Intelligent Software-Based Motion Controller

Automation1 iSMC

Get Moving Faster

The Automation1 Software-Based Machine Controller (iSMC) tightly integrates precision motion with process control. Whether you're programming a simple move, building a complete machine or doing something in between, the Automation1 iSMC delivers high-quality automation and improved throughput.

Because the iSMC integrates with our user-friendly Automation1 Motion Development Kit, you'll quickly configure and develop your application.

Capable of running a PC-based or drive-based hardware platform, the iSMC allows you flexibility in deploying a wide variety of motion control solutions.

Automation1

The iSMC is a part of the user-friendly Automation1 motion control platform, which includes the following:

- **Development Software**
- **Controls**
- **Motor Drives**
- **Fiber-Optic HyperWire® Communication Bus**

KEY FEATURES:

- Deploy powerful machine & motion control to either a **PC-BASED OR DRIVE-BASED** hardware platform with the same Automation1 Motion Development Kit (MDK)
- Connects to servo motor drives, galvo scan head controllers & more over our **HYPERWIRE® FIBER-OPTIC MOTION BUS**
- Programmable via modern **AEROSCRIPT PROGRAMMING LANGUAGE** or several controller APIs
- Enjoy **COMPLEX MOTION CONTROL MADE EASY** with a wide array of standard features & development tools

AUTOMATION1 iSMC SPECIFICATIONS

SPECIFICATION	AUTOMATION1 PC-BASED CONTROLLER	AUTOMATION1 DRIVE-BASED CONTROLLER
Programmable Coordinated Motion Trajectories	32 Axes	12 Axes
Programming Tasks	4 User Tasks (Std). 31 User Tasks (Opt.) 1 Reserved task	4 User Tasks (Std). 9 User Tasks (Opt.) 1 Reserved task
Communication/ Configuration Connection	Local PC Ethernet	Ethernet USB
Controller File System	Yes, memory depends upon PC.	Yes, 5 GB
Position Modes	Absolute, incremental, dynamic trajectory correction	
RS-274 G-Code Support	Automation1 includes RS-274 standard G-code motion, including linear, circular, helical and spherical interpolation; cutter radius compensation; normalcy; parts rotation; mirroring; path retrace; polar transformations and cylindrical transformations; and scaling.	
Coordinated Motion Types	**Coordinated Synchronous Motion** Coordinated motion refers to moves that follow a well-defined path in space. Coordinated moves start and stop axes at the same time. They can execute in velocity profiling mode. • Linear motion • Clockwise and counterclockwise	
Independent Motion Types	**Non-Coordinated Synchronous Motion** Non-coordinated motion refers to moves in which axes start at the same time but do not necessarily end at the same time. Each axis moves at its own velocity specified in the command or by axis parameters. Program execution does not continue to the next line until all axes in the move command have completed motion. **Homing** Multiple procedures are available to establish the home position of an axis: • Home past limit switch to home marker • Home to limit switch and reverse to home marker • Home to home marker • Home to limit switch • Home at current position and set to zero • Home at current position and set to nonzero • Home at current position and set to absolute position **MoveRapid Command** Generates single or multi-axis point-to-point motion **Asynchronous Motion** Asynchronous motion commands cause program execution to continue on to the next program block immediately after the move starts. The controller does not wait for the move to end before continuing to the next command. • Home an axis without waiting for completion • Free run an axis at the specified velocity • Move to an absolute position • Move incrementally • Move an axis out of a limit condition • Move an axis into a limit condition	

