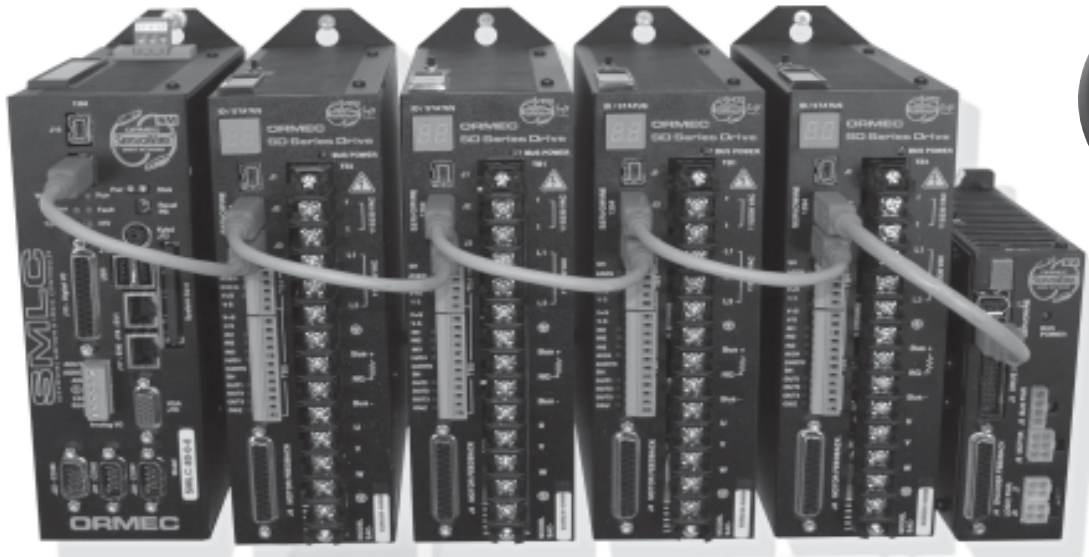


SMLC Products Catalog

Integrated Control Hardware

I/O Solutions



Firewire-based Servodrive Networking



IEC 61131-3 programming and high performance motion for up to 16 axes in a simple, cost-effective package.

Motion and logic. All in one. Now you can combine the best of both worlds with IEC 61131-3 programming tools and powerful motion control software for up to 16 axes.

ORMEC's ServoWire Motion & Logic Controller (SMLC) product family provides integrated, cost-effective control that leverages industry-standard hardware and software solutions.

Reduce your software development and support costs using the common "look and feel" of our CoDeSys software solution for programming applications using sequential function chart, relay ladder logic, function block diagrams,



instruction list and structured text. Utilize the PLCopen motion control library plus powerful ORMEC extensions for electronic gearing, camming, registration control, superimposed motion and coordinated, multi-axis applications.

Also, check out our line-up of Firewire-based digital drives and

servomotors, plus solutions for machine I/O, factory networking and HMI.



HMIs

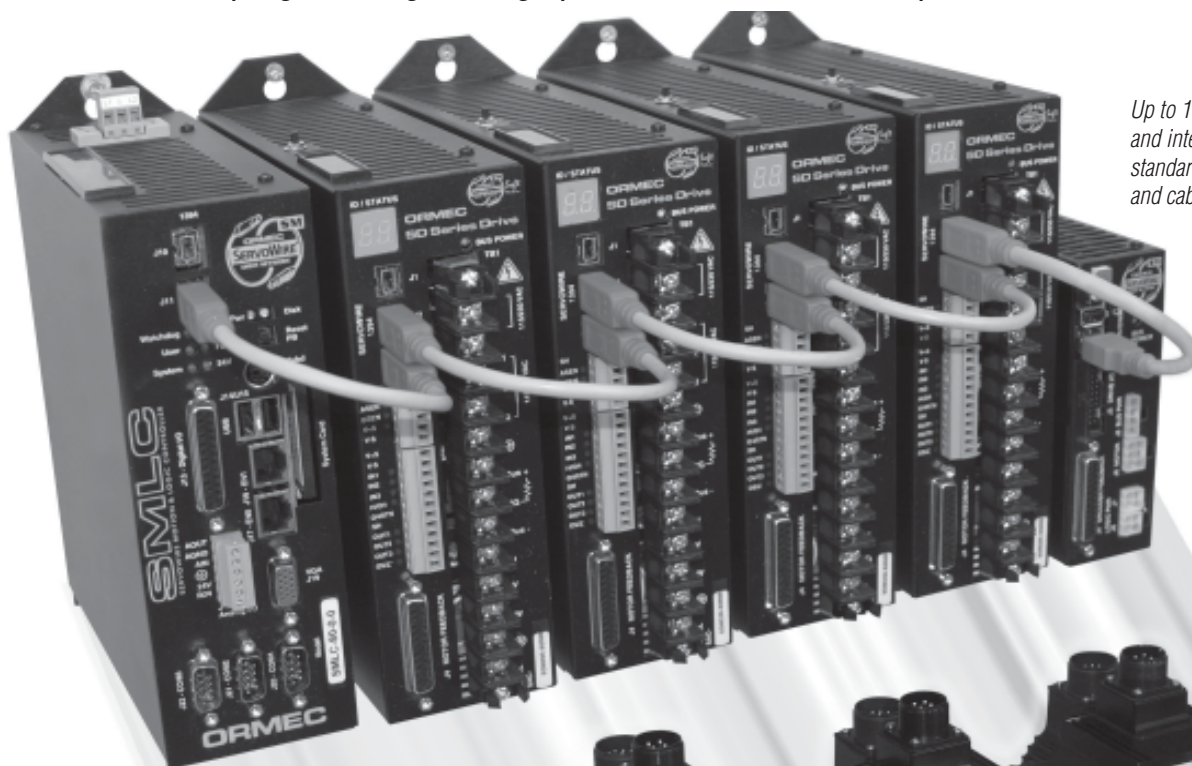
Table of Contents

Page

SMLC Product Overview.....	2
SMLC Model 30, 80 160	4
SMLC-SA (Single Axis Controller/Drive)....	6
CoDeSys Development Software	8
HMI Touchscreens	12
Machine I/O	14
<i>Ethernet & Profibus</i>	
Networking Solutions	17
ServoWire Pro	18
ServoWire SD Drives	20
230 Series	22
460 Series	24
LP (Low Power) Drive	26
Servomotors	28
Pacer Encoders	43
Contact Information.....	Back Cover

Fully integrated total systems solutions ...

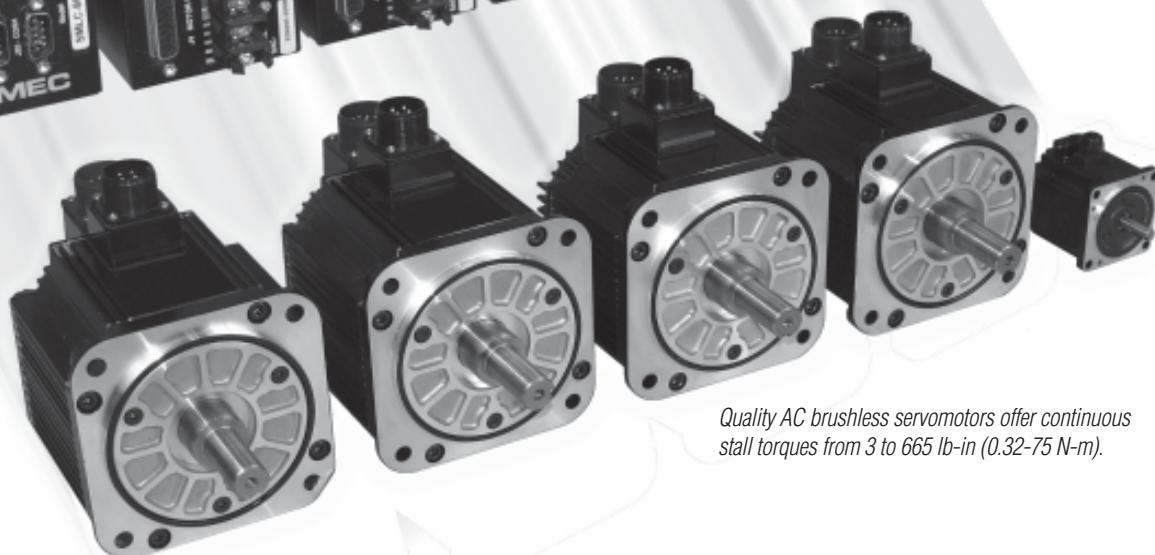
IEC 61131-3 programming and high performance motion for up to 16 axes in a single package.



Up to 16 servos can be daisy-chained and interfaced to the SMLC using standard IEEE-1394b network interface and cabling.

Machine I/O solutions include Ethernet or Profibus DP.

Integrated Control Hardware



Quality AC brushless servomotors offer continuous stall torques from 3 to 665 lb-in (0.32-75 N-m).

The ServoWire® Motion and Logic Controller is a cost-effective control platform offering rugged, industrial hardware, a proven RTOS and industry standard networking, programmed using standard IEC 61131-3 languages. An SMLC system offers low cost, compact, proven and reliable components.

- ✓ Featuring Pentium-class processors.
- ✓ Two built-in Ethernet ports, two FireWire ports, three or four serial ports.
- ✓ Compact Flash program storage (eliminates hard disk) and 32k battery-backed SRAM data storage.
- ✓ Reliable, QNX real-time operating system.

See page 4 for more information on controllers.

Firewire motion networking reduces cost & complexity

- ✓ Control one to 16 servos directly from one controller without specialized motion control hardware.
- ✓ ServoWire® SD drives offer a power range from 200 to 24,000 watts, continuous output currents from 2.4 to 60 amps RMS/phase with input voltages including 24-96 VDC, 115/230 VAC, and 460 VAC.

See page 20 for more information on ServoWire Drives.

Conveniently interface a variety of servos

- ✓ Mix and match servo technologies (DC brushless rotary, linear, DC brush-type or voice coil motors) in the same drive hardware.
- ✓ Continuous stall torques from 3 to 665 lb-in (0.32-75 N-m).

See page 28 for more information on AC Brushless Servomotors

Solutions for I/O Needs



Conserve panel space by utilizing Modbus/TCP (Ethernet) or Profibus DP to connect up to 512 I/O per bus coupler and thousands of I/O points.

See page 15 for more information.



HMI Touchscreens

Cost-effective, standalone touchscreen HMIs utilize Modbus RTU (Serial) or Modbus/TCP (Ethernet) communications. Or you can utilize Windows-based HMIs such as Wonderware InTouch, Rockwell Automation RS View, Intellution iFIX, CiTect or GE Cimplicity that communicate with the SMLC using an OPC Server. *See page 13 for more information.*

CoDeSys Development Software

Utilizing industry-standard IEC 61131-3, you can develop motion and I/O programming using standard tools that streamline development and create application programs that are both more effective and easier to support in the field. *See page 8 for more information.*

- ✓ Select among text-based and graphical languages to pick the right one for the job -- Relay Ladder Logic, Function Block Diagram, Structured Text, Instruction List or Sequential Function Chart programming.

- ✓ Program motion control and logic using standard IEC 61131-3 tools.
- ✓ Suite of programming languages and diagnostic tools streamlines machine development and simplifies support.
- ✓ PLCopen standard Motion Control Library, plus powerful ORMEC extensions, bring new levels of motion performance for electronic gearing, camming, registration control and coordinated, multi-axis applications.



ServoWire® Motion & Logic Controller - Models 30, 80, 160

ORMEC's ServoWire Motion & Logic Controller (SMLC) is at the center of a complete machine control solution that can meet all of your motion, I/O and networking needs. By combining Pentium processors, IEEE 1394b FireWire drive networking and Ethernet connectivity, the SMLC is a system that can control your entire machine. This allows you to focus on solving your application instead of integrating control components.

The SMLC, ServoWire Drive Network and Modbus/TCP provide state-of-the-art I/O and motion control (for up to 16 axes), all programmed using any of the five IEC 61131-3 standard languages including relay ladder logic.

SMLC Controllers

The ServoWire Motion & Logic Controller (SMLC) features high performance computing capability combined with a true real-time operating system (RTOS). Using the industry standard family of Intel 32-bit processors running the QNX RTOS provides plenty of cost effective, robust computing power for even the most demanding multi-axis motion and I/O control applications.

Machine I/O

The SMLC provides a multi-tiered, flexible approach to meeting machine I/O requirements. It has the ability to interface high-speed drive based I/O for microsecond position capture and single servo update response to sensor signals. It also provides sub-millisecond programmable limit switch outputs that are tightly coupled to the motion control.

General purpose I/O options are fully supported using WAGO 750 Series Ethernet I/O as well as optional Profibus DP Master support. In either case, a wide variety of analog and digital I/O modules can be cost effectively connected to and controlled by the SMLC.

SMLC Controller

1. Processor Options

- ▶ Intel architecture microprocessor
- ▶ 128 Mbytes DRAM
- ▶ 128 Mbytes of FLASH memory for program storage
- ▶ 32 Kbytes SRAM (battery backed) for non-volatile data storage

2. Communication Ports

- ▶ Two IEEE 1394b ServoWire (FireWire) Ports
- ▶ Two Ethernet Communication Ports.
- ▶ Three RS-232 Communication Connectors.

3. Input Power Supply

- ▶ 115/230 VAC input power (auto-ranging), 50/60 Hz
- ▶ +5, +/-12 VDC logic power output

4. Status LEDs

- ▶ Eight status LEDs on the face for indicating system status.

ServoWire Drive Network

ORMEC's AC brushless servomotors and ServoWire digital servodrives offer tested and guaranteed performance with the SMLC. The result is maximum performance from a tightly integrated, pre-engineered package that simplifies everything from system integration to maintenance.

Fully digital control offers compelling benefits—eliminating manual servodrive setup and providing real-time software access to all parameters. In an SMLC system, the position, velocity and torque loops are all closed by the digital signal processors (DSPs) in the ServoWire Drives based on position commands sent from the SMLC. Velocity observer software eliminates the need for analog tachometers, and potentiometers are eliminated since all gain and compensation parameters are set in software. All loop adjustments are automatically computed when a motor and its load inertia are specified in ServoWire Pro—greatly simplifying servo system tuning.



SMLC — At A Glance

- ✓ **Powerful and Robust:** Intel 32-bit processors running the QNX RTOS.
- ✓ **Compact Size:** 2.75" x 7.2" x 9" (W x D x H) for Model 30 and 80 or 4.25" x 7.2" x 9" for Model 160.
- ✓ **IEC 61131-3 Application Programming:** International programming standard for PLCs.
- ✓ **PLCopen Motion Blocks:** Standard compliant motion blocks, powerful ORMEC enhancements.
- ✓ **ServoWire:** High-bandwidth, synchronous, all-digital servodrive network based on IEEE 1394b.
- ✓ **Networking Options:** Modbus/TCP, Ethernet/IP and OPC Server.
- ✓ **I/O Options:** WAGO 750 Series Ethernet I/O, Profibus DP Master.

Specifications

General Specifications

- Input Voltage: 115/230 VAC, 1.0/0.5A (+15%, -20%), 50/60 Hz
- Operating Temperature: 0 to 50C
- Relative Humidity: 10 to 95% @ 40C (non-condensing)
- Weight: Approx. 3.1/3.5 lbs
- Dimensions: 2.75" x 7.2" x 9.0" (69.9 x 182.9 x 228.6 mm), W x D x H for Model 30 & 80 or 4.25" x 7.2" x 9.0" (108 x 182.9 x 228.6 mm) for Model 160.

Processor & Memory

- Main Processor: Industry standard 32-bit Intel microprocessors
- DRAM: 128 Mbytes
- Program Memory: 128 Mbytes (Removable Compact Flash)
- Non-Volatile Memory: 32 Kbytes (battery backed).

Motion Control

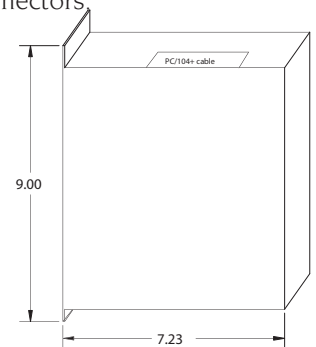
- All-digital control algorithms featuring velocity and acceleration feedforward for optimal performance.
- Position Command Update Rates: 1.0, 2.0, 2.66 kHz (axis count independent).
- High-speed sensor inputs to initiate motion within one position command update.
- High-speed hardware position capture (<1 usec), ideal for use in high-speed registration applications.
- Software controlled position, speed and current (torque) limits.
- Drive fault protection circuits, watchdog timers and integrated diagnostics for fail-safe operation.
- Full 32-bit position count or modulo position in user units.
- SMLC Model 30 - 3 axes
SMLC Model 80 - 8 axes
SMLC Model 160 - 16 axes

Inputs/Outputs

- SMLC I/O: 8 inputs, 8 outputs, 1 analog in, 1 analog out.
- General I/O: 64 modules per Wago 750 Series bus coupler, up to 512 I/O points connected via Ethernet (Modbus/TCP). Multiple bus couplers can be used for additional I/O.
- Profibus DP Master (optional) supports up to 126 I/O nodes.

Communications

- Standard: Three RS-232 serial ports, four on Model 160.
- Standard: Two Ethernet 10/100baseT ports with RJ45 connectors.

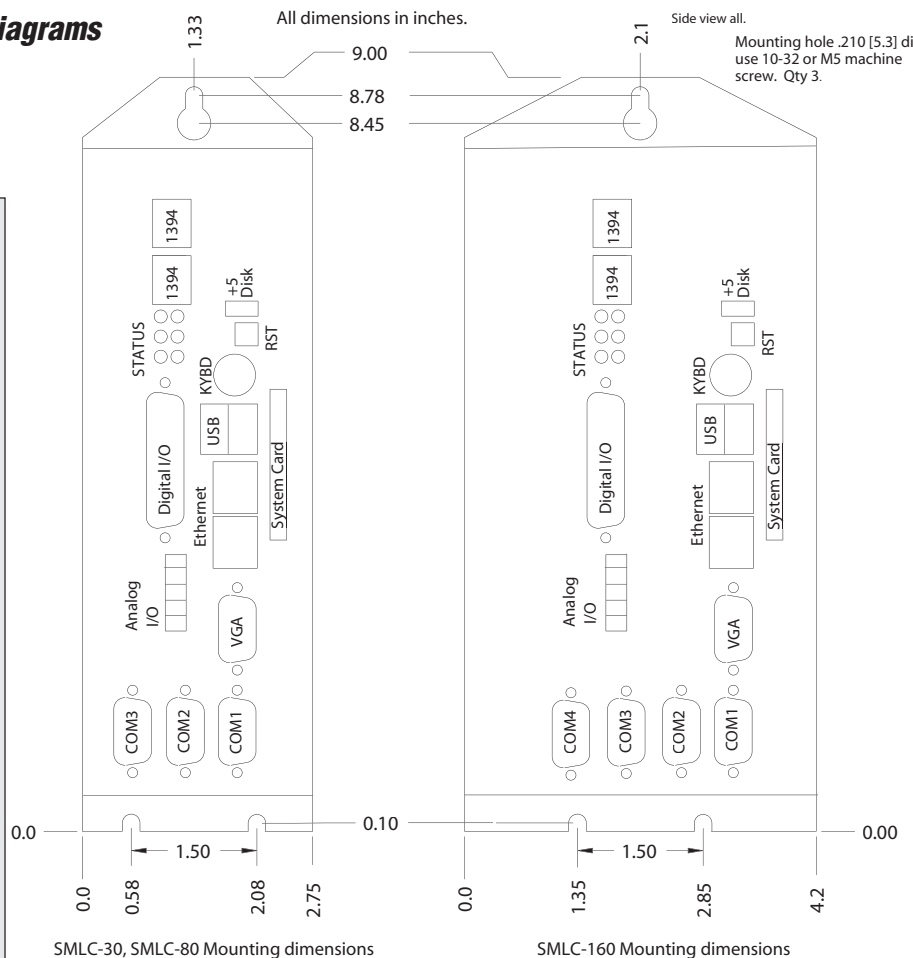


SMLC Mounting Diagrams

All dimensions in inches.

Side view all.

Mounting hole .210 [5.3] dia. use 10-32 or M5 machine screw. Qty 3.



ORDERING GUIDE

SMLC Model 30, 80 & 160 Motion Controllers

SMLC---0

- 0 No Fieldbus adapter
- PM Profibus Master

- 30 SMLC Model 30, 115/230 VAC, **3 axis unit**, two Firewire ports (IEEE 1394b), two Ethernet, three RS-232 interfaces and one PC104+ expansion slot.
- 80 SMLC Model 80, 115/230 VAC, **8 axis unit**, two Firewire ports (IEEE 1394b), two Ethernet, three RS-232 interfaces and one PC104+ expansion slot.
- 160 SMLC Model 160, 115/230 VAC, **16 axis unit**, two Firewire ports (IEEE 1394b), two Ethernet, **four** RS-232 interfaces and **two** PC104+ expansion slots.



SMLC with Integrated Servo Drive

The SMLC-SA combines ORMEC's high-performance drive technology with the IEC-61131-3 programming capabilities of the SMLC controller into a single, compact, cost-effective package. Standard PLCopen motion control function blocks reduce your software development costs and powerful ORMEC extensions make solving your toughest motion applications a snap. Application-specific function blocks such as Reciprocating Flying Shear and Rotary Knife are available to provide solutions right out of the box.

A total of fourteen models cover an output power range from 600 watts to 24,000 watts. The SA230 series offers eight models with continuous output currents from 2.5 to 60 amps RMS/phase for 115 to 230 VAC input. The SA460 series offers six models with continuous output currents from 5 to 50 amps RMS/phase for 230 to 460 VAC input.

The SMLC-SA uses the same development and commissioning tools as the SMLC product line, providing seamless scalability from one to sixteen axes. The CoDeSys Integrated Development Environment (IDE) and runtime engine are world class IEC-61131-3 tools used in hundreds of products worldwide. These are robust, full-featured tools with extensive diagnostic capabilities. ServoWire Pro is an easy to use, integrated suite of configuration, diagnostic and maintenance utilities to assist in the commissioning of the drive.

In addition to the built-in I/O there is a complete line of networked I/O expansion modules available based on Ethernet that can handle thousands of I/O points. HMI and factory networking support is provided via built-in Modbus/TCP as well as via the free OPC server.



The ServoWire Motion & Logic Controller - Single Axis (SMLC-SA) is a standard off-the-shelf, cost-effective control platform. Program motion control and logic using standard IEC 61131-3 tools. PLCopen standard motion control function blocks plus powerful ORMEC extensions reduce your software development costs and bring new levels of motion performance to single-axis applications.

KEY FEATURES

- Powerful enough to control your entire machine.**
- Program logic and motion using all five IEC 61131-3 languages.**
- Application-specific function blocks provide solutions right out of the box.**
- Broad power range, 600 to 24,000 watts (30+ horsepower).**
- Broad input voltage range, 115 to 480 VAC.**
- High performance Intel processor.**
- Reliable, robust, QNX real-time operating system.**
- Industrial, all metal enclosure.**
- Removable program storage (compact Flash).**
- Built-in I/O: 27 digital and 4 analog, expandable to thousands.**
- Two Ethernet and two serial ports included.**

Features

Logic Controller

- ▶ 32-bit microprocessor
- ▶ QNX RTOS
- ▶ IEC-61131-3 programming
- ▶ PLCopen compliant motion control function blocks
- ▶ Additional ORMEC specific motion control function blocks
- ▶ Two Ethernet ports
- ▶ 2 serial ports
- ▶ 64Mb compact Flash based program storage
- ▶ 128Mb RAM
- ▶ 32k battery backed SRAM for real time non-volatile variable storage

Built-in I/O

The SMLC-SA includes the following 29 built-in I/O:

- ▶ 2 High Speed Sensor inputs
- ▶ 12 Digital inputs, optically isolated
- ▶ 13 Digital outputs, optically isolated
- ▶ 1 14-bit Analog input (2nd optional)
- ▶ 1 14-bit Analog output (2nd optional)

Network I/O Options

You can expand the SMLC-SA I/O using the following interface:

- ▶ Wago 750 Series Ethernet I/O (Modbus/TCP)

Networking Options

The SMLC-SA includes the following network options that can be used for connection to an HMI, another machine or to a factory network:

- ▶ Modbus/TCP Server
- ▶ OPC Server
- ▶ Ethernet/IP (Industrial Protocol)

Other Features

- ▶ Diagnostic LEDs for the controller
- ▶ Two digit display for drive status
- ▶ UL/CE approvals: UL Listed and CE Mark (low voltage directive & EMC)

Drive Output

- ▶ IGBT pulse width-modulated with sinusoidal or trapezoidal commutation
- ▶ Internal shunt regulator for regenerative load dissipation (except 203 and 205)
- ▶ Peak currents up to 200% of RMS continuous capability
- ▶ Compatible w/ DC brushless rotary, linear, DC brush & voice coil motors
- ▶ Field Oriented Control (FOC) and Space Vector Modulation (SVPWM) for optimal performance at all motor speeds

Motor Feedback Interface

- ▶ Encoder or Resolver Interface
- ▶ Quadrature feedback 4x decoding with data rates to 8 Mhz (after decode) and open wire detection
- ▶ Three differential input channels for motor commutation feedback
- ▶ Support for Yaskawa Sigma II and Tamagawa serial encoders.
- ▶ Pacer encoder input (optional)
- ▶ Industry Standard D-sub interface connector (25-pin, Encoder/female; Resolver/male).

