ORMEC

ServoWire® Digital Drives

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

Eight drive models range from 600 to 15,000 watts, and offer continuous current output from 2.4 to 60 amps RMS/phase. 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 or 230 VAC input power, and provide both output short circuit and overvoltage protection.

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

Performance

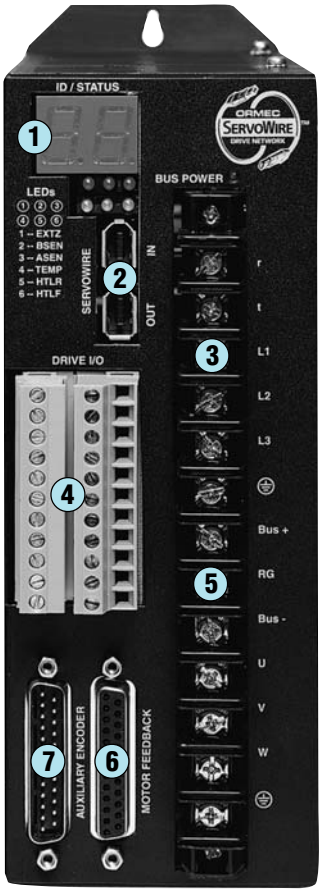
ServoWire® drives combine all-digital operation with DSP technology to produce fast update rates and current loop bandwidths up to 1200Hz. High bandwidth current loops teamed with high resolution motor feedback combine for quick and accurate torque, velocity and position control.

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 MotionDesk™ 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.

ServoWire® Drives -- At A Glance

- ✓ **Eight models:** offering continuous output currents from 2.4 to 60 amps RMS/phase.
- ✓ **All-digital design:** eliminates all manual drive setup including pots and jumpers
- ✓ **Small footprint:** provides high power density and reduces space requirements.
- ✓ **Sinusoidal commutation:** improves low speed torque ripple and system efficiency.
- ✓ **Trapezoidal commutation & DC operation:** provide user flexibility.
- ✓ **Integral shunt regulators:** add protection (All models except SAC-SW203 & SW205).
- ✓ **UL/CE approvals:** UL Listed and CE Mark (low voltage directive & EMC).



1. **Status Indicators:** Large two-digit display for showing network ID and drive status plus six LED indicators which show condition of sensors, travel limits and motor over-temperature.

2. **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 ServoWire® Axis Module.

3. **Drive Power Inputs:** Universal voltage input power accepts 115 or 230 VAC nominal featuring separate logic and bus power supplies with overvoltage protection.

4. **Flexible Drive I/O:** ServoWire® drives provide three high speed sensor inputs, up to six optically isolated programmable limit switch (PLS) outputs--(one of the PLSs can be used as a user-configurable fail-safe brake control output), two overtravel limit switch inputs, plus two high quality analog outputs for monitoring motor velocity and torque. Convenient screw terminal pluggable connectors.

5. **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 (All models except SAC-SW203 & SW205).

6. **Brushless Motor Feedback Interface:** Versatile encoder feedback interface accommodates differential or single-ended hall tracks, quadrature feedback, and optionally support the multi-revolution, absolute encoders available on ORMEC's D-Series motors.

7. **Auxiliary Encoder Input Option:** Provides an additional connector for a pacer encoder when applications require addition positioning information for web control applications. Also to be used for distributed feedback applications.

Configurations for each drive containing the motor parameters, all operational limits for torque and speeds, I/O configurations, load inertia and servo loop tuning parameters are stored in the ORION® controller as part of a system project and automatically downloaded at power up over the ServoWire® network. Simple cabling accommodates up to eight drives per network, and provide for quick and reliable installation.

Standard Motor Interface

ServoWire® drives interface encoder based motors using

quadrature feedback and hall track information. They provide smooth output torque using three phase sinusoidal commutation. An optional multi-revolution absolute encoder interface supports our D-series motors.

Integrated Drive I/O

Integration of digital drive technology with a high speed input and output interface 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, capture position with microsecond resolution, or reset PLS positions.

Versatile limit switch outputs are independently programmable and can be referenced from the motor position, motor command, another axis, or an on-board timer. Three optically isolated PLS outputs per axis can drive external actuators, can be wired to sensor inputs to initiate motion, and used to control when a sensor input is allowed to be seen by the drive during sensor 'blinding operations'.

