

ServoWire S2D Drives



Reduced Space Requirements

High power density in a small footprint decreases panel space requirements.

Motor Control

- ✓ S2D drive motor interfaces provide optimal performance at all motor speeds.
- ✓ Smooth output torque with three-phase sinusoidal commutation
- ✓ Field Oriented Control (FOC)
- ✓ Space Vector Modulation (SVPWM)

Feedback

Quadrature (hall track) and serial encoders along with resolver feedback are supported.

High Speed Drive I/O

Flexible and tight control over the interaction between motion and external sensors and actuators is provided. Analog input and output are available.

IEEE 1394 Interface

- ✓ 1394b standard supported
- ✓ High data throughput and more control
- ✓ 400 Mbit data transfer

Safety & Maintainability

To aid in the design of safe machinery, safety circuit options are available that support EN 13849-1 standards. These options provide a method to place the drive in a safe mode without the need for additional external components to power down the drive. To support this are:

- ✓ Standard safety interlocks
- ✓ Extensive alarm detection
- ✓ Reporting over ServoWire network
- ✓ Safe Torque Off (STO) and additional safety options

Drop-in retrofit for SD drives

Quick and easy field replacement for ORMEC SD servo drives.

The S2D Series of ServoWire drives offers high performance, all digital motion control. The drives are available in two series, 200V and 400V. Fourteen models provide continuous output power from 600 W to 24 kW.

Communication is via standard FireWire network connections and ServoWire protocol. Up to 16 ServoWire S2D drives can be interfaced to a single SMLC controller. The all-digital design eliminates all manual drive setup.

High Performance

- ✓ Fast update rates, high bandwidth control loops and high resolution motor feedback combine for a distributed control architecture that lessens computation burden on controllers.
- ✓ Quick and accurate torque, velocity and position control.

Flexible Drive Configuration

- ✓ Drive configurations are downloaded from the SMLC. This environment makes modifications easy without removing drives from the panel.
- ✓ Automatic calibration stored in flash memory (factory settings).
- ✓ Wide range of motors supported
- ✓ Standard set of motor configurations with custom editor to add others.
- ✓ Drive configuration data includes:
 - Torque and speed
 - I/O configurations
 - Load inertia
 - Servo loop tuning parameters
- ✓ Quick and reliable installation with simplified cabling.
- ✓ One connection point for all networked drives.

Drive Features

- ✓ **Drive Power Inputs**
Separate control and main power is used for maximum flexibility. Control power accepts 24 DC. Main power accepts 100 to 480 VAC.
- ✓ **UL and CE marked**
- ✓ **ServoWire Network Interface**
Two locking connectors provide an all digital control link to the ServoWire Network which is galvanically isolated from the drive. This interface is powered by the SMLC.
- ✓ **Real-time Hardware Counter**
Critical timing functionality with no latency is provided for: mark width discrimination, position delay triggers, timing advance registration, backup compensation and other applications. This is used for extremely fast, deterministic timing and synchronization.
- ✓ **Regen**
Dissipation of regenerative energy from the system is easily accomplished by connecting to an external resistor. Shunt regulator circuitry is included in the drive.
- ✓ **Safety Circuit**
For machines that require low-level, redundant safety circuitry, an internal safety relay is available. This supports cost-effective implementation of the EN13849-1 standard. Two contacts must be closed to allow the motor to be energized.
- ✓ **Energy Efficient use of Bus Power**
Bus power can be shared between select drives within a Series (i.e. 200V or 400V models)

Integrated Drive I/O features

- **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 the real-time axis position for either or both axes within one microsecond of assertion. Axis motion can be initiated on the next position loop update (between 0.375 and 1.0 msec delay—depending on loop rate).
- **Brake Output Safety**
Adjustable On/Off delays for maximum safety. A user-configurable output is provided for control of fail-safe brakes.
- **E-Stop and Over-travel Limit Inputs**
Each drive provides optically isolated inputs which can be configured as hardware over-travel limits or as an E-Stop or general purpose input.
- **Drive Ready**
A user-configurable output is provided to indicate when the drive is operating 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 provided.
- **Diagnostic LEDs**
Each I/O point has a visual state indicator.
- **3.81 mm Pitch Terminal Blocks for easy wiring access**
- **I/O types include:**
 - 3 isolated inputs
 - 4 isolated outputs
 - 1 bidirectional I/O
 - 1 analog input and 1 analog output

Motor features

- **Wide Range of Motors Supported**
 - AC brushless motors
 - Rotary motors
 - Linear motors
 - High poll count motors
 - Motor feedbacks supported include:
 - o Quadrature
 - o Serial
 - o Resolver
 - o Yaskawa Sigma I
 - o Yaskawa Sigma II
 - o Endat 2.1
 - o Tamagawa TS56
 - o (others will be added)
- **Sinusoidal Commutation**
Low torque ripple (even at low speeds) yields smooth operation and improves system efficiency.
- **Flexible Commutation Algorithms**
Easily interfaces to legacy motors that use trapezoidal commutation or DC operation.
- **Field Oriented Control and Space Vector Modulation**
Optimal performance at all motor speeds.
- **Integral shunt regulators**
Support for regenerative load dissipation.

