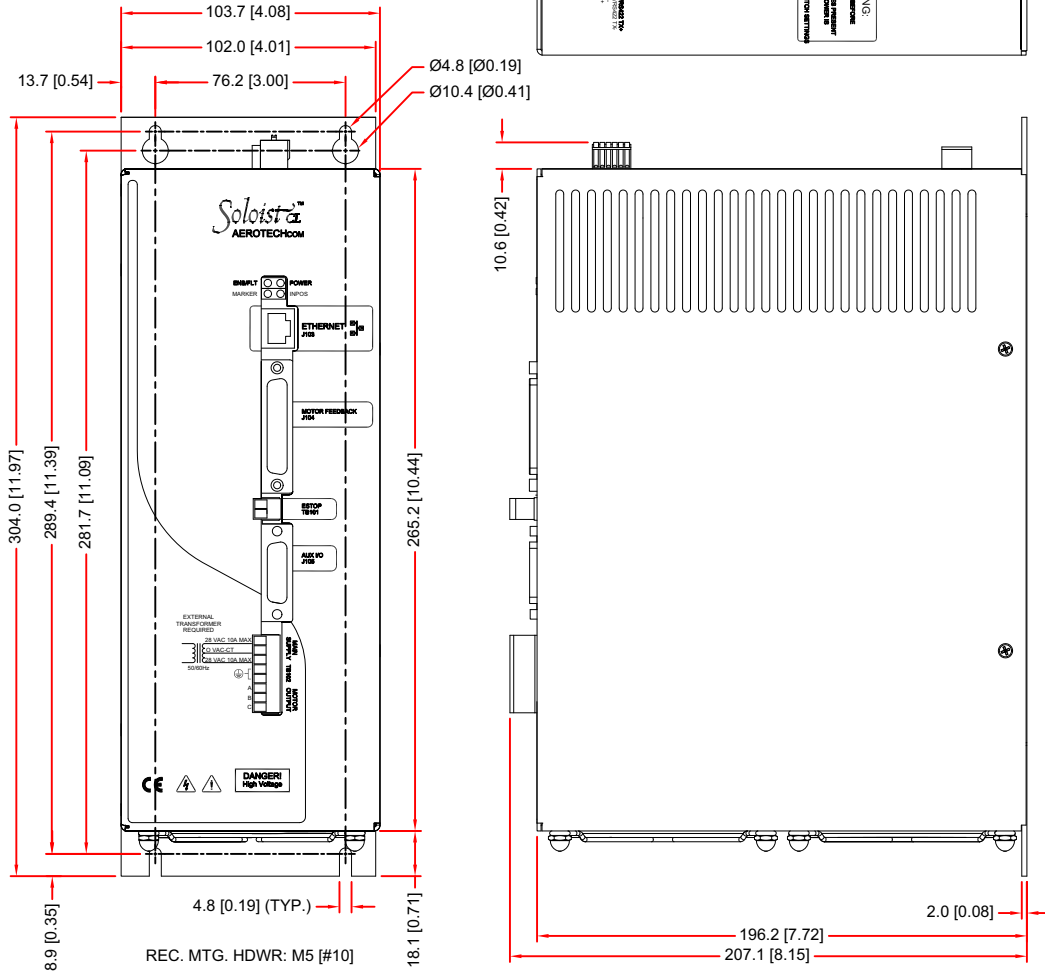
Soloist HLe DIMENSIONS

Soloist HLe with additional I/O



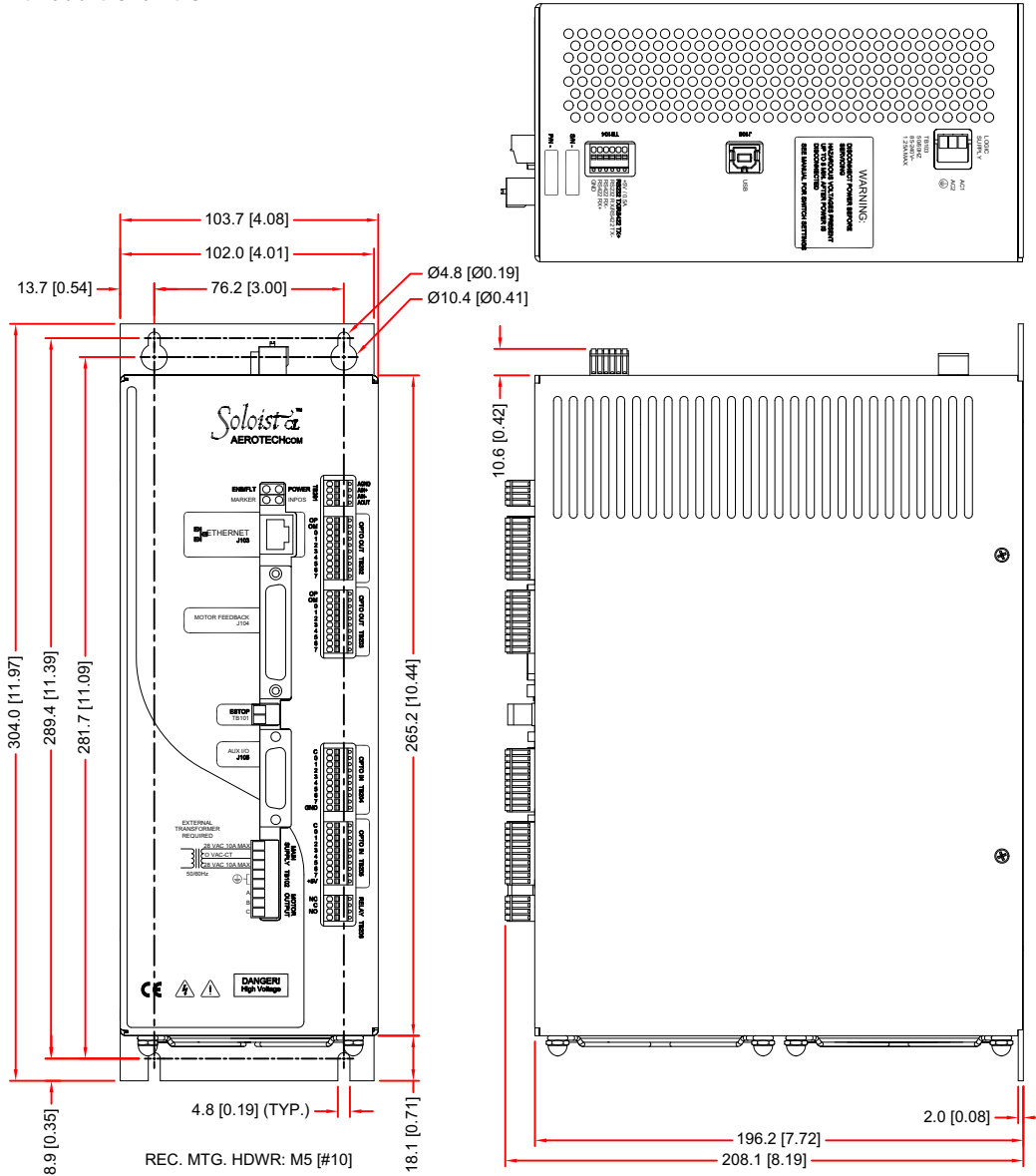
Soloist CL DIMENSIONS

Soloist CL



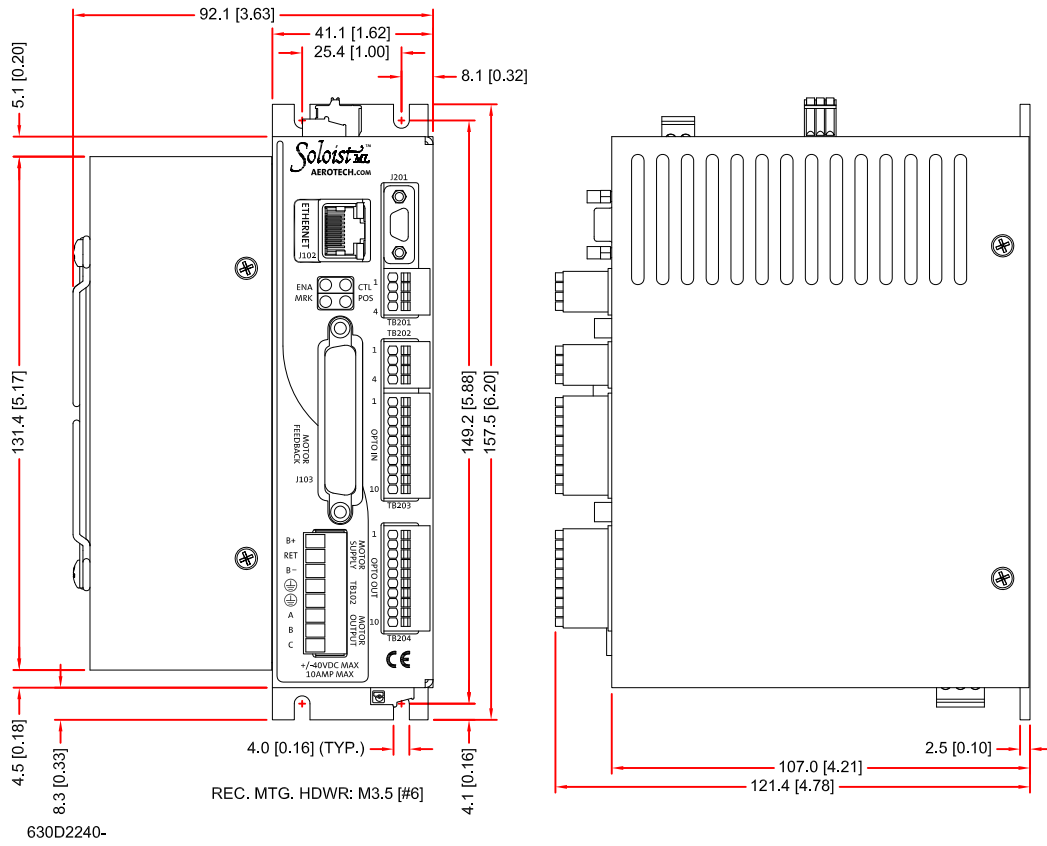
Soloist CL DIMENSIONS

Soloist CL with additional I/O



Soloist ML DIMENSIONS

Soloist ML with additional I/O
 (Dimensions without optional I/O are identical)



Soloist ORDERING INFORMATION

Ordering Example

Soloist HLe	20-40-X	-ENET	RDP1-10K
Base	Output Current	Control Option	Resolver Options
Soloist HLe	10-40-X 20-40-X 10-80-X	-IO -DUALPSO -TRIPLEPSO -PSOPTO2 -PSOPTO3 -PSOPTO4 -PSOAH -MXH -ENET	RDP1-10K RDP1-7.5K RDP1-5K RDP2-10K RDP2-7.5K RDP2-5K
Soloist CL	10-40	-IO -MXU	
Soloist ML	10-40	-IO -MXU -MXH	

Ordering Example

SOLOIST-MC	-MACHINE	-DYNAMIC CONTROLS TOOLBOX	-MOTION DESIGNER	-MAINTENANCE-1-0
Software	License	Controller Options	Motion Composer (MC) Options	Maintenance
SOLOIST-MC	-MACHINE -DEVELOPER	-DYNAMIC CONTROLS TOOLBOX -ENHANCED THROUGHPUT MODULE -ENHANCED TRACKING CONTROL -VERSION	-MOTION DESIGNER -LABVIEW	-MAINTENANCE-y-mm