Auxiliary Encoder Interface Option

An auxiliary encoder interface option is available for applications requiring a pacer encoder or dual encoder feedback. This option includes three additional PLS outputs plus a virtual axis command generator that can be used during maintenance when encoder motion is not available.

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, axis modules and ORION® controllers. System maintainability is enhanced by alarm detection and reporting.

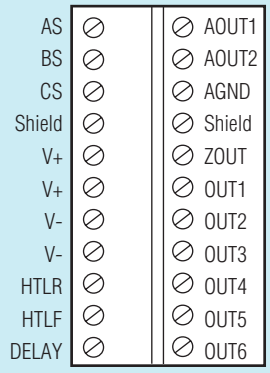
Integrated Drive I/O Interface

High Speed Sensors: Each drive provides interfaces for three high speed sensors. The AS, BS, and CS 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 0.2 and 1.0 milliseconds delay--depending on loop rate).

Overtravel Limits: Each axis provides both hardware overtravel limits (HTLR, HLTF) as well as software overtravel limits for use when motor travel is limited. e.g. ballscrews

Delay Counter: This optional 20-bit counter can be used to delay a sensor or encoder reference signal by the specified number of encoder counts. It can be configured in several operating modes providing a wide range of flexibility. The DELAY counter output is fully integrated into MotionBASIC® and can be used to initiate motion and/or capture position.

Analog Monitors: Two analog outputs (AOUT1, AOUT2) are provided to monitor torque and speed of the servomotor.



Brake Output: A user-configurable output (OUT6) is provided for control of fail-safe brakes. Brake options are available for G-Series and D-Series servomotors.

Zero Reference Output: The motor's zero reference (index mark) output signal (ZOUT) is available on this terminal.

Programmable Limit Switches: Each axis on the ServoWire™ Network provides three optically coupled programmable limit switch (PLS) outputs which respond at the position update rate. Each PLS is independently driven with actual or commanded position of an axis, or through the MotionDATA™ network. OUT4, OUT5 & OUT6 functionality is included with the auxiliary encoder option.

Understanding the ServoWire® Drive Model Numbers

SAC - SW2 05/ E P D A N

- N = Delete pluggable terminal blocks
- A = Absolute Encoder
- D = Delay Counter
- P = Auxiliary Encoder Input
- Encoder Feedback Interface
- Continuous current (amps)

ORDERING GUIDE

ServoWire® Drives: Single Phase 115 or 230 VAC Input

SAC-SW203/E	Servodrive, 2.4/4.2 amps RMS, encoder feedback
SAC-SW205/E	Servodrive, 4.1/7.1 amps RMS, encoder feedback

ServoWire® Drives: Three Phase 230 VAC Input

SAC-SW210/E	Servodrive, 8.2/14 amps RMS, encoder feedback
SAC-SW217/E	Servodrive, 14/24 amps RMS, encoder feedback
SAC-SW220/E	Servodrive, 16/28 amps RMS, encoder feedback
SAC-SW225/E	Servodrive, 25/50 amps RMS, encoder feedback
SAC-SW235/E	Servodrive, 35/70 amps RMS, encoder feedback
SAC-SW260/E	Servodrive, 60/120 amps RMS, encoder feedback

Specify options below by adding letter to servodrive model number

Option 1:	P	Auxiliary pacer encoder (incremental)
Option 2:	D	Delay counter hardware added
Option 3:	A	Absolute encoder support added
Option 4:	N	No pluggable I/O connectors (TB1)

Accessories

MIO-DC605-3	Solid-state relay for fail-safe brake circuit, panel mount, 3-32 VDC logic, 60 VDC switched load, 3 amps

Panel Mount Regen Resistors

SAC-SWRR/0055	Regen Resistor, 55 watts, 50 ohms, for SAC-SW210
SAC-SWRR/0095	Regen Resistor, 95 watts, 40 ohms, for SAC-SW217 & SW220
SAC-SWRR/0700	Regen Resistor, 700 watts, 54 ohms, for SAC-SW210
SAC-SWRR/0845	Regen Resistor, 845 watts, 40 ohms, for SW217 & SW220
SAC-SWRR/0846	Regen Resistor, 846 watts, 10 ohms, for SAC-SW225 & SW235
SAC-SWRR/1700	Regen Resistor, 1,700 watts, 6.5 ohms, for SAC-SW260

