

EC-PX

High-Performance EtherCAT® Motion Controller



Performance eXpansion - Platform eXtension

The EC-PX is an **EtherCAT**-based motion controller designed to meet the needs of high-tech original equipment manufacturers with demanding multi-axis motion control applications. The EC-PX extends the performance and capabilities of the SPiiPlusEC motion controller and SPiiPlus Platform motion control ecosystem.

Product Highlights

- > Control up to 128 axes and thousands of I/O
- > Up to 10kHz EtherCAT / controller cycle rate
- > ACSPL+ real-time motion programming language – flexible and customizable for advanced OEM applications
 - > Up to 64 buffers/threads
 - > Multi-level application protection – protect intellectual property while maintaining serviceability
 - > User-defined functions in native ACSPL+ or C (Real-Time C Functions)
 - > Object-oriented programming with data structures
- > Advanced profile generation and servo control algorithm options for optimizing motion performance
 - > **LearningBoost**
 - > **ServoBoost**
 - > **MotionBoost**
 - > SmoothPTP
 - > SmoothPath
 - > More...
- > Advanced EtherCAT network topologies for improving machine throughput and reducing downtime
 - > Dual EtherCAT network enables faster cycle rates for critical axes and I/O
 - > **NetworkBoost** provides redundancy to cable failure
- > Identical form factor to previous generation SPiiPlusEC motion controller
- > Complemented by full-featured ADK Suite and motion controller simulator for rapid controller application development
- > Complemented by full-featured host programming libraries for rapid host application / machine UI development



Specifications

Number of Axes and Maximum EtherCAT / Controller Cycle Rate

Single Network	
Number of Axes	Maximum Cycle Rate
2, 4 axes	10kHz ¹
8 axes	5kHz
16 axes	4kHz
32 axes	2kHz
64 axes	1kHz

¹ ACS drives supporting 10 kHz EtherCAT cycle rate: MDMst, UDMsa, UDMdx (single axis)

Dual Network			
EtherCAT Network 1		EtherCAT Network 2	
Number of Axes	Cycle Rate	Number of Axes	Cycle Rate
Up to 4 axes	10kHz ¹	Up to 8	5kHz
		Up to 32	2kHz
		Up to 64	1kHz
Up to 8 axes	5kHz	Up to 8	5kHz
		Up to 64	1kHz
Up to 16 axes	4kHz	Up to 16	4kHz
		Up to 32	2kHz
		Up to 64	1kHz
Up to 32 axes	2kHz	Up to 32	2kHz
		Up to 64	1kHz
Up to 64 axes	1kHz	Up to 64	1kHz

¹ ACS drives supporting 10 kHz EtherCAT cycle rate: MDMst, UDMsa, UDMdx (single axis)

Max Number of Connected EtherCAT Devices

- > 65,536 (application dependent)

ACSPL+ Programming Language

- > Real-time program execution at cycle rate up to 10 kHz
- > Up to 64 simultaneously running programs
- > User-defined functions in ACSPL+ language or C (real-time C functions)
- > Dynamic error compensation with 1D, 2D, 3D mapping
- > Object-oriented data structures
- > G-code CNC programming
- > Host programming libraries for C/C++, C#, .NET, Python, Linux, Matlab, macOS
- > Inverse/Forward kinematics and coordinate transformations

Program Memory

- > RAM: 1.5 GB
- > Flash: 16 GB

Communication with Host Application

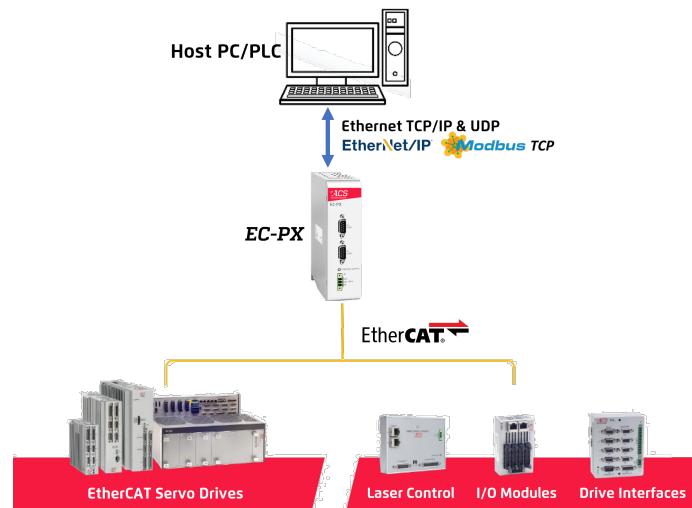
- > Ethernet: one port, TCP/IP, 100/1000 Mbs
- > Serial: two ports, RS-232. Up to 115,200 bps
- > Simultaneous communication through all channels is fully supported
- > Modbus as master or slave is supported over Ethernet and serial channels
- > Ethernet/IP protocol as adapter is supported over Ethernet channel