Specifications

Main Circuit Power

- 200V Series:** 100 - 240 VAC +15%, -20%, 50/60 Hz, single phase or three phase
- 400V Series:** 230-480 VAC +15%, -20%, 50/60 Hz, three phase

Control Circuit Power

- 24 VDC +/- 10% (all models except 435, 450), 0.5 amp typical or
- 115 - 230 VAC, +15%, -20%, 50/60 Hz, 56 W RMS, single phase (all models except 403, 405 or 410) 1 amp max

Position Command/Control Loop Update Rates

- Digital position command from the SMLC at the ServoWire loop rate
- Position loop rate: 5 kHz
- Velocity loop update rate: 5 kHz
- Torque loop update rate: 10 kHz

ServoWire Drive Output

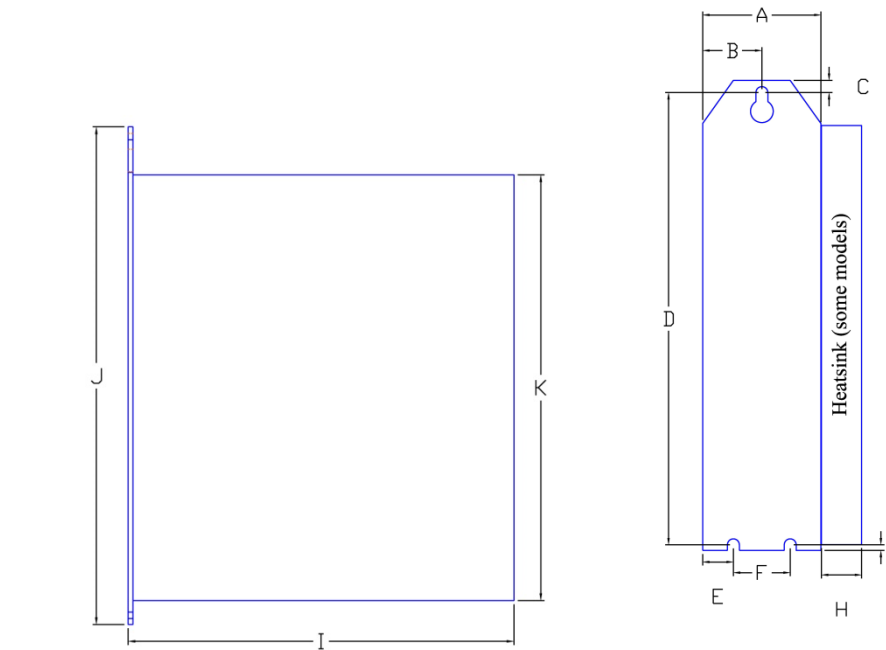
- 600 W to 24 kW of output power
- Up to 60 amps RMS/phase
- IGBT pulse-width modulated with sinusoidal or trapezoidal commutation
- Optional internal shunt regulator for regenerative load dissipation
- Peak currents up to 300% of RMS continuous capability

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 Encoder Feedback Interface

- Three differential or single-ended input channels for encoder position



Dimension	S2D Model									
	203-205	210	210H	215	225-260	403	405	410	417-425	435-450
A	2.15	2.73			6.8	2.73	2.73	2.73	6.8	7.8
B	1.11	1.38			1.44	1.38			1.44	1.96
C	0.22									
D	8.68				11.7	8.68			11.7	13.7
E	0.35	0.6			1.44	0.6			1.44	1.92
F	1.5		4.0							
G	0.1									
H	n/a	1.2	1.45	n/a			1.22	1.45	n/a	
I	7.4				8.22	7.4			8.22	9.23
J	9				12	9			12	14
K	7.8				10.9	7.8			10.9	12.9

- feedback with 5.3 volt encoder power are supplied.
- Quadrature feedback 4x decoding with data rates to 12 MHz (after decode).
- Optional auxiliary feedback for pacer or distributed feedback
- Open-wire detection on quadrature channels A and B and all serial encoders.
- Support for serial encoders including Yaskawa Sigma I and II, Tamagawa and EnDat.
- Three differential input channels for motor commutation feedback.
- Input connections for thermal contact from motor windings.
- Industry standard D-sub connector.

Motor Resolver Feedback Interface

- Configurable resolution of 12, 14, or 16 bit 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.

