Ensemble[™] HPe/CP/MP

Networked, Panel-Mount Drives – PWM

Network drives through a high-speed serial interface to coordinate up to ten axes of motion

Coordinate motion using up to five independent tasks

Drive and control linear or rotary brushless, DC brush servo, and micro-stepping motors

Command various motion types including: pointto-point, linear and circular interpolation, electronic gearing, and velocity profiling

Program in AeroBasic[™], Microsoft .NET (C[#], VB.NET, C, and C++/CLI), LabVIEW[®], and MATLAB[®]

Remotely command drives over Ethernet, USB, or RS-232 with an ASCII interface available for both Windows[®] and non-Windows[®] programs (including Linux)

Diagnose, tune, and program through an advanced Windows-based interface

CE approved and NRTL safety certification; follows the 2011/65/EU RoHS 2 Directive

Fully compatible with EPICS set of software tools and applications, making Ensemble ideal for use in synchrotron and general laboratory facilities

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



Ensemble HPe

Ensemble CP

Ensemble MP

The Ensemble[™] is Aerotech's next-generation, multi-axis controller for moderate- to high-performance applications. Versatility, power, and affordability make the Ensemble ideal for applications from basic laboratory experimentation and general-purpose positioning to advanced OEM systems.

Versatile, Flexible, Stand-Alone Multi-Axis Control

Network multiple Ensemble HPe/CP/MP combination controllers/drives for up to ten axes of coordinated motion, and seamlessly mix and match amplifiers (PWM) and motor types (brush, brushless, and stepper) within the same positioning system using a common programming and control platform. High-accuracy linear motor air-bearing stages can be controlled along with lower precision stages with servo or stepper motors. Each controller/drive can be reconfigured to accept different motors and feedback devices, allowing customers to adapt to changing system needs. Optional on-board encoder interpolation provides programmable axis resolution, including the ability to change interpolation (multiplication) values through software.

Powerful and Intuitive Programming

Monitor and control all aspects of the positioning system, no matter how complex, through the Ensemble GUI Integrated Development Environment software. An Autotuning utility minimizes startup time by allowing easy optimization of motion axes. Functional programs that can be modified and

Ensemble HPe/CP/MP DESCRIPTION

used in customer applications are included in the online Help. Pre-coded LabVIEW[®] VIs, AeroBasic[™] programming functionality, MATLAB[®] library, .NET tools for C#, VB.NET, and C++/CLI or C make the Ensemble even easier to use. See the **Ensemble Control** home page for detailed information on software capabilities and ordering options.

Advanced DSP Control

The processing power of a 225 MHz double precision, floating-point DSP supplies exceptional performance in a variety of applications including point-to-point motion, linear and circular interpolation, multi-axis error correction, 2D error mapping, direct commutation of linear and rotary brushless servomotors, and on-board servo autotuning. High-speed interrupts and data logging capabilities provide a real-time link to external systems. The Ensemble HPe/ CP/MP controller/drive combination also offers high-speed position latching capability and single-, dual-, or triple-axis PSO (Position Synchronized Output), depending on model. Whether the requirement is simple point-to-point motion or complex velocity-profiled contours with output on the fly, Ensemble ensures peak performance for critical operations.

Enhancing a Legacy of Success

Ensemble carries forward a legacy of success that originated in Aerotech's A3200 and Soloist[™] controllers. Enhanced capabilities make it an obvious choice for aggressive motion control applications. The Ensemble motion control architecture builds upon the Soloist[™] intuitive graphical user interface, while improving multi-axis control through advanced features.

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 Ensemble. 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.

EPICS Drivers

Each Ensemble installation includes full compatibility with the EPICS open source distributed control system. EPICS is used worldwide at leading light source (synchrotron) facilities and other government laboratories, allowing Ensemble to seamlessly integrate into applications at all major research institutions.





