



Soft Servo puts change in motion.

 **SOFT SERVO**

# We provide motion control solutions for the IoT era with confidence.

Soft Servo Systems was founded in 1998 in the suburbs of Boston by a research team from the Massachusetts Institute of Technology. Since then, we have provided high-end motion control solutions at low cost, blending state-of-the-art software and control technology.

Our core technology, "soft motion," is a unique software technology that enables high-speed synchronous and simultaneous control of multiple industrial devices with just one PC. No dedicated hardware nor specialized board is needed. In the control field of the IoT era, PCs are taking over dedicated FA equipment. The industry is moving closer to our vision of "soft motion."

We will continue to innovate in the future, coordinate with top manufacturers all over the world and provide cutting-edge motion control systems globally. This is our mission that remains the same since we founded Soft Servo Systems.

President and CEO  
**Yang, Boo-Ho**



## Profile

B.S. in Applied Mathematics and Physics, Kyoto University. M.S. and Ph.D. in Mechanical Engineering (Robotics), Massachusetts Institute of Technology (MIT). Appointed as a Research Scientist of MIT and was responsible for various research projects including the next generation CNC/motion control technology. Founded Soft Servo Systems, Inc., in 1998 in the United States, based on his research results. Since then, he has established overseas corporations in Japan, Korea and China.

## Corporate Profile

### Corporate Name

Soft Servo Systems, Inc.

### Headquarters

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Tachikawa, Tokyo 190-0022, Japan

Phone +81-(0)42-512-5377

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### President

President and CEO Yang, Boo-Ho

### Founded

April 26, 2006

### Capital

432.4 Million Yen

### Accounting Period

March

### Overseas Group Companies

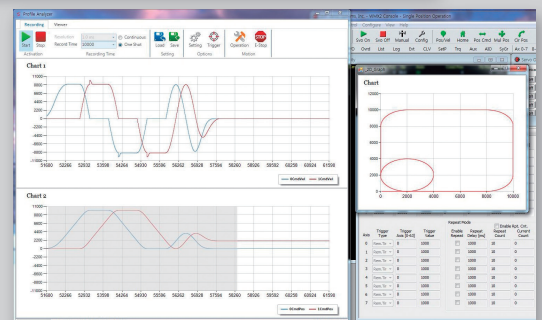
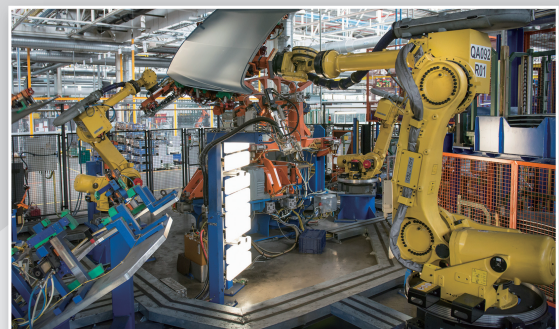
**[United States]** Soft Servo Systems, Inc.  
Boston, MA

**[Korea]** Soft Motions & Robotics Co., Ltd.  
(formerly Soft Servo Korea, Inc.)  
Suwon, Gyeonggi-do

**[China]** Shenzhen Softwin Technology  
Co., Ltd.  
Shenzhen, Guangdong

### URL

<http://www.softservo.co.jp>



Images are for illustrative purposes.

## Motion Controller Success Cases

### Semiconductor Manufacturing Equipment

- Coater/Developer
- Etching Machine
- Flip Chip Bonder
- Die Bonder/ LED Bonder
- Handler
- Wafer Cleaning System

### FPD Manufacturing Equipment

- FPD Exposure Apparatus
- LCD Inspection Equipment

### CNC Machines

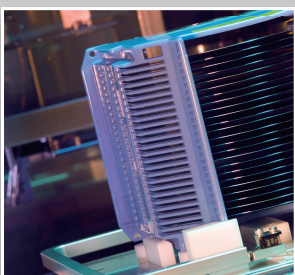
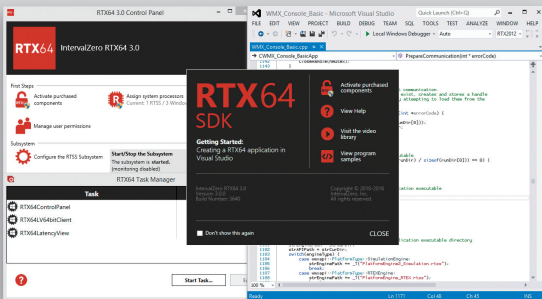
- Machining Center
- Lathe
- Laser Cutting Machine
- Plasma Cutting Machine
- EDM
- Dental Mill
- Stepper Lens Polishing Machine

### Industrial Robots

- Wafer Transfer Robot
- Pipe Bender
- Welding Robot

### Other Industrial Equipments

- Various smartphone related automated equipment
- Various battery related automated equipment



## Company History

**September 1995:** An international research project to develop the next generation CNC equipment and robot control technology was launched at the Massachusetts Institute of Technology (MIT), Department of Mechanical Engineering. Examined the usage of PC and Windows OS as a motion control platform.

