MPiec Machine Controllers

YASKAWA™

Global Programming Standard

Many programming languages exist today. Few excel at providing an environment for easily coding of ALL the functionality of modern automated machinery.

That's where Yaskawa's IEC 61131-3 programming environment shines. MotionWorks® IEC encourages the programmer to take advantage of the best of several programming languages within one development package.

- Ladder Logic is perfect for representing digital sensory data.
- Structured Text is a great solution for mathematical algorithms and assignments.
- Function Block Diagrams are best suited for motion control.
- Sequential Function Charts enhance program organization to simplify troubleshooting.
- Object oriented structure promotes programming flexibility and reusable code.

Hardware and Software Specifications.

MotionWorks® IEC Express Specifications	
Motion Interface	PLCopen specification
Motion Library	Over 50 function blocks for motion control included
Program Languages	IEC 61131-3 languages LD, ST, FB
Program Instances	500 per task
Program Tasks	1
Variables Global	15000
Variables Local	15000 per POU
Maximum POUs	2000 Program Organizational Units
Configuration	System tuning, monitoring, network data definition
Debug Tools	On Screen values, Watch Window, Logic Analyzer, Single Step, Breakpoints
MotionWorks® IEC Pro Additional Specifications	
Program Languages	IEC 61131-3 languages LD, ST, FB, IL, SFC
Program Tasks	16 per resource
Password Protection	Yes
MPiec Controller General Specifications	
Ethernet Speed	100 MB/sec
Ethernet Protocols	EtherNet/IP and Modbus/TCP, OPC, and web server support. Custom protocols can be created.
Expandable I/O	Digital and Analog, third party devices including temperature controllers
MP3200Siec Specifications	
Axes Maximum	Available in 4, 8, 16, 32, or 62 Axes Virtual Axes: 31
Number of Option Cards	Available with 5 Slot or 8 Slot Module Rack
Configuration Method	Automatic Configuration of the option cards and MECHATROLINK-III network
Dimensions (mm)	Power Unit: 64 x 130 x 137; CPU: 35 x 130 x 137; 5-Slot I/O: 126 x 130 x 108; 8-Slot I/O: 184 x 130 x 108
Communication	Ethernet, MECHATROLINK-III network
Motion Interface	Digital MECHATROLINK-III high speed deterministic network
Mounting	DIN rail standard, mounting bracket optional
Power Input	24 VDC or 100/200 VAC
Processor Speed	1 GHz, 64-bit
Servo Update Rate	125 uSec, position loop closed in the amplifier
MP2300Siec/MP2310iec Specifications	
Axes Maximum	16 plus additional nodes of remote I/O for a maximum of 21 nodes Virtual Axes: 16
Number of Option Cards	1 (MP2300Siec) or 3 (MP2310iec)
Configuration Method	Automatic Configuration of the option cards and MECHATROLINK-II network
Dimensions (mm)	MP2300Siec : 64 x 130 x 108 ; MP2310iec: 120 x 130 x 108
Communication	Ethernet, MECHATROLINK-II network
Motion Interface	Digital MECHATROLINK-II high speed deterministic network
Mounting	DIN rail standard, mounting bracket optional
Power Input	24 VDC
Processor Speed	240 MHz, 32-bit
Servo Update Rate	125 uSec, position loop closed in the amplifier
MP2600iec Specifications (Single-axis Motion Controller Integrated with the Σ-V SERVOPACK)	
Axes Maximum	1 servo, 6 virtual, 1 external
Configuration Method	Fixed configuration: Servo Axis, Local Digital & Analog I/O and External Encoder
Dimensions	See individual Σ-V SERVOPACK dimensions
Communication	Two Ethernet connections, on board I/O
Motion Interface	Motion control integrated with Σ-V SERVOPACK
Mounting	Panel mounting, see individual Σ-V SERVOPACK mounting dimensions
Power Input	120/240/480 V depending on Σ-V SERVOPACK, no other DC input required for controller power
Processor Speed	200 MHz, 32-bit
Servo Update Rate	125 uSec, position loop closed in the amplifier

MotionWorks® IEC Software

Express and Pro Versions for Simplicity and Flexibility

	MotionWorks® IEC EXPRESS	MotionWorks® IEC PROFESSIONAL
Tasks	1	16
IEC 61131-3 Languages	Ladder Diagram Function Blocks Structured Text	Ladder Diagram Function Blocks Structured Text Sequential Function Chart Instruction List