Ensemble HPe/CP/MP COMPARISON



Ensemble HPe Width: 99 mm Height: 232.4 mm



Ensemble CP Width: 63.5 mm Height: 198.2 mm



Ensemble MP Width: 41.1 mm Height: 141.2 mm

Ensemble Comparison Chart	Ensemble HPe	Ensemble CP	Ensemble MP	
PC Interface	Ethernet or USB	Ethernet or USB	Ethernet	
Current Output, Peak ⁽¹⁾	10-150 A	10-30 A	10 A	
Current Output, Continuous ⁽¹⁾	5-75 A	5-10 A	5 A	
Bus Voltage	±10-320 VDC	±10-320 VDC	±40 VDC	
Amplifier Type	PWM	PWM	PWM	
Motor Supply Voltage	2 or 3 Phase AC	2 Phase AC	DC	
Standard I/O ⁽²⁾	4-DO/6-DI 1-AO/1-AI	4-DO/6-DI 1-AO/1-A	1-Al	
Expansion I/O ⁽²⁾ (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 ⁽³⁾	Yes	Yes	Yes	
Dual Axis PSO ⁽³⁾	Yes	No	No	
Triple Axis PSO ⁽³⁾	Yes	No	No	
Ethernet Capable for Third-Party I/O	Yes	Yes	Yes	

- Note: 1. Peak value of the sine wave; rms current for AC motors is 0.707 * Apk. 2. DO = Digital Output; DI = Digital Input; AO = Analog Output; AI = Analog Input 3. PSO not available on Ensemble CP/MP when using integral MXU.

Ensemble HPe SPECIFICATIONS

Ensemble HPe	Units	10	20	30	50	75	100	150	200
Motor Style		Brush, Brushless, Stepper ⁽¹⁾							
Motor Supply	VAC	Single-Phase 7-240 V; 50/60 Hz Single- or Three-Phase 115 or 230 V; 50/60 Hz				60 Hz			
Control Supply ⁽²⁾	VAC	85-240 VAC; 50/60 Hz							
Bus Voltage ⁽³⁾	VDC	10-320(3)							
Peak Output Current (1 sec) ⁽⁴⁾	Apt	10	20	30	50	75	100	150	200
Continuous Output Current ⁽⁴⁾	An	5	10	10	25	37	50	75	75
Digital Inputs	—			6 Opt	tically-Isolate	ed (2 High S	peed)		
Digital Outputs		4 Optically-Isolated							
Analog Inputs				Or	ne 16-bit Diff	erential; ±10	V		
Analog Outputs		One 16-bit Single-Ended; ±10 V							
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					gh-Speed ut		
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					0 V, 16-bit)		
High Speed Data Capture					Yes (50 n	s Latency)			
Automatic Brake Control	—	Standard; 24 V at 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		500 kHz Amplified Sine Wave Standard (for onboard multiplier); 40 MHz TTL Square Wave							
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		40 W Continuous;440 W Continuous400 W Peak (5 seconds)440 W Continuous							
External Shunt		Optional							
Ethernet	—	Yes							
USB		Yes							
RS-232		Yes							
FireWire		No							
Fieldbus		Modbus TCP; Ethernet/IP							
Current Loop Update Rate	kHz	20							
Servo Loop Update Rate	kHz	1 to 20							
Power Amplifier Bandwidth	kHz	Selectable Through Software							
Minimum Load Inductance	mH	0.1 @ 160 VDC (1.0 mH @ 320 VDC)							
Operating Temperature	°C	0 to 50							
Storage Temperature	°C	-30 to 85							
Weight	kg (lb)	2.36 (5.2) 6.64 (14.6) 11.06 (24.4)			(24.4)				
Standards			CE approve	ed, NRTL sa	fety certifica	tion, EU 201	5/863 RoHS	3 directive	

Notes: 1. For stepper motors only, one-half of bus voltage is applied across the motor (e.g., 80 VDC supply results in 40 VDC across stepper motor). 2. "Keep Alive" supply. 3. Output voltage dependent upon input voltage. 4. Peak value of the sine wave; rms current for AC motors is 0.707 * A_µ. 5. Requires IO option. 6. Requires external relay to remove motor supply power.