**April 1997:** Developed "Soft Motion Technology" that enables high-performance, real-time motion control processing with the CPU of a Windows PC.

**February 1998:** Founded Soft Servo Systems, Inc. (US corporation) in order to commercialize the project.

**August 2001:** Began shipment of CNC products (ServoWorks) to machine tool makers.

**November 2004:** Patented "Soft Motion Technology."

**April 2006:** Moved the headquarters to Japan and founded Soft Servo Systems, Inc. (Japanese corporation) in Hamamatsu City, Shizuoka, to expand business to the Asian market.

**April 2007:** Received a certification of "Small Business Enterprise of the R&D Center of Manufacturing Technology" from the Ministry of Economy, Trade and Industry of Japan.

**June 2007:** Released general motion control products adapting Panasonic's RealtimeExpress (RTEX), Japan's first Ethernet servo network, and Yaskawa's MECHATROLINK. Expanded the number of control axes up to 64.

**March 2008:** Developed an original EtherCAT master stack. Released EtherCAT compatible CNC and motion control products.

**April 2010:** Developed and sold Japan's first EtherCAT slave development board (SH2 based). Adopted by many Japanese servo manufacturers.

**March 2013:** Released "WMX," a high-performance general-purpose motion controller.

**August 2013:** Established a technical alliance with the largest semiconductor manufacturing equipment maker in Korea, SEMES (a member of the Samsung Electronics Group).

**March 2014:** Founded Soft Servo Korea, Inc. in Korea.

**March 2014:** Headquarters moved to Tachikawa, Tokyo.

**April 2015:** Started providing WMX to smartphone manufacturing equipment makers that supply equipment for Apple. Established Shenzhen Softwin Technology Co., Ltd. in Shenzhen, China.

**February 2016:** Released the next generation "WMX2" with enhanced functionality and performance. Added various robot control functions.

# What is "Soft Motion"

"Soft Motion" refers to technology for controlling industrial equipment with specialized software running on a commercially available PC instead of an NC board or a dedicated controller.

## Structure of a conventional motion control system for factory automation



## Structure of a "Soft Motion" system for factory automation



## Advantages of Soft Motion

**Significant cost reduction can be achieved** due to the only required hardware being a commercially available Windows PC. No expensive NC boards or dedicated motion controllers are necessary.

If a PC is used for image processing, then **it is possible to integrate image processing and motion control** for applications such as "visual servoing."

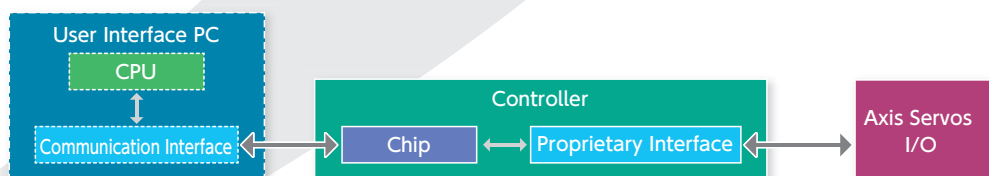
The reduction in the number of hardware components and cables helps save space and **reduce failure rates**.

Because no specialized components are used, maintenance is simplified and **replacement parts are readily obtainable**, even in the long term.

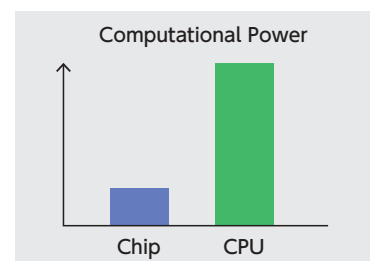
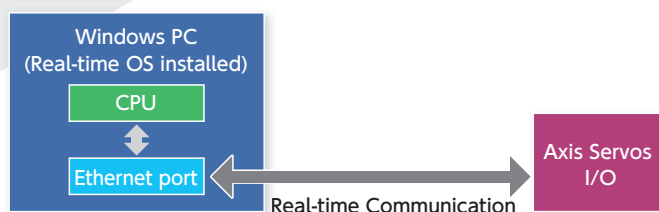
**Development of complex control programs is simplified** by using popular programming languages on Microsoft Visual Studio (or similar IDE).

