PRODUCT LINE IIS Emerald Technology



At-A-Glance

- $\sqrt{}$ Designed to control high speed multiaxis production machinery.
- √ Ideal for web control, synchronized cut-off, form-fill-seal, cut and seal, punching and forming applications.
- √ For use in the manufacture of metal, plastic, paper, and film products.
- √ Control up to 32 servo axes using SERCOS II, a deterministic Ethernet device network with scan rates of 500 µsecs minimum.
- √ Select from a wide power range of servomotors and inexpensive matching servo drives.
- √ Access and control up to 512 digital and analog I/O points.
- √ Industrial Ethernet TCP/IP Connectivity
- √ DeviceNet Connectivity
- $\sqrt{}$ Serial Communication Ports
- Inexpensive software tools for application development and system commissioning.



Select from a wide range of Servo Motors

Call us today at (585) 924-9181 to discuss our product line in greater detail

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Emerald Automation Controller

Overview

The Emerald Automation Controller is an open architecture high performance multi-axis motion controller designed for demanding applications that require close synchronization of up to 32 servo axes, I/O and auxiliary equipment. The Emerald Automation Controller is powerful enough to execute all of the control functions required in a production environment, thus eliminating the need for additional control devices such as a PLC.

Emerald motion control technologies include indexing, positioning, complex motion trajectories, high speed registration, electronic gearing, electronic cams and programmable limit-switch functions.

Emerald Motion Language[™](EML) developed specifically for high performance automation systems, along with the Emerald Development Environment[™] (EDE) programming tools, provide all that is needed to produce quality application programs for today's advanced systems.

Real-time Process Environment

Now designers can setup their own real-time configuration for their application using powerful "Event Interrupts." The Emerald Automation Controller defines events as the real-time response to changes of a device state. During the controller configuration process, events are mapped to application software routines designed to perform an immediate action to satisfy the needs of the event. An event can be the result of any change in the state of any input or output device, servo drive status, timers and internal flags.

Motion Functions

- Positioning -- absolute and relative
- Indexing -- linear and rotary
- Synchronizing motion to a registration mark
- Homing or search for the home position mark
- Jogging in the CW or CCW direction
- Acceleration/deceleration profile shapes (trapezoidal, S-curve, or a custom profile)
- Electronic gear ratio between a master encoder and motor, or motor to a motor.
- Versatile slave to master locking methods that are analogous to a mechanical clutch, but are programmable.



Programmable Limit Switches (PLS)

Any digital output can be configured as a programmable limit switch. A programmable limit switch is defined as an output that will turn off and on at the required angle positions of a master rotating source such as a motor or encoder. Once configured and enabled by the application, the PLS function operates as an independent process in a real-time environment. Up to eight PLS engine-tasks can be operating simultaneously, each PLS engine controlling up to 16 outputs.

Master/Slave Lock and Unlock Functions

Multiple methods are available for locking a slave function to a master position vector. Slave functions include electronic cams, electronic gear ratio, and the PLS.

External Memory

For convenient machine configuration and setup, the Emerald Automation Controllers use SD and SDHC memory cards to hold backup files for the operating system firmware and application programs.

Ethernet Connectivity

Standard TCP/IP port for Ethernet communication with various industry protocols provide a high speed link to factory networks, PLCs, and HMI devices.

Emerald Specifications

Master Encoder Input Connector

Digital input port provides line shaft encoder interface for synchronizing the entire automation system.

- Two quadrature A and B channel inputs, with a Z-index input, will interface to industry standard encoder devices.
- An additional high speed input, to access the position trap circuit for sensing a registration mark position, is standard.

DeviceNet

Universal connectivity network for interfacing to auxiliary devices ranging from simple temperature sensors and controls to sophisticated robotic systems. DeviceNet slave interface is standard, master is optional.

Rs232 Comm Port

Serial interface port available to the application program to access external text displays and color touchscreens.