UL Listed Line Filters

SAC-LF215U	Line Filter, 115/230 VAC, 1-phase, 15 amps, 4.2"l, 2.9"w, 2.0"d
SAC-LF230U	Line Filter, 115/230 VAC, 1-phase, 30 amps, 5.5"l, 3.0"w, 2.8"d
SAC-LF30C	Line Filter, 230 VAC, 3-phase, 30 amps, 13.9"l, 2.4"w, 5.9"d
SAC-LF55C	Line Filter, 230 VAC, 3-phase, 55 amps, 14.8"l, 3.1"w, 7.3"d
SAC-LF100C	Line Filter, 230 VAC, 3-phase, 100 amps, 17.2"l, 3.5"w, 8.7"d

SPECIFICATIONS

Main Circuit Power

- ❒ 115 or 230 VAC +15%, -20%, 50/60 Hz, single phase or three phase
- ❒ 600 to 15,000 watts of incoming service power (see Servomotor Selection Charts for power requirements on matching drives)

Control Circuit Power

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

Torque Command

- ❒ 16 bit digital command from the ServoWire® Axis Module over the Drive Network.
- ❒ Current loop bandwidth up to 1.2 kHz

ServoWire® Drive Output

- ❒ IGBT pulse width-modulated with sinusoidal or trapezoidal commutation
- ❒ Large heat sinks with temperature monitor (fan cooled on SAC-SW220 - SW260)
- ❒ Internal shunt regulator for regenerative load dissipation on all except SW203 & SW205
- ❒ 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

External Analog Monitors

- ❒ Torque Monitor output ±3.0V @ 100% rated torque
- ❒ Speed Monitor output ±10.0V @ 1.0V /1000 RPM, 2.0V/1000 RPM, or 5.0V/1000 RPM; scale depends on motor's max speed.

ServoWire® Drive I/O

- ❒ Sensors inputs are software configurable for either NPN or PNP output transistor types and level or edge triggered response
- ❒ Inputs provide one microsecond response time to capture machine position and initiate motion within one servo update cycle
- ❒ Optically isolated interface for programmable limit switches, motor reference and delay counter outputs updated every servo cycle with a maximum sink current of 33ma per output
- ❒ External I/O power supply connections will accept 5-24 VDC (285mA maximum) to power input and output circuits

Motor Feedback Interface

- ❒ Three differential input channels for encoder position feedback with 5.3 volt encoder power supplied
- ❒ Quadrature feedback 4x decoding with positioning rates to 4 Mbps
- ❒ Three differential input channels for motor commutation feedback
- ❒ Open-wire detection on all differential encoder connections
- ❒ Support for absolute encoder when option is installed
- ❒ Input connections for thermal contact from motor windings.
- ❒ Industry standard D-sub connector (25 pin female) interface.

Auxiliary Feedback Interface

- ❒ Industry standard D-sub connector (25 pin male) interface.
- ❒ Three differential input channels for encoder position feedback with 5.3 volt encoder power supplied
- ❒ Three additional programmable limit switch outputs