Drive I/O

- ▶ High speed sensor inputs are software configurable for NPN or PNP output transistors, level or edge triggered response, one microsecond position capture and can initiate motion within one servo loop update.
- ▶ Externally powered 5-24 VDC opto-isolated general purpose I/O

Specifications

Main Circuit Power

SMLC-SA203, 205, 210, 217, 220, 225, 235, 260

- ▶ 115/230 VAC, +15%, -20%, 50/60 Hz

SMLC-SA405, 410, 417, 425, 435, 450

- ▶ 230/480 VAC, +10%, -20%, 50/60 Hz

Control Circuit Power

- ▶ 115/230 VAC, 1.0/0.5A (+15%, -20%), 50/60 Hz, 56 Watts RMS, (230 VAC only on SMLC-SA435 and 450 models)

Control Loop Update Rates

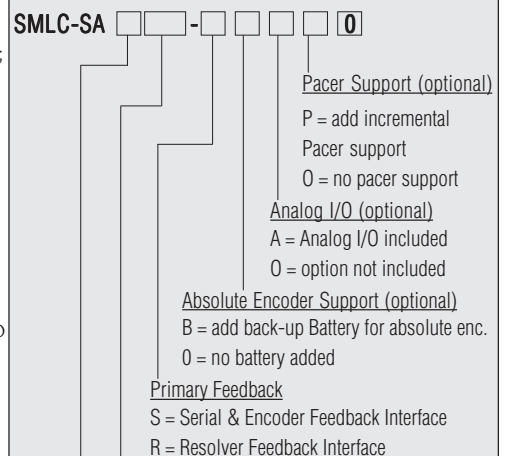
- ▶ Position loop update rate: up to 2.66KHz
- ▶ Velocity loop update rate: up to 5kHz
- ▶ Torque loop update rate: 10kHz

Environmental

- ▶ Ambient operating is 0 to 50C
- ▶ Ambient storage is -20 to 70C
- ▶ Humidity operating/storage is 90% RH or less (non-condensing)

ORDERING GUIDE

SMLC Model SA



Maximum Continuous Current

- 03 = 2.5 A rms/ph (115/230 VAC model)
- 05 = 4.1 A rms/ph (115/230 VAC model)
- 05 = 5 A rms/ph (460 VAC model)
- 10 = 8.2 A rms/ph (115/230 VAC model)
- 10 = 10 A rms/ph (460 VAC model)
- 17 = 13.9 A rms/ph (115/230 VAC model)
- 17 = 17 A rms/ph (460 VAC model)
- 20 = 16.3 A rms/ph (115/230 VAC model)
- 25 = 25 A rms/ph (both VAC models)
- 35 = 35 A rms/ph (both VAC models)
- 50 = 50 A rms/ph (460 VAC model)
- 60 = 60 A rms/ph (115/230 VAC model)

Bus Voltage

- 2 = 115/230 VAC
- 4 = 460 VAC

Dimensions (Approximate) in inches

Model	Height	Width	Depth
SMLC-SA203, SA205, SA210	9.0	4.2	8.3
SMLC-SA217	9.0	5.4	8.3
SMLC-SA220	9.0	5.5	8.3
SMLC-SA225, SA235, SA260	12.0	8.6	8.45
SMLC-SA405	11.0	6.1	8.3
SMLC-SA410	11.0	6.2	8.3
SMLC-SA417, SA425	12.0	8.6	8.45
SMLC-SA435, SA450	14.0	9.6	9.45



CoDeSys Development Software

Developing motion control and I/O programming using a standard set of software tools streamlines software development and creates application programs that are more effective and easier to support in the field.

The CoDeSys Development Software utilizes standard IEC 61131-3 programming and PLCopen motion function blocks to provide proven, open standard tools for developing application programs for motion control and I/O control -- running on a single controller.

IEC 61131-3 Programming

The key advantage of IEC 61131-3 is that it provides an *integrated set of software tools and graphical interfaces* to meet a wide range of software development needs:

- ✓ Relay Ladder Logic (LD)
- ✓ Structured Text (ST)
- ✓ Sequential Function Chart (SFC)
- ✓ Function Block Diagram (FBD)
- ✓ Instruction List (IL)

Developing application programs using IEC 61131-3 offers the following advantages:

- ✓ Reduces training costs by learning one set of programming languages used by multiple control vendors.
- ✓ Provides flexibility for selecting the best programming approach

Programming tools simplify software development

CoDeSys Development Tools

- ▶ Program motion control and logic using standard IEC 61131-3 tools
- ▶ Suite of programming languages and charting tool simplifies machine development and support
- ▶ Select among graphical and text-based languages -- Relay Ladder Logic, Function Block Diagram, Structured Text, Instruction List, Sequential Function Chart or Continuous Function Chart

PLCopen Motion Control Library

- ▶ Standard library of motion function blocks which cover all of the IEC 61131-3 languages.

ORMEC Motion Control Extensions

- ▶ ServoWire Motion Blocks provide enhanced functionality for high performance electronic gearing and coordinated multi-axis control.
- ▶ Analog feedback control.
- ▶ Registration control.


Built-in Networking Support

- ▶ Standard networking solutions and support for Ethernet, TCP/IP, Modbus/TCP, Profibus DP and OPC server.
- ▶ Connectivity for motion and I/O control, HMIs and factory data networks.

ServoWire Pro

- ▶ ServoWire Setup: menus and software wizards to simplify configuration of ServoWire SD drives.
- ▶ ServoWire Monitor: diagnostic utilities for monitoring drive and network performance.
- ▶ ServoWire Tune: tuning scope optimizes performance.
- ▶ ServoWire Upgrade: tools for maintaining new firmware.



	Administrative		Motion	
	Single Axis	Multiple Axis	Single Axis	Multiple Axis
	Power	CamTableSelect	MoveAbsolute	CamIn
	ReadStatus		MoveRelative	CamOut
	ReadAxisError		MoveVelocity	GearIn
	ReadParameter		Home	GearOut
	ReadBoolParameter		Stop	
	WriteParameter		PositionProfile	
	WriteBoolParameter			
	ReadActualPosition			
	Reset			
	DigitalCamSwitch			

and methods for specific application tasks and requirements.

- ✓ Offers the ability for the programmer to develop and deploy reusable function blocks which can reduce future software development costs and protect your company's intellectual property.

PLCopen Motion Control Library

PLCopen is an independent, worldwide association promoting IEC 61131-3 that has defined standard motion programming function blocks which cover all the IEC 61131-3 programming languages.

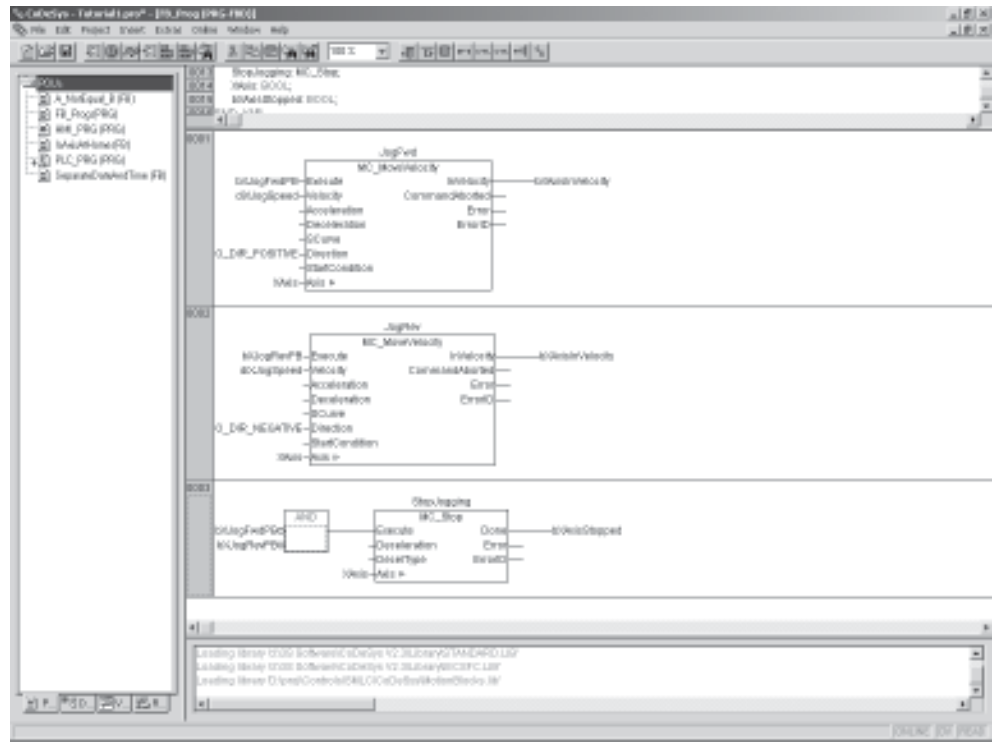
ORMEC's motion programming implementation (ServoWire Motion Blocks) conforms to the PLCopen motion block definitions and provides powerful, flexible functionality beyond that defined in the standard. Using the ServoWire Motion Blocks, a variety of applications can be written in any of the IEC 61131-3 programming languages.

The ServoWire Motion Blocks provide the following enhanced functionality:

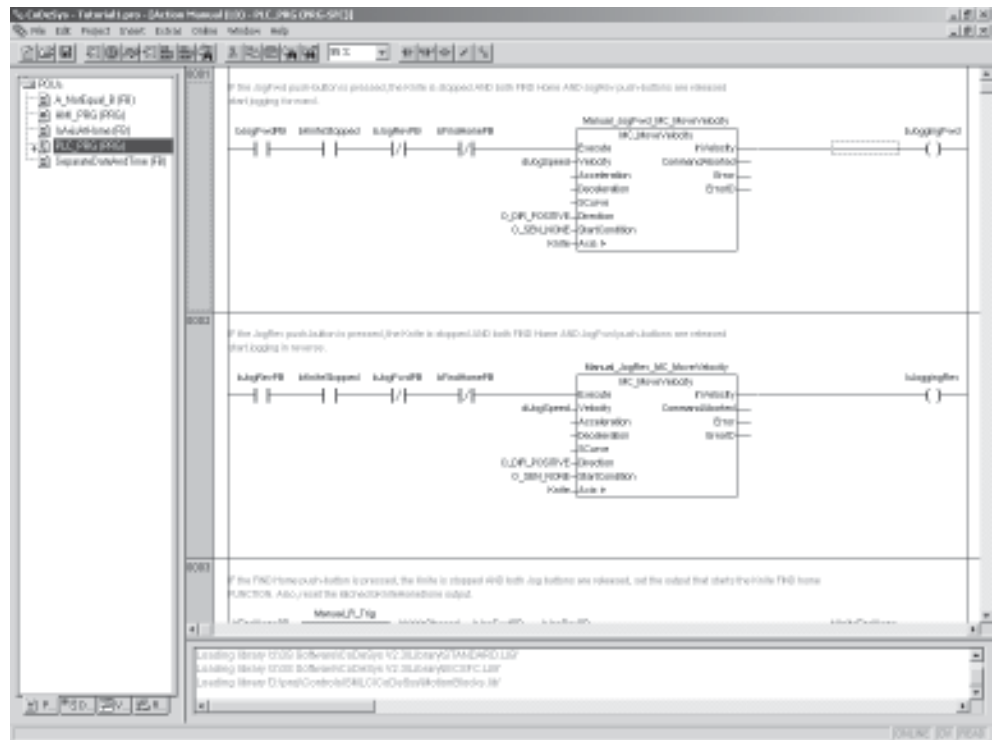
- ✓ Move Relative At Velocity
- ✓ Move Relative In Time
- ✓ Move Absolute At Velocity
- ✓ Move Absolute In Time
- ✓ Gear Relative At Ratio
- ✓ Gear Relative In Master Distance
- ✓ Cam Relative
- ✓ Plus administrative function blocks including enhanced diagnostic capabilities

Move Relative and *Gear Relative* motions can also be "superimposed" on a *Gear In* motion-- ideal for adjusting the phasing of a slave axis relative to the master position axis, as in flying shear, rotary knife and registered labeling applications.

ServoWire Motion Blocks can be inserted into relay ladder logic or function block diagrams to coordinate motion with I/O updates. Optional parameters allow motions to be triggered at the position command update rate using high-



Function block diagrams provide a graphical tool for creating effective motion control and I/O programming. Pre-defined function blocks can be easily configured and combined in a logical program flow which makes the application program both easier to understand and "self-documenting" for plant personnel.



Using ServoWire motion blocks in ladder logic makes application software both simpler to develop and easier to support in the factory. Ladder logic provides a graphical, power flow for viewing program structure and execution.

speed drive inputs, and *automatically repeated* independent of, and faster than the I/O updates. This motion command flexibility allows an SMLC system to meet the high performance requirements of demanding automation applications.

IEC 61131-3 Development Tools

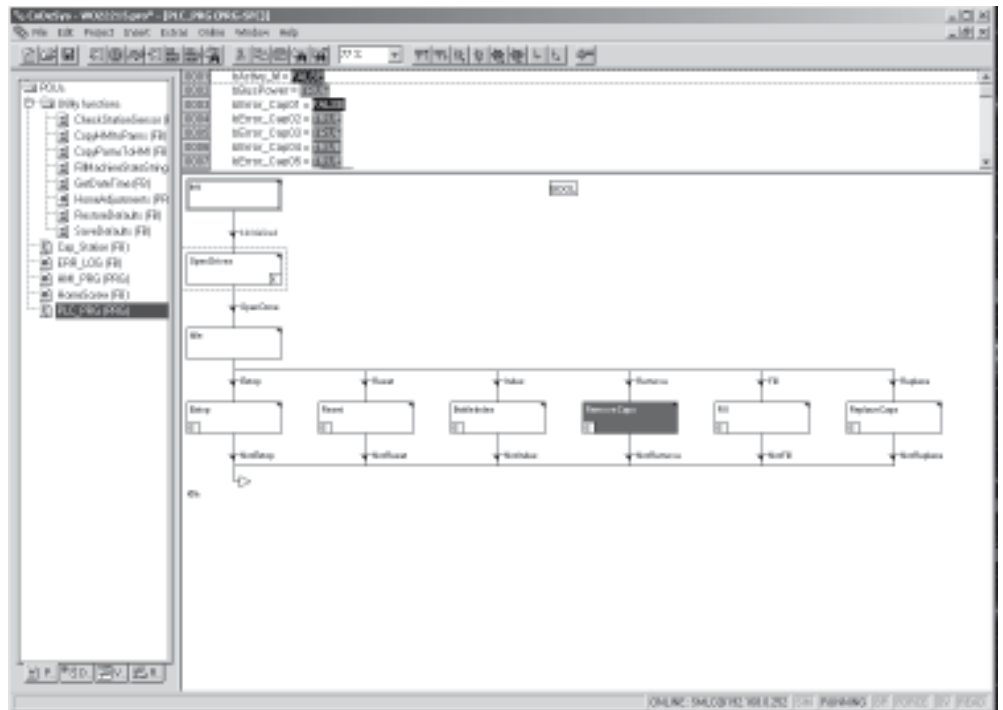
Powerful IEC 61131-3 development tools are provided for writing, debugging and maintaining application programs. This development environment will assist you in writing your application program by providing automatic variable declaration, automatic code formatting, syntax coloring and global search/replace functionality. There are tools for importing and exporting code modules, and a Library Manager for adding additional system libraries to your project.

The Input Assistant identifies possible entries for input variables, function calls and IEC keywords. A simulation mode is available for testing your program logic without needing the controller and other hardware.

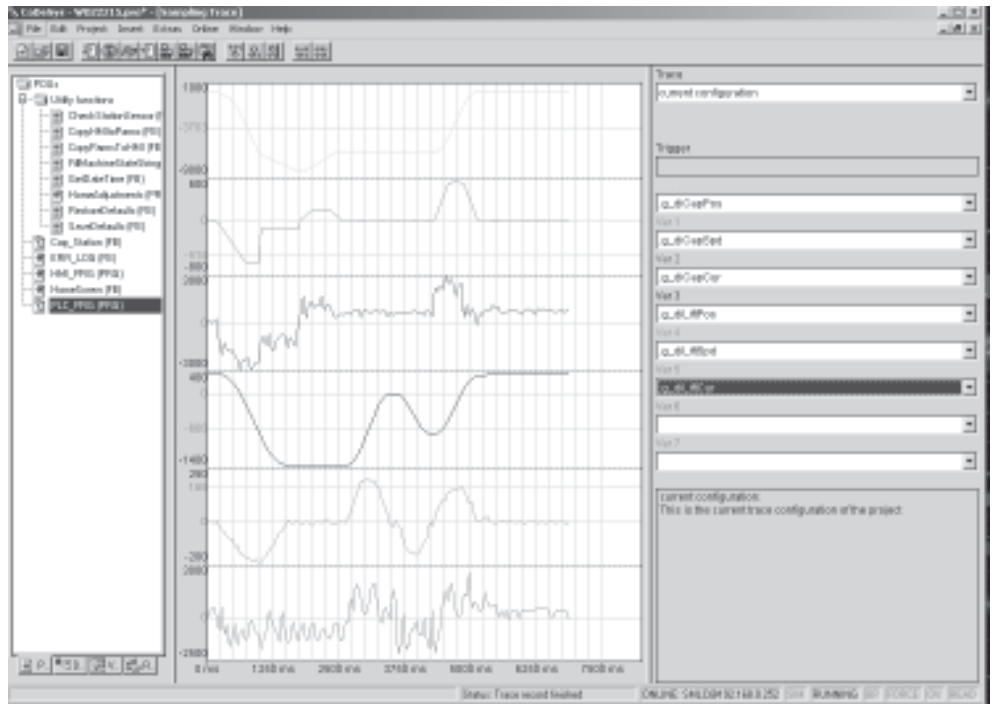
To debug your application, a *watch window* is provided for monitoring and writing variable values, along with tools for setting real-time program breakpoints -- single stepping or single cycling through the program. To monitor your machine during operation, a digital storage scope provides cyclic or single-shot storage and can display up to eight program variables.

The CoDeSys development environment provides tools for creating visualizations which can be used to build operator entry and diagnostic displays useful for testing and debugging the application.

When your application program is complete, all the source and supporting files can be downloaded to the SMLC. Application program source files can be password protected to limit access to authorized personnel only, and the controller acts as a storage medium for the application software, making field maintenance a snap.



Sequential Function Chart provides a graphical flow charting tool that illustrates the program flow and structure of the user's application program. SFC makes it easy to view a multi-layered, graphical model of the program and provides excellent tools for application development and maintenance.



The Sampling Trace tool can be used to trigger and view eight program variables with up to 500 data points for each variable. It is useful for application debugging, monitoring performance and capturing process information.

ORDERING GUIDE

CoDeSys Development Software

CDS-SDK/C	CoDeSys Developers Kit, CD-ROM, incl. ServoWire Pro, serial cable and one year of maintenance & support (for all SMLC models)
CDS-SDK-SA/C	CoDeSys Developers Kit, CD-ROM, incl. ServoWire Pro, serial cable and one year of maintenance & support (for SMLC-SA only)
CDS-SDK-MAINT	CoDeSys SDK Annual Maintenance & Support Contract Renewal



CoDeSys Programming Example

Programming languages and graphical tools work together to simplify software development

A key strength of the CoDeSys development environment is the different types of graphical and text-based programming tools it provides for a particular job -- simplifying both the software development process and support of the machine by engineering and plant personnel.

3 -- Structured text programming is easily integrated into the programming structure and flow, simplifying development and support. CoDeSys support for a variety of programming techniques provides a range of effective tools for creating powerful yet manageable application programs.

The screenshot displays the CoDeSys development environment. On the left is a project tree for 'Cap_Station (PLC_PRG)'. The main workspace is divided into three panes: a state machine diagram (SFC) in the center, a structured text editor (ST) at the top right, and a variable declaration window at the top left. The SFC shows states like 'Idle', 'Homing', 'LowerGrip', 'Start Replace', 'UnscREW Cap', 'CheckTight', and 'Crossed'. The ST editor shows ladder logic rungs for state transitions, such as '0001 (* If the EstopOK input is false, or any MC function block threw...)' and '0002 IF EstopOK = FALSE OR State = STATE_ESTOP OR Error THE...'. The variable declaration window lists parameters like 'EStopOK = TRUE', 'State = STATE_R0', and 'bInternalDone = FALSE'.

1 -- Sequential Function Chart provides an excellent tool for illustrating program flow and structure. SFC simplifies viewing and understanding the software modules in the application program.

2 -- By writing your program as a state machine in SFC, each individual state can contain only a few rungs of Ladder Logic. Instead of hundreds or thousands of contiguous lines of ladder logic programming, this structured approach makes programs easier to develop, understand and maintain.

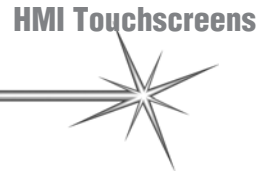
This detailed view shows a function block 'MC_Gearin' being called within a ladder logic rung. The rung is labeled 'R2_01' and is triggered by 'bExecute'. The function block has several parameters: 'Parameters.RatioNumerator=171', 'Parameters.RatioDenominator=1000', 'O_ACL_MDIST', 'O_SC_NONE', and 'CONCAT(sStation,'_R2_01')=1'. It also has inputs for 'InGear', 'CommandAborted', and 'ErrorID'. The function block is connected to a state variable 'STATE'.

4 -- Embedding function blocks in ladders programming makes software easier to support in the factory.



ORMEC

HMI Touchscreens



ORMEC's MMI-320 and MMI-640 flatpanel touchscreens provide a variety of sizes and functionality for human-machine interfaces. MMI-320/640 units are available in six, eight and ten inch screen sizes (diagonal), with TFT color displays.

The MMI-320/640 touchscreen is designed to provide the operator an effective way to control machine operation. The operator can easily be alerted to machine alarms and status conditions. Different panels can be quickly selected to present different sets of machine functions typically found for setup, maintenance, changing product runs and fault conditions. Operator control functionality can be built into the MMI-320/640 representing a typical factory operator panel, without the bulky hardware, I/O modules and wiring needed to build it.

Each individual panel can be designed and built in minutes using the "drag and drop" graphical objects found in the EasyBuilder application development utility. EasyBuilder includes a library of standard shapes to select from, as well as the ability to use bitmap images, when creating various panel objects. When upgrading a machine, the "look and feel" of an existing physical panel can be maintained to reduce operator retraining. After the design and installation of an MMI-320/640 is complete, its flexibility allows the designer to easily add and change control functions without having to physically add switches, legend plates, I/O modules and their associated wiring.

MMI-320/640 touchscreens include built-in recipe management, allowing for easy storage and retrieval of machine setup parameters. Having this powerful capability in the HMI eliminates the need for developing recipe management in the machine control application program, saving



ORMEC's touchscreen operator interfaces provide a fully graphical, easy to use human-machine interface.

software development time and simplifying the system design.

Each MMI-320/640 unit is shipped with the latest revision of the EasyBuilder development software and a development communications serial cable. This insures that the customer has the software and cabling necessary to properly install and configure their HMI.

Operation

Communications with an SMLC controller can be through either a serial connection using Modbus RTU, or Ethernet using Modbus/TCP. Screen objects are tagged to input and output registers that are mapped to input and output variables in the CoDeSys application program running on the SMLC.

Ordering Guide

Operator Interface Terminals

MMI-320/3TE	5.7" diagonal, 320w x 234h pixels, TFT Color, Ethernet
MMI-640/8T	7.7" diagonal, 640w x 480h pixels, TFT Color, Ethernet
MMI-640/10T	10.4" diagonal, 640w x 480h pixels, TFT Color, Ethernet

Each Operator Interface unit includes EasyBuilder development software and serial cable.

Ethernet Cables and Accessories

CBL-SMLC-MMI-232/x	Serial Cable, SMLC to MMI-320/640, RS-232, x ft.
CBL-MMI-MMI/x	Serial Cable, MMI-320/640 to MMI-320/640 (multi-drop), x ft.
CBL-PC-MMI	Serial Cable, PC to MMI-320/640, for application program download
EISK5-100T	Ethernet Switch, 100BASE-T, 5 port, 24 VDC input, DIN rail mount
CBL-ENET/x	Cable, Ethernet, RJ45, 3, 7, 10, 25, 50, 75 & 100 ft.
CBL-ENETX/x	Cable, Ethernet crossover, RJ45, 3, 7, 10 & 25 ft.

Development Software

EBD-SDK/C	EasyBuilder, MMI-320/640 application development software
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Touching a screen object, or entering data, sets the state of the variables in the SMLC application program. How the change of state is used in the program defines the object's control function.

Graphical Panel Objects

- Pilot Light (Bit Lamp)
- Word Lamp
- Force Coil (Set Bit)
- Write Register (Set Word)
- Toggle Switch
- Multi-State Switch
- Function Key
- Numeric Input
- Numeric Display
- ASCII Data
- ASCII Display
- Moving Shape
- Animation
- Indirect Window
- Direct Window
- Alarm Display
- Trend Display
- XY Plot
- Bar Graph
- Meter Display
- Alarm Bar
- Recipe Upload/Download
- Event Display

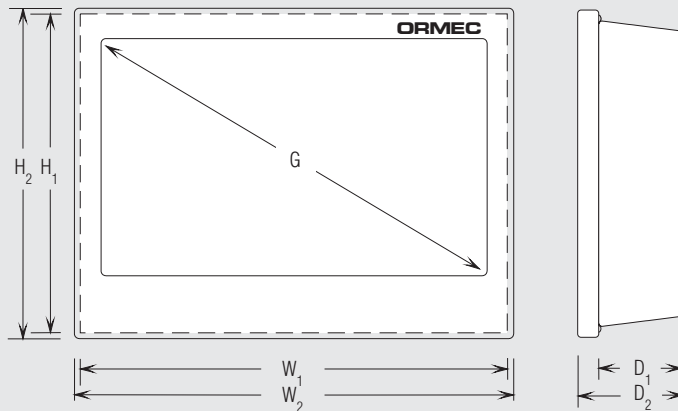
Mounting & Sealing

HMI-320/640 units are cabinet mounted, and feature a gasket and four or six mounting brackets to maintain a NEMA 4 rating.

LED Indicators

Each HMI-320/640 unit has three status indicator LEDs to assist with installation and troubleshooting.

Cabinet Mounted Unit Dimensions



	Dimension	MMI-320/3TE	MMI-640/8T	MMI-640/10T
Mounting & Cutout	G	5.7" 145 mm	7.7" 196 mm	10.4" 264 mm
	H1	5.43" 138 mm	6.57" 167 mm	8.86" 225 mm
	W1	7.56" 192 mm	8.75" 222 mm	11.89" 302 mm
	D1	2.55" 65 mm	1.17" 30 mm	2.04" 52 mm
Overall	H2	5.9" 150 mm	6.93" 176 mm	9.37" 238 mm
	W2	8.0" 203 mm	9.09" 231 mm	12.4" 315 mm
	D2	2.95" 75 mm	1.57" 55 mm	2.44" 62 mm

PWR - Indicates the unit has power.

CPU - Indicates that the processor is operating properly.

COM - Flashes during serial communications.

CE Mark

All HMI-320/640 units are CE Marked, indicating compliance with European Union directives EN 55011: Group I, Class A; EN50081-2 (Also US FCC Class A) and EN50082-2.

General Specifications

Touch panel type Resistive
Color Type TFT
 TFT 256 color

Touch Resolution
 6 inch 320W x 234H pixels
 8 and 10 inch 640W x 480H pixels

Installation
 All sizes Cabinet Mount

Vibration 10 to 25Hz 2Gs on each x,y, z plane for 30 min.

Temperature
 Operating 0C to 45C
 Storage -10C to 60C

Relative Humidity
 Operating 10% to 90% non-condensing
 Storage 5% to 85% non-condensing

Enclosure Ratings
 NEMA 4/IP65 front panel (O-ring seals).

Weight
 MMI-640/10T 4.4 lbs (2.0 kg)
 MMI-640/8T 2.6 lbs (1.2 kg)
 MMI-320/3TE 1.8 lbs (0.8 kg)

Input Power
 21-25 Volt DC @ 700mA

CE
 Complies with EN50081-2 and EN50082-2 standards

EMI
 Complies with FCC Class A



Machine I/O

WAGO Ethernet and Profibus DP I/O feature a wide variety of analog and digital I/O modules that reliably interface the ServoWire Motion & Logic Controller (SMLC) to industrial devices such as switches, sensors, solenoids, valves and motor starters.