Specifications

Size and weight Power requirements Operating environment

Storage environment

Processor and memory

Processor External memory, Internal memory,

Interfaces

SERCOS II Ethernet USB / Rs232 DeviceNet slave DeviceNet master* Master encoder

Indicators

Visual

History view

150 x 40 x 100 mm, 1.2 kg 24 Vdc, 500 milliamps -10° to 55° C Ambient 10% to 90% RH Non -Condensing -10° to 65° C

756 Mips, 32 bit bus SD card slot up to 4G bytes 8 Mbytes of DRAM w/NOR flash

16 Mhz, 32 devices 100 Mhz, TCP/IP 115,000 / 38,400 Baud 500 kbaud, 64 devices 500 kbaud, 64 devices 4 Mhz input, quadrature

Built-in 7 segment display, Network status indicators 31 Diagnostic states with alarm storage history

USB 2.0 Port

Executive Serial Port for software development and firmware updates from a PC.

Status Indicator

Seven segment display provides a quick visual indication of real-time operating status.

SERCOS II Automation Network -- A fiber optic cable network option is available for compatibility with our Emerald Drive series of servo products. Users of a SERCOS II network will see an increase in processing power over the legacy EMC-2005 controller model.



I/O capacity

Digital points	256 Inputs, 256 Outputs
Analog points	32 Inputs, 16 Outputs

Ordering Guide

SERCOS II controller	EMC-2100S2
SERCOS II controller/DeviceNet master	EMC-2100S2S
SERCOS II network cable	C-753001.5
Ethernet Cat5 cable (1 meter)	ECC-ENA101
USB A/B cable (1 meter)	ECC-USB101
Rs232 comm cable	C-987010
PC comm 9-pin adapter	C-822000
Master Encoder (2048 ppr)**	THA-2-2048
Master Encoder (4096 ppr)	THA-2-4096
Encoder Cable (YYY is length)	C-300YYY
Interface Adapter	INT-810
Memory Card	EMM-SD2G
Development Software	EDE v3.06 or later

* DeviceNet master is optional, ** Other line counts are available

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Emerald Motion Technology Overview

The heart of a multi-axis automation system is the ability to synchronize the motion of multiple motors to a designated "master" source device. Depending on the machine application, a source device may be an encoder device measuring web travel, position feedback from another motor that is driving a feed roll, or an Emerald Virtual (software) Motor. A Virtual Motor provides a software-configured internal master source with control over its virtual distance, speed and acceleration.

Synchronization between the source device and a servomotor is achieved using the Emerald electronic gear ratio or electronic cam motion functions. The process starts by locking the master source device to the slave servomotor. How the source device gets locked to the servomotor is critical especially when the source is running. The Emerald Automation Controller provides eight lock methods for smooth and accurate transition regardless of the speed of the source. The source device and the lock method are specified first. Then, the lock control is enabled to start the synchronization process.

Digital outputs are synchronized to a master source using the programmable limit switch (PLS) function. Up to eight independent PLS engines can be enabled with each engine controlling the action of sixteen outputs. Digital outputs can be located on the servo drive or on the SERCOS network using 3rd party I/O interface blocks.

Emerald Automation Controller Functions for Multi-Axis Synchronization



Emerald technology is a universal motion technology that combines real-time functions in a unique software based mechanical / electrical environment

System Application Highlights

Sealing and Perforating



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Rotary Knife Cutting

Feed rolls move a ribbon of sheet metal with printed labels under a rotary knife to be cut into individual sheets with the labels centered. A double cut action is performed using switched cam functions available in the Emerald Automation Controller. The registration sensor connected to the high speed trap input measures the label position relative to the knife edge. An electronic cam table is adjusted accordingly, either to advance or retard the knife's position for the first cut. The cam table is switched for the second knife cut that determines the exact length of the sheet.

The Emerald Automation Controller provides all the necessary functionality to preform contoured cutting or marking with a G-Code conversion utility using DXF file information to produce electronic cam tables for the X and the Y axis.

Using a Virtual Motor as a master source to synchronize cam tables for the X and Y axis, patterns are produced on the x-y plane of a Cartesian assembly. The Z axis is used to control the instrument for marking, cutting, perforating, or sewing a variety of materials.