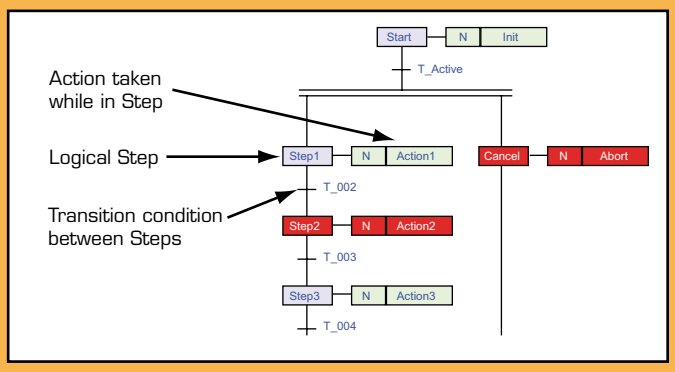
MotionWorks® IEC PROFESSIONAL also includes the following:

- Password Protection
- Project Comparison
- POU Grouping
- Configurable Task Priority
- Configurable I/O Task Assignment
- Auto Save Setting
- Debug Powerflow

Sequential Function Chart.

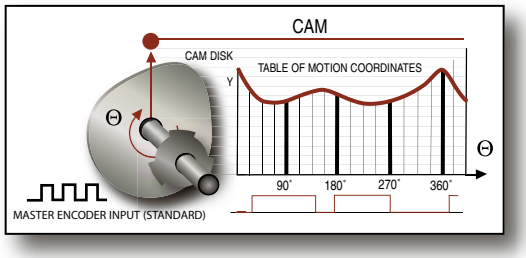
Sequential Function Chart (SFC) is one of the standardized languages available in IEC 61131-3 and is supported in the Professional version of MotionWorks® IEC.

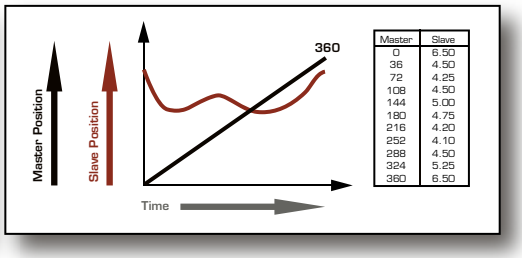
SFC allows the programmer to graphically create program organization in terms of steps, actions, and transitions. Active steps are indicated in red, which simplifies troubleshooting of complex operations.



Camming Function Blocks.

Electronic camming controls the positional relationship of a pair of axes based on a master/slave lookup table





MotionWorks® IEC includes 10 Function Blocks dedicated to camming. These are customized by Yaskawa based on the PLCopen specification, previous controller cam technology, and decades of synchronized motion experience. The function blocks fall into one of four functional topics:

Cam Data Management
- Y_CamFileSelect
- Y_CamStructSelect
- Y_ReleaseCam

Cam Engagement
- Y_CamIn
- Y_CamOut

On-the-Fly Adjustments
- Y_CamShift
- Y_CamScale
- Y_SlaveOffset

Cam Data Transfer
- Y_ReadCamTable
- Y_WriteCamTable

The Standard in Mechatronics Control.

EtherNet/IP™

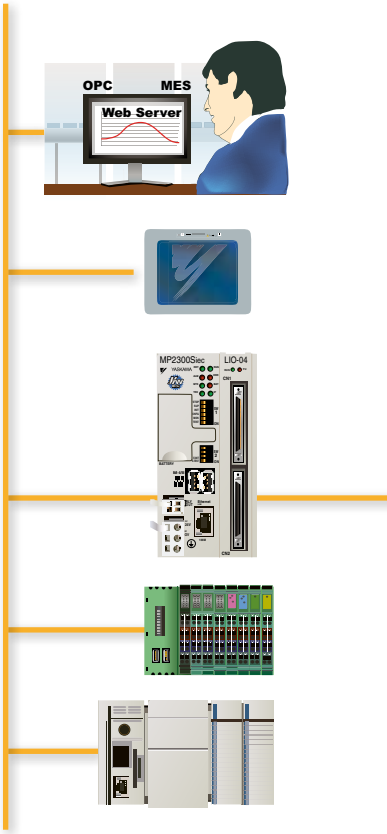
Modbus/TCP

The MPiec machine controller series facilitates a new realm of possibilities in the world of machine control. By combining many proven technologies in one platform, Yaskawa offers a powerful system with ample flexibility.