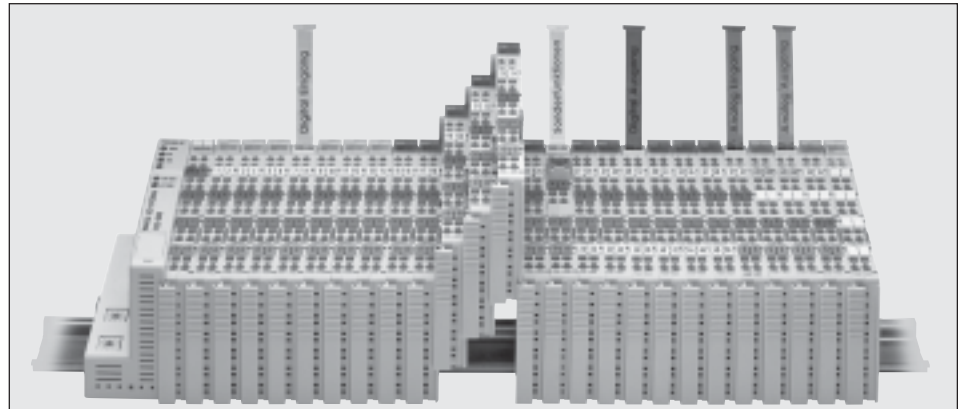
WAGO I/O utilizes either a Ethernet or Profibus DP Fieldbus Coupler for each node, which is connected to DIN rail mounted I/O modules. The user can select appropriate modules (AC In/Out, DC In/Out, sinking/sourcing, Analog current/voltage, etc.) for their specific application.

The WAGO Fieldbus Couplers are compact, flexible, high-performance processors that provide the interface between the I/O modules and either a Profibus DP or dedicated Ethernet network. DIN rail mounted modules provide an efficient method for mounting that minimizes panel space.

The 24 VDC digital input modules include built-in noise filters, available with either a 3.0 or 0.2 msec time constant. The AC digital output modules utilize zero voltage turn-on and zero current turn-off of the load to greatly reduce generated EMI and RFI, and feature an internal dv/dt snubber network for protection from voltage transients on the line. All digital I/O modules feature internal LED indicators and digital output modules include electronic short-circuit protection.

The analog input modules are available with 12 or 16-bit resolution, and support a variety of input signal current and voltage levels, including 0-20 mA, 4-20 mA, +/-10 V and 0-10V. Analog input modules are also available for use as interfaces to thermocouples, RTD sensors and resistor bridges. The analog output modules are 12-bit, and also support a variety of signal types.

Specialty modules are available with up/down counters, incremental



WAGO I/O: At a Glance

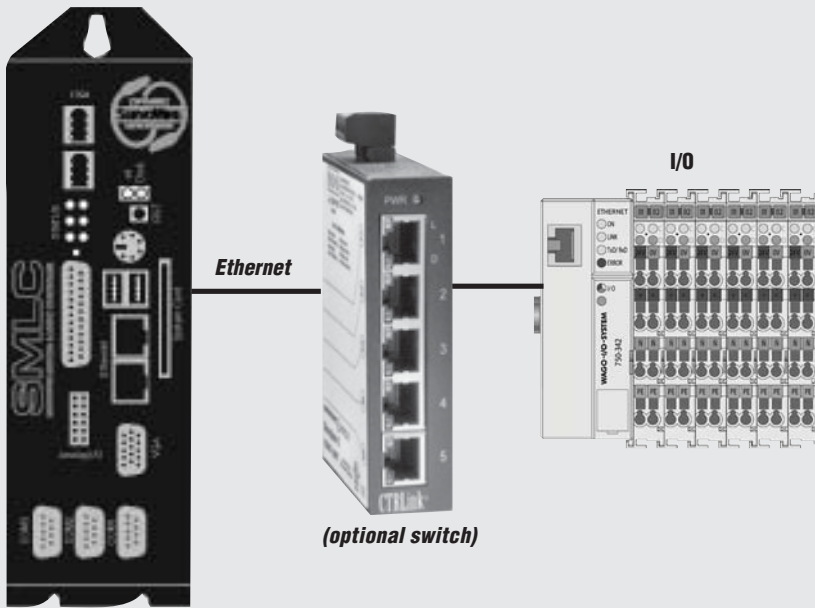
- ✓ **Standard Connectivity Solutions** – WAGO Ethernet and Profibus DP I/O provide standard connectivity solutions for interfacing digital and analog I/O to the ServoWire Motion & Logic Controllers (SMLCs) that is easy to implement, operate and maintain.
- ✓ **Flexible Interface** – All WAGO I/O modules connect to the SMLC using a Fieldbus Coupler, one per rack. The Fieldbus Coupler interfaces to the Ethernet or Profibus DP network providing a high-speed connection to all I/O in the rack. I/O can be remotely distributed throughout the machine.
- ✓ **Quick and Reliable Installation** – Each module incorporates CAGE CLAMP connection system for vibration-proof, fast and maintenance-free wiring with test points for easy access to signals with wiring in place.
- ✓ **Digital I/O Modules** – WAGO I/O provides a full line of digital I/O modules. DC inputs (5 & 24 VDC), DC outputs (5 & 24 VDC), AC inputs (80 to 230 VAC) and AC outputs (60 to 230 VAC) provide flexible interface options. Digital modules feature compact 2, 4 and 8 channel designs.
- ✓ **Analog I/O Modules** – Analog voltage inputs range from 0 to 10 volts, +/- 10 volts, and 4-20 mA. Analog output modules provide 0 to 10 volts, +/- 10 volts ranges. Analog input modules are available as efficient 2-channel devices. Interface to temperature sensors, load cells, dancer control systems, and other industrial analog voltage or current control points.
- ✓ **Minimum Panel Space** – Compact 12 mm (0.47 in) and 24 mm (0.94 in) wide, DIN rail mounted module designs allow the OEM designer to use a minimum amount of panel space.

encoder interfaces, SSI interfaces and more.

The I/O modules are color coded by function and provide a high degree of isolation and noise immunity between the motion controller and

external components. Optional labeling components are available to clearly indicate I/O point number, power and ground connections for easier installation and maintenance.

Ethernet I/O



ServoWire Motion & Logic Controller

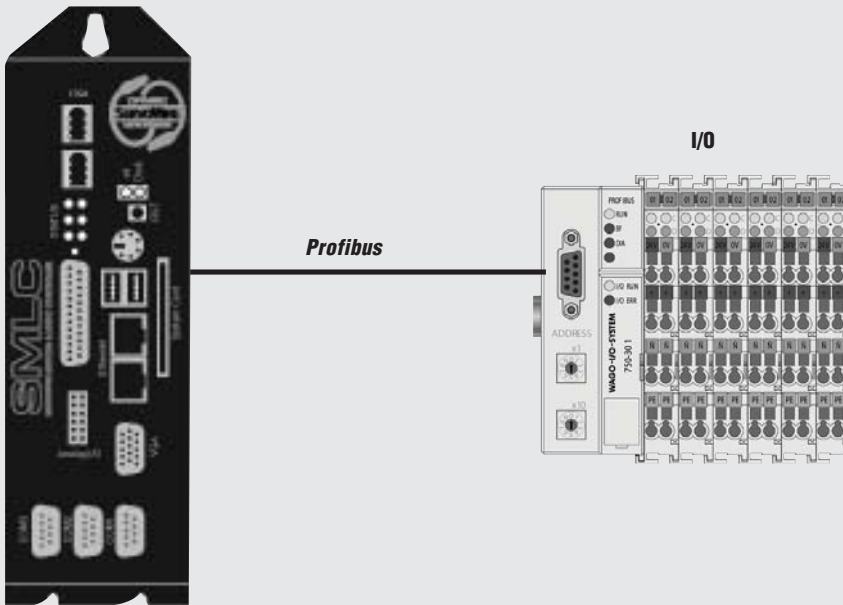
Specs:

- ✓ Data Rate: 10 Mbits/sec
- ✓ Physical Media: CAT-5 cable, RJ-45 connector
- ✓ Isolation: Transformer
- ✓ Max Distance Node to Node: 100M
- ✓ Max I/O Modules per Node: 64

Advantages:

- ✓ Transformer isolation for noise immunity
- ✓ Low cost industry standard cabling
- ✓ Long distance between nodes and long total network length
- ✓ Optional industrial hubs and switches for various network topologies

Profibus DP



ServoWire Motion & Logic Controller

Specs:

- ✓ Data Rate: 12Mbaud (max) at 100M
- ✓ Physical Media: Shielded twisted pair, 22 AWG
- ✓ Isolation: None, RS-485
- ✓ Max Distance Node to Node: 1200M at 93.75 kbaud or lower (9500M total network with repeaters)
- ✓ Max Number of Nodes: 96 (with repeaters)
- ✓ Max I/O Modules per Node: 63

Advantages:

- ✓ Long distances between nodes and long total network length
- ✓ Highly efficient data transmission, typically <1 msec/node
- ✓ In addition to WAGO I/O, Profibus DP interfaces are available on a wide variety of devices, including sensors, pneumatic manifolds, HMIs, etc.

ORDERING GUIDE

Fieldbus Coupler Kits

WAGO-ETH-KIT	Ethernet Fieldbus Coupler Kit, 10baseT, 64 I/O modules (256 points) max. (incl. one End Module and two 10 mm End Stops) <i>(see note 1)</i>
WAGO-PFB-KIT	Profibus DP Fieldbus Coupler Kit, 12 Mbaud, 64 I/O modules (256 points) max. (incl. one End Module and two 10 mm End Stops) <i>(see note 1)</i>

Digital Input Modules

WAGO-750-400	2-Ch DC In, Sourcing (hi-side sw), 24 VDC, 3.0 msec filter
WAGO-750-401	2-Ch DC In, Sourcing (hi-side sw), 24 VDC, 0.2 msec filter, hi spd
WAGO-750-410	2-Ch DC In, Sourcing (hi-side sw), 24 VDC, 3.msec filter, 2-wire prox. switch
WAGO-750-411	2-Ch DC In, Sourcing (hi-side sw), 24 VDC, 0.msec filter, hi speed, 2-wire prox. switch
WAGO-750-418	2-Ch DC In, Sourcing (hi-side sw), 24 VDC, 3.0 msec filter, diagnostics w/acknowledgment
WAGO-750-419	2-Ch DC In, Sourcing (hi-side sw), 24 VDC, 3.0 msec filter, diagnostics
WAGO-750-412	2-Ch DC In, Sourcing (hi-side sw), 48 VDC, 3.0 msec filter <i>(see note 2)</i>
WAGO-750-424	2-Ch DC In, Sourcing (hi-side sw), 24 VDC, Intruder Detection
WAGO-750-402	4-Ch DC In, Sourcing (hi-side sw), 24 VDC, 3.0 msec filter
WAGO-750-403	4-Ch DC In, Sourcing (hi-side sw), 24 VDC, 0.2 msec filter, hi spd
WAGO-750-405	2-Ch AC In, 230 VAC <i>(see note 2)</i>
WAGO-750-406	2-Ch AC In, 120 VAC <i>(see note 2)</i>
WAGO-750-408	4-Ch DC In, Sinking (low-side sw), 24 VDC, 3.0 msec filter
WAGO-750-409	4-Ch DC In, Sinking (low-side sw), 24 VDC, 0.2 msec filter, hi spd
WAGO-750-414	4-Ch DC In, Sourcing (hi-side sw), 5 VDC, 0.2 msec filter, hi spd <i>(see note 2)</i>
WAGO-750-422	4-Ch DC In, Sourcing (hi-side sw), 24 VDC, 1.0 msec filter, w/ 10 msec extension
WAGO-750-415	4-Ch AC/DC In, 24 VAC/VDC, 20 msec filter, 2-wire connection <i>(see note 2)</i>
WAGO-750-423	4-Ch AC/DC In, Sourcing (hi-side sw), 24 VAC/VDC, 50 msec filter, w/ power jumper contacts <i>(supply module req'd for 24 VAC operation, see note 2)</i>
WAGO-750-430	8-Ch DC In, Sourcing (hi-side sw), 24 VDC, 3.0 msec filter
WAGO-750-431	8-Ch DC In, Sourcing (hi-side sw), 24 VDC, 0.2 msec filter, hi spd
WAGO-750-435	1-Ch DC In, 24 VDC, 3.0 msec filter, NAMUR, Eex i
WAGO-750-425	2-Ch DC In, 24 VDC, 3.0 msec filter, NAMUR

Digital Output Modules

WAGO-750-501	2-Ch DC Out, Sourcing (hi-side sw), 24 VDC, 0.5 A
WAGO-750-502	2-Ch DC Out, Sourcing (hi-side sw), 24 VDC, 2.0 A
WAGO-750-504	4-Ch DC Out, Sourcing (hi-side sw), 24 VDC, 0.5 A
WAGO-750-506	2-Ch DC Out, Sourcing (hi-side sw), 24 VDC, 0.5 A, w/ diagnostics
WAGO-750-507	2-Ch DC Out, Sourcing (hi-side sw), 24 VDC, 2.0 A, w/ diagnostics
WAGO-750-509	2-Ch AC/DC Out, SSR, 230 VAC/VDC, 300 mA <i>(see note 2)</i>
WAGO-750-512	2-Ch Relay Out, normally open, 230 VAC/30 VDC, 2.0 A <i>(see note 2)</i>
WAGO-750-513	2-Ch AC/DC Out, Isolated relay, 250 VAC/30 VDC, 2.0 A <i>(see note 2)</i>
WAGO-750-514	2-Ch Relay Out, changeover contacts (SPDT), 125 VDC/30 VDC, 0.5 A <i>(see note 2)</i>
WAGO-750-516	4-Ch DC Out, Sinking (low-side sw), 24 VDC, 0.5 A
WAGO-750-517	2-Ch Relay Out, changeover contacts (SPDT), 230 VDC/300 VDC, 1.0 A <i>(see note 2)</i>
WAGO-750-519	4-Ch DC Out, Sourcing (hi-side sw), 5 VDC, 20 mA <i>(see note 2 below)</i>
WAGO-750-522	2-Ch AC Out, opto isolated, 35-230 VAC, 0.5 A, 3.0A for 30 sec once per hour <i>(see note 2)</i>
WAGO-750-523	1-Ch AC Out, opto isolated 230 VAC, 16A, auto/manual operation
WAGO-750-530	8-Ch DC Out, Sourcing (hi-side sw), 24 VDC, 0.5 A
WAGO-750-535	2-Ch DC Out, Sourcing (hi-side sw), 24 VDC Eex i

Analog I/O Modules

WAGO-750-465	2-Ch Analog In, 0-20 mA, 12-bit, single-ended
WAGO-750-453	4-Ch Analog In, 0-20 mA, 12-bit, single-ended
WAGO-750-452	2-Ch Analog In, 0-20 mA, 12-bit, differential <i>(see note 3)</i>
WAGO-750-480	2-Ch Analog In, 0-20 mA, 13-bit, differential <i>(see note 3)</i>

WAGO-750-472	2-Ch Analog In, 0-20 mA, 16-bit, single-ended
WAGO-750-472/005-000	2-Ch Analog In, 0-20 mA, 16-bit, single-ended, 60 Hz
WAGO-750-466	2-Ch Analog In, 4-20 mA, 12-bit, single-ended
WAGO-750-455	4-Ch Analog In, 4-20 mA, 12-bit, single-ended
WAGO-750-485	2-Ch Analog In, 4-20 mA, 12-bit, single-ended, explosion protection
WAGO-750-454	2-Ch Analog In, 4-20 mA, 12-bit, differential <i>(see note 3)</i>
WAGO-750-492	2-Ch Analog In, 4-20 mA, 12-bit, differential, isolated <i>(see note 3)</i>
WAGO-750-474	2-Ch Analog In, 4-20 mA, 16-bit, single-ended
WAGO-750-474/005-000	2-Ch Analog In, 4-20 mA, 16-bit, single-ended, 60 Hz
WAGO-750-456	2-Ch Analog In, +/- 10 V, 12-bit, differential <i>(see note 3)</i>
WAGO-750-457	4-Ch Analog In, +/-10 V, 12-bit, single-ended
WAGO-750-479	2-Ch Analog In, +/-10 V, 14-bit, differential <i>(see note 3)</i>
WAGO-750-476	2-Ch Analog In, +/-10 V, 16-bit, single-ended
WAGO-750-467	2-Ch Analog In, 0-10 V, 12-bit, single-ended <i>(see note 3)</i>
WAGO-750-459	4-Ch Analog In, 0-10 V, 12-bit, single-ended
WAGO-750-468	4-Ch Analog In, 0-10 V, 12-bit, single-ended <i>(see note 3)</i>
WAGO-750-478	2-Ch Analog In, 0-10 V, 16-bit, single-ended
WAGO-750-460	4-Ch Analog In for RTD, Pt100 resistance sensors <i>(see note 3)</i>
WAGO-750-483	2-Ch Analog In, 0-30 V14-bit, differential
WAGO-750-469	2-Ch Analog In for Thermocouple, w/ diagnostics <i>(Contact ORMEC for Thermocouple types supported.) (see note 3)</i>

WAGO-750-461	2-Ch Analog In for RTD <i>(Contact ORMEC for resistance sensor types supported. (see note 3)</i>
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WAGO-750-491	1-Ch Analog In for Resistor Bridges, 16-bits, 250 msec conversion time <i>(see note 3)</i>
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WAGO-750-491/000-001	1-Ch Analog In for Resistor Bridges, 16-bits, 65 msec conversion time <i>(see note 3)</i>
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Analog Output Modules

WAGO-750-552	2-Ch Analog Out, 0-20 mA, 12-bit
WAGO-750-585	2-Ch Analog Out, 0-20 mA, 12-bit, explosion protection
WAGO-750-554	2-Ch Analog Out, 4-20 mA, 12-bit
WAGO-750-556	2-Ch Analog Out, +/-10 V, 12-bit <i>(see note 3)</i>
WAGO-750-557	4-Ch Analog Out, +/-10 V, 12-bit
WAGO-750-550	2-Ch Analog Out, 0-10 V, 12-bit <i>(see note 3)</i>
WAGO-750-559	4-Ch Analog Out, 0-10 V, 12-bit

Specialty Modules

WAGO-750-404	1-Ch Up/Down Counter, 24 VDC, 32-bit, 100 kHz
WAGO-750-638	2-Ch Up/Down Counter, 24 VDC, 16-bit, 500 Hz
WAGO-750-511	2-Ch PWM Output, 24 VDC, 0.1A, 10-bit, 250 Hz, configurable duty cycle
WAGO-750-630/000	SSI Transmitter Interface <i>(Contact ORMEC for transmitter interface types supported.)</i>
WAGO-750-631	Incremental Encoder Interface, 16-bit pos capture, 5 VDC edr power output <i>(see note 2)</i>
WAGO-750-637	Incremental Encoder Interface, 32-bit pos capture, pos compare, 5 VDC edr power output <i>(see note 2)</i>
WAGO-750-635	Digital Impulse Interface, for magnetostrictive distance measurement sensors

Power Supplies and Accessories

WAGO-787-602	Power Supply 1.3A, 24 VDC output
WAGO-787-612	Power Supply 2.5A, 24 VDC output
WAGO-787-622	Power Supply 5.0A, 24 VDC output
WAGO-787-632	Power Supply 10A, 24 VDC output
WAGO-787-640	Power Supply 10A, 24 VDC output, 3-phase 230 VAC input
WAGO-750-601	Supply module with fuse, 24 VDC
WAGO-750-612	Supply module, 0-230 AC/DC (incl. 5 VDC modules)
WAGO-750-602	Supply module, 24 VDC
WAGO-750-615	Supply module with fuse, 120 VAC
WAGO-750-609	Supply module with fuse, 230 VAC
WAGO-750-622	Binary Spacer Module
WAGO-750-600	End Module
WAGO-249-117	End Stop
WAGO-247-PWR	Power and Ground Label Strip Pack: blue "0V", blue "+", red "24V", red "+", light green ground symbol, light green "PE", 100 each
WAGO-247-513/522	I/O Point Numbering Label Strip Pack, digits 00-99, 10 each

NOTE 1: WAGO Fieldbus couplers supply a limited amount of 24 VDC power to the I/O modules, which may not be sufficient for the application. A Power Supply and Supply Module may be required. Refer to the WAGO Ethernet I&O Manual or the WAGO Web Site for further information.

NOTE 2: Any WAGO Digital I/O modules operating at voltages other than 24 VDC require a Power Supply and Supply Module with the appropriate voltage rating for input power and isolation. Also, this type of module passes its operating power supply on to next modules to the right in the rack, or none at all. A supply module will be required provide the appropriate input power and isolation for the I/O module operating on a different voltage to the right of this module. Refer to the WAGO Ethernet I&O Manual or the WAGO Web Site for further information.

NOTE 2: Some WAGO Analog I/O modules do not pass the power supply on to other modules in the rack. A supply module will be required for the I/O module to the right of one of these Analog I/O modules in a WAGO I/O system. Refer to the WAGO Ethernet I&O Manual or the WAGO Web Site for further information.

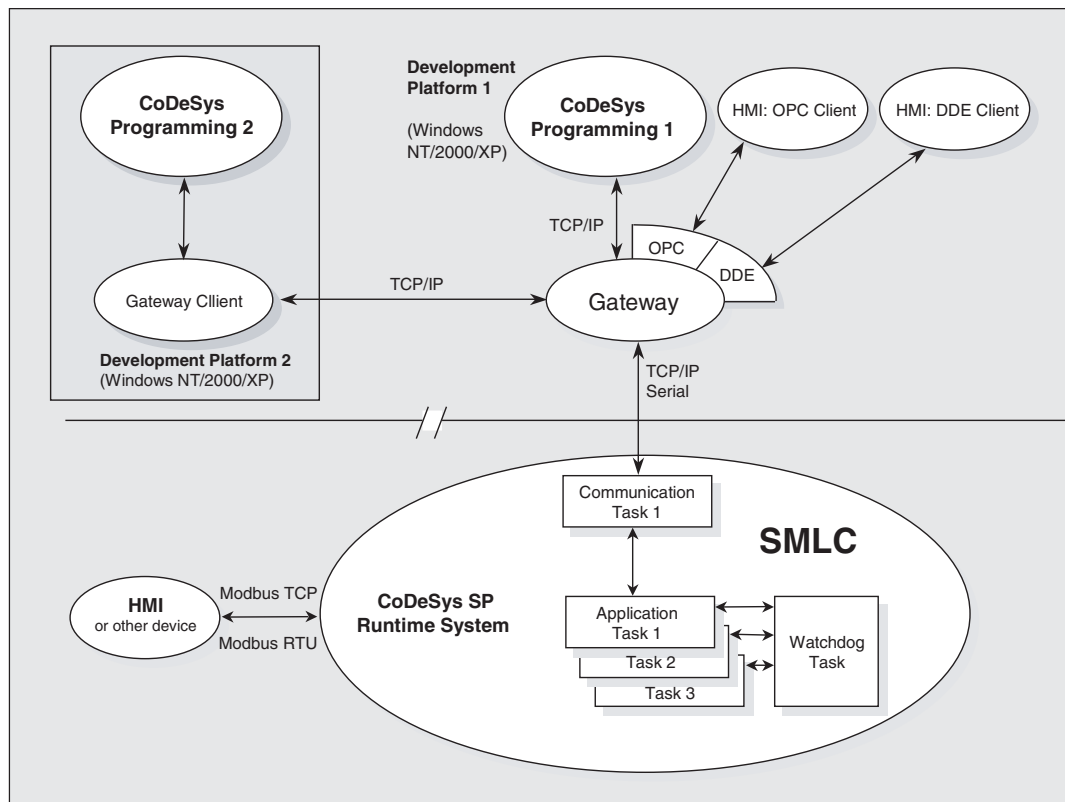


Networking Solutions

Built-in networking options provide solutions for factory automation.

The SMLC and CoDeSys Development software combine to provide flexible and effective networking solutions for interfacing machine I/O, HMIs and factory data networks.

Support for open technologies such as Ethernet, TCP/IP, Modbus/TCP, Ethernet/IP and OPC provide a wide range of application solutions. Plus the CoDeSys development software includes a CoDeSys Gateway which controls communications with the SMLC at no additional charge. The CoDeSys Gateway includes OPC and DDE servers, and is installed on a PC connected to the SMLC.



The CoDeSys gateway communication server insures communication between the CoDeSys development software running on a development PC and the run-time system on the SMLC. This gateway enables the user to gain access to the data from the CoDeSys application with different external tools via standardized interfaces such as OPC server and DDE links. Because the gateway is accessed via TCP/IP, remote access to the SMLC via the internet is also possible.

Ethernet and TCP/IP

The SMLC includes two standard Ethernet ports to provide connectivity to I/O, HMIs, PLCs, factory and enterprise networks. CoDeSys includes all the software necessary for communications via Ethernet and TCP/IP, enabling easy access to the SMLC from any system connected to the network. This capability allows users to easily implement remote debug and diagnostics capabilities without the need to purchase additional software.

OPC (OLE for Process Control)

OPC is open, interoperable connectivity for automation and the enterprise systems used in industrial applications. Interoperability is assured by creation and maintenance of open standards and specifications by an independent organization that includes both users and manufacturers of industrial automation equipment.

The CoDeSys OPC Server is included with CoDeSys at no additional charge and includes tools for assigning the SMLC name and IP address, selecting the groups of variables to be

accessible through the server, refresh properties, etc. A wide variety of data acquisition and HMI software packages are available that include OPC clients, as well as ActiveX controls for adding OPC support to VisualBasic and C++ applications.

Ethernet/IP

EtherNet/IP (Ethernet Industrial Protocol) is an open communication standard managed by the ODVA and supported by hundreds of vendor products worldwide. EtherNet/IP is the leading industrial Ethernet network standard for real-time I/O messaging and message exchange.

The SMLC provides Ethernet/IP Adapter capability allowing it to communicate with other Ethernet/IP enabled devices.

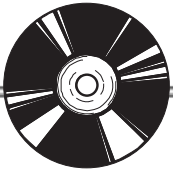
The adapter capability permits receipt of connected and unconnected

messages from an Ethernet/IP scanner. It also supports receiving legacy PCCC messages. Library function blocks are provided for sending unconnected messages to other Ethernet/IP devices.

Modbus/TCP

Modbus/TCP is the most widely accepted open Ethernet communications protocol used in industry today, allowing users to easily pass I/O as well as register data between control devices.

The SMLC can be configured as a Modbus/TCP Server, allowing Modbus clients to easily read and write integer, floating, string and bit data. As with OPC, there are a wide variety of data acquisition and HMI software packages available that support Modbus/TCP, as well as ActiveX controls for adding Modbus/TCP support to VisualBasic and C++ applications.