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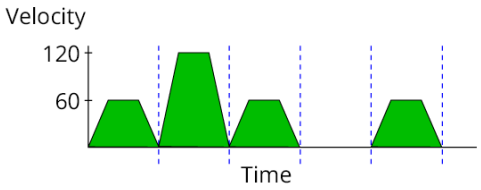
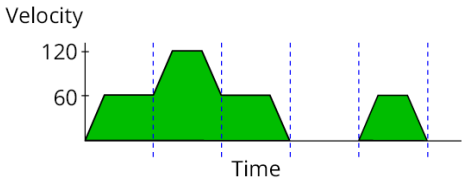
SPECIFICATION	AUTOMATION1 PC-BASED CONTROLLER	AUTOMATION1 DRIVE-BASED CONTROLLER
Point-by-Point Motion Types	**Time-point (PT) and Vectoral Time-Point Motion (PVT)** MovePT and MovePVT commands do not behave like the other synchronous or asynchronous motion commands. After these command are processed, the program immediately executes the next line in the program, much like an asynchronous motion command. However, unlike an asynchronous motion command, these motion commands are buffered and executed one after another. If a stream of MovePT or MovePT commands is executed sequentially, it is possible to fill this buffer. If the buffer is full, subsequent MovePT or MovePVT commands wait on the line until buffer space becomes available. MovePT and MovePVT commands normally blocks the task.	
Acceleration Profiles	**Acceleration Types** • Linear-constant acceleration applied, resulting in linear velocity profile • Sine (sinusoidal half-sine)-parabolic acceleration applied, resulting in a sine wave velocity profile • S-curve-trapezoidal acceleration applied, resulting in an “s-curve” velocity profile **Acceleration Modes** • Time based - axis acceleration takes place over a specified time • Rate based - axis acceleration takes place at a specified rate	
Velocity Profiling	Blend multiple, coordinated motion commands into one continuous motion path. In velocity profiling mode, the controller does not decelerate to zero between consecutive, coordinated moves. Velocity can be changed during the move sequence. The axes will increase or decrease in speed in a coordinated way to maintain the programming path.  *Without velocity profiling*  *With velocity profiling*	
Lookahead Mode	**Lookahead Synchronization** For some advanced motion features, the controller must execute the program before it causes the motion so that it can precalculate the moves and speeds. This operation is called lookahead. These advanced motion features make lookahead active: • Velocity Blending • Cutter Radius Compensation • Corner Rounding **Function Synchronization During Lookahead** Some AeroScript functions are always synchronized to motion. These functions are synchronized when lookahead is active or not active. Many other functions that are not natively synchronized with motion can be made to be synchronized with motion, even when lookahead mode is enabled.	
Advanced Features	• Camming Motion • Corner rounding • Tool normalcy control • Cutter compensation • Programmable fixture offsets • Part profile rotation • Part profile scaling • Polar & cylindrical transformations	• Orthogonality correction • Electronic gearing • EasyTune® & classical tuning • Backlash compensation • Spindle motion • High-speed registration • Multi-dimensional error mapping

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AUTOMATION1 iSMC SPECIFICATIONS

SPECIFICATION	AUTOMATION1 PC-BASED CONTROLLER	AUTOMATION1 DRIVE-BASED CONTROLLER
Access Control	Control who can connect to the Automation1 controller. Access Control utilizes Windows groups and users, including the active directory, to quickly deploy added security to your system.	Not available.
Controller Files	The Automation1 Controller has a local file system. Part programs, program automation files, calibration files and more are stored locally on the controller and managed via the Studio application.	
Safe Zones	The Safe Zone feature is a protective mechanism that safely decelerates axes before they move through user-defined boundaries. You can specify these boundaries on two or more axes to make a "safe zone", which can be visualized as an n-dimensional space. • Typical dimensions: 1, 2 or 3 • Maximum dimension: 32 • Maximum number of safe zones: 32 • Boundary action: When motion approaches the boundary of an area that is not permitted, the motion decelerates smoothly and stops one count before it reaches the boundary.	
Controller Programming	• AeroScript • RS-274 G-code	
APIs	• .NET • C • EPICS	
Motion Bus	HyperWire	
Supported HyperWire Drives	**Servo Motor Drives** Automation1-XC6e Automation1-XC4e Automation1-XC2e Automation1-XC4 Automation1-XC2 Automation1-XR3 Automation1-XL5e Automation1-XL2e Automation1-SI4 Automation1-XI4 **Laser Scan Head Drives** Automation1-GL4 Automation1-XL4s Automation1-GI4	**Servo Motor Drives** Automation1-XC6e Automation1-XC4e Automation1-XC2e Automation1-XC4 Automation1-XC2 Automation1-XR3 Automation1-XL5e Automation1-XL2e Automation1-SI4 Automation1-XI4
Supported Trajectory Rates	100 kHz, laser scan head drives 20 kHz, servo motor drives	20 kHz, servo motor drives