Governed by internationally standardized functions, MPiec machine controllers incorporate a potent motion engine at their core. They include a built-in web server and are compatible with the most popular network protocols.

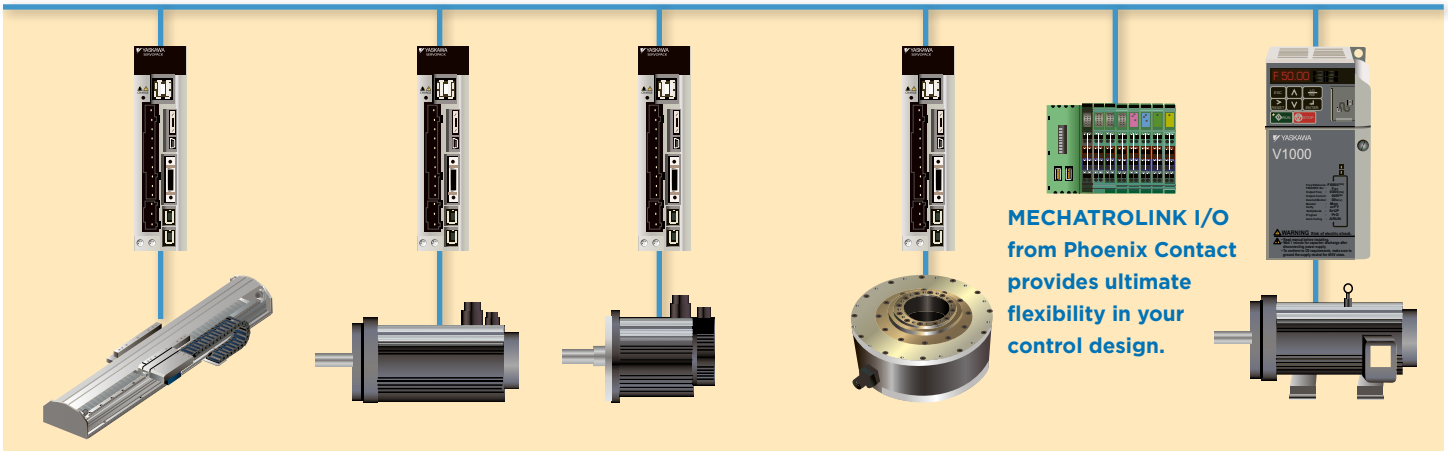
Yaskawa's superior-quality hardware coupled with industry-standard programming tools, maximizes the total automation system value.

Modular Connectivity



MECHATROLINK

High-Speed Deterministic Motion and I/O Network



MECHATROLINK I/O from Phoenix Contact provides ultimate flexibility in your control design.

Linear Servos
Peak Force:
85 – 6,000 N
Velocity:
up to 5m/s
Supply Voltage:
240, 480 VAC

Rotary Sigma Servos
Peak Torque:
13.5 – 1,988 in-lb
Velocity:
up to 5,000 rpm
Supply Voltage:
120, 240, 480 VAC

Direct Drive Servos
Peak Torque:
53 – 5,310 in-lb
Velocity:
up to 500 rpm
Supply Voltage:
240 VAC

VFDs
Output:
V1000 (up to 25 hp)
A1000 (up to 1000 hp)
Velocity:
up to 3,600 rpm base
Supply Voltage:
240, 480 VAC

Features and Benefits of Mechatronics Control.

Network Communication:
Built-in EtherNet/IP and Modbus/TCP (master and slave) connect to most PLC's and expanded I/O.
An OPC server is available to easily connect to PC's, HMI's, or business systems like MES, ERP, or databases.

Standard Programming Languages:
MotionWorks® IEC Software complies to the IEC 61131-3 standard, assuring that programs can be developed and executed with predictable behavior.

PLCopen Function Blocks:
Yaskawa developed the motion control interface to comply with PLCopen, yet preserved the motion algorithms developed over decades of accumulated motion control experience.

Reusable Code:
Libraries enable import and reuse of previously developed logic.

Web Server
All controllers have a built in web server which greatly reduces field maintenance time and allows users to load new programs and update controller firmware without the need for special software.

Controller-Centric Commissioning:
The MECHATROLINK motion network provides a conduit to configure the machine from a single location with one software tool, resulting in minimal commissioning time.