ServoWire® Pro Software

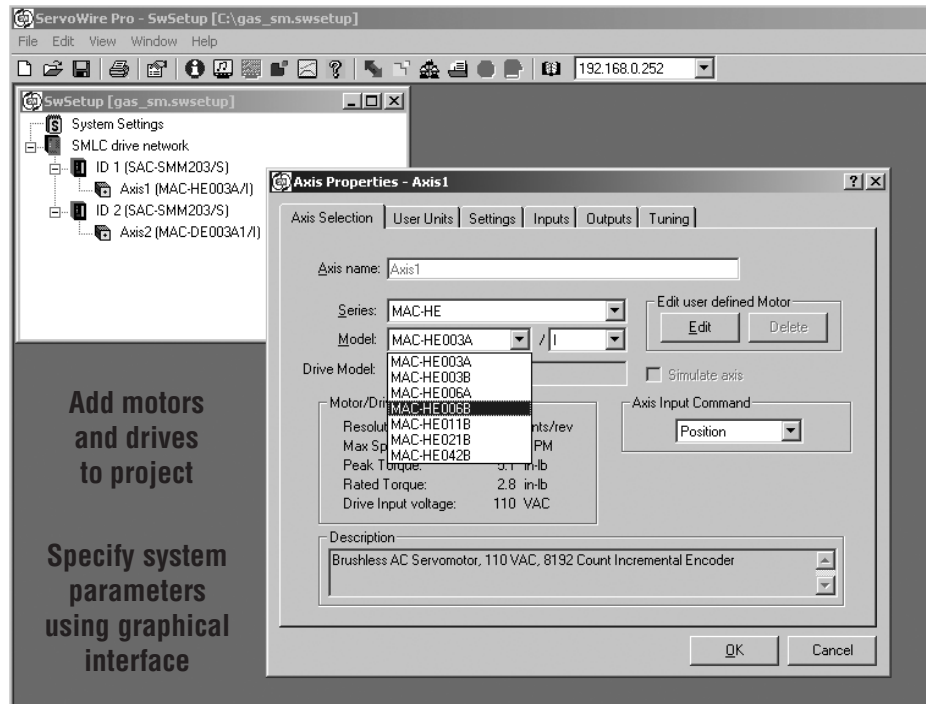
ServoWire Pro provides an integrated suite of configuration, diagnostic and maintenance utilities that assist in the development and on-going support of ServoWire SD drive systems. The software is designed to run on a Windows-based development PC.

ServoWire® Setup

ServoWire® Setup simplifies the process of configuring ServoWire® SD drives. This includes system settings such as loop update rates, the types of drives that make up the system as well as initial parameter settings.

Setup Utility Features

- ✓ Configure system parameters such as loop update rate and drive types.
- ✓ Add, remove, copy and paste up to 16 drives onto the ServoWire network.
- ✓ Add motors to the ServoWire drives either by selecting from a pre-defined list of ORMEC products or by selecting from a user-defined library of custom motors.
- ✓ Configure each drive's operating voltage, local I/O and external regen resistor (optional).



Add motors and drives to project

Specify system parameters using graphical interface

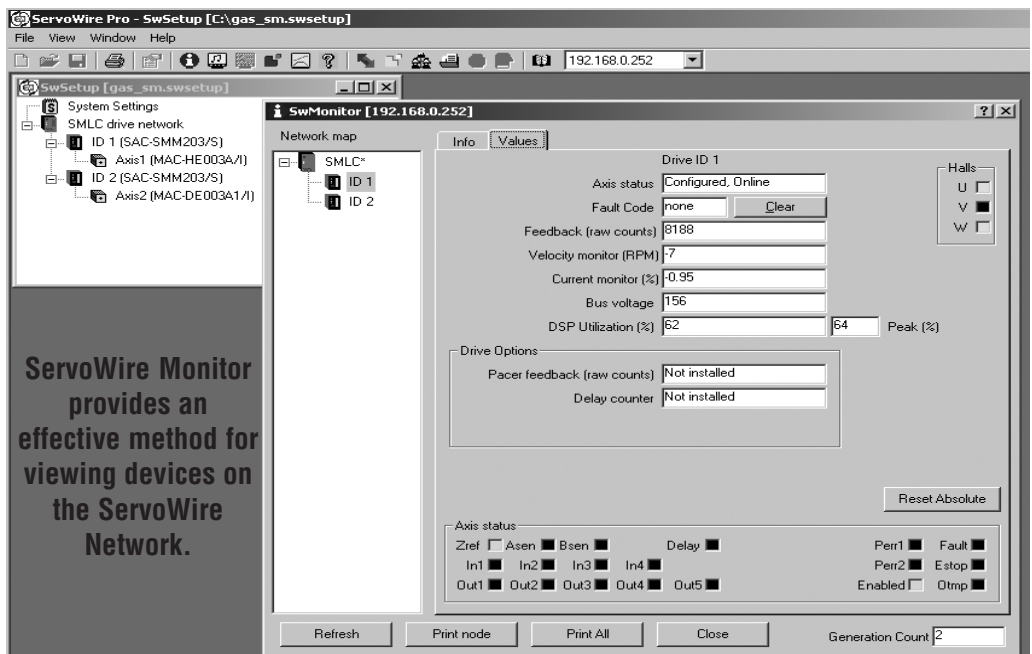
- ✓ Configure axis position, velocity and acceleration units and establish the maximum range limits.
- ✓ Configure axis response to drives' high-speed discrete inputs (rising-edge, falling-edge or level).
- ✓ Configure axis output for brake control.
- ✓ Establish initial axis tuning parameters for position, velocity and current control loops.

ServoWire® Monitor

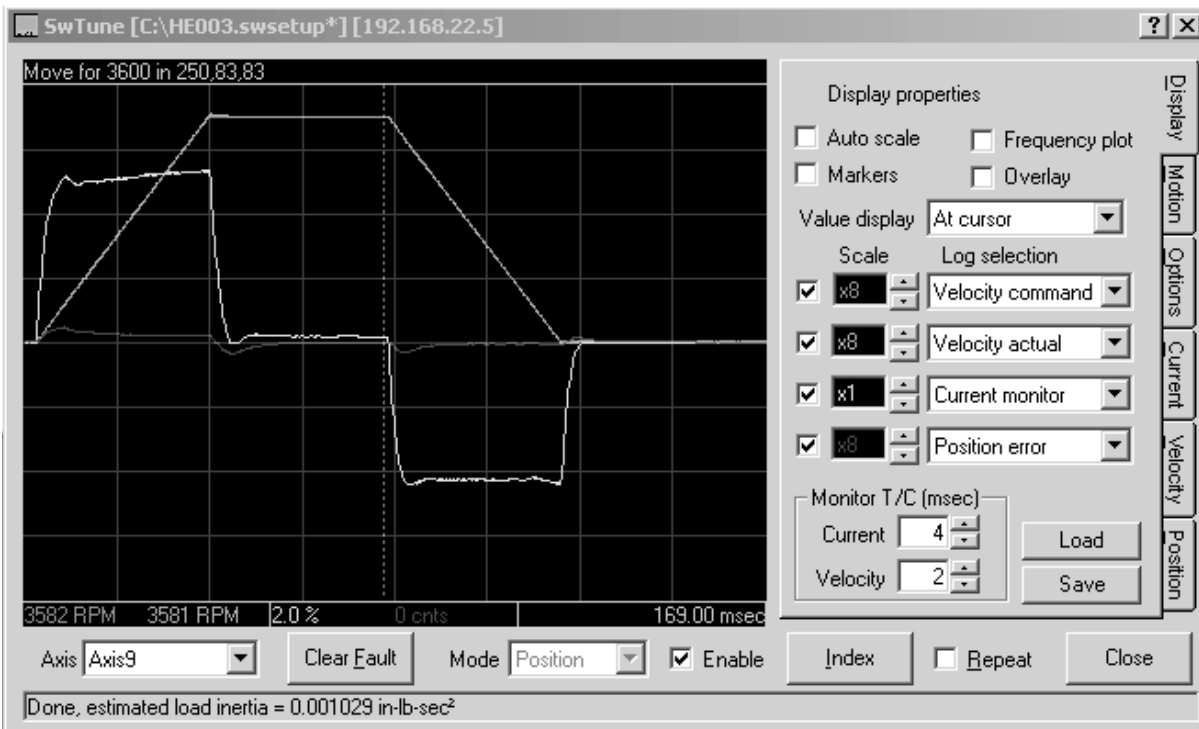
The ServoWire® Monitor provides a way to view devices on the ServoWire® Network. This includes the 1394b Adapter Card in the SMLC and all drives and devices on the 1394b network.

Monitor Utility Features

- ✓ Displays 1394b Adapter Driver Information.
- ✓ Displays drive model and serial numbers, firmware revisions, hardware revisions and modifications.
- ✓ Provides real-time drive performance information. Data is presented for: drive DC bus, drive fault data, Hall sensor status, drive I/O status, network performance and more.
- ✓ Monitor system data while user application program is running.



ServoWire Monitor provides an effective method for viewing devices on the ServoWire Network.



ServoWire Tune allows modification of the control system parameters to provide the proper response to motion profiles specific to your application with a real-time display of position error, velocity command, actual velocity and torque response.

ServoWire® Tune

ServoWire® Tune provides users software utilities for optimizing motion performance, and documenting tuning parameters for future reference.

Tuning Utility Features

- ✓ Perform user-specified motion on a ServoWire axis and graphically display up to four performance parameters.
- ✓ Change tuning parameters for position, velocity and current loops and immediately observe the effects on system performance.

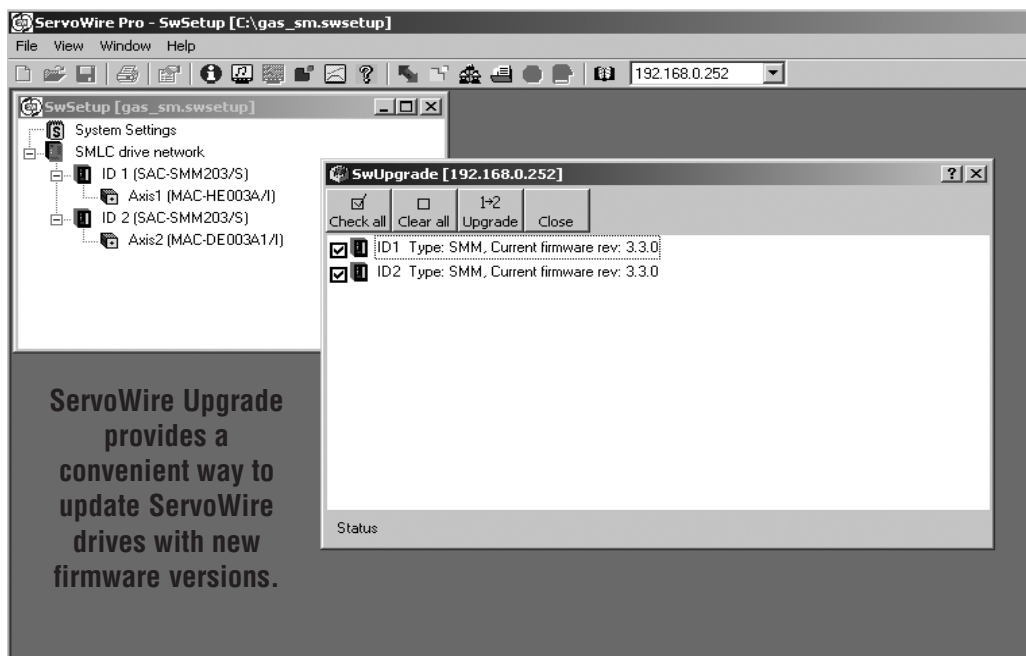
- ✓ Graph data including velocity, torque, position error, drive bus voltage and motor phase currents. Zoom/Pan views allow for precise and thorough examination of the data.
- ✓ Frequency Plot graphing simplifies locating machine resonance frequencies, which can be reduced using Soft Motion's digital filter algorithms.
- ✓ User-friendly interface with ability to save motion and graphing setups. The user can also save and/or retrieve displayed graphical data for viewing or printing.

ServoWire® Cam/Profile Designer

ServoWire® Cam/Profile Designer aids users in creating Cam (master pos. vs. follower pos.) and Profile (axis pos. vs. time) data. Users can enter the data directly into Cam/Profile Designer, or they can import data from a file.

Cam/Profile Designer Utility Features

- ✓ View commanded position, velocity, acceleration and jerk data for the specified motion.
- ✓ Set the type of interpolation used on a segment by segment basis.



ServoWire® Upgrade

The ServoWire® Upgrade Utility provides the user with the means to update ServoWire® Drives with new firmware versions as they become available from ORMEC.

Upgrade Utility Features

- ✓ Displays current version of firmware of all connected ServoWire Drives.
- ✓ Allows for download of a different firmware version (older or newer), which is burned into the drives' Flash memory.



ServoWire® SD Servodrives



Model
425
Shown

ServoWire SD 230 Series

- Network Drives: Eight models offer continuous output currents from 2.5 to 60 amps RMS/phase
- 600 to 15,000 watts of output power
- 115 or 230 VAC input

See page 22 for specifications

ServoWire SD 460 Series

- Network Drives: Six 460 Volt models offering continuous output currents from 5 to 50 amps RMS/phase
- 2,400 to 24,000 watts of output power
- 230 or 460 VAC input bus; 115 or 230 VAC for logic power

See page 24 for specifications

ServoWire SDdrives are designed to offer high performance motion control using all-digital servodrives connected via an open standard FireWire network. Two series of drives offer solutions with power from 600 to 24,000 watts, and continuous current output from 2.5 to 60 amps RMS/phase.

ServoWire SD Drives

ServoWire SD drives provide high performance servo operation utilizing digital networking technology based on IEEE-1394b (FireWire). This network not only provides high speed, but also ease of use through cost-effective, industry-standard cabling. Each ServoWire drive supports a variety of high performance servomotors. Consult ORMEC for OEM applications of user-supplied brushless rotary or linear motors—as well as DC brush-type and voice-coil motors.

All ServoWire drives utilize reliable IGBT-based intelligent power modules and provide a cost effective solution for today's motion control applications. ServoWire drives operate on 115, 230 or 460 VAC input power, and provide both output short circuit and overvoltage protection.

All-digital design eliminates the troublesome analog interface between PC and drive systems, replacing it with a modern high-speed network based on the IEEE-1394b standard.

Performance

ServoWire SD drives combine all-digital operation with DSP technology to produce fast update rates, and correspondingly high performance. The high bandwidth control loops in the ServoWire SD Drives, along with high-resolution motor feedback, combine for quick and accurate torque, velocity and position control. Position, velocity and torque loops are all closed in the ServoWire SD drives. This distributed control architecture allows for high performance without placing a heavy computing burden on the SMLC.

Programmable Drive Configuration

ServoWire drives have no pots, jumpers or field component changes whatsoever. Even factory adjustments are digital, automatically calibrated and stored in Flash memory. All user configurations are done in software using axis configuration tools in our ServoWire Pro software. Motor types

are selected from a database of ORMEC standard products or the custom motor editor can be used to add other motor types to the database.

Configuration data for each drive, containing motor parameters, all operational limits for torque and speed, I/O configurations, load inertia and servo loop tuning parameters, are stored in the SMLC and can be downloaded by the application program as needed over the ServoWire network. Simple cabling accommodates up to sixteen drives per network, and provides for quick and reliable installation.

Standard Motor Interface

ServoWire SD drives interface to motors that use encoders or resolvers. The encoders supported are quadrature encoders with hall track information, or serial encoders. The drives provide for smooth output torque by using three-phase sinusoidal commutation.

Field Oriented Control (FOC) and Space Vector Modulation (SVPWM) contribute to optimize performance at all motor speeds.

Integrated Drive I/O

Integrating high speed I/O at the drive level gives the user greater flexibility and tighter control over the interaction between motion and external sensors and actuators. External sensors can initiate motion

within one servo loop update and capture position with microsecond resolution.

Three optically isolated inputs, four optically isolated outputs and one bi-directional I/O point are available.

These may be used as general purpose I/O or for a variety of preprogrammed functionality, including an e-stop input, buffered encoder reference output, drive ready output, fail-safe brake output and more.

ORDERING GUIDE

ServoWire SD Servodrives

SAC-SDM203	AC Servodrive, 115/ 230 VAC input,	2.5 / 4.2 A rms/ph cont/peak
SAC-SDM205	AC Servodrive, 115/ 230 VAC input,	4.1 / 7.1 A rms/ph cont/peak
SAC-SDM210	AC Servodrive, 115/ 230 VAC input,	8.2 / 14.2 A rms/ph cont/peak
SAC-SDM217	AC Servodrive, 115/ 230 VAC input,	13.9 / 24.1 A rms/ph cont/peak
SAC-SDM220	AC Servodrive, 115/ 230 VAC input,	16.3 / 28.3 A rms/ph cont/peak
SAC-SDM225	AC Servodrive, 230 VAC input,	25.0 / 50.0 A rms/ph cont/peak
SAC-SDM235	AC Servodrive, 230 VAC input,	35.0 / 70.0 A rms/ph cont/peak
SAC-SDM260	AC Servodrive, 230 VAC input,	60.0 / 120.0 A rms/ph cont/peak
SAC-SDM405	AC Servodrive, 460 VAC input,	5.0 / 10.0 A rms/ph cont/peak
SAC-SDM410	AC Servodrive, 460 VAC input,	10.0 / 20.0 A rms/ph cont/peak
SAC-SDM417	AC Servodrive, 460 VAC input,	17.0 / 34.0 A rms/ph cont/peak
SAC-SDM425	AC Servodrive, 460 VAC input,	25.0 / 50.0 A rms/ph cont/peak
SAC-SDM435	AC Servodrive, 460 VAC input,	35.0 / 70.0 A rms/ph cont/peak
SAC-SDM450	AC Servodrive, 460 VAC input,	50.0 / 100.0 A rms/ph cont/peak

Feedback Type

-	S					Serial & quadrature encoder feedback interface
-	R					Resolver feedback interface

Options

-		0	0	0	0	no options (indicated by zeroes as placeholders)
-		B			0	add Multi-Rev Abs. Encoder Backup Battery Option
-			A		0	add Analog I/O Option
-				P	0	add Auxiliary Encoder Interface Option

ServoWire Cables

CBL-SW-B-3	Cable, ServoWire, 9p-9p, 3.3 ft. (1m)
CBL-SW-B-6	Cable, ServoWire, 9p-9p, 6.6 ft. (2m)
CBL-SW-B-14	Cable, ServoWire, 9p-9p, 14.8 ft. (4.5m)
CBL-SW-B-33	Cable, ServoWire, 9p-9p, 33.3 ft. (10m)

Panel Mount Regen Resistors

SAC-SWRR/0055	Regen Resistor, 55 watts, for SAC-S_210 (panel mounted, no enclosure)
SAC-SWRR/0095	Regen Resistor, 95 watts, for SAC-S_217 & SAC-S_220 (panel mounted, no encl.)
SAC-SWRR/0700	Regen Resistor w/ Enclosure, 700 watts, for SAC-S_210
SAC-SWRR/0845	Regen Resistor w/ Enclosure, 845 watts, for SAC-S_217, SAC-S_220, SAC-S_417 & SAC-S_425
SAC-SWRR/0846	Regen Resistor w/ Enclosure, 846 watts, for SAC-S_225 & SAC-S_235
SAC-SWRR/1700	Regen Resistor w/ Enclosure, 1700 watts, for SAC-S_260
SAC-SWRR/0230	Regen Resistor w/ Enclosure, 230 watts, for SAC-S_405
SAC-SWRR/0650	Regen Resistor w/ Enclosure, 650 watts, for SAC-S_405 & SAC-S_410
SAC-SWRR/0825	Regen Resistor w/ Enclosure, 825 watts, for SAC-S_425 & SAC-S_435
SAC-SWRR/1650	Regen Resistor w/ Enclosure, 1650 watts, for SAC-S_260 & SAC-S_450

Line Filters

SAC-LF215U	Line Filter, 115/230 VAC, Single Phase, 15 amps, UL, 4.2"l, 2.9"w, 2.0"d
SAC-LF230U	Line Filter, 115/230 VAC, Single Phase, 30 amps, UL, 5.5"l, 3.0"w, 2.8"d
SAC-LF30C	Line Filter, 230/460 VAC, Three Phase, 30 amps, UL, CSA, 13.9"l, 2.4"w, 5.9"d
SAC-LF55C	Line Filter, 230/460 VAC, Three Phase, 55 amps, UL, CSA, 14.8"l, 3.1"w, 7.3"d
SAC-LF100C	Line Filter, 230/460 VAC, Three Phase, 100 amps, UL, CSA, 17.2"l, 3.5"w, 8.7"d

IEEE 1394 Interface (OHCI)

The SD drives implement a 1394b interface, the third generation in the evolution of this IEEE standard. This high speed network connects the drives to the controller, providing significantly more control and data than is possible with a low speed network. Data transfers run at up to 400 MBit using the isochronous channel for time critical information and asynchronous channel for other data. Compatibility to earlier 1394 versions is maintained.

Feedback Option Modules

ServoWire SD drives include an interface for feedback option modules.

Feedback option modules provide for the addition of an auxiliary feedback interface, making a ServoWire SD drive an axis and a half unit. These modules also allow for a variety of motor encoder options, such as resolvers, serial and multi-rev absolute encoders.

Safety & Maintainability

Safety interlocks are standard in all ServoWire drives. The network's integral safety interlocks and comprehensive alarm detection provide safe operation for ServoWire drives and the SMLC. The I/O on each ServoWire Drive can be configured to include an e-stop input and drive ready output, which can be connected to the machine e-stop interlock circuit. Overall system maintainability is enhanced by extensive alarm detection and reporting via the ServoWire network.



ServoWire® SD 230 Series Drives

Up to 16 ServoWire SD drives can be interfaced to the SMLC utilizing the ServoWire protocol for motion control networking. Eight models offer continuous output currents from 2.5 to 60 amps RMS/phase at 115 or 230 VAC. The all-digital design eliminates all manual drive setup including pots and jumpers.

Drive Features

- ✓ **Small Footprint:** higher power density reduces space requirements
- ✓ **Sinusoidal commutation:** improves low speed torque ripple and system efficiency
- ✓ **Trapezoidal commutation & DC operation:** provide user flexibility
- ✓ **Field Oriented Control (FOC) and Space Vector Modulation (SVPWM):** optimal performance at all motor speeds.
- ✓ **Integral shunt regulators:** for regenerative load dissipation (All models except SAC-SDM203 & SDM205).
- ✓ **UL/CE approvals:** UL Listed and CE Mark (low voltage directive & EMC)
- ✓ **Status Indicator:** Two digit display for network ID & drive status
- ✓ **ServoWire Network Interface:** Three connectors provide an all-digital control link to ServoWire Network, which is galvanically isolated from the drive and powered by the SMLC.
- ✓ **Drive Power Inputs:** Input power accepts 115 or 230 VAC nominal featuring separate logic and bus



Up to 16 ServoWire SD drives can be networked directly to the SMLC using standard cabling.

power supplies with overvoltage protection.

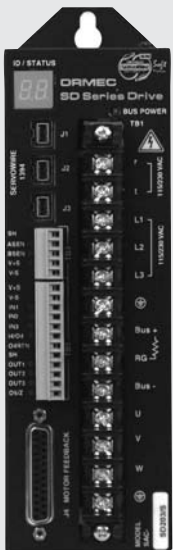
- ✓ **Analog I/O:** One 14-bit input; one 14-bit output
- ✓ **Flexible Drive I/O:** ServoWire drives provide two high speed sensor inputs, four optically isolated outputs (one output can be used as a user-configurable fail-safe brake control output and another as a drive ready output), three optically isolated inputs (one input can be used as an e-stop input and/or as hardware overtravel limit switch inputs) and one bi-directional I/O point. Diagnostic LEDs aid debugging and terminal blocks make connecting easy.
- ✓ **External Regen & Bus Connections:** Allows bus

power to be shared between drives (Models SAC-SDM225, SDM235 & SDM260 only) and/or the addition of an external resistor for dissipating regenerative energy from the system (All models except SAC-SDM203 & SDM205).

- ✓ **Feedback Types:** All models available with Encoder or Resolver feedback interface.
- ✓ **Brushless Motor Feedback:** Versatile encoder feedback interface accommodates quadrature encoders, and differential or single-ended hall tracks.
- ✓ **Serial Encoders:** Supports serial encoders including Yaskawa Sigma II and Tamagawa.

Integrated Drive I/O

- ✓ **High Speed Sensors:** Each drive provides interfaces for two high-speed sensors. The ASEN and BSEN inputs, along with the internal encoder reference signal, can capture real-time axis position for either or both axes within *one microsecond* of assertion. They can initiate axis motion on the next position loop update (between 0.375 and 1.0 msec delay—depending on loop rate).
- ✓ **E-Stop and Overtravel Limit Inputs:** Each drive provides optically isolated inputs, which can be configured as hardware overtravel limits or an E-Stop.
- ✓ **Brake Output:** A user-configurable output is provided for control of fail-safe brakes. Brake options are available for H-Series servomotors.
- ✓ **Drive Ready:** A user-configurable output is provided to indicate when the drive is operating normally, without faults. This output is intended for use in the system e-stop interlock circuit.
- ✓ **Zero Reference Output:** A buffered motor zero reference (index mark) output signal is available.
- ✓ **Diagnostic LEDs:** Each I/O point has a visual indicator of its state.
- ✓ **Terminal Blocks:** Easy wiring to 3.81mm pitch terminal blocks.