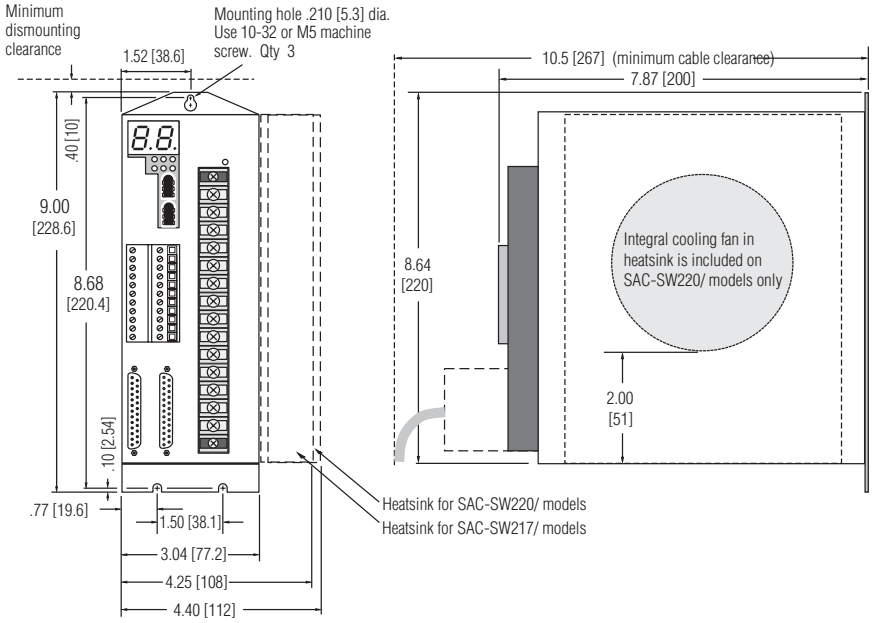
Environmental

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

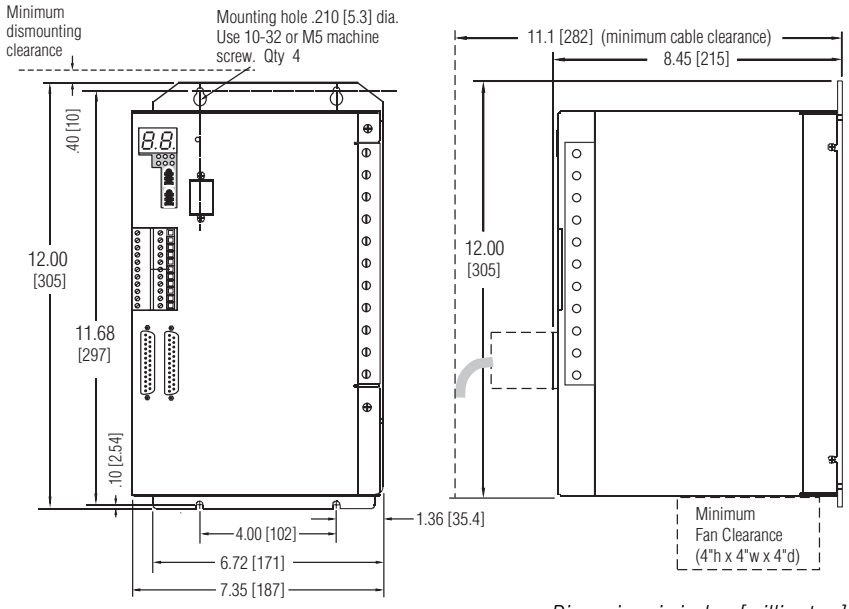
Drive Weights

- ❒ SAC-SW203/E 3.8 lbs (1.7 kg)
- ❒ SAC-SW205/E 3.8 lbs (1.7 kg)
- ❒ SAC-SW210/E 4.2 lbs (1.9 kg)
- ❒ SAC-SW217/E 5.9 lbs (2.7 kg)
- ❒ SAC-SW220/E 6.7 lbs (3.1 kg)
- ❒ SAC-SW225/E 17.8 lbs (8.1 kg)
- ❒ SAC-SW235/E 17.8 lbs (8.1 kg)
- ❒ SAC-SW260/E 17.8 lbs (8.1 kg)