License

-L1	Automation1 iSMC installation on a single PC
-L2	Adds a paid option to an existing license* **
-L3	Extends the subscription period for an existing license*
-L4	Increases the number of seats for an existing license*
-L5	Provides hard copy media for an existing license*

**Requires the current License ID.*

***Price is based on the new options added. If a subscription extension is required, an -L3 must be processed first.*

Hardware Platform

-iPC	Controller to be installed on a Windows PC
-iXR3*	Controller to be installed on an Automation1-iXR3
-iXC4e	Controller to be installed on an Automation1-iXC4e
-iXC4	Controller to be installed on an Automation1-iXC4
-iXC2e*	Controller to be installed on an Automation1-iXC2e
-iXC2*	Controller to be installed on an Automation1-iXC2

**Coming soon (not yet available)*

Controller Plus

-CP0	Base controller (four user tasks, one reserved task)
-CP1	Controller plus option (31 user tasks, one reserved task)*

**9 user tasks, one reserved task on drive-based controllers*

HyperWire® Axes

-H00*	No HyperWire axes connectivity (virtual mode)
-H01**	Connect to one HyperWire axis (single axis smart drive)
-H06	Connect up to six HyperWire axes (default)
-H12**	Connect up to 12 HyperWire axes
-H16*	Connect up to 16 HyperWire axes
-H32*	Connect up to 32 HyperWire axes

**Only available with the -iPC hardware platform.*

***Only available for the non iPC (drive-based controller) hardware platforms.*

Contoured Motion

-CM1	Up to four axes of contoured motion
-CM2	Five or more axes of contoured motion (export controlled)

Hexapod Support

-HX0	Does not include hexapod support
-HX1	Contoured motion for hexapods

5-Axis Contouring Support

-FA0	Does not include 5-axis scan head support
-FA1	Contoured motion for 5-axis scan heads

ordering options continued on next page

AUTOMATION1 iSMC ORDERING OPTIONS

Controller Subscription

-S1	One-year subscription to software version upgrades
-S3	Three-year subscription to software version upgrades
-S5	Five-year subscription to software version upgrades
-S0	One-month subscription to software version upgrades

HyperWire Card

-HW0	No HyperWire card
-HW1	HyperWire card included

Installation Medial

-M1	Installation file downloaded from aerotech.com
-M2	Installation file provided on USB and downloadable from aerotech.com
-M3	Installation file provided on CD and downloadable from aerotech.com

Version

-Default	Current version of software
-Legacy	Legacy version of software

HyperWire Card

-HW0	No HyperWire card
-HW1	HyperWire card included

HYPERWIRE COMMUNICATION NETWORK ORDERING OPTIONS

Automation1 Communication Accessories (Automation1-ComAcc)

