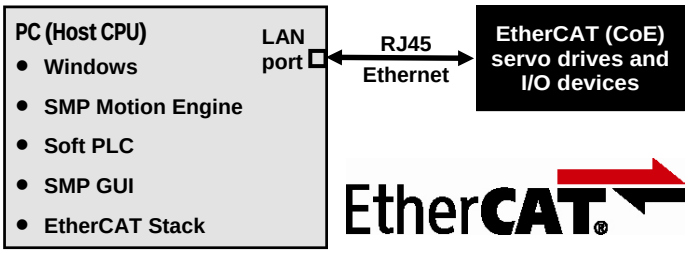
# SMP™ Series 4.0 with EtherCAT — Versatile General Motion Control Software

Soft Servo SYSTEMS, INC




## Overview

SMP Series 4.0 with EtherCAT pairs innovative SMP high-speed controllers with the popular and proven EtherCAT interface system — a fast, vendor-independent, Ethernet-based realtime open network for servo and I/O communications that works with CANopen over EtherCAT (CoE) servo drives and I/O devices.

With this system, RJ45 Ethernet cables are plugged directly into the Ethernet port on the PC, and servo drives are connected in a simple, single-line daisy-chain – no hardware is required, making it perfect for embedded applications. Up to 32 servo drives (plus additional I/O stations) can be integrated in one network.

SMP general motion controllers provide high-end motion control functions (up to 32 axes), an industry-standard PLC, and a Windows-based GUI, in a single software package. These "soft motion" controllers are truly PC-based, providing all-software motion and machine control solutions that require no proprietary motion control/PLC boards.

SMP products run on Windows 2000, Windows XP or Windows XPe, with a real-time kernel such as IntervalZero's RTX® or INtime® by TenAsys. SMP software can be easily ported to embedded platforms such as VxWorks® or embedded Linux for a target application. The SMP series is packaged for the number of axes to control: SMP450, SMP850, SMP1600 and SMP3200, for 4, 8, 16 or 32 axes (respectively).

Utility software applications are provided that facilitate the setup, configuration, servo tuning and testing of an SMP system, as well as real-time monitoring of motion, I/O and PLC status.

## SMP Offers Great Flexibility

The core part of the SMP software is its versatile, function-rich motion API libraries that allow users to develop their own motion control applications. Developers can design and customize SMP applications in the real-time subspace (RTOS) through the real-time API and/or in the Win32 subspace through the Windows API. SMP Windows applications can be created using .NET 2.0 or the legacy Visual Studio 6.0 (C/C++, Visual Basic 6.0).

SMP motion libraries embed a variety of advanced motion control functions featuring high-speed 32-axis synchronization, various interpolations, multi-system (channel) controls, electric cam/gear, PLC-axis control, position synchronous output, many smoothing filters, block buffering, and user profile motion control, to name a few. Even a G code parser is integrated, to process and execute CNC programs. These advanced, flexible motion control functions make the SMP ideal for motion control applications in many industries: semiconductor equipment, flat panel/solar panel equipment, packaging, materials handling, pick and place, converting, food processing, laser cutting/engraving, plasma cutting, wood-working, and even general machine tools.

## EtherCAT Features

- Extremely fast — control of up to 32 servo axes with a cycle time as fast as 0.5 ms
- Simple wiring — single-line daisy chain without even a terminator
- Normal, off-the-shelf Ethernet cabling
- Easy to configure, diagnose and maintain
- Less expensive, due to simplified configuration, no plug in cards, no switches/hubs, and standard cabling
- Well proven technology
- Offers redundancy against cable or node failures (with second Ethernet port)
- Servo drives from different manufacturers can be connected in the same network

## EtherCAT Communications

EtherCAT (Ethernet Control Automation Technology) is an industrial Ethernet fieldbus network that is real-time down to the I/O level — no delays in gateways, no underlying sub-systems.

This interface system is based on 100 Mbps Ethernet.