The operator interface is a PC with CAD programming software for pattern development teamed up with a Visual Basic program using the DLL provided by IIS to connect to the Emerald Automation Controller.



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Emerald SERCOS II Drive Overview



Signal Interface Features for the Emerald SERCOS II Drive

The Emerald Series servo drives and motors use the latest servo technology to bring cost effective solutions to the automation market. The wide range of sizes and feature rich functions make the Emerald servo drive the most versatile servo system in today's automation market. State of the art software minimizes hardware cost while maximizing features and performance.

The Emerald servo drive is a certified SERCOS II drive designed to integrate with any industry standard SERCOS II controller. The SERCOS II standard forms a fiber optic isolated network and when interfaced to the IIS Emerald Automation Controller, this drive is part of a network of up to 32 servo drives or I/O devices with a minimum 500 µsecs scan rate.

The Emerald Servo Drive is available in 7 size ranges: 5, 10, 20, 40 and 60 amp @ 220 VAC and 25 and 50 amp @ 440 VAC. Emerald servo motors are available from 400W to 21kW, 1500 to 3400 RPM rated speeds with low and medium rotor inertia versions. And is designed to operate at temperatures of up to 55C° at full rated power.

A	"Quick Connect" Main Drive Power Connections
В	Motor Feedback Connector
С	Safety Loop "OK" Contact for external shut-down control
D	Seven Segment Display
Е	SERCOS Network Interface
F	Communication Port RS232
G	Communication Port USB for easy interfacing to laptop PC for drive diagnostic and setup procedures.
н	Hi-Speed Traps for storing encoder position relative to a sensor to provide web or product registration functions.
I	Analog Interface and Auxiliary Encoder Input
J	Controller Power Input

IIS Servo Motor Overview

Туре	Frame Size	Shaft Dia.	Pilot Dia.	Power	Speed Rated	Torque Rated	Speed Max	Torque Max	Inertia	Matching Drive	Servo Motor
$\overline{}$	mm	mm	mm	watts	rpm	Nm	rpm	Nm	kg-m2 x10 ⁻⁴	ESD-#	ESM#
	60	14	50	400	3000	1.27	4000	3.8	0.40	5/AEP	60A
	85	14	30	400	2000	1.9	4000	5.7	2.44	5/AEP	85A-C
с	85	16	30	600	2000	2.48	4000	9.0	3.34	5/AEP	85B-C
	85	16	50	750	2000	3.53	4000	10.6	4.20	5/AEP	85C-C
	85	16	50	1000	2000	4.8	4000	11.5	5.10	10/AEP	85D-C
	125	19	70	750	2000	3.6	4000	10.8	6.66	5/AEP	125A(I)
	125	22	70	1000	2000	4.8	4000	14.4	10.10	5/AEP	125B(I)
	125	24	80	1500	2000	7.2	4000	21.6	14.40	10/AEP	125C(I)
	125	24	80	2200	2000	10.5	4000	31.5	20.35	20/AEP	125D(I)
	125	28	80	3000	2000	14.3	4000	42.9	27.25	20/AEP	125E(I)
	125	28	110	4000	2000	19	4000	48.7	35.90	20/AEP	125F(I)
	125	22	110	1000	1500	4.8	4000	14.4	10.10	5/AEP	125B(II)
	125	24	110	1500	1500	7.2	4000	21.4	14.40	5/AEP	125C(II)
А	125	24	110	2200	1500	10.5	4000	31.5	20.35	10/AEP	125D(II)
	125	28	110	2300	1500	14.3	4000	42.9	27.25	10/AEP	125E(II)
	125	28	110	2600	1300	19	4000	48.7	35.90	10/AEP	125F(II)
	130	22	110	1800	3400	5.09	4000	11.2	6.00	10/AEP	130-1800/34E
	130	22	110	3700	3400	10.5	4000	28.6	11.60	20/AEP	130-3700/34E
	130	26	110	5700	3400	15.9	4000	47.7	17.20	40/AEP	130-5700/34E
	130	26	110	5700	2000	15.9	4000	45	17.20	20/AEP	130-5700H/34E
	142	24	130	5100	2400	20.2	4000	62.6	23.7	20/AEP	142-5100/24E
	142	24	130	9100	2800	31	4000	109.2	32.4	40/AEP	142-9100/28E
	145	32	130	4000	2000	19	4000	48.7	66.48	20/AEP	145B(I)
В	145	32	130	5600	2000	26.7	4000	80.1	91.15	40/AEP	145C(l)
A	180	32	114.3	7500	2000	35.8	3000	88	57	40/AEP	180-7500/20E
	180	34.925	216.28	18300	2000	92	4500	278	160	50/CEP	180-18.3KW/20EF
D	190	38	114.3	6000	1500	39	4000	97.5	102.7	25/CEP	190B(II)
	190	38	114.3	7500	1500	48	4000	144	139.8	25/CEP	190C(II)
	190	42	114.3	11000	1500	71.5	4000	188	177.4	50/CEP	190D(II)
	190	42	114.3	15000	1000	95	2000	200	214.5	60/AEP	190E(II)
	190	34.925	114.3	10300	2000	51.6	3000	144	84.7	40/AEP	190-10.3KW/20E
	190	32	180	13000	3000	41.8	3000	110	84.7	60/AEP	190-13KW/30E
	190	34.925	114.3	15400	2000	62.1	3000	172.8	84.7	60/AEP	190-15.4KW/20E
А	190	32	180	11900	3600	31.6	4000	135.6	48.8	50/CEP	190-11.8KW/36E
D	190	48	180	21400	2400	85.5	3000	298.3	122.2	50/CEP	190-21.5KW/24E
	210	41.275	216.28	9300	1200	86.7	4500	569	347	50/CEP	210-9.3KW/12E