Environmental

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

SAC-S2DM000-000000

Bus Voltage & Current

115 & 230 VAC Input

- 203 – 3 Amp
- 205 – 5 Amp
- 210 – 10 Amp
- 215 – 15 Amp
- 225 – 25 Amp
- 235 – 35 Amp
- 260 – 60 Amp

115 & 230 VAC Input

- 403 – 3 Amp
- 405 – 5 Amp
- 410 – 10 Amp
- 417 – 17 Amp
- 425 – 25 Amp
- 435 – 35 Amp
- 450 – 50 Amp

Primary Feedback		Option Selection			
ORMEC Motor	Feedback Type	-N	-S	-R	-D
MAC-N	Serial Inc & Abs	✓			
MAC-M	Quadrature	✓	✓		✓
MAC-H	Serial Inc & Abs	✓	✓		✓
	Quadrature	✓	✓		✓
	Yaskawa Sigma V Inc & Abs	✓			
	Yaskawa Sigma II Inc & Abs	✓	✓		✓
	Yaskawa Sigma I Incremental Only		✓		✓
	EnDat 2.1,2.2 Inc & Abs			✓	
	Resolver			✓	
	Tamagawa TS56xx		✓		
	Indramat (old Protocol)			✓	

Safe Torque Off Support

S – Safe torque off

0 – Not Included

Regen Support

R – Regen* (225-260 & 417-450 Always)

0 – Not Included

Pacer Support

P – Incremental Encoder

0 – Not Included

Analog IO

A – Additional Analog IO

0 – Not Included

Control Voltage

A – 120/230 VAC (Unavailable 403-410)

D – 24VDC (Unavailable 435 – 450)

SD vs. S2D Drive

SD	Replacement*	Continuous/Peak Current Power	
		SD	S2D
SD 203	S2D 203	2.4 / 4.8 A 590 W	3.0 / 9.0 A 747 W
SD 205	S2D 205	4.1 / 8.2 A 980 W	5.0 / 15 A 1245 W
SD 210	S2D 210	8.2 / 16.4 A 40 W	10 / 30 A 2491 W
SD 217	S2D 215	13.8 / 27.6 A 3320 W	15 / 45 A 3736 W
SD 220	S2D 215 or S2D 225	16.3 / 32.6 A 3910 W	
SD 225	S2D 225	25 / 50 A 6000 W	25 / 50 A 6000 W
SD 235	S2D 235	35 / 70 A 8400 W	35 / 70 A 8400 W
SD 260	S2D 260	60 / 120 A 14000 W	60 / 120 A 14000 W#
	S2D 403		3.0 / 9.0 A 1400 W
SD 405	S2D 405	5.0 / 10.0 A 2400 W	5.0 / 15 A 2400 W
SD 410	S2D 410	10 / 20 A 4800 W	10 / 30 A 4800 W
SD 417	S2D 417	17 / 34 A 8100 W	17 / 34 A 8100 W
SD 425	S2D 425	25 / 50 A 12000 W	25 / 50 A 12000 W
SD 435	S2D 435	35 / 70 A 17000 W	35 / 70 A 17000 W
SD 450	S2D 450	50 / 100 A 24000 W	50 / 100 A 24000 W

* Recommended, dependent upon your application.

Drive Weight & Rated Power

Model	Weight	KW	HP
S2DM203	3.7 lbs (1.7 kg)	0.7	1.0
S2DM205	3.7 lbs (1.7 kg)	1.2	1.6
S2DM210	4.1 lbs (1.9 kg)	2.5	3.3
S2DM215	5.8 lbs (2.6 kg)	3.7	5.0
S2DM225	18.2 lbs (8.3 kg)	6.2	8.2
S2DM235	18.2 lbs (8.3 kg)	8.6	11.5
S2DM260	18.2 lbs (8.3 kg)	14.3	19.2
S2DM403	3.7 lbs (1.7 kg)	1.4	1.9
S2DM405	5.2 lbs (2.4 kg)	2.4	3.2
S2DM410	7.0 lbs (3.2 kg)	4.8	6.4
S2DM417	18.2 lbs (8.3 kg)	8.1	10.9
S2DM425	18.2 lbs (8.3 kg)	11.9	16.0
S2DM435	27.3 lbs (12.4 kg)	16.7	22.4
S2DM450	27.3 lbs (12.4 kg)	23.9	32.0

Additional Resources

Safety Standards:

- EN ISO 13849-2:2008 and IEC 62061

ORMEC:

- ORMEC safety circuitry for implementing ISO 13849-1 at: bit.ly/ormec_safety
- SMLC multi-axis controller information: bit.ly/ormec_SMLC

SD to S2D improvements

Compatible mounting holes for drop in replacement (most models)

- 24V I/O power available
- Machinery safety features

ORMEC-MKT-2100-01