EtherCAT Ports

- > Two ports, primary and secondary
- > Rate: 100 Mbit/sec
- > Protocols: ACS proprietary drive protocol, CANOpen over EtherCAT (CoE) for qualified non-ACS devices, File transfer over EtherCAT (FoE) for qualified non-ACS devices

Motion Modes

- > Single and multi-axis coordinated 3rd order point-to-point with smooth on-the-fly changes of target position, velocity, acceleration
- > Single and multi-axis coordinated tracking
- > Multi-axis segmented motion with geometrical processing (corner rounding, skywriting) and velocity/acceleration/jerk-limited look-ahead
- > User/host defined multi-axis path motion with linear or PVT cubic spline interpolation
- > **MotionBoost** – high-order minimum energy motion profile intended for rapid / short duration point-to-point motions
- > SmoothPTP – 4th order point-to-point motion profile reduces resonance, highly effective for stages with non-collocated loads, e.g., ballscrew stages with encoder on motor
- > Input Shaping – modified point-to-point motion profile avoids exciting specific resonant frequencies
- > SmoothPath – multi-axis motion for up to 5 coordinated axes for complex trajectory applications, e.g., 5-axis laser processing of 3D workpieces
- > NURBS motion – parametric multi-axis motion for up to 5 coordinated axes for complex trajectory applications such as 5-axis laser processing of 3D workpieces



EC-PX controls a wide range of SPiiPlus Platform EtherCAT products

Environment

- > Operating temperature: 0°C to 50°C
- > An internal fan is automatically activated when internal operating temperature rises above 30°C
- > Storage temperature: -20°C to 85°C
- > Humidity: 90%RH, non-condensing

Control Supply

- > 24VDC $\pm$ 10%, 0.8A

Certifications

- > CE: Yes
- > EMC: EN-61326-1:2013 with EN IEC61326-1:2021

Accessories

- > DIN rail mounting kit (DINM-13-ACC) included with product

Dimensions

- > 159.6 x 124.5 x 45.8 mm

Weight

- > 476.6 grams

Ordering Options

	Field	Example	Optional Values
Maximum number of axes	1	A	2 = 2 4 = 4 8 = 8 A = 16 B = 32 C = 64 D = 128 ¹
Maximum controller cycle rate	2	B	A = 2 kHz ² B = 4 kHz / 5 kHz C = 10 kHz
Advanced Network Topologies	3	C	N = None A = Dual EtherCAT Network B = NetworkBoost C = Flexible Configuration
Advanced Control Algorithms - ServoBoost and ServoBoost Plus	4	B	N = None A = 4 axes ServoBoost B = 4+ axes ServoBoost C = 4 axes ServoBoost Plus (includes ServoBoost) D = 4+ axes ServoBoost Plus (includes ServoBoost)
Advanced Control Algorithms - Additional Algorithms	5	A	N = None A = Level 1: Autofocus B = Level 2: Level 1 options, Non-Linear Control C = Level 3: Level 2 options, LearningBoost
Advanced Programming	6	B	N = None A = Level 1: Max Number of Program Buffers (64), G-Code, Real-Time C Functions B = Level 2: Level 1 options, Tool Center Point Programming
Advanced Profile Generation	7	A	N = None A = Level 1: MotionBoost, SmoothPTP, Input Shaping, 2-Axis SmoothPath, 2-Axis NURBS B = Level 2: Level 1 options, 3+ Axis SmoothPath, 3+ Axis NURBS
XL SCAN	8	A	N = None A = XL SCAN with 1 node SLEC B = XL SCAN with 2 nodes SLEC
Reserved	9	N	N
Reserved	10	N	N

¹ 128 axes requires the *Dual EtherCAT Network* option.

² Limited to 1 kHz for 64 axes on a single network or 128 axes on a dual network.

Example: EC-PX-ABCBA-BAANN

Field	1	2	3	4	5	6	7	8	9	10	
PN	EC-PX-	A	B	C	B	A	B	A	A	N	N

SPiiPlusEC vs. EC-PX

The following table shows the differences between the SPiiPlusEC and the EC-PX.

Feature	SPiiPlusEC	EC-PX
Maximum number of axes	64	128
Maximum EtherCAT cycle rate	5kHz	10kHz
Dual EtherCAT network cycle rates	Same rate must be used on both EtherCAT networks	Different rates can be used on each EtherCAT network
Memory and storage	RAM: 1 GB Flash: 2 GB	RAM: 2 GB Flash: 16 GB
Ordering options	Legacy	Simplified
Minimum firmware version	HW Rev D: 2.70.07	4.00
Board level version	Standard ordering option	Not standard - contact ACS
Dimensions	HW Rev D: 159.6 x 124.5 x 45.8 mm HW Rev A-C: 158 x 124 x 45 mm	159.6 x 124.5 x 45.8 mm
Enclosure color	Grey	White with red accent