Remote I/O:
Numerous third-party remote I/O modules such as Phoenix, Wago, and Opto 22 can be interfaced with the system via MECHATROLINK or Ethernet.

Local I/O:
Choose from eight option cards offered for the expansion slot to accommodate most automation requirements.

IEC on the Drive
The Σ-V SERVOPACK with 1.5 Axis MP2600iec Motion Controller option module offers a compact controller/servo combination, providing standardized programming on Yaskawa's latest high quality servo system.

Scalability
One software platform for the MPiec machine controllers allows applications to scale up from single to multi-axis control.

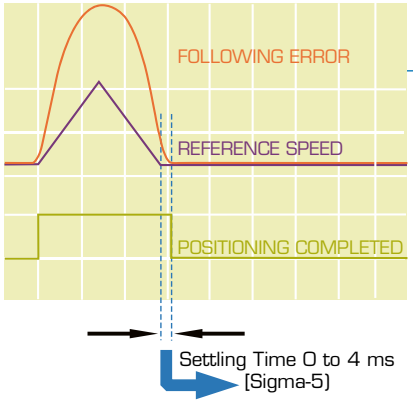
Programmable Amplifier Outputs:
The controller can operate local outputs. This reduces panel cost and space requirements when just a couple of outputs are necessary.

MotionWorks® IEC and Σ-V Servos

SERVOPACKs and motors:

- 1.6 kHz Bandwidth
- 20-Bit Absolute Encoder
- Vibration Suppression
- Integrated Safety

Yaskawa Continues to Deliver the New Frontier in Servo Performance



Highest Performance in the Industry	• Frequency Response of 1.6 kHz • Settling Time from 0 to 4 ms
Ease of Use	• Tuning-less Function for Real-time Adaptive Tuning • Advanced Autotuning for Optimal Gain Adjustment • Configure and Tune from MotionWorks® IEC
Vibration Control	• Advanced Vibration Suppression Function
Reduced Size	• Amplifiers and Motors up to 30% Smaller than the Competition
Integrated Safety	• Integrated Safety Tested According to EN954-1 Safety Category 3 and IEC 61508-1 SIL2

IEC on the Drive.

IEC 61131-3 on the Σ-V SERVOPACK

- One software platform, MotionWorks® IEC, allows applications to scale up from single to multi-axis control within a standard IEC 61131-3 environment.
- Built-in EtherNet/IP and Modbus/TCP (master and slave) connect to most PLC's and expanded I/O.
- PLCopen Function Blocks in MotionWorks IEC simplify programming.
- Diagnostic Web server reduces field maintenance time.
- Optional OPC server allows for HMI or Data Acquisition.
- Σ-V autotuning and vibration suppression algorithms facilitate easy setup.
- Wide product range of Σ-V (3W to 55kW) enables flexible designs.

System Components

DESCRIPTION		PART NUMBER	NOTES	
MECHATROLINK-III Network Components				
MP3200iec	CPU Module	PMC-U-MP320 □□	□□: Maximum number of MECHATROLINK Axes: 04: 4 • 08: 8 • 16: 16 • 32:32 • 62:62	
	Power Supply Module	JEPMC-PS□3012-E	□: Input Power: D: 24 VDC • A: 100/200 VAC	
	Option Module Rack	JEPMC-BUB300□-E	For optional I/O modules	□: Input Power: 5: 5 Slots • 8: 8 Slots
MECHATROLINK-III Cables		JEPMC-W6012-□□-E	□□: Cable Length: A2: 0.2m • A5: 0.5m • 01: 1.0m • 02: 2.0m • 03: 3.0m • 04: 4.0m • 05: 5.0m	
Accessories	Network Hub	JEPMC-MT2000-E	8 slave ports	
	Battery	JEPMC-BA3001	Replacement battery	
	Power Supply Side Cover	JEPMC-OP3001	Replacement power supply side cover	
	Option Base Side Cover	JEPMC-OP3002	Replacement option base side cover	
	Network Termination Resistor	N/A	Not required for MECHATROLINK-III network	