Specifications

Main Circuit Power

- 115 or 230 VAC +15%, -20%, 50/60 Hz, single phase or three phase

Control Circuit Power

- 115 or 230 VAC, +15%, -20%, 50/60 Hz, 56 watts RMS, single phase

Position Command/Control Loop Update Rates

- Digital position command from the host PC via the ServoWire® network.
- Position loop updated on command at up to 2.66 kHz (application dependent).
- Velocity loop update rate: up to 5 kHz
- Torque loop update rate: 10 kHz

ServoWire® Drive Output

- 600 to 15,000 watts of output power (see Servomotor Selection Charts for power requirements on matching drives)
- IGBT pulse width-modulated with sinusoidal or trapezoidal commutation
- Large heat sinks (fan cooled on SAC-SDM220 – SDM260)
- Internal shunt regulator for regenerative load dissipation on all except SDM203 & SDM205
- Peak currents up to 200% of RMS continuous capability
- DC Bus voltage of 325 VDC at nominal input of 230 VAC and 163 VDC at 115 VAC

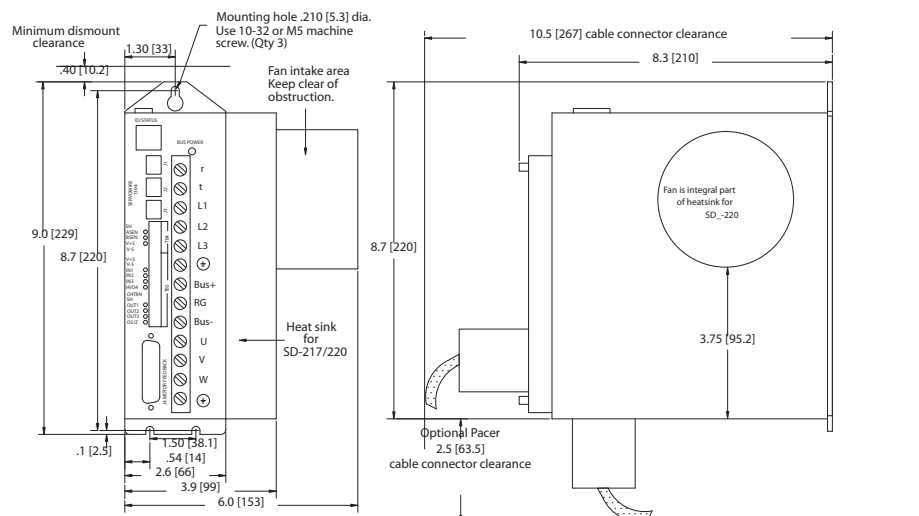
ServoWire® Drive I/O

- Sensor inputs are software configurable for either NPN or PNP output transistor types and level or edge triggered response
- Sensor inputs provide one microsecond response time to capture machine position and initiate motion within one servo loop update
- Optically isolated interface for general purpose and motor reference outputs updated every servo loop update with a maximum sink current of 33ma per output
- External I/O power supply connections will accept 5-24 VDC (240mA maximum) to power input and output circuits

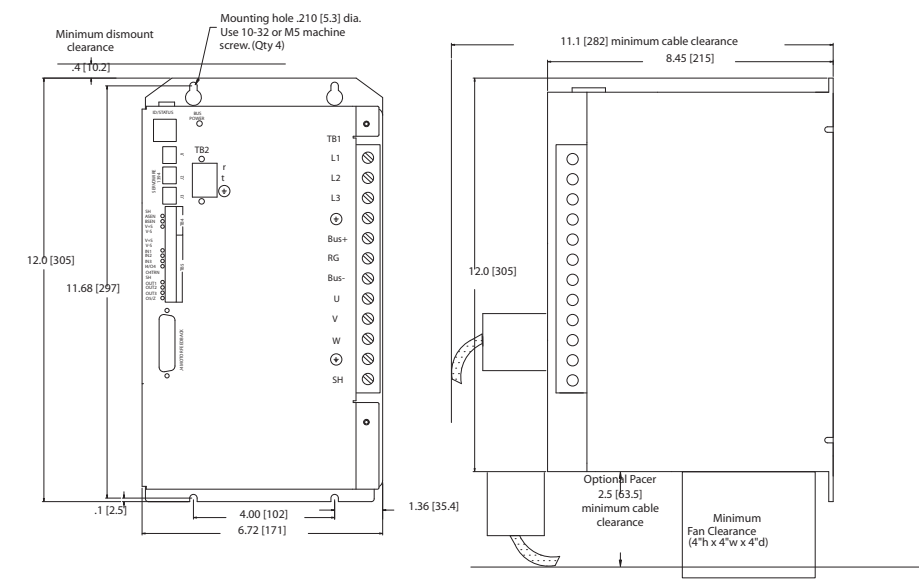
Motor Encoder Feedback Interface

- Three differential input channels for encoder position feedback with 5.3 volt encoder power supplied
- Quadrature feedback 4x decoding with data rates to 8 MHz (after decode)
- Open-wire detection on quadrature channels A and B

Mounting Information for SAC-SDM-203, 205, 210, 217 & 220



Mounting Information for SAC-SDM-225, 235 & 260



- Support for serial encoders including Yaskawa Sigma II and Tamagawa
- Three differential input channels for motor commutation feedback
- Input connections for thermal contact from motor windings
- Industry standard D-sub connector (25-pin female) interface

Motor Resolver Feedback Interface

- Configurable conversion resolution of 12,14, or 16 bits position counts per revolution
- Configurable reference signal excitation frequency and transformation ratio
- Input connections for thermal contact from motor windings
- Industry standard D-sub connector (25-pin male) interface

Environmental

- Ambient operating is 0 to 50C
- Ambient storage is -20 to 70C
- Humidity operating/storage is 90% RH or less (non-condensing).

Drive Weights

- SAC-SDM203, 3.7 lbs (1.7 kg)
- SAC-SDM205, 3.7 lbs (1.7 kg)
- SAC-SDM210, 4.1 lbs (1.9 kg)
- SAC-SDM217, 5.8 lbs (2.6 kg)
- SAC-SDM220, 6.6 lbs (3.0 kg)
- SAC-SDM225, 17.7 lbs (8.0 kg)
- SAC-SDM235, 17.7 lbs (8.0 kg)
- SAC-SDM260, 17.7 lbs (8.0 kg)

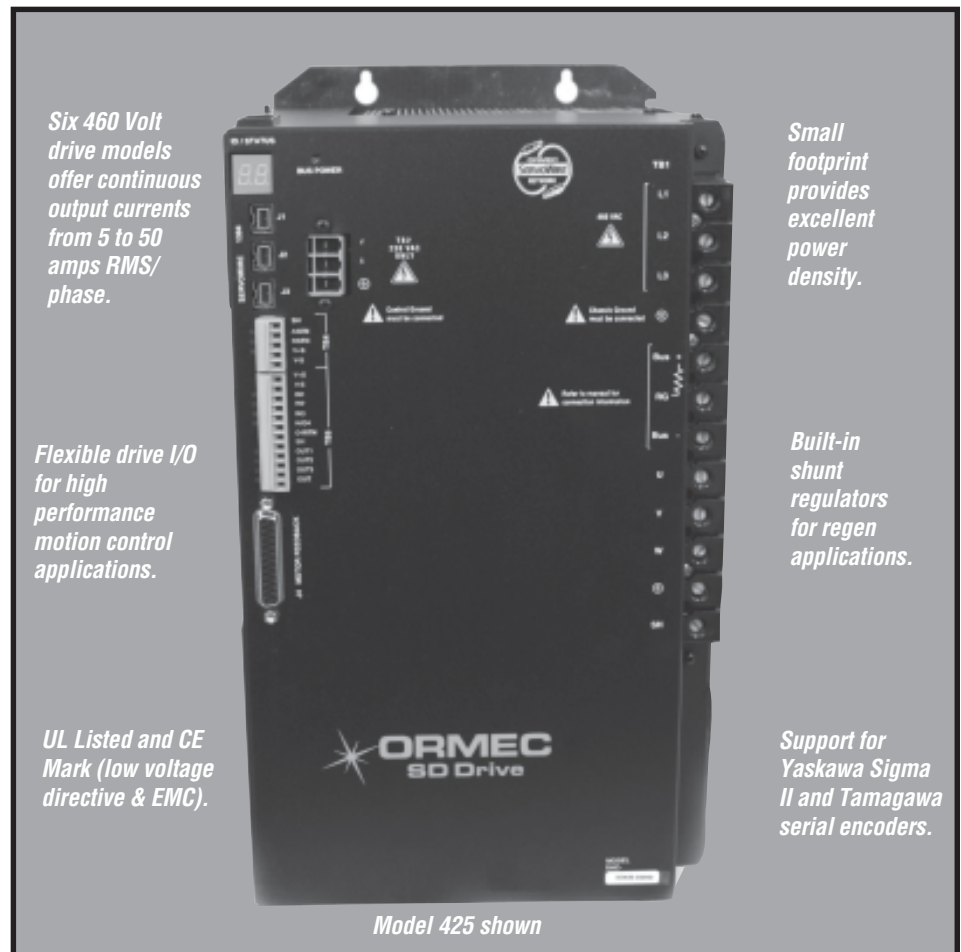


ServoWire® SD 460 Series Drives

Up to 16 ServoWire SD drives can be interfaced to the SMLC utilizing the ServoWire protocol for motion control networking. Six models offer continuous output currents from 5 to 50 amps RMS/phase, and an all-digital design eliminates all manual drive setup including pots and jumpers.

Drive Features

- ✓ **Small Footprint:** higher power density reduces space requirements
- ✓ **Sinusoidal commutation:** improves low speed torque ripple and system efficiency
- ✓ **Trapezoidal commutation & DC operation:** provides user flexibility
- ✓ **Field Oriented Control (FOC) and Space Vector Modulation (SVPWM):** optimal performance at all motor speeds.
- ✓ **Integral shunt regulators:** for regenerative load dissipation
- ✓ **UL/CE approvals:** UL Listed and CE Mark (low voltage directive & EMC)
- ✓ **Status Indicator:** Two digit display for network ID & drive status
- ✓ **ServoWire Network Interface:** Three connectors provide an all-digital control link to ServoWire Network, which is galvanically isolated from the drive and powered by SMLC.
- ✓ **Drive Power Inputs:** 230 or 460 VAC (nominal) input bus power with separate 115/230 VAC logic supply and overvoltage protection.
- ✓ **Flexible Drive I/O:** ServoWire drives provide two high speed sensor inputs, four optically isolated outputs (one output can be used as a user-configurable fail-safe brake control output and another as a drive ready output), three optically isolated inputs (one input can be used as an e-stop input and/or as hardware overtravel limit switch inputs) and one bi-directional I/O point. Diagnostic LEDs aid debugging and terminal blocks make connecting easy.
- ✓ **External Regen & Bus Connections:** Allows bus power to be shared between drives and/or the addition of an external resistor for dissipating regenerative energy from the system.
- ✓ **Feedback Types:** All models available with Encoder or Resolver feedback interface.
- ✓ **Brushless Motor Feedback Interface:** Versatile encoder feedback interface accommodates quadrature feedback, and differential or single-ended hall tracks.
- ✓ **Serial Encoders:** Supports serial encoders including Yaskawa Sigma II and Tamagawa.
- ✓ **Analog I/O:** One 14-bit input; one 14-bit output.



Up to 16 drives can be networked directly to the SMLC using standard cabling.

Integrated Drive I/O

- ✓ **High Speed Sensors:** Each drive provides interfaces for two high-speed sensors. The ASEN and BSEN inputs, along with the internal encoder reference signal, can capture real-time axis position for either or both axes within *one microsecond* of assertion. They can initiate axis motion on the next position loop update (between 0.375 and 1.0 msec delay—depending on loop rate).
- ✓ **E-Stop and Overtravel Limit Inputs:** Each drive provides optically isolated inputs, which can be configured as hardware overtravel limits or as an E-Stop and general purpose input.
- ✓ **Brake Output:** A user-configurable output is provided for control of fail-safe brakes. Brake options are available for H-Series servomotors.
- ✓ **Drive Ready:** A user-configurable output is provided to indicate when the drive is operating normally, without faults. This output is intended for use in the system e-stop interlock circuit.
- ✓ **Zero Reference Output:** A buffered motor zero reference (index mark) output signal is available.
- ✓ **Diagnostic LEDs:** Each I/O point has a visual indicator of its state.
- ✓ **Terminal Blocks:** Easy wiring to 3.81mm pitch terminal blocks.

Specifications

Main Circuit Power

- 230 - 480 VAC +10%, -20%, 50/60 Hz, three phase

Control Circuit Power

- 115 or 230 VAC, +15%, -20%, 50/60 Hz, 56 watts RMS, single phase (230 VAC only on SMM435 and SMM450 models)

Position Command/Control Loop Update Rates

- Position loop updated on command at up to 2.66 kHz (application dependent).
- Velocity loop update rate: up to 5 kHz
- Torque loop update rate: 10 kHz

ServoWire® Drive Output

- 2,400 to 24,000 watts of output power (see Servomotor Selection Charts for power requirements on matching drives)
- IGBT pulse width-modulated with sinusoidal or trapezoidal commutation
- Internal shunt regulator for regenerative load dissipation
- Peak currents up to 200% of RMS continuous capability

ServoWire® Drive I/O

- High speed sensor inputs are software configurable for NPN or PNP output transistors, level or edge triggered response, one microsecond position capture and can initiate motion within one servo loop update
- Externally powered 5-24 VDC optically isolated general purpose I/O and motor encoder reference output, controlled at the servoloop update

Motor Feedback Interface

- Encoder or Resolver Interface
- Quadrature feedback 4x decoding with data rates to 8 MHz (after decode) and open wire detection
- Three differential input channels for motor commutation feedback
- Support for serial encoders including Yaskawa Sigma II and Tamagawa
- Industry standard D-sub interface connector (25-pin: Encoder/female; Resolver/male)
- Input for high temp contact from motor

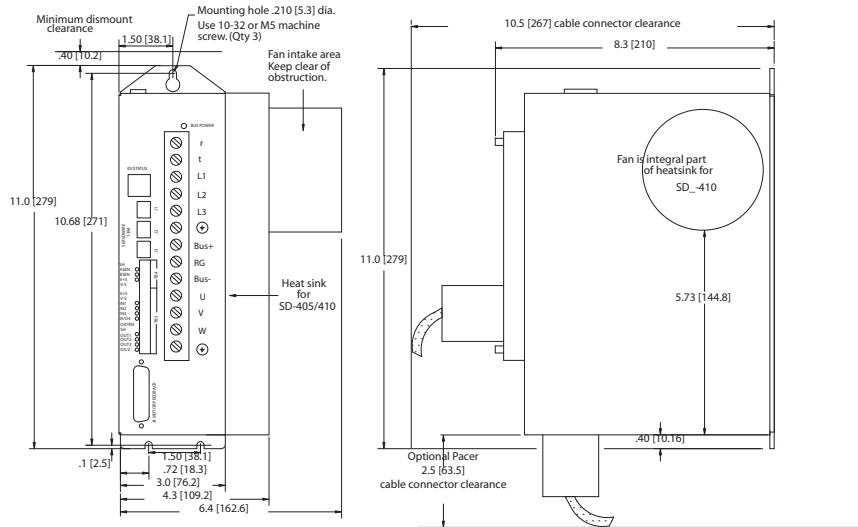
Environmental

- Ambient operating is 0 to 50C
- Ambient storage is -20 to 70C
- Humidity operating/storage is 90% RH or less (non-condensing).

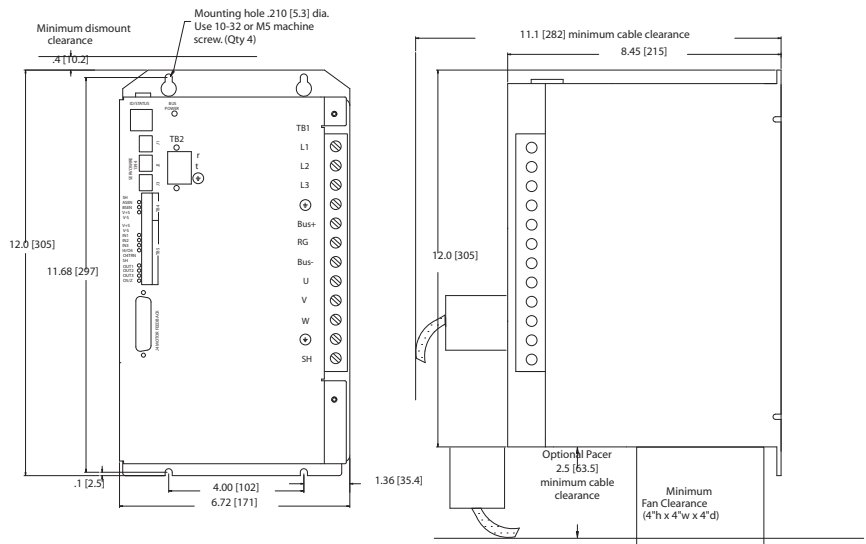
Drive Weights

- SAC-SDM405, 7.9 lbs (3.7 kg)
- SAC-SDM410, 8.3 lbs (3.9 kg)
- SAC-SDM417, 17.7 lbs (8.0 kg)
- SAC-SDM425, 17.7 lbs (8.0 kg)
- SAC-SDM435, 22 lbs (10.1 kg)
- SAC-SDM450, 22 lbs (10.1 kg)

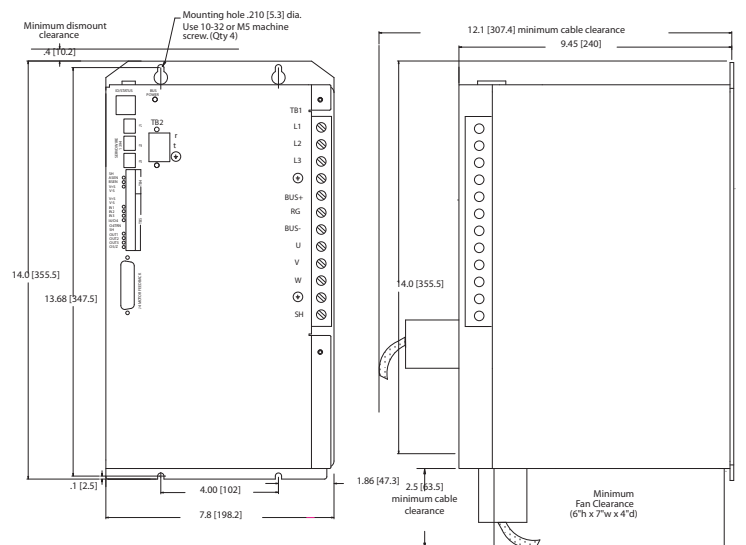
Mounting Information for SAC-SDM-405 & 410

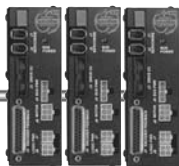


Mounting Information for SAC-SDM-417 & 425



Mounting Information for SAC-SDM-435 & 450





ServoWire® Low Power Drive

The ServoWire SM Low-Power Drive offers high performance motion control using all-digital servodrives (3.0 amps RMS/phase continuous output currents) connected via an open standard FireWire network.

Key Features

All-digital, low power: The LP drive offers the unique combination of low power and all-digital performance. Most low power drives are analog input drives which are difficult to calibrate, setup and maintain. The LP drive *eliminates all manual drive settings* and is totally configurable in software using ORMEC's ServoWire Pro maintenance and diagnostic tool.

Compact Size: The LP drive delivers a space efficient design and power in its space-efficient, panel-mountable drive footprint.

Drive Networking Saves on Installation & Setup: Discrete wiring is a thing of the past -- and dramatically reduces installation and setup costs.

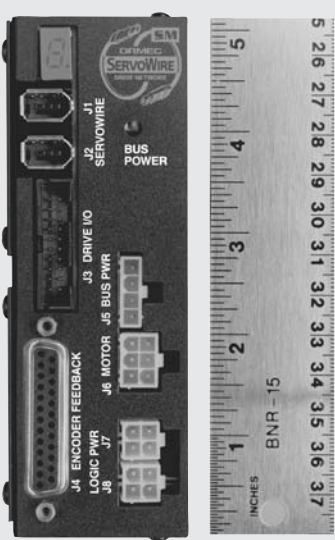
- **Network Drives:** Up to 16 ServoWire SM drives interface to an SMLC utilizing the ServoWire protocol for motion control networking.
- **Brushless or DC Servomotors:** Standard feedback interface uses quadrature encoders and hall track information, serial encoders and resolvers (optional) for brushless operation.



- **One model:** offering 3.0 amps RMS/phase continuous output currents

KEY FEATURES

- Low Power Drive:** Offer 3.0 amps RMS/phase continuous output currents
- Compact Size**
- All-Digital Operation:** No manual drive settings. Totally configurable in software -- unlike other low power drives.
- FireWire Motion Networking:** IEEE-1394 drive network
- ServoWire Pro:** Software utilities for drive configuration, diagnostics and maintenance



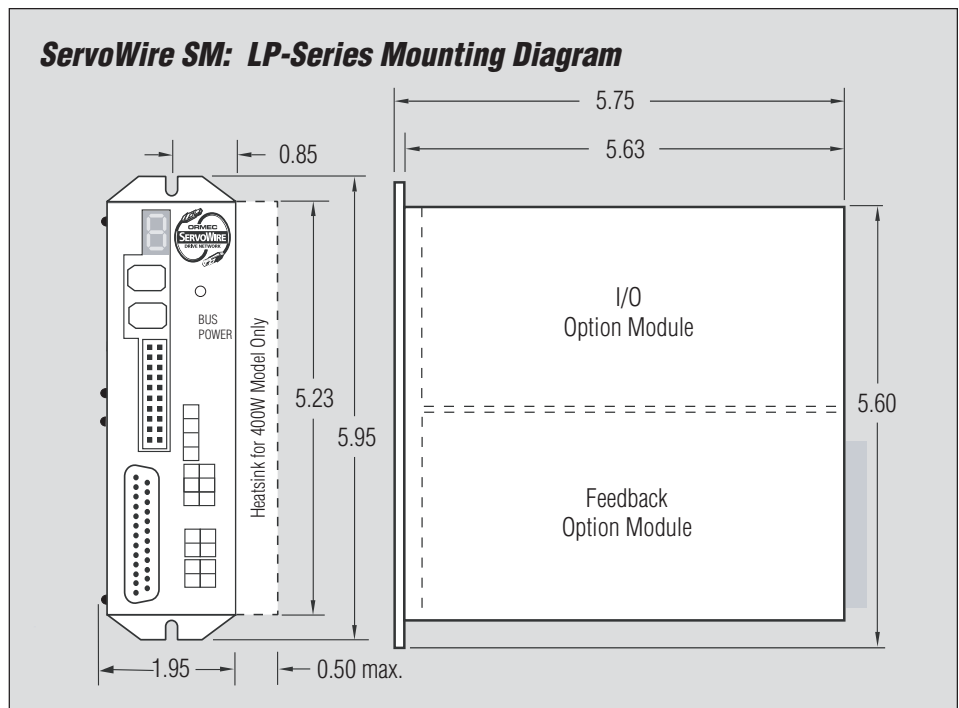
Small Drive Footprint & Excellent Power Density

The ServoWire SM LP drive provides an highly space-efficient design and excellent power density in a space-efficient, panel-mountable drive footprint.

Advantages

- Conserve panel space with a highly efficient drive footprint
- Drive can be mounted only 1/2 inch apart to further conserve space

- **All-digital design:** eliminates all manual drive setup including pots & jumpers
- **Small footprint:** high power density reduces space requirements
- **Sinusoidal commutation:** improves low speed torque ripple and efficiency
- **Trapezoidal commutation & DC operation:** provide user flexibility
- **Status Indicator:** Single digit display for network ID & drive status
- **ServoWire Network Interface:** Two connectors provide an all-digital control link to ServoWire drive network. Network interface is galvanically isolated from the drive and powered by the SMLC.
- **Drive Power Inputs:** Separate 24 VDC logic power input and 24 – 96 VDC (nominal) bus power input with overvoltage protection.
- **Flexible Drive I/O:** ServoWire drives provide two high speed sensor inputs, four optically isolated outputs (one output can be used as a user-configurable fail-safe brake control output and another as a drive ready output), three optically isolated inputs (one input can be used as an e-stop input and/or as hardware overtravel limit switch inputs) and one bi-directional I/O point.
- **External Power Supply Configuration:** Allows bus power to be shared between drives with a single optional shunt regulator on the external power supply for dissipating regenerative energy from the system.



Specifications

Main Circuit Power

- 24 to 96 VDC $\pm 10\%$

Control Circuit Power

- 24 VDC, +15%, -20%

Position Command/Control Loop Update Rates

- Digital position command from the SMLC via the ServoWire® network.
- Position loop updated on command at up to 2.66 kHz (application dependent).
- Velocity loop update rate: up to 5 kHz
- Torque loop update rate: 10 kHz

ServoWire® Drive Output

- 200 watts of output power (see Servomotor Selection Charts for power requirements on matching drives)
- IPM with IGBT pulse width-modulated sinusoidal or trapezoidal commutation
- Field Oriented Control (FOC) and Space Vector Modulation (SVPWM) for optimal performance at all motor speeds
- PWM frequency: 40 kHz
- Minimum inductance: 300 μ H
- Peak currents up to 200% of RMS continuous capability
- Integrated output short circuit, over voltage, over temperature and peak current protection

ServoWire® Drive I/O

- Sensor inputs are software configurable for either NPN or PNP output transistor types and level or edge triggered response
- Sensor Inputs provide one microsecond response time to capture machine position and initiate motion within one servo loop update
- Optically isolated interface for general purpose and motor reference outputs updated every servo loop update with a maximum sink current of 33 ma per output
- External I/O power supply connections will accept 5-24 VDC (240mA maximum) to power input and output circuits

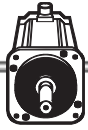
Motor Feedback Interface

- Three differential input channels for encoder position feedback with 5 volt encoder power supplied
- Quadrature feedback 4x decoding with data rates to 8 MHz (after decode)
- Three differential or single-ended input channels for motor hall sensors
- Serial encoder
- Resolver (optional).

ORDERING GUIDE

ServoWire LP Servodrive

SAC-SMMA03/S	Swire SM Servodrive, 24-96 VDC input, 3.0 amps RMS/phase
CON-SMMA-PWR	Conn. set, mtr. & pwr SAC-SMMA, 16-20 AWG



H-Series Servomotors

ORMEC's H-series AC brushless servomotors provide high torque-to-inertia ratios and excellent continuous torque and peak torque performance in a compact design. These industrial-quality servomotors incorporate high-energy, rare earth, neodymium-iron-boron magnets and a highly efficient stator winding design which results in excellent power density.

The H-series servomotors also completely eliminate brush wear maintenance problems, and feature extremely durable construction which includes heavy duty bearings.

Rugged MS connectors provide reliable interconnections to both motor and optical encoder.

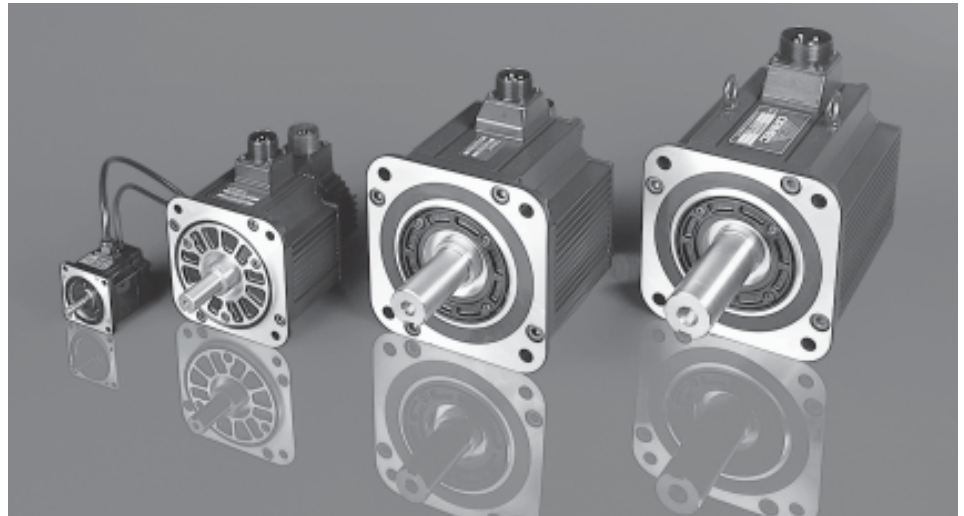
Features

- ❑ Continuous stall torques from 3 to 665 in-lb (0.32 to 75 N-m)
- ❑ High peak torques from 8 to 1,000 in-lb (0.96 to 113 N-m)
- ❑ Output power from 100 to 11,000 watts (0.13 to 15 HP)
- ❑ High maximum speeds from 3,000 to 5,000 RPM
- ❑ Incremental encoder resolutions up to 131,072 counts per revolution
- ❑ Optional absolute encoders feature multi-rev operation up to 1,048,576 cts/rev.
- ❑ Class B or F insulation providing long winding life under rated operating conditions
- ❑ Minimum torque ripple & cogging for smooth low-speed performance
- ❑ Totally Enclosed Non-Ventilated (TENV) standard IP-67 except shaft opening, optional shaft oil seal is available.
- ❑ Optional fail-safe holding brakes

Motor/Drive Combinations

The performance of these servomotors is a direct function of the factory-matched servomotor/drive combination.