## SMP Included Components

- The SMP Motion Engine — a real-time soft motion control engine for high-performance, highly-coordinated control of up to 32 axes
- The SMP Console — a Windows application that allows users to set up, tune and run an SMP system. A memory mode operation is provided to program and run motion programs in G code.
- A real-time kernel for Windows (RTX or INtime)
- LadderWorks PLC, including the LadderWorks PLC Engine (a real-time soft PLC engine for industry-standard ladder logic control with axis control modules for independent and individual positioning of PLC axes) and the LadderWorks Console (a graphical PLC ladder diagram editor, monitor, debugger and compiler for Windows)
- The SMP Motion Parser — providing powerful, automatic execution of motion programs in G code (for up to 8 axes) for CNC applications
- Motion Development Kit (MDK) with C/C++, Visual Basic 6.0 or .NET 2.0 APIs
- RealTime Motion Development Kit (RTMDK) with RTX API or INtime API

## SMP Advantages

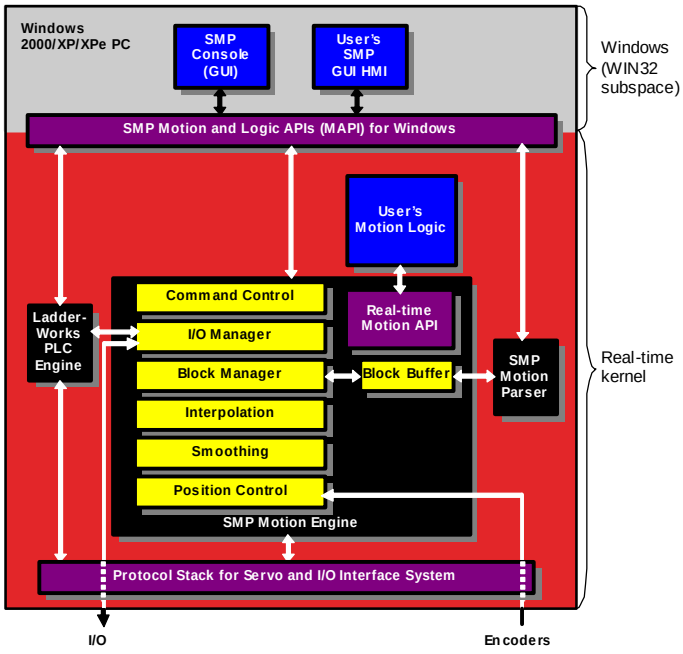
**Powerful and innovative.** SMP easily handles computation-heavy algorithms without additional expensive processors with unique soft motion technology that fully exploits the super-fast, super-precise (double-precision floating point) computation power of ordinary PCs.

**Fast.** Interpolation rate as fast as 0.5 ms for highly coordinated 32-axis motion. 5 msec standard PLC scan time. Plus, as the speed and power of CPUs increases, so does the speed and power of an SMP product.

**Multi-core motion control.** The recent multi-core CPU technology allows the SMP to run on a dedicated core while executing a user's Windows applications on another core, providing the ultimate performance and stability.

**Complete coordinated motion/machine control.** Soft motion and soft PLC are integrated into a single motion/machine control application for incomparable motion and machine control.

**Quick, simple setup and integration.** Simple cabling and connections reduce time to market, minimize maintenance and lower total cost of ownership.




SMP Software Architecture

## Motion Control Functions

- Up to 32 axes of coordinated (interpolated) motion control with up to 0.5 ms interpolation cycle
- Multiple system (channel) control of up to 32 systems (independent channels)
- Linear (32 axes), circular (2 axes), and helical interpolation
- Advanced smoothing filters: acceleration and deceleration can be programmed for linear, bell-shaped and exponential filters with jerk control
- PLC axes for independent, individual positioning
- Electric cam/gear/clutch
- Multi-axis completely synchronous control for master-slave operation
- Virtual axis for electric cam/gear and synchronization
- User profile (acceleration, velocity and distance) motion control
- Multiple block buffers for high-speed execution of multiple tasks
- Dynamic position/velocity change
- Velocity feedforward to improve motion performance
- Linear scale feedback control
- Memory mode operation of up to 8 axes with G-code programming — powerful, automatic execution of G-code programs, processing up to 1000 blocks per second
- Inter-system event synchronous positioning
- Dynamic gain change
- Time-optimized motion profiling

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Revised October 13, 2009