Soloist HLe Single-Axis Controller

SOLOIST HLe10-40-x	10 A peak, 5 A continuous, ± 40 VDC bus, auxiliary 115/230 VAC input to power logic circuitry; supports brushless, brush, and stepper motors; includes 4 opto-isolated digital inputs (sinking or sourcing), 2 high speed inputs, 4 opto-isolated digital outputs (sinking only), 1 16-bit analog output, 1 16-bit differential analog input, single-axis PSO capability, 2 quadrature encoder input channels, ESTOP sense input
SOLOIST HLe20-40-x	20 A peak, 10 A continuous, ± 40 VDC bus, auxiliary 115/230 VAC input to power logic circuitry; supports brushless, brush, and stepper motors; includes 4 opto-isolated digital inputs (sinking or sourcing), 2 high speed inputs, 4 opto-isolated digital outputs (sinking only), 1 16-bit analog output, 1 16-bit differential analog input, single-axis PSO capability, 2 quadrature encoder input channels, ESTOP sense input
SOLOIST HLe10-80-x	10 A peak, 5 A continuous, ± 80 VDC bus, auxiliary 115/230 VAC input to power logic circuitry; supports brushless, brush, and stepper motors; includes 4 opto-isolated digital inputs (sinking or sourcing), 2 high speed inputs, 4 opto-isolated digital outputs (sinking only), 1 16-bit analog output, 1 16-bit differential analog input, single-axis PSO capability, 2 quadrature encoder input channels, ESTOP sense input

SOLOIST HLe I/O Options

-I/O	Expansion board with 16 opto-isolated inputs (sinking or sourcing) and 16 outputs (sinking or sourcing), 3 16-bit differential analog inputs, 3 16-bit analog outputs, 2 SSI Net, absolute encoder interface, and 1 mechanical brake relay
-MXH	Programmable encoder multiplier up to x16384 (x65536 after quadrature), supports single-/dual-axis PSO and real-time encoder quadrature output
-ETHERNET/IP	ODVA certified EtherNet/IP™ module provides full integration with Allen Bradley PLC and programmable from RSLogix™; module has two APIs – ASCII and Register-to-Register

SOLOIST HLe Control Options

-PSOPTO2	Opto-isolator for PSO; requires IOx option (<+15 V, high speed, low current, 6N136)
-PSOPTO3	Opto-isolator for PSO; requires IOx option (<+30 V, low speed, high current, 4N33)
-PSOPTO4	Opto-isolator for PSO; requires IOx option (TIL117-M, 40 kHz, 5-25 VDC, 50 mA)
-PSOAH	Active-high PSO output

Soloist ORDERING INFORMATION

SOLOIST HLe Resolver Options

-RDP1-10K	Soloist 1 channel resolver to digital feedback card with dynamic resolution switching capability; 10 kHz carrier frequency
-RDP1-7.5K	Soloist 1 channel resolver to digital feedback card with dynamic resolution switching capability; 7.5 kHz carrier frequency
-RDP1-5K	Soloist 1 channel resolver to digital feedback card with dynamic resolution switching capability; 5 kHz carrier frequency
-RDP2-10K	Soloist 2 channel resolver to digital feedback card with dynamic resolution switching capability; 10 kHz carrier frequency
-RDP2-7.5K	Soloist 2 channel resolver to digital feedback card with dynamic resolution switching capability; 7.5 kHz carrier frequency
-RDP2-5K	Soloist 2 channel resolver to digital feedback card with dynamic resolution switching capability; 5 kHz carrier frequency

SOLOIST HLe Power Stage Options

-S	400 W peak internal shunt resistor network (not valid with SOLOIST HL)
-EXTSHUNT	2-pin connector for external shunt; external shunt not provided (only valid with SOLOIST HPe50/75/100/150)
-FAN-115	115 VAC external cooling fan (only valid with SOLOIST HPe50/75; included on SOLOIST HPe100/150)
-FAN-230	230 VAC external cooling fan (only valid with SOLOIST HPe50/75; included on SOLOIST HPe100/150)
-SOLOIST150-SHARED_BUS	Shares bus to minimize power used by the system

Soloist Software

SOLOIST-MC	<p>Full installation of Soloist controller and selected software components on a new system. Full part number includes software options listed below. Pricing is summation of selected software products. Maintenance (software update) included in price for one year from date of purchase.</p> <p>MOTION COMPOSER STANDARD: Includes the Integrated Development Environment, Scope, System Diagnostics, and System Maintenance; Soloist Motion Composer is intended for deployment on desktop or industrial PCs with a minimum Intel Pentium 4 processor, 512 MB RAM, Windows® XP or Windows® Vista Business (without SPI installed); a full list of PC requirements and recommendations is available at www.aerotech.com. Includes the following software options:</p>
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License