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Type A Low inertia, high torque motors for quick response and frequent repetitive motion.

Type B Medium inertia motor for applications that require stable velocity and rigid shaft control.

 $\ensuremath{\mathsf{Type}}\xspace C$ Compact motors with small weight and quick response.

Type D Heavy-duty motors with maximum torques of 298 Nm up to 2400 rpm.

NOTE: Additional motor sizes and styles are available but are not listed in the table above. Please call or email us if you have other requirements like wash-down, explosion-proof, and stainless servo motors. Servo rated gearboxes are available for any servomotor we offer.



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Emerald System Accessories

Servo-rated Gearboxes



Our pre-sales support team will help specify servo-rated gearboxes for light duty or heavy duty applications that will match the servo motor for the best system performance, quaranteed.



Adjustable Speed Drives with an interface adapter (DNET-104) for the DeviceNet network.



Encoders, cables and breakout assemblies are available for the Master Encoder interface port on the Emerald Automation Controller. The THA-2-4096 encoder with cable and the INT-810 terminal breakout are shown. Various encoder line counts are in stock.





The IPS-24 is a 24 volt dc power supply for I/O and controllers are available in various capacities.

Standard communications cables with 9-pin PC adapters used for all controllers, amplifiers, and drives for programming and configuration are always in stock.



Various I/O blocks are available for a full complement of digital and analog inputs and outputs for the SERCOS II Network.

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The ESD-ACE and the ESD-ACR modules are used to provide position loop control for analog interface drives on the **SERCOS II network**. Mainly used to replace position loop functionality of the legacy MSC-250 and MSC-850 controllers, the DIN-rail mountable ESD-ACR modules are used in new designs where a resolver is used as a master source device or where an interface to an adjustable speed drive is required on the network. For encoder feedback position loops, use the ESD-ACE module.

The ESD-ACE and the ESD-ACR modules also include the hi-speed position trap input, a holding register for registration applications, and a general purpose 12 bit analog output.



Our servo motors are for complex environments such as food production, medical applications, oil refining, explosive liquid, dust and vapor atmospheres, and submersible assemblies. Agency standards: UL, cUL, ATEX, IECEx and FDA (rated and certified).