ORMEC's ServoWire® drives provide software controlled all-digital performance for consistent operation that totally eliminates analog potenti-



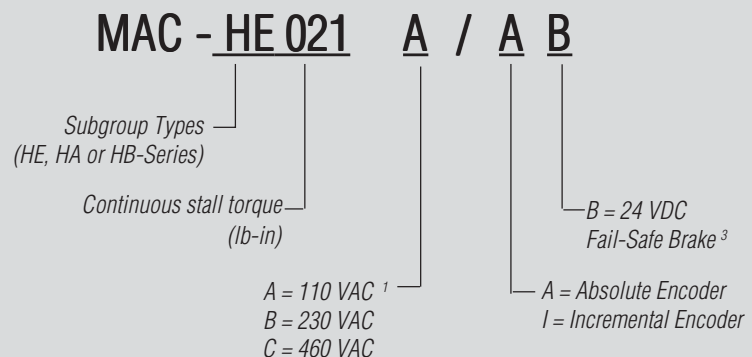
ORMEC's H-series servomotors offer continuous stall torques from 3 to 665 lb-in (0.32 to 75 N-m).

ometer adjustments. High bandwidth operation and a quality high resolution encoder provide the response & accuracy for demanding applications. Peak torques up to three times the rated torque are available for a few seconds, allowing the motor/drive to handle high inertial loads & heavy duty cycle requirements. Each drive's motor parameters are configured in software for high performance and RMS current limiting.

Absolute Encoder Option

Cost-effective absolute encoder support provides axis position over a range of 65,536 revolutions. In continuous uni-directional operation, the position count continually "wraps" through the full range while maintaining absolute position within the cycle. Position is maintained through power cycles by a lithium battery (optional) on the ServoWire® digital drive.

Understanding the H-Series Servomotor Model Numbers



¹ 110 VAC operation is only available on MAC-HE003 and HE006 motors.

² Specify ServoWire drive with absolute encoder support when ordering this motor.

³ Specify cables with the brake option when selecting a motor with a Fail-Safe brake.

H-Series Compatibility Chart

ORMEC's all-digital drive technology provides the ability to control a variety of servomotors with a single servodrive. The chart (below) provides an overview of ServoWire drive capability with ORMEC's H-series servomotors.

The recommended servodrive (★) provides sufficient power to provide the continuous torques specified for the corresponding servomotor.

Compatible servodrive (✓) may be used instead of the recommended servodrive to increase the amount or duration of peak torque, and also allow each servodrive model to support a wider range of motors, simplifying the stocking of spare parts.

Servomotor Model Number	Single Phase Drives (No Regen)			Three Phase Drives-230VAC (External Regen)						Three Phase Drives-460VAC (External Regen)						Input Power ^{(1) (2)} watts/amps
	SAC-SDM203-S	SAC-SDM205-S	SAC-SDM210-S	SAC-SDM217-S	SAC-SDM220-S	SAC-SDM225-S	SAC-SDM235-S	SAC-SDM260-S	SAC-SDM405-S	SAC-SDM410-S	SAC-SDM417-S	SAC-SDM425-S	SAC-SDM435-S	SAC-SDM450-S		
MAC-HE003A	★	✓													110 / 1.0	
MAC-HE003B	★	✓													110 / 0.5	
MAC-HE006A		★	✓												210 / 1.9	
MAC-HE006B	★	✓													210 / 0.9	
MAC-HE011B		★	✓												440 / 1.9	
MAC-HE021B		★	✓												825 / 3.6	
MAC-HE042B			★	✓											1,650 / 7.2	
MAC-HA030B			★	✓											1,100 / 4.8	
MAC-HA030C								★	✓						1,100 / 2.4	
MAC-HA055B				★	✓	✓									2,100 / 9.1	
MAC-HA055C									★	✓					2,100 / 4.6	
MAC-HA090B						★	✓								3,300 / 14	
MAC-HA090C						★	✓		★	✓					3,300 / 7.2	
MAC-HA110B						★	✓	✓							4,290 / 19	
MAC-HA110C										★	✓				4,290 / 9.3	
MAC-HA140B							★	✓							5,390 / 23	
MAC-HA140C										★	✓				5,390 / 12	
MAC-HB025B		★	✓												485 / 2.1	
MAC-HB025C								★	✓						485 / 1.1	
MAC-HB055B			★	✓											940 / 4.1	
MAC-HB055C								★	✓						940 / 2.0	
MAC-HB080B				★	✓										1,430 / 6.2	
MAC-HB080C									★	✓					1,430 / 3.1	
MAC-HB100B					★	✓									1,980 / 8.6	
MAC-HB100C									★	✓					1,870 / 4.1	
MAC-HB200B						★	✓								3,190 / 14	
MAC-HB200C										★	✓				3,190 / 7	
MAC-HB300B							★	✓							4,840 / 21	
MAC-HB300C										★	✓				4,840 / 11	
MAC-HB330B								★							6,050 / 26	
MAC-HB330C											★	✓			6,050 / 13	
MAC-HB465B									★						8,250 / 36	
MAC-HB465C											★	✓			8,250 / 18	
MAC-HB700B								★							12,100 / 53	
MAC-HB700C											★	✓			12,100 / 26	

★ Recommended drive model ✓ Compatible drive model

¹ Power listed is the required incoming line power in watts when the motor is operating at rated output. To determine total incoming power requirements, add up the listed values for each servomotor/drive combination in the system.

² Current listed in amps is the recommended slow-blow fuse capacity for each leg of the three phase power. To select fuses for the system, add the recommended fuse capacities for each servomotor/drive combination in the system.



H-Series AC Brushless Servomotors

Inertia specifications for Brake Models on page 37.

Performance Specifications (1)	Units	HE003A	HE003B	HE006A
Maximum Speed	RPM	5,000	5,000	5,000
Continuous Stall Torque	lb-in	2.8	2.8	5.6
	N-m	0.32	0.32	0.64
Rated Speed	RPM	3,000	3,000	3,000
Rated Torque	lb-in	2.8	2.8	5.6
	N-m	0.32	0.32	0.64
Rated Power	HP	0.13	0.13	0.27
	watts	100	100	200
Peak Torque ⁽²⁾	lb-in	5.1	8.2	14
	N-m	0.58	0.93	1.5
Continuous Stall Torque/Inertia	radians/sec ²	64,437	64,437	32,786

Mechanical Specifications				
Moment of Inertia	lb-in-sec ² x 10 ⁻³	0.043	0.043	0.171
	kg-m ² x 10 ⁻⁴	0.049	0.049	0.193
Friction Torque, Static	lb-in	0.048	0.048	0.11
	N-m	0.0054	0.0054	0.012
Servomotor Weight	lbs	1.5	1.5	3.1
	kg	0.7	0.7	1.4
Maximum Radial Shaft Load (centered at end of shaft)	lbs	17	17	55
	N	78	78	245
Maximum Axial Shaft Load	lbs	11	11	15
	N	49	49	68

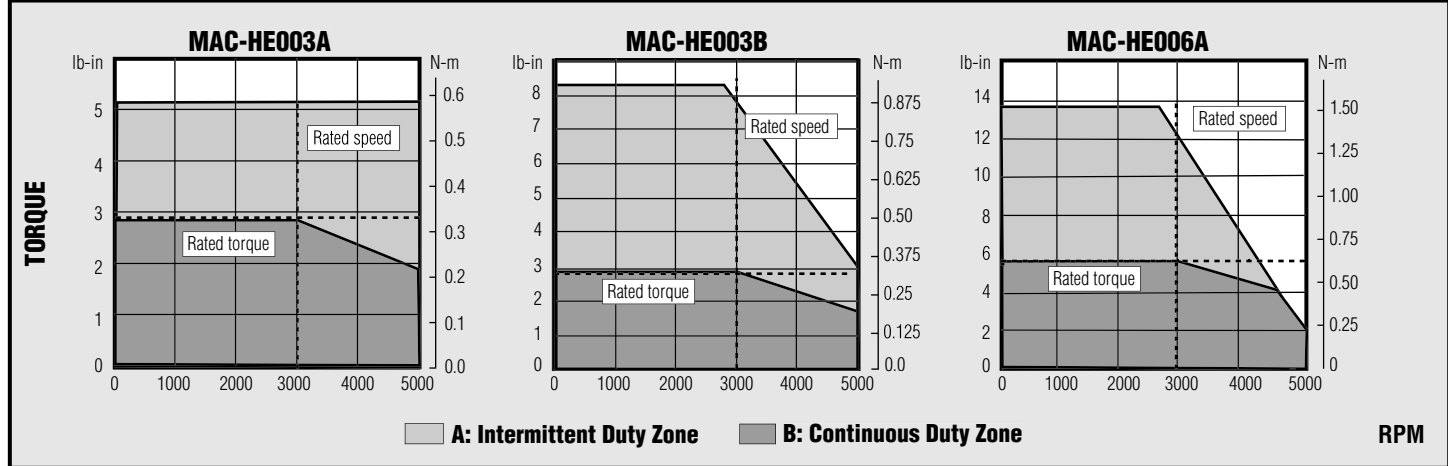
Electrical Specifications				
Torque Sensitivity	lb-in/Amp _{Rms/Ø}	1.4	3.5	2.3
	N-m/Amp _{Rms/Ø}	0.16	0.39	0.26
Servodrive Model Number	SAC-	SDM203-S	SDM203-S	SDM205-S
Servodrive Input Power	volts AC	115	230	115
Continuous Motor Current	Amps _{Rms/Ø}	2.2	0.89	2.7
Peak Motor Current	Amps _{Rms/Ø}	7.1	2.8	8.4

Motor Thermal Specifications				
Ambient Temperature	degrees C	40	40	40
Insulation Class		B	B	B

Encoder Specifications				
Incremental Encoder Resolution	counts/revolution	8,192	8,192	8,192
Absolute Encoder Resolution	counts/revolution	65,536	65,536	65,536

(1) Ratings are obtained with servomotor ambient temperature of 40C, and armature winding temperature of 100C. (2) Motor's peak torque is limited by the peak current of the servodrive. The next larger drive may be used to increase the amount of peak torque available. Consult an ORMEC Applications Engineer for details.

Torque vs. Speed Characteristics





H-Series AC Brushless Servomotors

Inertia specifications for Brake Models on page 37.

Performance Specifications (1)	Units	HE006B	HE011B	HE021B
Maximum Speed	RPM	5,000	5,000	4,700
Continuous Stall Torque	lb-in	5.6	11	21
	N-m	0.64	1.3	2.4
Rated Speed	RPM	3,000	3,000	3,000
Rated Torque	lb-in	5.6	11	21
	N-m	0.64	1.3	2.4
Rated Power	HP	0.27	0.54	1.0
	watts	200	400	750
Peak Torque ⁽²⁾	lb-in	11	28	34
	N-m	1.3	3.2	3.9
Continuous Stall Torque/Inertia	radians/sec ²	32,786	37,551	11,088

Mechanical Specifications				
Moment of Inertia	lb-in-sec ² x 10 ⁻³	0.171	0.293	1.86
	kg-m ² x 10 ⁻⁴	0.193	0.331	2.10
Friction Torque, Static	lb-in	0.11	0.20	0.32
	N-m	0.012	0.022	0.036
Servomotor Weight	lbs	3.1	4.6	9.3
	kg	1.4	2.1	4.2
Maximum Radial Shaft Load (centered at end of shaft)	lbs	55	55	88
	N	245	245	392
Maximum Axial Shaft Load	lbs	15	15	33
	N	68	68	147

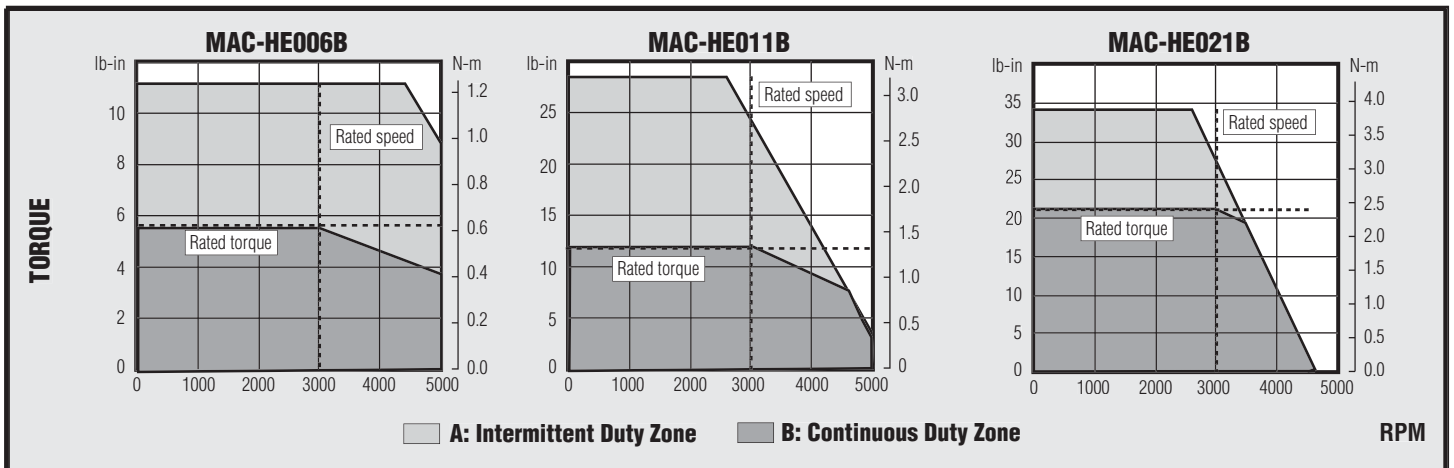
Electrical Specifications				
Torque Sensitivity	lb-in/Amp _{Rms/Ø}	3.1	4.7	5.7
	N-m/Amp _{Rms/Ø}	0.35	0.54	0.64
Servodrive Model Number	SAC-	SDM203-S	SDM205-S	SDM205-S
Servodrive Input Power	volts AC	230	230	230
Continuous Motor Current	Amps _{Rms/Ø}	2.0	2.6	4.1
Peak Motor Current	Amps _{Rms/Ø}	6.0	8.0	14

Motor Thermal Specifications				
Ambient Temperature	degrees C	40	40	40
Insulation Class		B	B	B

Encoder Specifications				
Incremental Encoder Resolution	counts/revolution	8,192	8,192	8,192
Absolute Encoder Resolution	counts/revolution	65,536	65,536	65,536

(1) Ratings are obtained with servomotor ambient temperature of 40C, and armature winding temperature of 100C. (2) Motor's peak torque is limited by the peak current of the ServoWire™ drive. The next larger drive may be used to increase the amount of peak torque available. Consult an Ormec Applications Engineer for details.

Torque vs. Speed Characteristics





H-Series AC Brushless Servomotors

Inertia specifications for Brake Models on page 37.

Performance Specifications (1)	Units	HE042B	HA030B	HA030C	HA055B	HA055C
Maximum Speed	RPM	4,300	4,700	4,800	5,000	
Continuous Stall Torque	lb-in	42	28		56	
	N-m	4.8	3.2		6.3	
Rated Speed	RPM	3,000	3,000		3,000	
Rated Torque	lb-in	42	28		56	
	N-m	4.8	3.2		6.3	
Rated Power	HP	2.0	1.3		2.7	
	watts	1500	1000		2000	
Peak Torque ⁽²⁾	lb-in	73	68	84	101	169
	N-m	8.3	7.7	9.5	11	19
Continuous Stall Torque/Inertia	radians/sec ²	11,575	18,183		19,836	

Mechanical Specifications						
Moment of Inertia	lb-in-sec ² x 10 ⁻³	3.56	1.54		2.82	
	kg-m ² x 10 ⁻⁴	4.02	1.74		3.19	
Friction Torque, Static	lb-in	0.53	0.43		0.62	
	N-m	0.060	0.049		0.070	
Servomotor Weight	lbs	15	10		15	
	kg	6.6	4.6		7.0	
Maximum Radial Shaft Load (centered at end of shaft)	lbs	110	154		154	
	N	490	686		686	
Maximum Axial Shaft Load	lbs	33	44		44	
	N	147	196		196	

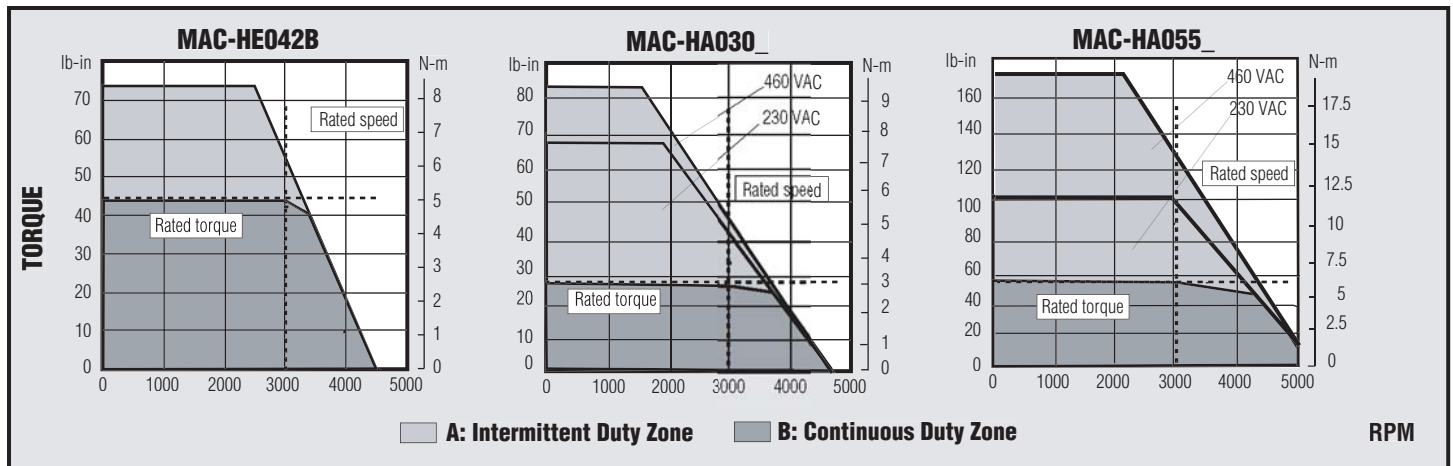
Electrical Specifications						
Torque Sensitivity	lb-in/Amp _{Rms/Ø}	6.1	5.6	11	4.8	9.9
	N-m/Amp _{Rms/Ø}	0.69	0.64	1.7	0.54	1.1
Servodrive Model Number	SAC-	SDM210-S	SDM210-S	SDM405-S	SDM217-S	SDM410-S
Servodrive Input Power	volts AC	230	230	460	230	460
Continuous Motor Current	Amps _{Rms/Ø}	7.5	5.7	2.8	13	6.2
Peak Motor Current	Amps _{Rms/Ø}	23	17	8.5	42	20

Motor Thermal Specifications						
Ambient Temperature	degrees C	40	40		40	
Insulation Class		B	F		F	

Encoder Specifications						
Incremental Encoder Resolution	counts/revolution	8,192	131,072		131,072	
Absolute Encoder Resolution	counts/revolution	65,536	131,072		131,072	

(1) Ratings are obtained with servomotor ambient temperature of 40C, and armature winding temperature of 100C. (2) Motor's peak torque is limited by the peak current of the ServoWire™ drive. The next larger drive may be used to increase the amount of peak torque available. Consult an Ormec Applications Engineer for details. (3) Load centered at end of shaft.

Torque vs. Speed Characteristics





H-Series AC Brushless Servomotors

Inertia specifications for Brake Models on page 37.

Performance Specifications (1)	Units	HA090B	HA090C	HA110B	HA110C	HA140B	HA140C
Maximum Speed	RPM	5,000		5,000		4,900	4,800
Continuous Stall Torque	lb-in	87		112		140	
	N-m	9.8		13		16	
Rated Speed	RPM	3,000		3,000		3,000	
Rated Torque	lb-in	87		112		140	
	N-m	9.8		13		16	
Rated Power	HP	4.0		5.4		6.7	
	watts	3,000		4,000		5,000	
Peak Torque ⁽²⁾	lb-in	217	179	207	274	321	318
	N-m	24	20	23	31	36	36
Continuous Stall Torque/Inertia	radians/sec ²	14,024		13,183		12,861	

Mechanical Specifications							
Moment of Inertia	lb-in-sec ² x 10 ⁻³	6.20		8.50		10.9	
	kg-m ² x 10 ⁻⁴	7.00		9.60		12.3	
Friction Torque, Static	lb-in	0.74		0.95		1.1	
	N-m	0.083		0.11		0.13	
Servomotor Weight	lbs	24		31		37	
	kg	11		14		17	
Maximum Radial Shaft Load (centered at end of shaft)	lbs	220		264		264	
	N	980		1,176		1,176	
Maximum Axial Shaft Load	lbs	88		88		88	
	N	392		392		392	

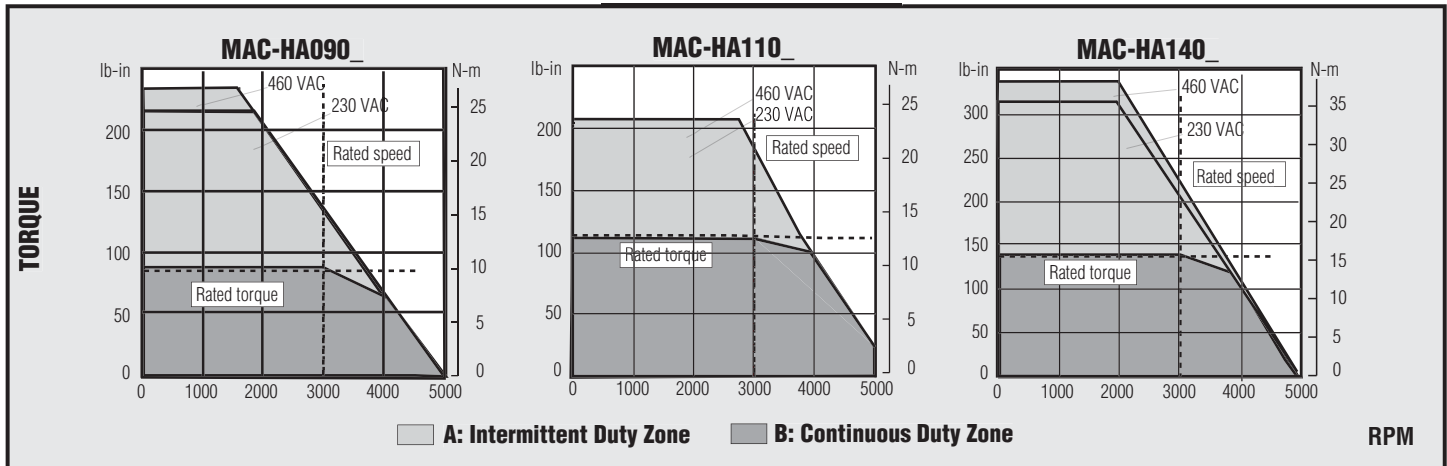
Electrical Specifications							
Torque Sensitivity	lb-in/Amp _{Rms/∅}	5.1	11	4.7	9.5	5.3	11
	N-m/Amp _{Rms/∅}	0.57	1.2	0.53	1.1	0.60	1.2
Servodrive Model Number	SAC-	SDM225-S	SDM410-S	SDM225-S	SDM417-S	SDM235-S	SDM417-S
Servodrive Input Power	volts AC	230	460	230	460	230	460
Continuous Motor Current	Amps _{Rms/∅}	19	8.9	25	13	29	14
Peak Motor Current	Amps _{Rms/∅}	56	28	77	38	84	42

Motor Thermal Specifications					
Ambient Temperature	degrees C	40		40	40
Insulation Class		F		F	F

Encoder Specifications					
Incremental Encoder Resolution	counts/revolution	131,072		131,072	131,072
Absolute Encoder Resolution	counts/revolution	131,072		131,072	131,072

(1) Ratings are obtained with servomotor ambient temperature of 40C, and armature winding temperature of 100C. (2) Motor's peak torque is limited by the peak current of the ServoWire™ drive. The next larger drive may be used to increase the amount of peak torque available. Consult an Ormec Applications Engineer for details.

Torque vs. Speed Characteristics





H-Series AC Brushless Servomotors

Inertia specifications for Brake Models on page 37.

Performance Specifications (1)	Units	HB025B	HB025C	HB055B	HB055C	HB080B	HB080C
Maximum Speed	RPM	3,000		3,000		3,000	
Continuous Stall Torque	lb-in	25		53		74	
	N-m	2.8		6.0		8.4	
Rated Speed	RPM	1,500		1,500		1,500	
Rated Torque	lb-in	25		48		74	
	N-m	2.8		5.4		8.4	
Rated Power	HP	0.60		1.1		1.7	
	watts	450		850		1,300	
Peak Torque ⁽²⁾	lb-in	44	68	88	105	152	177
	N-m	4.9	7.7	10	12	17	20
Continuous Stall Torque/Inertia	radians/sec ²	3,902		4,308		4,059	

Mechanical Specifications							
Moment of Inertia	lb-in-sec ² x 10 ⁻³	6.41		12.3		18.2	
	kg-m ² x 10 ⁻⁴	7.24		13.9		20.5	
Friction Torque, Static	lb-in	0.43		0.65		0.87	
	N-m	0.049		0.074		0.098	
Servomotor Weight	lbs	12		17		21	
	kg	5.5		7.6		9.6	
Maximum Radial Shaft Load (centered at end of shaft)	lbs	110		110		154	
	N	490		490		686	
Maximum Axial Shaft Load	lbs	22		22		77	
	N	98		98		343	

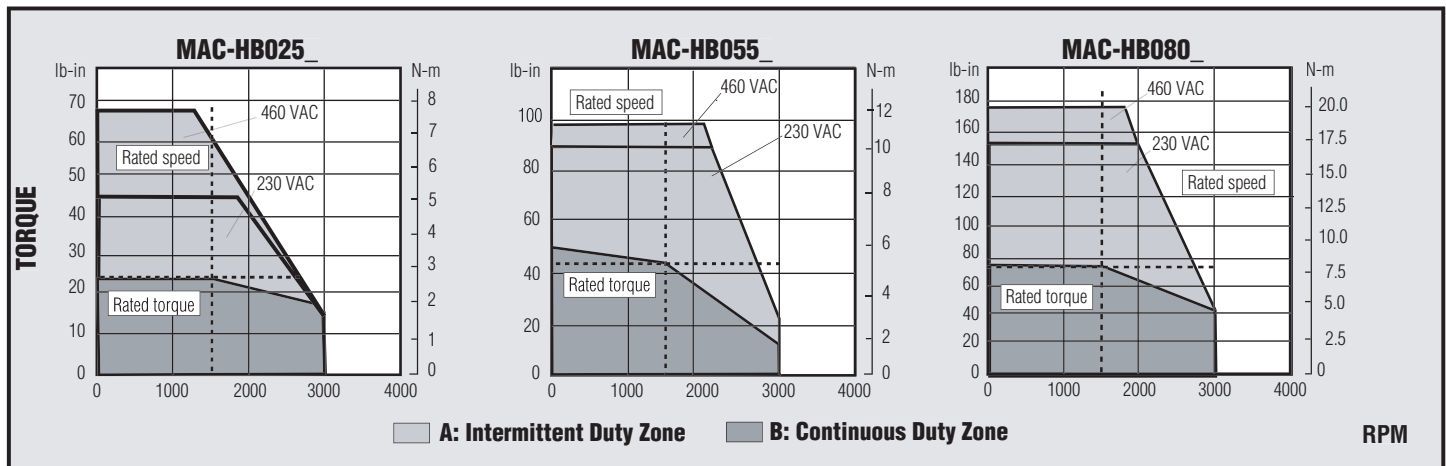
Electrical Specifications							
Torque Sensitivity	lb-in/Amp _{Rms/∅}	7.3	15	7.3	15	7.4	15
	N-m/Amp _{Rms/∅}	0.82	1.6	0.83	1.7	0.84	1.7
Servodrive Model Number	SAC-	SDM205-S	SDM405-S	SDM210-S	SDM405-S	SDM217-S	SDM410-S
Servodrive Input Power	volts AC	230	460	230	460	230	460
Continuous Motor Current	Amps _{Rms/∅}	3.8	1.9	7.1	3.5	11	5.4
Peak Motor Current	Amps _{Rms/∅}	11	5.5	17	9	28	14

Motor Thermal Specifications							
Ambient Temperature	degrees C	40		40		40	
Insulation Class		F		F		F	

Encoder Specifications							
Incremental Encoder Resolution	counts/revolution	131,072		131,072		131,072	
Absolute Encoder Resolution	counts/revolution	131,072		131,072		131,072	

(1) Ratings are obtained with servomotor ambient temperature of 40C, and armature winding temperature of 100C. (2) Motor's peak torque is limited by the peak current of the ServoWire™ drive. The next larger drive may be used to increase the amount of peak torque available. Consult an ORMEC Applications Engineer for details.