Mounting Information for SAC-SWS203, SWS205, SWS210, SWS217 & SWS220

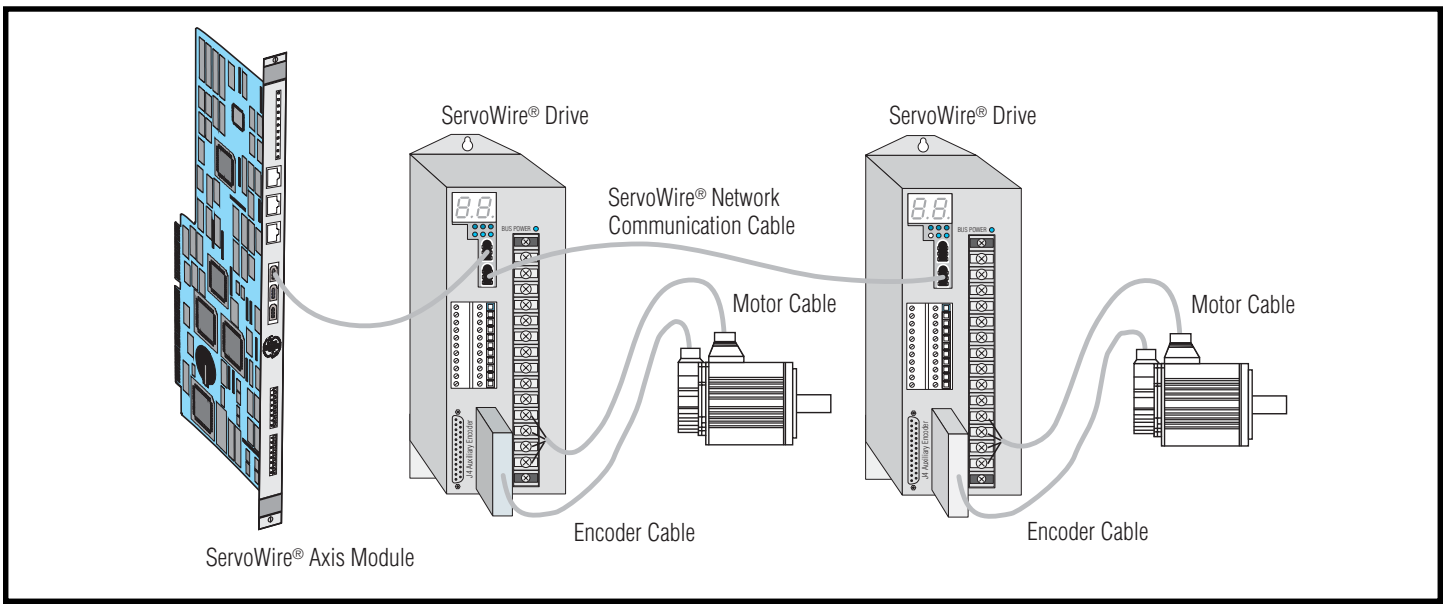


Mounting Information for SAC-SWS225, SWS235 & SWS260



Dimensions in inches [millimeters]

ServoWire® Cable Ordering Guide



ServoWire® cable interconnection diagram for G-series servomotors.

ServoWire® Drive Interface Cables and Connectors

ORMEC offers standard, 100% computer-tested servomotor, servodrive and encoder cables for reliably interfacing to all of our G-series AC brushless servomotors.

ServoWire® Drive Network Cables

CBL-SW/1	ServoWire® Cable, 1 ft. (305 mm)
CBL-SW/2	ServoWire® Cable, 2 ft. (710 mm)
CBL-SW/6	ServoWire® Cable, 6 ft. (1.8 meters)
CBL-SW/14	ServoWire® Cable, 14 ft. (4.3 meters)

Drive I/O Interface Connectors

CON-SW-TB1L	ServoWire® Drive, Drive I/O (TB1) left terminal block plug, pins 1-11
CON-SW-TB1R	ServoWire® Drive, Drive I/O (TB1) right terminal block plug, pins 12-22

G-Series Encoder and Motor Cables

Standard	*IP-67 Sealing*	*Brake Option*	*Brake w/IP-67 Sealing*	
CBL-GMSW/X	CBL-GMSWV/X	(p/o motor cable)	(p/o motor cable)	Encoder cables for MAC-G016 & G030 - G115 motors, 1-150 ft
CBL-GMSW/X CBL-GMSW1/X	CBL-GMSWV/X	CBL-GMSWB/X CBL-GMSWB1/X	CBL-GMSWVB/X	Encoder cables for MAC-G130 - G640 motors, 1-150 ft Motor/Encoder cables for MAC-G005 - G015, & G019 motors with ServoWire drives, 1-150 ft
Standard	*IP-67 Sealing*	*Brake Option*	*Brake w/IP-67 Sealing*	
CBL-GMSW2/X	CBL-GMSWV2/X	CBL-GMSWB2/X	CBL-GMSWVB2/X	Motor cables for MAC-G016 & G030-G115 with ServoWire® drives , 1-150 ft
CBL-GMSW3/X	CBL-GMSWV3/X	(p/o encoder cable)	(p/o encoder cable)	Motor cables for MAC-G130 - G210 with ServoWire® drives, 1-150 ft
CBL-GMSWT5/X	CBL-GMSWVT5/X	(p/o encoder cable)	(p/o encoder cable)	Motor cables for MAC-G210, MAC-G280A4 & G360A4 with ServoWire® drives, 1-150 ft
CBL-GMSWT6/X	CBL-GMSWVT6/X	(p/o encoder cable)	(p/o encoder cable)	Motor cables for MAC-G280A2 & G360A2 with ServoWire® drives, 1-150 ft
CBL-GMSWT9/X	CBL-GMSWVT9/X	(p/o encoder cable)	(p/o encoder cable)	Motor cables for MAC-G640A2 with ServoWire, 1-150 ft

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