By utilizing the high computing power of PC CPUs, **motion that is impossible with conventional motion controllers becomes possible**. This includes mathematically complex algorithms and synchronization of a large number of systems (as might be useful for semiconductor manufacturing equipment).

## Conventional Motion Controller



## Soft Motion

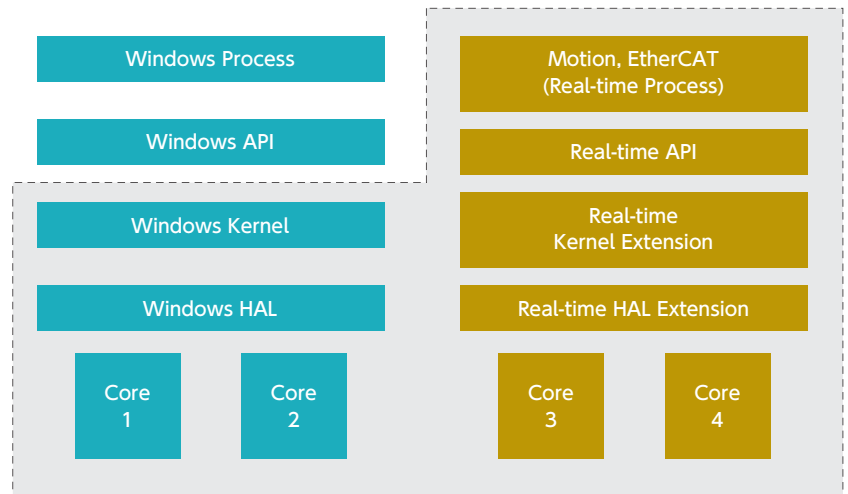


## Is real-time control possible on Windows?

A real-time OS (RTX), installed alongside Windows, achieves real-time performance even on a Windows PC.

By allocating one or more CPU cores exclusively to Soft Motion operations, fast and stable real-time control that is unaffected by Windows processes becomes possible.

RTX has been adopted by many companies worldwide, even in areas requiring critical reliability such as aviation and medical equipment.



## Original EtherCAT Master

Since our master stack has been developed internally, there is no black box in the software. We are able to provide expert technical support as well as customize the software based on the needs of our users.

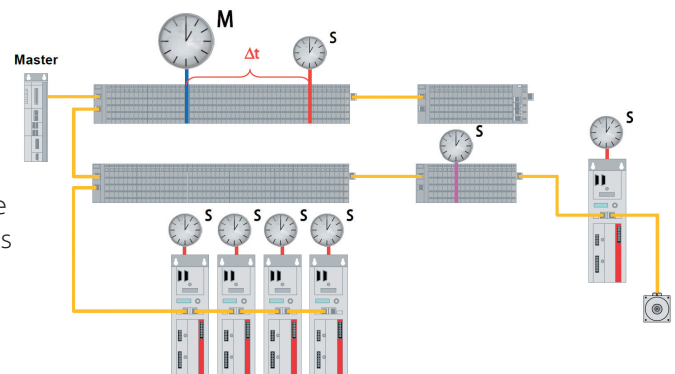
### Meets the EtherCAT Standard Specifications

- Supports the various topologies such as Line, Ring, etc.
- Compatible with CANopen over EtherCAT (CoE), File over EtherCAT (FoE)
- Supports Hot Connect, Hot Swap
- Supports DC clock synchronization and SM synchronization



### Reduces Network Setup Time

- Network setup does not require expert knowledge of EtherCAT
- Tools for configuration, diagnosis, and tuning are available
- A wide range of network control functions are provided as APIs