Torque vs. Speed Characteristics





H-Series AC Brushless Servomotors

Inertia specifications for Brake Models on page 37.

Performance Specifications (1)	Units	HB100B	HB100C	HB200B	HB200C	HB300B	HB300C
Maximum Speed	RPM	3,000		3,000		3,000	
Continuous Stall Torque	lb-in	102		196		300	
	N-m	12		22		34	
Rated Speed	RPM	1,500		1,500		1,500	
Rated Torque	lb-in	102		165		252	
	N-m	12		19		28	
Rated Power	HP	2.4	2.3	3.9		5.9	
	watts	1,800	1,700	2,900		4,400	
Peak Torque ⁽²⁾	lb-in	155	214	350		479	554
	N-m	18	24.2	40		54	63
Continuous Stall Torque/Inertia	radians/sec ²	3,624		4,815		5,015	

Mechanical Specifications							
Moment of Inertia	lb-in-sec ² x 10 ⁻³	28.1		40.7		59.8	
	kg-m ² x 10 ⁻⁴	31.7		46.0		67.5	
Friction Torque, Static	lb-in	1.0		1.4		2.3	
	N-m	0.12		0.16		0.25	
Servomotor Weight	lbs	31		40		51	
	kg	14		18		23	
Maximum Radial Shaft Load (centered at end of shaft)	lbs	264		330		330	
	N	1,176		1,470		1,470	
Maximum Axial Shaft Load	lbs	110		110		110	
	N	490		490		490	

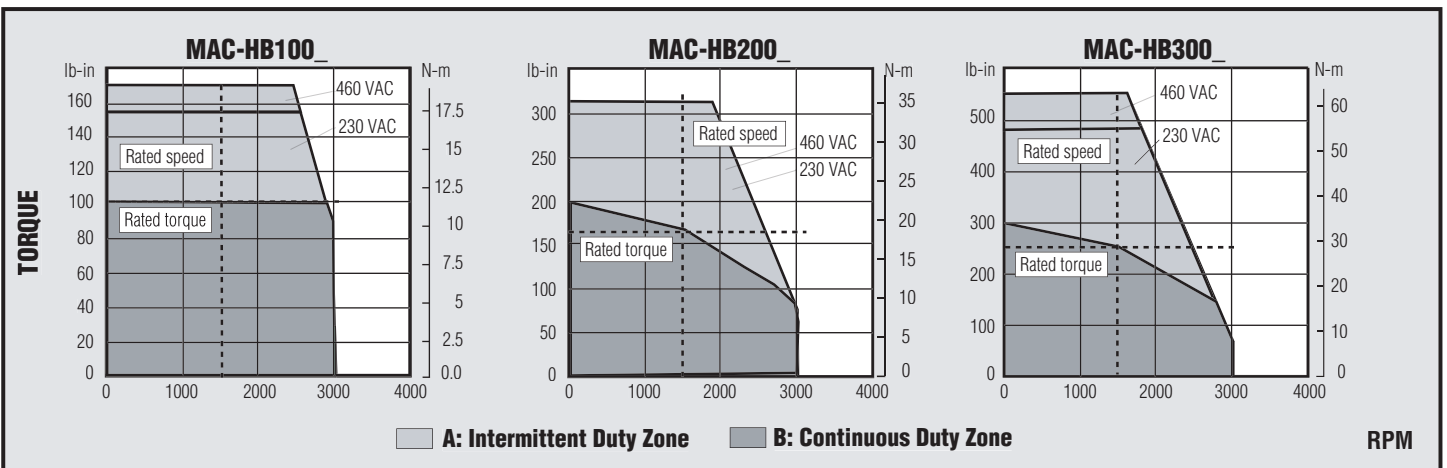
Electrical Specifications							
Torque Sensitivity	lb-in/AmpRms/Ø	6.5	13	7.3	15	8.0	16
	N-m/AmpRms/Ø	0.73	1.5	0.82	1.7	0.91	1.8
Servodrive Model Number	SAC-	SDM220-S	SDM410-S	SDM225-S	SDM417-S	SDM235-S	SDM417-S
Servodrive Input Power	volts AC	230	460	230	460	230	460
Continuous Motor Current	AmpsRms/Ø	17	8.4	24	12	33	17
Peak Motor Current	AmpsRms/Ø	42	20	56	28	84	41

Motor Thermal Specifications							
Ambient Temperature	degrees C	40		40		40	
Insulation Class		F		F		F	

Encoder Specifications							
Incremental Encoder Resolution	counts/revolution	131,072		131,072		131,072	
Absolute Encoder Resolution	counts/revolution	131,072		131,072		131,072	

(1) Ratings are obtained with servomotor ambient temperature of 40C, and armature winding temperature of 100C. (2) Motor's peak torque is limited by the peak current of the ServoWire™ drive. The next larger drive may be used to increase the amount of peak torque available. Consult an ORMEC Applications Engineer for details.

Torque vs. Speed Characteristics





H-Series AC Brushless Servomotors

Inertia specifications for Brake Models on page 37.

Performance Specifications (1)	Units	HB330B	HB330C	HB465B	HB465C	HB700B	HB700C
Maximum Speed	RPM	3,000		3,000		2,000	
Continuous Stall Torque	lb-in	345		450		665	
	N-m	39		51		75	
Rated Speed	RPM	1,500		1,500		1,500	
Rated Torque	lb-in	310		425		620	
	N-m	35		48		70	
Rated Power	HP	7.4		10		15	
	watts	5,500		7,500		11,000	
Peak Torque ⁽²⁾	lb-in	728	655	839	978	1,000	
	N-m	82	74	95	111	113	
Continuous Stall Torque/Inertia	radians/sec ²	4,380		4,055		2,670	

Mechanical Specifications

Moment of Inertia	lb-in-sec ² x 10 ⁻³	78.8		111		249	
	kg-m ² x 10 ⁻⁴	89.0		125		281	
Friction Torque, Static	lb-in	3.0		4.2		7.2	
	N-m	0.33		0.47		0.81	
Servomotor Weight	lbs	66		88		127	
	kg	30		40		58	
Maximum Radial Shaft Load (centered at end of shaft)	lbs	397		397		397	
	N	1,764		1,764		1,764	
Maximum Axial Shaft Load	lbs	132		132		132	
	N	588		588		588	

Electrical Specifications

Torque Sensitivity	lb-in/Amp _{Rms/Ø}	7.8	15	8.2	18	11	23
	N-m/Amp _{Rms/Ø}	0.88	1.8	0.93	2.0	1.2	2.6
Servodrive Model Number	SAC-	SDM260-S	SDM425-S	SDM260-S	SDM425-S	SDM260-S	SDM435-S
Servodrive Input Power	volts AC	230	460	230	460	230	460
Continuous Motor Current	Amps _{Rms/Ø}	42	21	55	25	59	28
Peak Motor Current	Amps _{Rms/Ø}	110	55	130	65	140	70

Motor Thermal Specifications

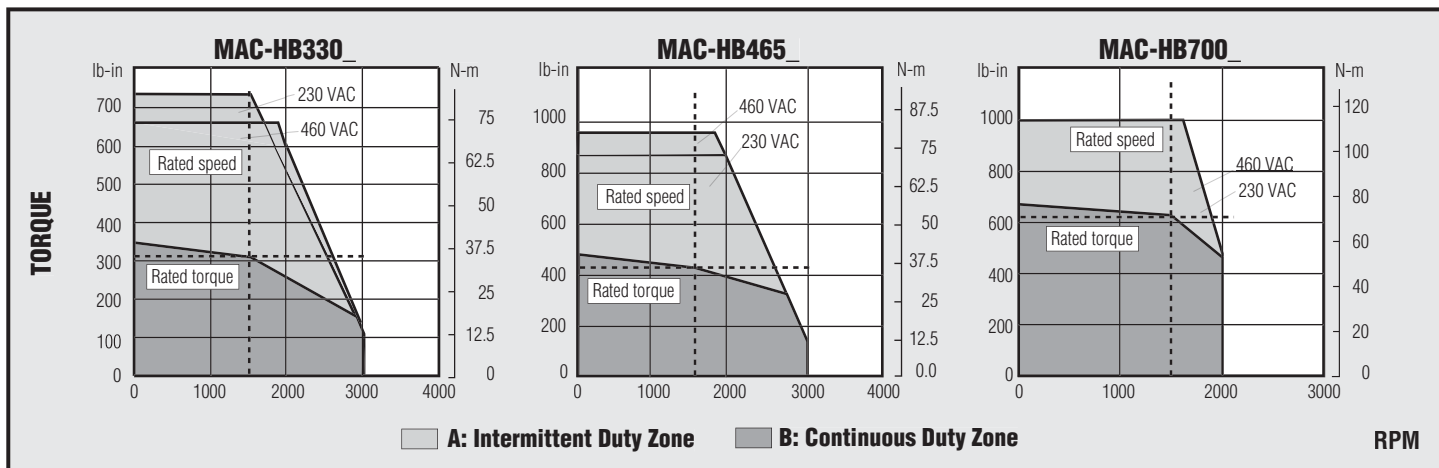
Ambient Temperature	degrees C	40		40		40	
Insulation Class		F		F		F	

Encoder Specifications

Incremental Encoder Resolution	counts/revolution	131,072		131,072		131,072	
Absolute Encoder Resolution	counts/revolution	131,072		131,072		131,072	

(1) Ratings are obtained with servomotor ambient temperature of 40C, and armature winding temperature of 100C. (2) Motor's peak torque is limited by the peak current of the ServoWire™ drive. The next larger drive may be used to increase the amount of peak torque available. Consult an ORMEC Applications Engineer for details.

Torque vs. Speed Characteristics

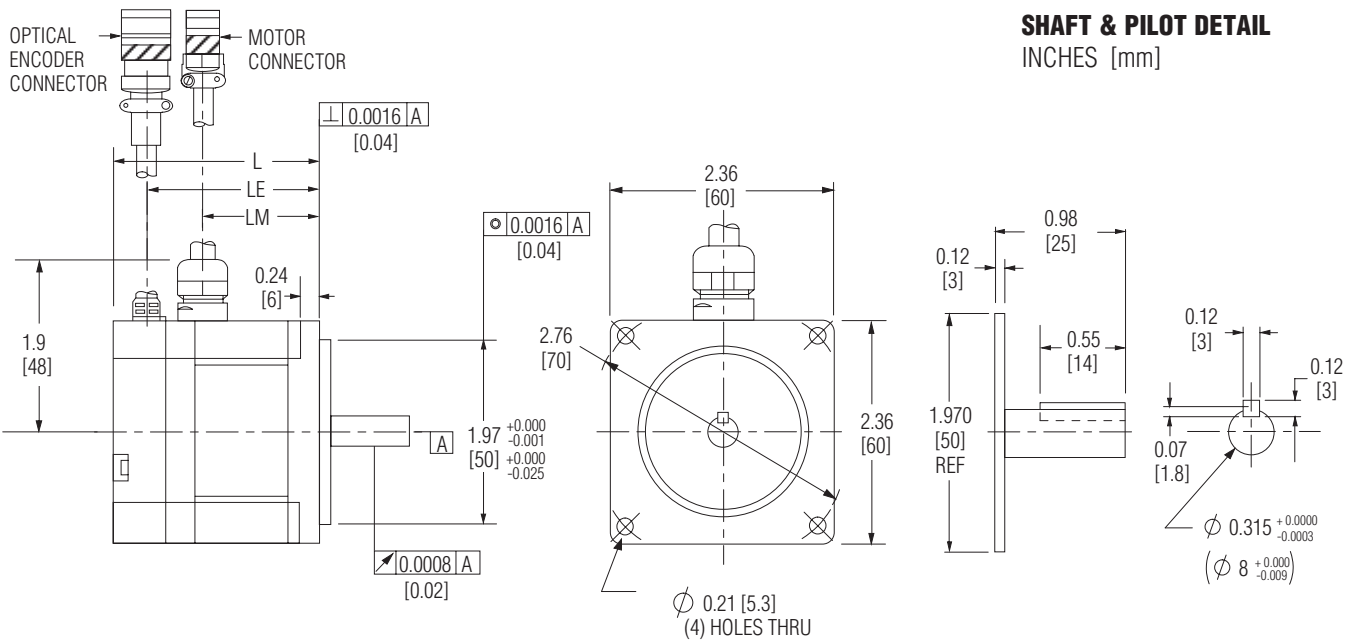


Specifications for H-Series Servomotors with Fail-Safe Brakes

Servomotor Model Number	Brake Holding Torque ⁽¹⁾ (lb-in / N-m)	MODEL with BRAKE				Brake Coil Resistance	Brake Rated Current
		Continuous Stall Torque to Inertia Ratio (radians/sec ²)	Moment of Inertia (lb-in-sec ² / kg-m ²)	Motor Length (in / mm)	Motor Weight (lb / kg)		
MAC-HE003A	4.3 0.49	40,510	0.069 x 10 ⁻³ 0.781 x 10 ⁻⁴	3.6 91	1.5 0.7	96	.25
MAC-HE003B	4.3 0.49	40,510	0.069 x 10 ⁻³ 0.781 x 10 ⁻⁴	3.6 91	1.5 0.7	96	.25
MAC-HE006A	8.7 0.98	20,953	0.267 x 10 ⁻³ 0.302 x 10 ⁻⁴	3.9 99	4.2 1.9	115	.21
MAC-HE006B	8.7 0.98	20,953	0.267 x 10 ⁻³ 0.302 x 10 ⁻⁴	3.9 99	4.2 1.9	115	.21
MAC-HE011B	17 1.9	28,249	0.389 x 10 ⁻³ 0.440 x 10 ⁻⁴	4.7 119	5.7 2.6	76	.32
MAC-HE021B	32 3.6	7,976	2.63 x 10 ⁻³ 2.98 x 10 ⁻⁴	4.8 123	13 5.7	77	.31
MAC-HE042B	63 7.1	9,695	4.33 x 10 ⁻³ 4.90 x 10 ⁻⁴	5.8 148	18 8.1	58	.42
MAC-HA030_	66 7.8	15,310	1.83 x 10 ⁻³ 2.07 x 10 ⁻⁴	7.6 193	13 6.0	82	.29
MAC-HA055_	66 7.8	17,994	3.11 x 10 ⁻³ 3.52 x 10 ⁻⁴	9.5 242	19 8.5	82	.29
MAC-HA090_	177 20	10,749	8.09 x 10 ⁻³ 9.15 x 10 ⁻⁴	9.3 237	31 14	58.5	.41
MAC-HA110_	177 20	10,784	10.4 x 10 ⁻³ 11.7 x 10 ⁻⁴	10.8 274	38 17	58.5	.41
MAC-HA140_	177 20	10,958	12.8 x 10 ⁻³ 14.4 x 10 ⁻⁴	12.4 314	44 20	58.5	.41
MAC-HB025_	39 4.4	3,028	8.26 x 10 ⁻³ 9.33 x 10 ⁻⁴	6.9 176	17 7.5	58.5	.41
MAC-HB055_	112 13	3,745	14.2 x 10 ⁻³ 16.0 x 10 ⁻⁴	7.8 199	21 9.6	58.5	.41
MAC-HB080_	112 13	3,685	20.1 x 10 ⁻³ 22.7 x 10 ⁻⁴	8.8 223	26 12	58.5	.41
MAC-HB100_	380 43	2,842	35.9 x 10 ⁻³ 40.6 x 10 ⁻⁴	8.5 217	42 19	31.1	.77
MAC-HB200_	380 43	4,045	48.4 x 10 ⁻³ 54.8 x 10 ⁻⁴	9.6 243	52 24	31.1	.77
MAC-HB300_	380 43	4,439	67.6 x 10 ⁻³ 76.4 x 10 ⁻⁴	10.9 277	63 29	31.1	.77
MAC-HB330_	646 73	3,988	86.6 x 10 ⁻³ 97.8 x 10 ⁻⁴	12.2 311	77 35	24.5	.98
MAC-HB465_	646 73	3,790	119 x 10 ⁻³ 134 x 10 ⁻⁴	15.2 385	100 46	24.5	.98
MAC-HB700_	744 84	2,502	266 x 10 ⁻³ 300 x 10 ⁻⁴	15.1 383	145 67	18	1.33

⁽¹⁾Caution: The built-in fail-safe brake is designed for holding and not for decelerating the motor. In normal operation the brake should be applied only after the motor is stopped. Fail-safe brakes are useful in applications when a servomotor is used to control a vertical axis. A servomotor with a fail-safe brake prevents the moveable part from dropping due to gravitation when the system power is turned OFF.

HE003A & HE003B Outline Drawings



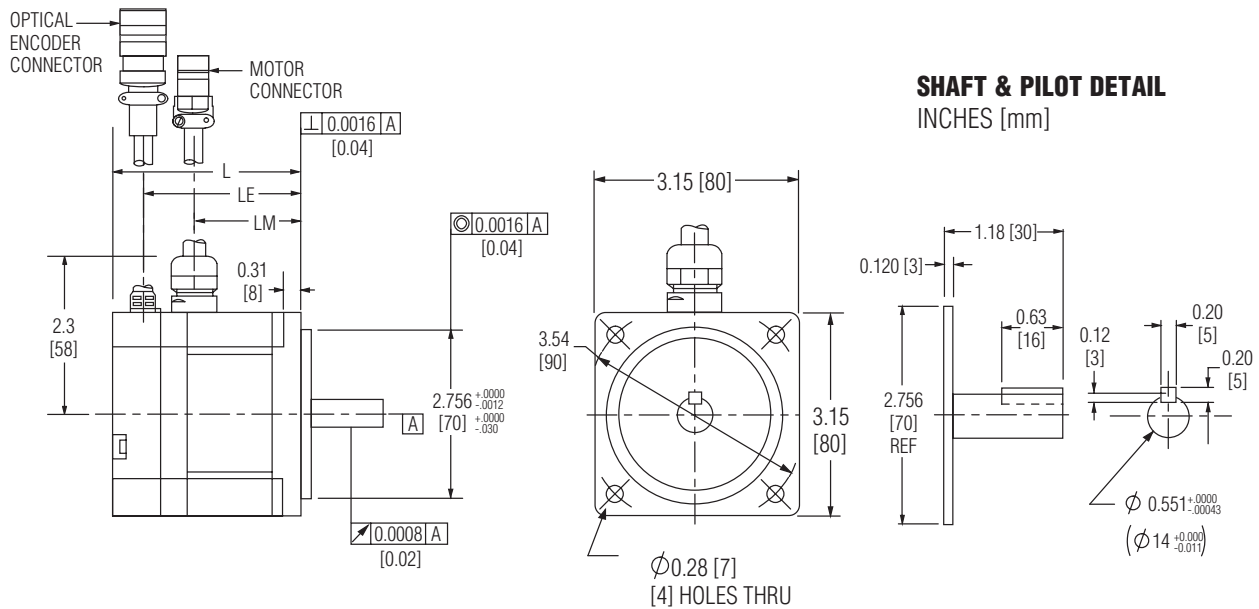
Dimensions	L	LE	LM
MAC-HE003A	2.4 [62]	1.9 [48]	1.3 [32]
MAC-HE003B	2.4 [62]	1.9 [48]	1.3 [32]

Note: Minimum cable clearance from motor centerline for encoder cable is 2.8 inches 71 mm); for motor cable is 3.8 inches (97 mm). Cable lengths to connector approximately 11 inches [280 mm].

For length of models with brake option selected, see page 37. Call for design details.

All dimensions in inches [millimeters]

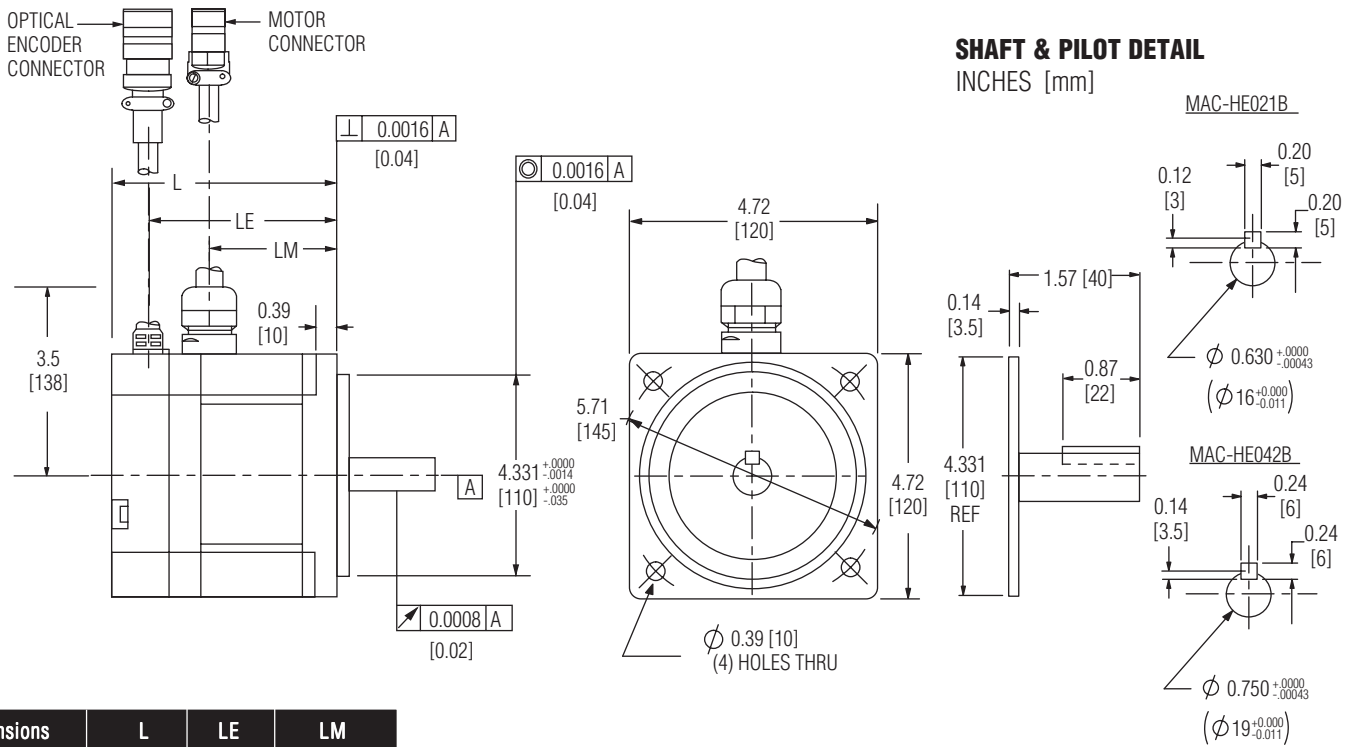
HE006A, HE006B, & HE011B Outline Drawings



Dimensions	L	LE	LM
MAC-HE006A	2.6 [67]	2.1 [53]	1.6 [40]
MAC-HE006B	2.6 [67]	2.1 [53]	1.6 [40]
MAC-HE011B	3.4 [87]	2.9 [73]	2.4 [60]

Note: Minimum cable clearance from motor centerline for encoder cable is 3.2 inches (81 mm); for motor cable is 4.2 inches (107 mm). Cable lengths to connector approximately 11 inches [280 mm].

HE021B & HE042B Outline Drawings



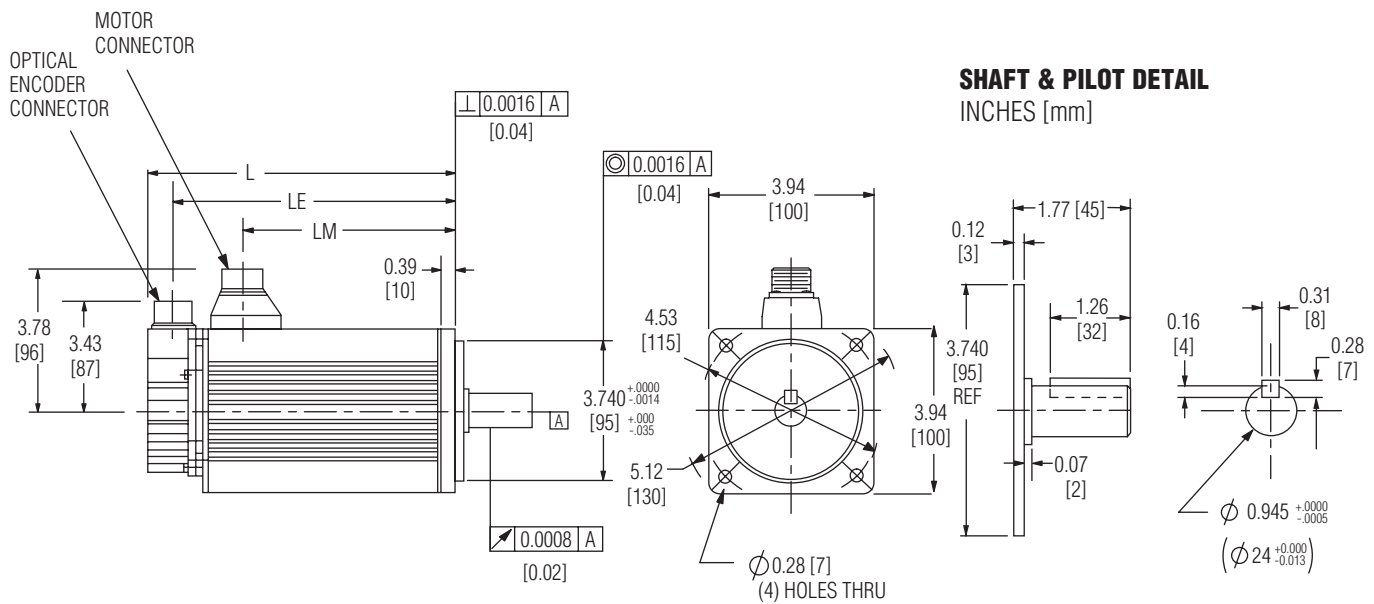
Dimensions	L	LE	LM
MAC-HE021B	3.4 [87]	2.9 [73]	2.2 [56]
MAC-HE042B	4.5 [115]	3.9 [100]	3.3 [84]

Note: Minimum cable clearance from motor centerline for encoder cable is 4.0 inches (102 mm); for motor cable is 5.0 inches (127 mm). Cable lengths to connector approximately 11 inches (280 mm).