HyperWire® PCIe	HyperWire interface card, PCIe bus

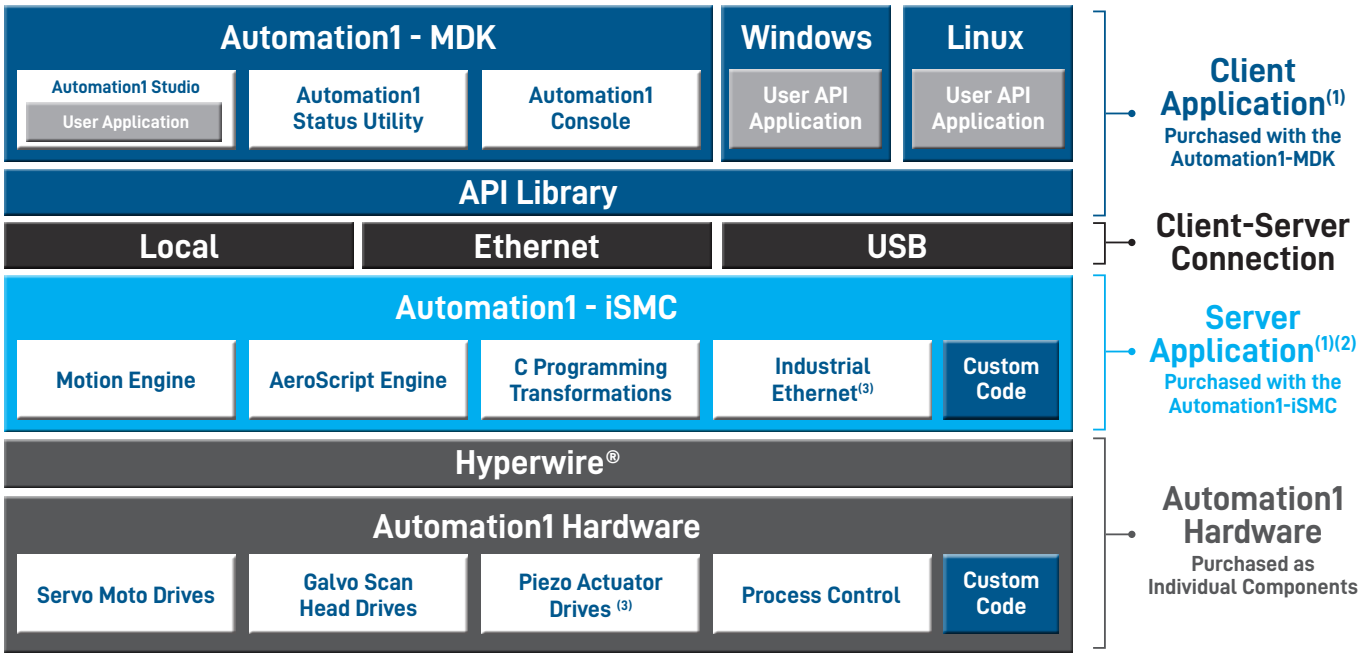
Communication Cables (Cable-Communication)

HyperWire AO10-5	HyperWire cable, AOC, 10G, 5DM
HyperWire AO10-10	HyperWire cable, AOC, 10G, 10DM
HyperWire AO10-30	HyperWire cable, AOC, 10G, 30DM
HyperWire AO10-50	HyperWire cable, AOC, 10G, 50DM
HyperWire AO10-200	HyperWire cable, AOC, 10G, 200DM
USB-AMCM-xx*	USB cable, USB-A male to USB-C male, xx length. (Direct controller connection)
ENET-CAT6-xx**	CAT6 Ethernet cable, xx length

** Standard performance. Used to directly connect to a drive-based controller.*

*** High performance. Used to connect to make a network connection to a PC-based or drive-based controller.*

AUTOMATION1 PLATFORM ARCHITECTURE



1. Automation1 client and server applications can be installed on the same or on different PCs.
2. The Automation1 server application (i.e. the controller) can be installed on a PC-based or a drive-based hardware platform.
3. In development. Not yet available.

The Automation1 MDK includes:

Studio application
Status Utility application
Console application
.NET API DLLs (built on .NET Core)
Help Files

The Automation1 iSMC includes:

The Automation1 iSMC motion engine
The Automation1 iSMC AeroScript engine
The Automation1 iSMC C transformation interface (consult factory)
Industrial Ethernet support (coming soon)

The HyperWire® fiber-optic communication bus and Automation1 hardware devices, including:

Servo motor drives
Galvo scan head drives
Piezo nanopositioner drives (coming soon)
Process control features on each drive
Custom controller and drive firmware code is available (consult factory)