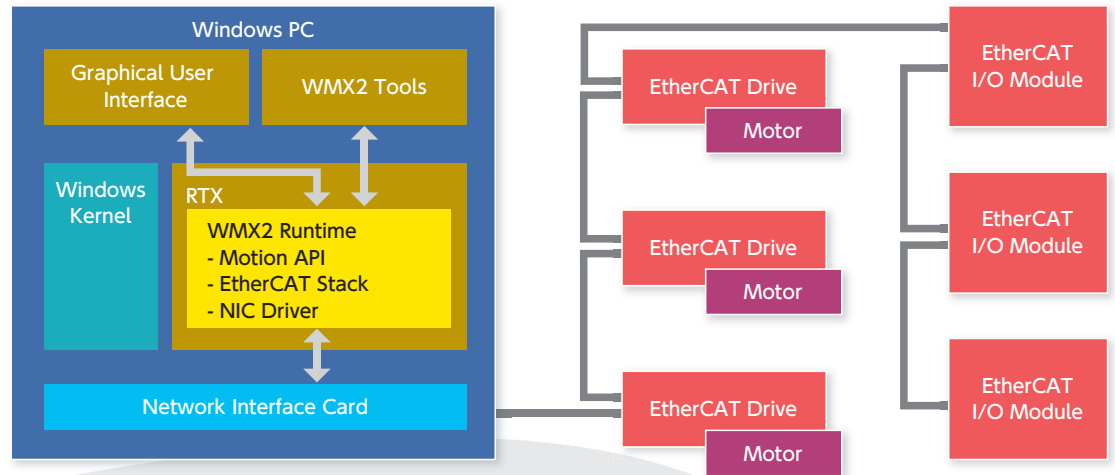


### No Dedicated Hardware Required

- The EtherCAT protocol has been implemented entirely in software
- In place of proprietary chips or hardware, the Ethernet port on PCs are used
- Combined with Soft Motion technology, a "Zero Hardware" motion controller is realized
- A motion control solution that is ideal for small IPCs for IoT

## WMX2

The WMX2 general purpose motion controller is capable of independently controlling 64 axes and 10,000 points of I/O with a mere 0.5ms cycle time. A wide variety of advanced motion control and interpolation, I/O manipulation, and EtherCAT device operation functions are provided as API libraries. Robot control and IEC-61131-3 PLC functions are also offered as optional add-on packages.



## WMX2 Specifications

Number of Axes	Max 64 axes
I/O Points	About 6 KB each for input and output
Motion Functions	Jog, Homing, PTP, List Motion (continuous positioning), API Buffer, Event Driven, Electronic Cam, Trajectory Control (line and arc, spline), Position Synchronous Output, Constant Surface Speed Control, etc
Interpolation Functions	Linear (maximum 64 axes), circular arc (2D and 3D), helical
Acceleration / Deceleration Profiles	Trapezoidal, S-Curve, Jerk (Jerk-limited or Jerk ratio), Time-Based, Sinusoidal, Parabolic. Acceleration and deceleration can be different. Other Profiles: Two-Velocity, PVT
Homing Functions	19 types, gantry axes supported, custom homing routines supported
Override Functions	Dynamically change target position, profile shape and profile parameters (velocity, acceleration, deceleration, etc.) during motion
Synchronization Control	Skew compensation function for gantry axes
Command Modes	Position, velocity, torque
Compensation Functions	Pitch error (1D and 2D), backlash, straightness correction
EtherCAT Master	Functions: CoE, FoE, DC Sync, line/star/ring topology, hot connect Shortest communication cycle time: 0.125 ms (Dependent on PC performance, axis count)
Number of Threads	Concurrent function calls from 256 threads and processes
API Languages	C/C++ (native) .NET compatible languages (C#, VB, etc.) .NET Framework: 2.0, 3.5
Development Environment	Visual Studio 2008, 2010, 2012, 2013, 2015 C++ Builder XE7
Operating Environment	OS: Windows 7 (32-bit and 64-bit), Windows 10 (64-bit) .NET Framework: 4.5.1 or later CPU: Min. Atom 2GHz (E3845, etc.), 2 cores or more Memory: 4 GB or more recommended

## Optional Packages

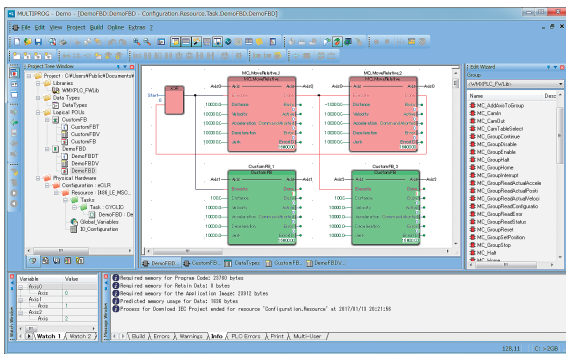
Optional packages are available to expand the functionality of WMX2. Multiple packages can be combined.

### Robot Control Package

This package adds out-of-the-box compatibility with several types of industrial robots including vertical articulated robots, SCARA robots, delta robots, etc. Multiple robots and additional auxiliary axes can be synchronized. Various forward kinematics and inverse kinematics calculations are supported.