Ensemble CP SPECIFICATIONS

Ensemble CP	Units	10	20	30
Motor Style		Brush, Brushless, Stepper ⁽¹⁾		
Motor Supply	VAC	Single-Phase 7-240 VAC; 50/60 Hz		
Control Supply ⁽²⁾	VAC	85-240 VAC; 50/60 Hz		
Bus Voltage ⁽³⁾	VDC	20-340(3)		
Peak Output Current (1 sec) ⁽⁴⁾	A*	10 10		30
Continuous Output Current ⁽⁴⁾	A	5	10	10
Digital Inputs	—	6	Optically-Isolated (2 High Spee	d)
Digital Outputs		4 Optically-Isolated		
Analog Inputs		One 16-bit Differential; ±10 V		
Analog Outputs	—	One 16-bit Single-Ended; ±10 V		
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 A	Analog In (±10 V, 12-bit Different	ial); 1 Analog Out (±10 V, 16-bit)
High Speed Data Capture			Yes (50 ns Latency)	
Automatic Brake Control	—	Standard; 24 V at 1 A		
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		200 kHz Amplified Sine Wave Standard (for onboard multiplier); 40 MHz TTL Square Wave		
Secondary Encoder Input Frequency		32 MHz Square Wave		
Encoder Multiplication	—	Up to x4096 (MXU)		
Absolute Encoder		Renishaw Resolute BiSS, EnDat 2.1, EnDat 2.2		
Resolver Interface	—	N/A		
Internal Shunt Resistor		40 W Continuous; 400 W Peak (5 seconds)		
External Shunt		Optional		
Ethernet	—	Yes		
USB		Yes		
RS-232		Yes		
FireWire		No		
Fieldbus		Modbus TCP; Ethernet/IP		
Current Loop Update Rate	kHz	20		
Servo Loop Update Rate	kHz	1 to 20		
Power Amplifier Bandwidth	kHz	Selectable Through Software		
Minimum Load Inductance	mH	0.1 @ 160 VDC (1.0 mH @ 320 VDC)		
Operating Temperature	°C	0 to 50		
Storage Temperature	°C		-30 to 85	
Weight	kg (lb)	1.6 (3.6)		
Standards		CE approved, NRT	L safety certification, EU 2015/8	63 RoHS 3 directive

Notes: 1. For stepper motors only, one-half of bus voltage is applied across the motor (e.g., 80 VDC supply results in 40 VDC across stepper motor). 2. "Keep Alive" supply. 3. Output voltage dependent upon input voltage. 4. Peak value of the sine wave; rms current for AC motors is 0.707 * A_s. 5. Requires IO option. 6. Requires external relay to remove motor supply power.

Ensemble MP SPECIFICATIONS

Ensemble MP	Units		
Motor Style	ĺ	Brush, Brushless, Stepper ⁽¹⁾	
Motor Supply	VDC	10-80	
Control Supply ⁽²⁾	VDC	24-80	
Bus Voltage ⁽³⁾	VDC	10-80	
Peak Output Current (1 sec) ⁽⁴⁾	A*	10	
Continuous Output Current ⁽⁴⁾	A*	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		N/A	
I/O Expansion Board ⁽⁵⁾	_	8/8 Digital Opto-Isolated; 1 Analog In (±10 V, 12-bit Differential); 1 Analog Out (±5 V, 16-bit); sin, cos, mkr for Aux Enc; Aux Enc can be used for PSO Output	
High Speed Data Capture		Yes (50 ns Latency)	
Automatic Brake Control	_	Optional ⁽⁶⁾	
Emergency Stop Sense Input (ESTOP) ⁽⁶⁾	-	Standard; 24 V Opto-Isolated	
Position Synchronized Output (PSO)	—	Optional ⁽⁵⁾	
Can Output Multiplied Encoder		No	
Can Output Square Wave Encoder		Yes	
Primary Encoder Input Frequency		200 kHz Amplified Sine Wave Standard (for onboard multiplier); 40 MHz TTL Square Wave	
Secondary Encoder Input Frequency		32 MHz Square Wave	
Encoder Multiplication	—	Up to x4096 (MXU)	
Resolver Interface	—	N/A	
Internal Shunt Resistor		N/A	
External Shunt		N/A	
Ethernet	—	Yes	
USB		No	
RS-232		Yes	
FireWire		No	
Fieldbus		Modbus TCP; Ethernet/IP	
Current Loop Update Rate	kHz	20	
Servo Loop Update Rate	kHz	1 to 20	
Power Amplifier Bandwidth	kHz	Selectable Through Software	
Minimum Load Inductance	mH	0.1 @ 80 VDC	
Operating Temperature	°C	0 to 50	
Storage Temperature	°C	-30 to 85	
Weight	kg (lb)	0.45 (1.0)	
Standards		CE approved, NRTL safety certification, EU 2015/863 RoHS 3 directive	

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6. Requires external relay to remove motor supply power.

Ensemble HPe DIMENSIONS



Ensemble HPe DIMENSIONS



Ensemble CP DIMENSIONS

Ensemble CP



Ensemble CP DIMENSIONS



Ensemble MP DIMENSIONS



Ensemble MP DIMENSIONS



Ensemble Ordering Information

Visit Aerotech's website for complete ordering information.