Automation Software Tools

Servo Motor Sizing

ed Drive Applic

Application: 56 inch solid USA machine 10" @ 180 Feed angle Nip Boll #2 Master (Driven) Roll 2.4000 li 2.9750 2 2500 in 2.0000 in 56.0000 56.0000 Length: Length 0.040 Plastic Material Density 0.040 Plastic --Quantity Quantity 0.002022 [b-ft-sec^2 0.001168 lb-ft-sec^2 Inertia Mechanic **III** Results Fo Web Weight Application: 56 inch solid USA machine 10" @ 210 @ 180 Motor/Drive: ESD-40 & ESM142-9100/20E Pass: 🔽 Web Tension Motor/Drive Requirements -Load Parama Motor: ESM142-9100/28E 28.24 Acceleration Torque System Friction at Load: Drive: ESD-40/AEF 1.62 lb-ft Run Torque 10.000 24.99 ndex Distance: Deceleration Torque Ib-ft 0.143 Seconds 0.36 Index Time Holding Torque Customer Data 1156.72 28.24 Top Speed RPM Peak Torque 142.1 185.3 [%] Speed Margin: Peak Torque Margin 404.45 15.44 Rev/Sec^2 ion Rate **BMS** Torque 021604 [b-ft-sec^2 48.1 (%) Inertia orque Margin 6.2 1.66 : Gear Batio: 590.8 (%) HP Margin: 3.281 Inertia Ratio Needed? Resista Maximum W Watts Wire Gauge Regen V 5-15 Ob 2500M 10 AWG (3.5 mm Show Motors/Dri Print Report Restart SMA

- Servo motor selection starts with a complete description of the mechanical system entered to the Servo Mechanical Analysis (SMA) software. Menus for the basic types of systems are provided for analyzing ballscrew conveyor, chain, and feedroll systems.
 - The resulting analysis shows all performance data for the motor and drive package selected from our database. Free pre-sales support is always available to assist you in the selection of the motor and drive.

The EDE program code editor is content sensitive and easy to use. The Emerald Motion Language (EML) is a straight forward language that uses a standard structure with mature functions tailored to the real-time aspects of motion control.

> f_decel if device status

set_local

gosub set_ratio

lock

if io

ct wt decel

FEED, jAccel FEED_BUSY, ON, ct_wt_decel

monitor FEED, rqRNum, rqRDe:

FEED. jAccel

RUN AUTO, ON, ct run

CAM AT START, FEED, MASTER ENCODER

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FEED

Application Development

The Emerald Development Environment (EDE) provides project management utilizing a system component configuration window to manage all the drives, I/O devices and files used in an automation system.

> The EDE provides a debugging window for program development support. Watch data values, trace the program flow and view network device status in real-time.

Commissioning Support

Two software tools are available for setup and tuning the motor-drive system. ShanX for the SERCOS III Toshiba drives and eDrive for the SERCOS II Emerald series drives.

Real-time scope functions display the motor velocity and torque responses to assure the



required motor response is achieved.

Once the motor and the drive are installed you can fine tune the motor's response by adjusting the servo loop parameters for maximum performance.

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Data - Long Data - Long

> Menus from the configuration window allow you to select and configure all the devices in your system for fast and easy setup.

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The IIS Team



Discover how our advanced motion control components and superior support can redefine your operations. Let's embark on a journey to operational excellence. Ready to elevate the efficiency, consistency, and repeatability in your operations? Call us today at (585)924-9181 to discuss your application.



Headquarters in Victor NY

Our location houses all critical departments: Applications Engineering, R&D, Production, Warehouse, Panel Shop, Quality Control, Sales, Marketing, and Customer Support. Having everything under one roof speeds communications and provides better service to our customers.

Check out our IIS InMotion Blog for the Servo Motion Control Professional ~ https://www.iis-servo.com/blog/



for Industrial Indexing Systems, where you'll play a crucial role in boosting brand recognition and nurturing client connections, contact our offices: (585) 924-9181 ~ Email: sales@iis-servo.com



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