-MACHINE	Provides the ability to write, compile, execute, debug programs in AeroBASIC; full access to .NET 2.0 and C Library; access full diagnostics, fault, and status information; access and set I/O, registers, and variables; collect, analyze, and save data; view files from machine for analysis and record keeping; connect PC to machine through Ethernet TCP/IP or USB; upgrades can be installed (firmware or controller) using Loader; includes Soloist-MC Standard; Note: The price of the first MACHINE license is included in the hardware price. The list price of the MACHINE license is used for multiple license copies and/or computing the Maintenance Price.
-DEVELOPER	Provides the ability to write, compile, execute, debug programs in AeroBASIC; full access to .NET 2.0 and C Library; access full diagnostics, fault, and status information; access and set I/O, registers, and variables; collect, analyze, and save data; view files from machine for analysis and record keeping; connect PC to machine through Ethernet TCP/IP or USB; CANNOT upgrade firmware or controller software; CANNOT simulate trajectory; includes Soloist-MC Standard except loader; Note: System and Control Options are not valid for Developer License

Controller Options

-DYNAMIC CONTROLS TOOLBOX	Includes Harmonic Cancellation
-ENHANCED THROUGHPUT MODULE	Includes setup and monitoring screens of the ETM module; included in the price of the hardware modules sold separately
-ENHANCED TRACKING CONTROL	Enhanced tracking control for reduced dynamic following error and settling times
-VERSION	VERSION X.XX: Previous release of Soloist, where X.XX is the previous release number

Soloist ORDERING INFORMATION

System Options

-ETHERNET/IP	ODVA certified EtherNet/IP™ module provides full integration with Allen Bradley PLC and programmable from RSLogix™. Module has two APIs: ASCII and Register-to-Register
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Motion Composer (MC) Options

-MOTION DESIGNER	The Motion Designer is an add-on software component to the Digital Scope that provides the ability to create, import, run, and evaluate motion profiles (trajectories)
-LABVIEW	Includes LABVIEW 8.2 VI samples

Maintenance

- MAINTENANCE	First year of maintenance is included with the initial purchase; additional years can be purchased
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Accessories

ENET-XOVER-9	0.9 m (3 ft) Ethernet cross-over cable
ENET-XOVER-15	1.5 m (5 ft) Ethernet cross-over cable
ENET-XOVER-30	3 m (9.8 ft) Ethernet cross-over cable
ENET-XOVER-45	4.5 m (14.7 ft) Ethernet cross-over cable
ENET-XOVER-75	7.5 m (24.6 ft) Ethernet cross-over cable
USB-AMBM-18	0.9 m (3 ft) USB cable A-male to B-male
USB-AMBM-30	3.05 m (10 ft) USB cable A-male to B-male
USB-AMBM-45	4.6 m (15 ft) USB cable A-male to B-male
HT	Handheld terminal
JOY	Joystick with 5 ft (1.5 m) cable
JI	Industrial joystick with 1.5 m (5 ft) cable
C19791-30	Joystick extension cable, flying leads, 3 m (10 ft); requires I/O option if used on the SOLOIST MP 10
HWA32-26HD-50	Soloist CP/Soloist MP handwheel with 5 meter cable and 26-pin high-density connector
HWA32-26HD-30	Soloist CP/Soloist MP handwheel with 3 meter cable and 26-pin high-density connector
HWA32-FLY-30	Soloist CP/Soloist MP handwheel with 3 meter cable and flying leads
C20931-5	Soloist MP Micro 9-pin D connector to standard 9-pin D connector; connects to J201 for auxiliary encoder input
C20932-5	Soloist MP Micro 9-pin D connector to standard 25-pin D style connector; connects to J201 for auxiliary encoder input
ECZ01343	Soloist MP Micro 9-pin D connector to flying leads; connects to J201 for auxiliary encoder input