For length of models with brake option selected, see page 37. Call for design details.

All dimensions in inches [millimeters]

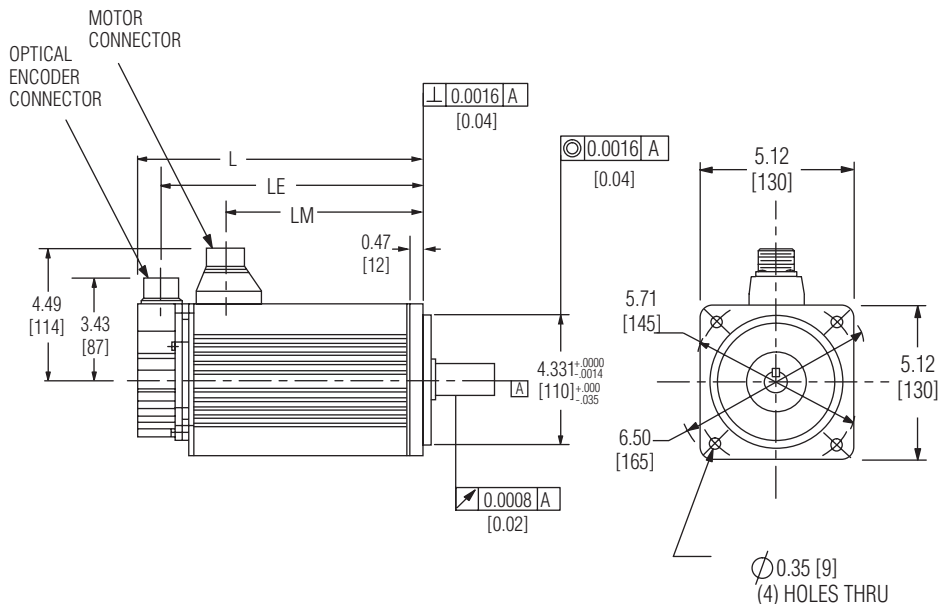
HA030_ & HA055_ Outline Drawings



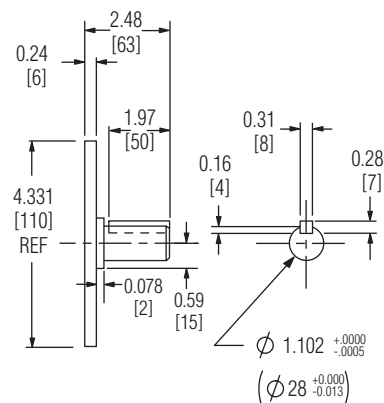
Dimensions	L	LE	LM
MAC-HA030_	5.9 [149]	5.0 [128]	3.0 [76]
MAC-HA055_	7.8 [198]	7.0 [178]	4.9 [125]

Note: Minimum cable clearance from motor centerline for Encoder Cable is 6.2 inches (157 mm); for Motor Cable is 6.6 inches (168 mm).

HA090_ , HA110_ & HA140_ Outline Drawings



SHAFT & PILOT DETAIL INCHES [mm]



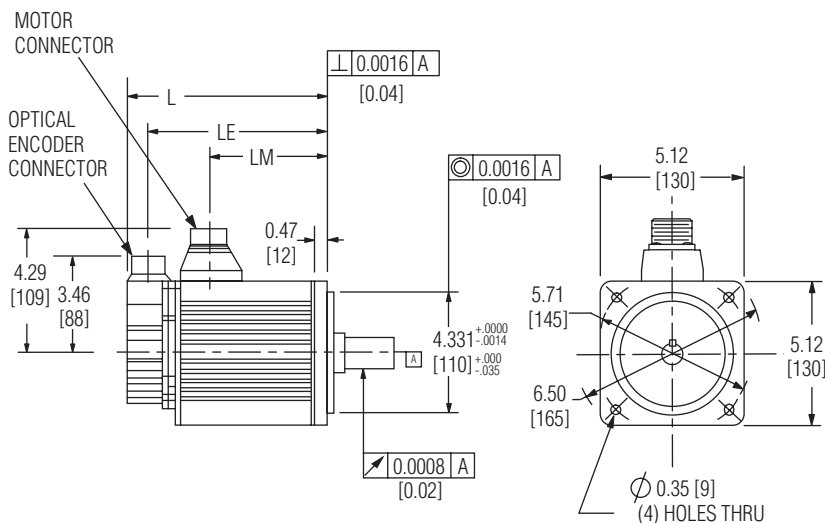
Dimensions	L	LE	LM
MAC-HA090_	7.8 [199]	7.0 [177]	4.8 [122]
MAC-HA110_	9.3 [236]	8.5 [215]	6.3 [159]
MAC-HA140_	10.9 [277]	10.0 [255]	7.8 [199]

Note: Minimum cable clearance from motor centerline for encoder cable is 6.2 inches (157 mm); for motor cable is 7.5 inches (191 mm).

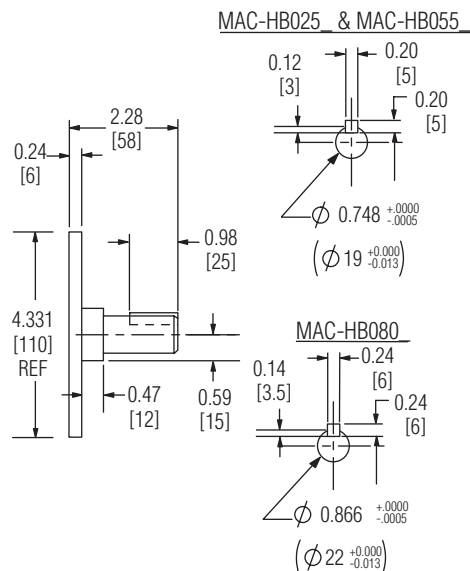
For length of models with brake option selected, see page 37. Call for design details.

All dimensions in inches [millimeters]

HB025_ , HB055_ & HB080_ Outline Drawings



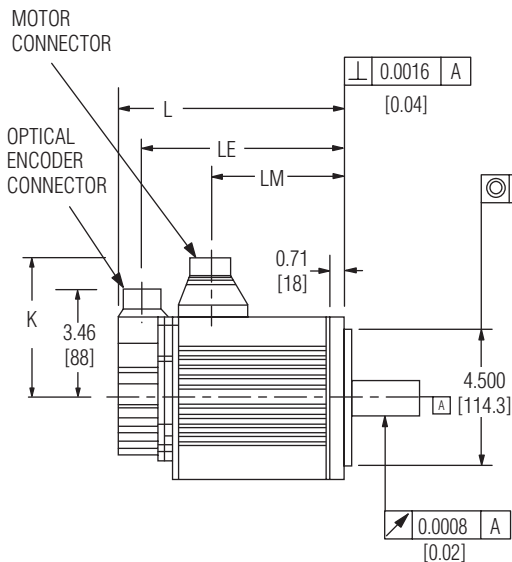
SHAFT & PILOT DETAIL INCHES [mm]



Dimensions	L	LE	LM
MAC-HB025_	5.4 [138]	4.6 [117]	2.5 [64]
MAC-HB055_	6.3 [161]	5.5 [140]	3.4 [88]
MAC-HB080_	7.3 [185]	6.5 [164]	4.4 [112]

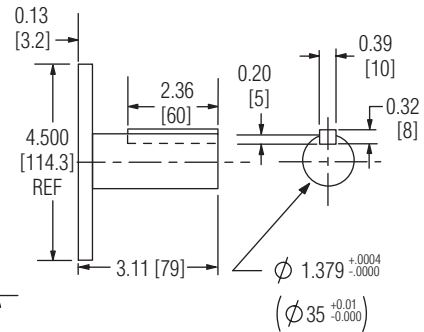
Note: Minimum cable clearance from motor centerline for encoder cable is 6.3 inches (160 mm); for motor cable is 7.0 inches (178 mm).

HB100_ , HB200_ , HB300_ , HB330_ & HB465_ Outline Drawings

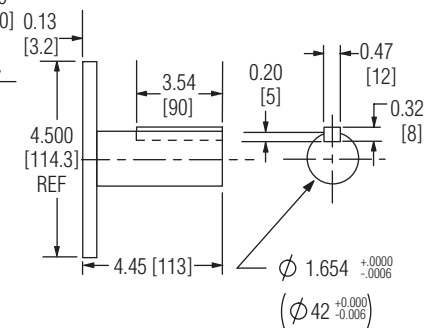


SHAFT & PILOT DETAIL INCHES [mm]

MAC-HB100_ , MAC-HB200_ & MAC-HB300_



MAC-HB330_ & MAC-HB465_



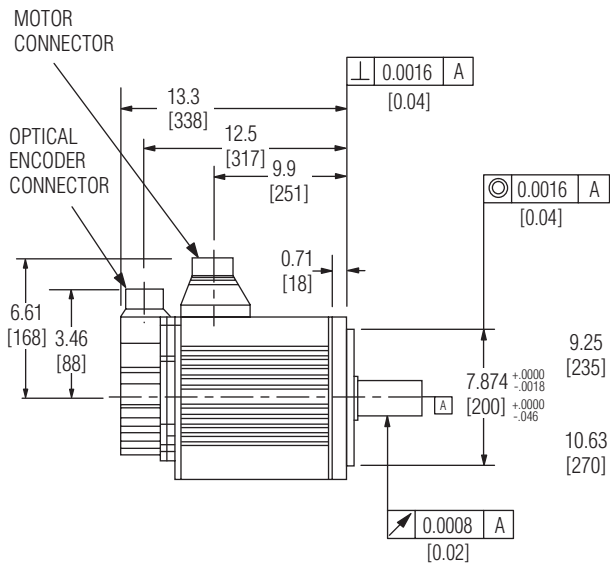
Note: Minimum cable clearance from motor centerline for encoder cable is 6.3 inches (160 mm); for motor cable is 9.5 inches (241 mm)

Dimensions	L	LE	LM	K
MAC-HB100_	6.5 [166]	5.7 [145]	3.5 [89]	5.5 [140]
MAC-HB200_	7.5 [192]	6.7 [171]	4.5 [115]	5.5 [140]
MAC-HB300_	8.9 [226]	8.1 [205]	5.9 [149]	5.5 [140]
MAC-HB330_	10.2 [260]	9.4 [239]	6.8 [174]	5.9 [150]
MAC-HB465_	13.2 [334]	12.3 [313]	9.8 [248]	5.9 [150]

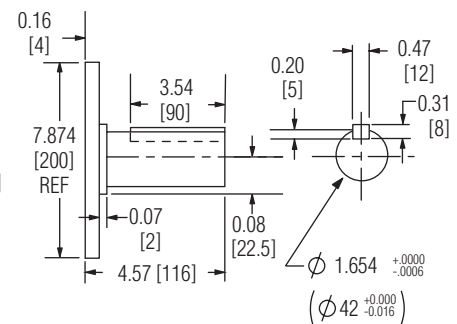
For length of models with brake option selected, see page 37. Call for design details.

All dimensions in inches [millimeters]

HB700_ Outline Drawing



SHAFT & PILOT DETAIL INCHES [mm]



Note: Minimum cable clearance from motor centerline for encoder cable is 6.3 inches (160 mm); for motor cable is 9.5 inches (241 mm)

Servomotor Connectors

MOTOR / POWER RECEPTACLES

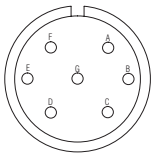


Fig. W

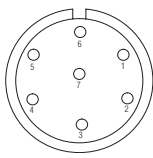


Fig. Y

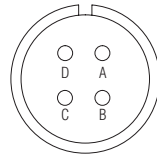


Fig. X

A	1	Phase U	RED
B	2	Phase V	WHT
C	3	Phase W	BLU
D	6	Ground	GRN
E	5	Brake Term	RED
F	4	Brake Term	BLK

BRAKE CONNECTOR (Figure B)

A	Brake Term
B	Brake Term
C	--

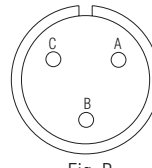


Fig. B

Connector Type	Manufactured by
MS....	Amphenol
FIN....	Yaskawa
SRU....	Interconnectron

ENCODER FEEDBACK RECEPTACLES (Figure U & Z)

S	1	BAT-
T	2	BAT+
C	3	DATA+
D	4	DATA-
H	8	+5VDC
G	9	0V
J	Shell	Case Ground

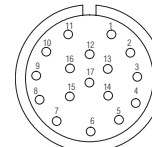


Fig. Z

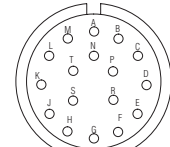


Fig. U

MOTOR / FEEDBACK / OPTION -- MATING CONNECTOR CHART

MOTOR TYPE	FIG	MOTOR/POWER	MATING	FIG	FEEDBACK	MATING
115,230 & 460 VAC Motors (incremental or absolute feedback)						
All of MAC-HE series motors	Y	SRUC06JM5CN236	FIN075-B2	Z	SRUC17GMRCN087	FIN17CA2 ²
MAC-HA030B, HA055B, HB025B, DB055B, HB080B	X	MS-3102A18-10P	MS-3106F18-10S	U	MS-3102A20-29P	MS-3106F20-29S
MAC-HA090B, HA110B, HA140B, HB100B, HB200B, HB300B	X	MS-3102A22-22P	MS-3106F22-22S	U	MS-3101A20-29P	MS-3106F20-29S
MAC-HB330B, HB465B & HB700B	X	MS-3102A32-17P	MS-3106F32-17S	U	MS-3101A20-29P	MS-3106F20-29S
115 & 230 VAC Motors with Fail-safe Brake						
All of MAC-HE series motors	Y	SRUC06JM5CN236	FIN075-B2	Z	SRUC17GMRCN087	FIN17CA22
MAC-HA030B, HA055B, HB025B, HB055B, HB080B	W	MS-3102A20-15P	MS-3106F20-15S	U	MS-3101A20-29P	MS-3106F20-29S
MAC-HA090B, HA110B, HA140B, HB100B, HB200B, HB300B	W	MS-3102A24-10P	MS-3106F24-10S	U	MS-3101A20-29P	MS-3106F20-29S
MAC-HB330C, HB465C & HB700C	X	MS-3102A32-17P ¹	MS-3106F32-17S ¹	U	MS-3101A20-29P	MS-3106F20-29S
MAC-HB330B, HB465B & HB700B	B	MS-3102A10SL-3P ¹	MS-3106F10SL-3S ¹			
460 VAC Motors with Fail-safe Brake						
MAC-HA030C, HA055C, HB025C, HB055C, HB080C	W	MS-3102A20-15P	MS-3106F20-15S	U	MS-3101A20-29P	MS-3106F20-29S
MAC-HA090C, HA110C, HA140C, HB100C, HB200C, HB300C	W	MS-3102A24-10P	MS-3106F24-10S	U	MS-3101A20-29P	MS-3106F20-29S
MAC-HB330C, HB465C & HB700C	X	MS-3102A32-17P ¹	MS-3106F32-17S ¹	U	MS-3101A20-29P	MS-3106F20-29S
Brake connector for all 460 VAC H-Series motors	B	MS-3102A10SL-3P ¹	MS-3106F10SL-3S ¹			

¹ Brake option requires separate motor and brake cables. ² Requires Crimp tool B150 and positioner.

H-Series Encoder and Motion Cables (115 VAC and 230 VAC)

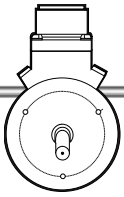
Standard	Flex Option ³	IP-67 Sealing	Brake Option	Brake w/IP-67 Sealing	
CBL-HEMSW/X	CBL-HEMSWF/X	N/A	N/A	N/A	Encoder cable for HE-Series motors, 1-150 ft.
CBL-HEMSW1/X	CBL-HEMSWF1/X	N/A	CBL-HEMSWB1/X	N/A	Motor Cable for all MAC-HE motors, 1-150 ft.
CBL-HMSW/X	CBL-HMSWF/X	CBL-HMSWV/X	N/A	N/A	Encoder cable for HA & HB-Series motors, 1-150 ft.
CBL-HMSW1/X	CBL-HMSWF1/X	CBL-HMSWV1/X	CBL-HMSWB1/X	CBL-HMSWVB1/X	Motor cable for MAC-HA030, HA055, HB025-HB080 motors, 1-150 ft.
CBL-HMSW2/X	CBL-HMSWF2/X	CBL-HMSWV2/X	CBL-HMSWB2/X	CBL-HMSWVB2/X	Motor cable for MAC-HA090, HA110 & HB200 motors, 1-150 ft.
CBL-HMSW3/X	CBL-HMSWF3/X	CBL-HMSWV3/X	CBL-HMSWB3/X	CBL-HMSWVB3/X	Motor cable for MAC-HA140 & HB300 motors, 1-150 ft.
CBL-HMSW4/X	CBL-HMSWF4/X	CBL-HMSWV4/X	CBL-HMSWB4/X	CBL-HMSWVB4/X	Motor cable for MAC-HB100 motors, 1-150 ft.
CBL-HMSW5/X	CBL-HMSWF5/X	CBL-HMSWV5/X	Note: CBL-HMSWB/X is in addition to motor cable.		Motor cable for MAC-HB330 motors, 1-150 ft.
CBL-HMSW6/X	CBL-HMSWF6/X	CBL-HMSWV6/X	CBL-HMSWB/X	CBL-HMSWVB/X	Motor cable for MAC-HB465 & HB700 motors, 1-150 ft.
					Brake cable for MAC-HB330, HB465 & HB700 motors, 1-150 ft.

H-Series Encoder and Motion Cables (460 VAC)

Standard	Flex Option ³	IP-67 Sealing	Brake Option	Brake w/IP-67 Sealing	
CBL-HMSW/X	CBL-HMSWF/X	CBL-HMSWV/X	N/A	N/A	Encoder cable for HA & HB-Series motors, 1-150 ft.
CBL-HMSW1/X	CBL-HMSWF1/X	CBL-HMSWV1/X	Note: CBL-HMSWB/X is in addition to motor cable.		Motor cable for MAC-HA030, HA055, HB025-HB080 motors, 1-150 ft.
CBL-HMSW2/X	CBL-HMSWF2/X	CBL-HMSWV2/X			Motor cable for MAC-HA090, HA110 & HB200 motors, 1-150 ft.
CBL-HMSW3/X	CBL-HMSWF3/X	CBL-HMSWV3/X			Motor cable for MAC-HA140 & HB300 motors, 1-150 ft.
CBL-HMSW4/X	CBL-HMSWF4/X	CBL-HMSWV4/X			Motor cable for MAC-HB100 motors, 1-150 ft.
CBL-HMSW5/X	CBL-HMSWF5/X	CBL-HMSWV5/X			Motor cable for MAC-HB330 motors, 1-150 ft.
CBL-HMSW6/X	CBL-HMSWF6/X	CBL-HMSWV6/X	CBL-HMSWB/X	CBL-HMSWVB/X	Motor cable for MAC-HB465 & HB700 motors, 1-150 ft.
					Brake cable for all 460 VAC H-Series motors, 1-150 ft.

³ Consult factory for flex cables beyond 100 feet.

Note: For all cables above, specify length of the cable by adding the numerical length in the "X" placeholder in the Model Number.



Lineshaft Pacer Encoders

The ability to interface a position encoder to a ServoWire Drive can provide vital position information to the motion control system.

This approach is simple, yet effective, because information for the “encoder axis” is available to be used in the same way that information is used from any “servo axis”.

Uses of Remote Encoders

- 1) **Pacer Encoders** measure real-time shaft position data of a machine axis to be sent to other servo axes in the system when **electronic gearing** and/or **cam profiling** are used in an application.
- 2) **Programmable limit switches** on each ServoWire drive can be configured to turn on or off based on pacer encoder position.
- 3) **Position and velocity information** is accessible from the application program for every encoder used with an SMLC system.
- 4) **Remote Feedback Encoders** can be used to provide position feedback directly from the load under control, usually used in conjunction with velocity feedback from the servomotor shaft to provide an additional level of precision for the control system.

ServoWire Drive Interface

The encoder interface is a partial servo axis interface, consisting only of differentially received quadrature A and B channels and a reference Z-channel. Selecting the “encoder input” axis control mode disables servodrive alarm detection but still provides open wire detection to insure encoder position information integrity.

Optical Position Encoders

ORMEC’s Model EDR-25 optical, incremental position encoders are ideal for a wide variety of rugged industrial applications where reliability is a prime concern.

LED light sources rated for 100K hours MTBF, 40 pound axial/40 pound

radial shaft loading capability, 200 KHz frequency response allow these encoders to be effective in harsh, industrial applications.

The EDR-25 provides a 1/4 cycle wide gated zero reference output. Models with cycle interpolation have maximum resolutions up to 200,000 counts per shaft revolution.

Electrical Specifications

Excitation voltages: 5 VDC @ 100 mA maximum.

Output format: Two outputs (A and B) in phase quadrature with a zero reference (Z) output

Output Specifications: Output stage is an MC3487 (or performance equivalent) differential line driver with 20 ma sink and -20 ma source current.

Mechanical Specifications

Maximum Shaft loading: 80 lb. max, 40 lb. rated, axially and radially

Shaft radial runout: 0.001" T.I.R.

Maximum Starting torque at 25C: 3.0 oz-in typical

Shaft angular acceleration: 10⁵ radians/sec² (maximum)

Moment of inertia: 5.2 x 10⁻⁴ oz-in-sec²

Bearing type: Precision ABEC ball bearing

Minimum Bearing Life: 1.5 x 10⁹ revolutions at rated shaft loading.

Shaft: 303 stainless steel

Maximum shaft speed: 8000 RPM or 200 KHz count channel output frequency, whichever occurs first (before cycle interpolation).

Weight: 11 oz. typical (25S)
14 oz. typical (25C)

Environmental Specifications

Operating temperature range: 0 to +70C

Storage temperature range: -25 to +85C

Maximum Shock: 75G’s for 11 milliseconds duration

Vibration: 58 Hz to 500 Hz at 20G’s

Maximum Humidity: 98% R.H. (non-condensing)

ORDERING GUIDE

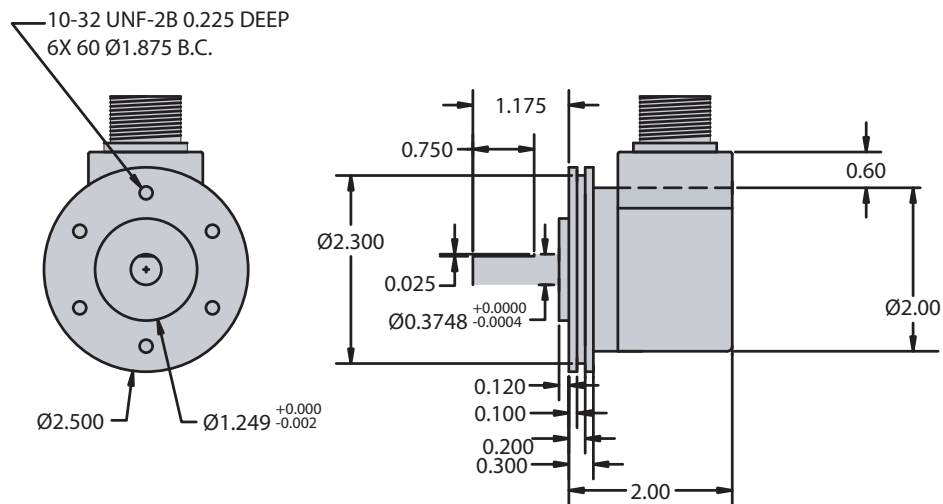
Lineshaft Pacer Encoders

EDR-25S/A1000	Position Encoder: 1000 linecount, servo mount provides 4,000 counts per rev
EDR-25S/A1250	Position Encoder: 1250 linecount, servo mount provides 5,000 counts per rev
EDR-25S/A2500	Position Encoder: 2500 linecount, servo mount provides 10,000 counts per rev
EDR-25S/A5000	Position Encoder: 5000 linecount, servo mount provides 20,000 counts per rev
EDR-25S/B5000	Position Encoder: 10,000 linecount, servo mount provides 40,000 counts per rev
EDR-25S/E2500	Position Encoder: 12,500 linecount, servo mount provides 50,000 counts per rev
EDR-25S/D5000	Position Encoder: 20,000 linecount, servo mount provides 80,000 counts per rev
EDR-25S/E5000	Position Encoder: 25,000 linecount, servo mount provides 100,000 counts per rev
EDR-25S/F5000	Position Encoder: 25,000 linecount, servo mount provides 100,000 counts per rev, high freq.
EDR-25S/G5000	Position Encoder: 50,000 linecount, servo mount provides 200,000 counts per rev, high freq.

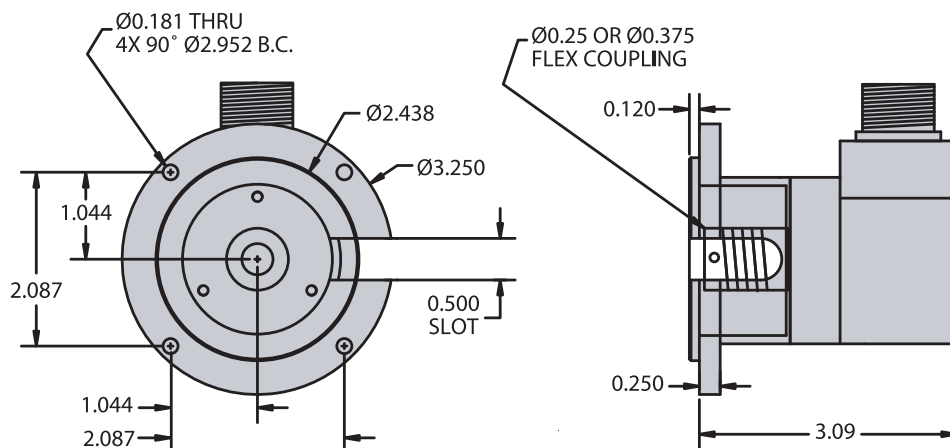
Note: To specify encoder with flange mount and integral coupling, replace “25S” in model numbers above with “25C”.

CBL-QE25SW/X	Encoder Cable, EDR-25 to ServoWire Drive, 5-150 ft
CBL-QE25SWV/X	Encoder Cable, EDR-25 to ServoWire Drive, IP-67, water-resistant, 5-150 ft
CON-E25	Encoder Connector, for EDR-25 Encoders

EDR-25S Outline Drawing



EDR-25C Outline Drawing



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