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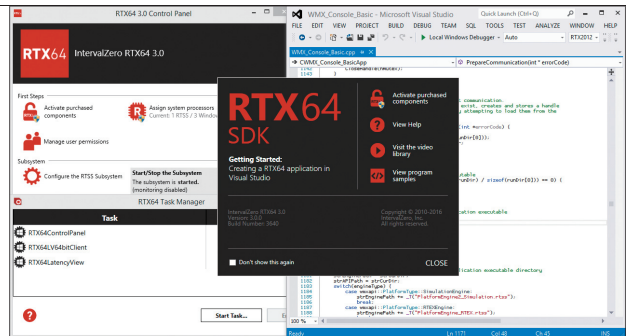
### IEC 61131-3 PLC Package

This package includes a soft PLC application from the global leader in soft PLC, Phoenix Contact Software (formerly known as KW Software). Five IEC 61131-3 standard languages (LD, FBD, ST, IL, SFC) for PLC programming are supported. A PLC runtime is integrated with WMX2's motion controller runtime. Function Block (FB) libraries may also be created by the user.

### Real-time Motion SDK Package

This package adds a development environment for developing user applications or custom motion libraries that run directly on RTX (a real-time OS). All WMX2 API functions can be called from RTX user applications and libraries. With this package, WMX2 can be expanded to create a powerful motion controller that is tailored to the needs of the user.

\* Requires RTX SDK separately

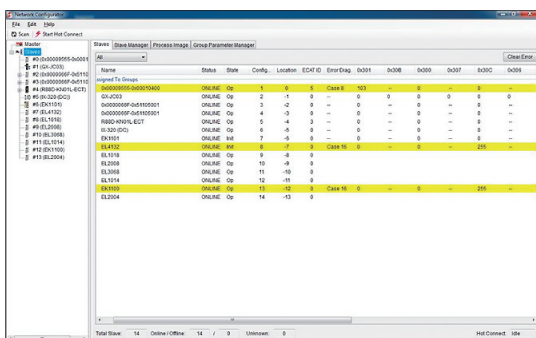


## Utility Tools (WMX2 Tools)

WMX2 is packaged with utility tool applications that help the user utilize WMX2 to its utmost potential.

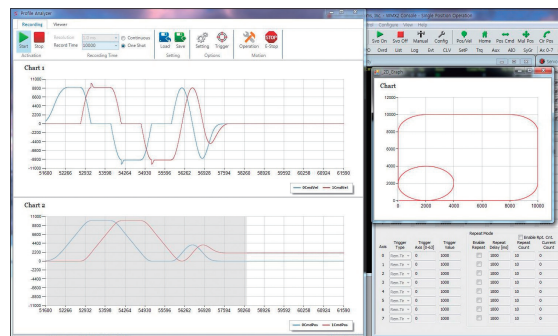
### Network Configuration and Diagnostics Tool

This tool is used to monitor and configure the EtherCAT network. By analyzing the communication error counters of all slave devices, the cause of the error can be determined.



### Motion Analysis Tool

This tool plots the movement of multiple servos, I/O, and robot tool positions for detailed analysis. Based on the analysis results, the motion can be optimized for improved efficiency.



## Product Support Information

Comprehensive product support is available to ensure the stable operation of the users' control systems.

Initial Integration Support	
<b>Product Training</b>	Covers the installation procedure and operation of the software.
<b>PC Selection Support</b>	Assistance in selecting a PC to host the motion controller.
<b>System Setup Support</b>	Assistance in configuring the software to match the machine mechanism and movement.
<b>EtherCAT Slave Connection Support</b>	Assistance in setting up the system to communicate with the slave devices.
Maintenance Support	
<b>Technical Support</b>	Engineers will answer your general product questions by phone or e-mail.
<b>Version Upgrade</b>	It is always possible to update to the latest version with new features and improvements.
<b>Function Development Request</b>	Requests for additional functions will be considered. Depending on the function, we may require a development fee to implement the function.
Custom Development	
<b>WMX2 Customization</b>	We can develop and provide a customized or OEM version of WMX2 for a unique application or equipment. This will require a development fee.

Please contact us for additional details.

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RTX is a registered trademark of IntervalZero in the United States and other countries.  
RealtimeExpress (RTEX) is a registered trademark of Panasonic Corporation.  
MECHATROLINK is a registered trademark of YASKAWA Electric Corporation.

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