MECHATROLINK-II Network Components				
MP2300Siec	Controller	PMC-U-MP23S □□	without I/O module	□□: Maximum number of MECHATROLINK Axes: 04: 4 • 08: 8 • 16: 16
		PMC-U-MP23S □□L1	with factory installed LIO-01	
		PMC-U-MP23S □□L2	with factory installed LIO-02	
MP2310iec	Controller	PMC-U-MP231 □□	without I/O module	
MECHATROLINK-II Cables		JEPMC-W6003-□□-E	□□: Cable Length: A5: 0.5m • 01: 1.0m • 03: 3.0m • 05: 5.0m • 10: 10.0m • 20: 20.0m	
Accessories	Panel Mounting Bracket	JEPMC-OP2300S-E	For screw mounting MP2300Siec/MP2310iec	
	DIN Rail Clips	JEPMC-OP300	Extra clips for MP2300Siec/MP2310iec (2 per set)	
	Battery	JZSP-BA01	Replacement battery	
	Network Termination Resistor	JEPMC-W6022	Required for ends of MECHATROLINK-II network (one included with MP2300Siec)	

Single-Axis Controller Option with SERVOPACK			
MP2600iec	Controller/SERVOPACK	SGDV□□□□E1A002000300	□□□□: denotes output capacity and voltage of Σ-V SERVOPACK

Common Components				
Software	MotionWorks IEC Express	PDE-U-IE□Sx	□: Software Version: C : 1 • 2 : 2	x: Number of Licenses: A : 1 • B : 5 • C : 10
	MotionWorks IEC Pro	PDE-U-IE□Px	□: Software Version: C : 1 • 2 : 2	x: Number of Licenses: A : 1 • B : 5 • C : 10 • H: Floating License
	MotionWorks IEC OPC Server	PDE-U-OPCPx	x: Licenses: A : 1 B : 5 C : 10 D : 20	
Option Cards (for MP3200iec, MP2300Siec, MP2310iec)		JAPMC-AN2300	Analog Inputs (AI-01)	(8) channels; +/- 10V @ 16-bit resolution @ 20kΩ or 4-20mA @ 15-bit @ 250Ω
		JAPMC-AN2310	Analog Outputs (AO-01)	(4) channels; +/- 10V @16-bit resolution; 5mA max load current
		JAPMC-DO2300	Output Module (DO-01)	(64) 24VDC sinking outputs; 100mA/output
		JAPMC-IO2300-E	I/O Module (LIO-01)	(16) 24VDC sinking or sourcing inputs; (16) 24VDC sinking outputs; 100mA/output; (1) Encoder Counter; A/B/C channels; differential; latch response time 5µs; max frequency 500kHz
		JAPMC-IO2301-E	I/O Module (LIO-02)	(16) 24VDC sinking or sourcing inputs; (16) 24VDC sourcing outputs; 100mA/output; (1) Encoder Counter; A/B/C channels; differential; latch response time 5µs; max frequency 500kHz
		JAPMC-IO2303	I/O Module (LIO-04)	(32) 24VDC sinking or sourcing inputs; (32) 24VDC sinking outputs; 100mA/output
		JAPMC-IO2304	I/O Module (LIO-05)	(32) 24VDC sinking or sourcing inputs; (32) 24VDC sourcing outputs; 100mA/output
		JAPMC-IO2305-E	Multi-Function (LIO-06) I/O Option Module	Analog/Digital/Encoder
		JAPMC-CM2301-E	Communications Option (28IF-Y1)	(1) Ethernet port 10 MBit; (1) RS232 port
Terminal Block Conversion Kits		CBK-U-MP2A-□□	For LIO-01/02	□□: Cable Length: A5: 0.5m • 01: 1.0 m • 03: 3.0m
		CBK-U-MP2B-□□	For LIO-04/05/06/ MP2600iec	
		SBK-U-VBA-□□	For SGDV Servo Amp- CN1	
Flying Lead Cables (for I/O Modules and MP2600iec)		JEPMC-W6080-□□	For AI-01 Analog Input Module	□□: Cable Length: 05: 0.5m • 10: 1.0 m • 30: 3.0m
		JEPMC-W6090-□□	For AO-01 Analog Output Module	
		JEPMC-W6060-□□	For LIO-04/05 I/O Module	
		JEPMC-W2061-□□	For LIO-01/02 I/O Module	□□: Cable Length: A5: 0.5m • 01: 1.0 m • 03: 3.0m
		JEPMC-W2064-□□-E	For LIO-06 I/O Module	
		CFC-U-MP2B-□□	For MP2600iec Single Axis Controller	
Accessories	Slot Cover	JEPMC-OP2300	Front cover for empty slots on MP3200iec, MP2300Siec, MP2310iec	

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