

Motion: SureServo



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SureServo[®] servo2



SureServo2 AC Servo Systems

SureServo2[®] AC servo systems

The SureServo family of brushless servo systems is fully digital and offers a rich set of features to cover a broad range of motion control applications. There are 26 standard servo motors that can be operated in combination with one of sixteen standard servo drives.

The SureServo family includes standard accessories such as: servo motor encoder cables, servo motor power/brake cables, direct mount and DIN-rail mount I/O break-out kits for easy connection of external command and I/O signals, optional battery backup for the encoder, optional external braking resistors, and optional AC input filters. Optional Modbus TCP and EtherNet/IP modules for networking (full command and control capability).

Why use a servo?

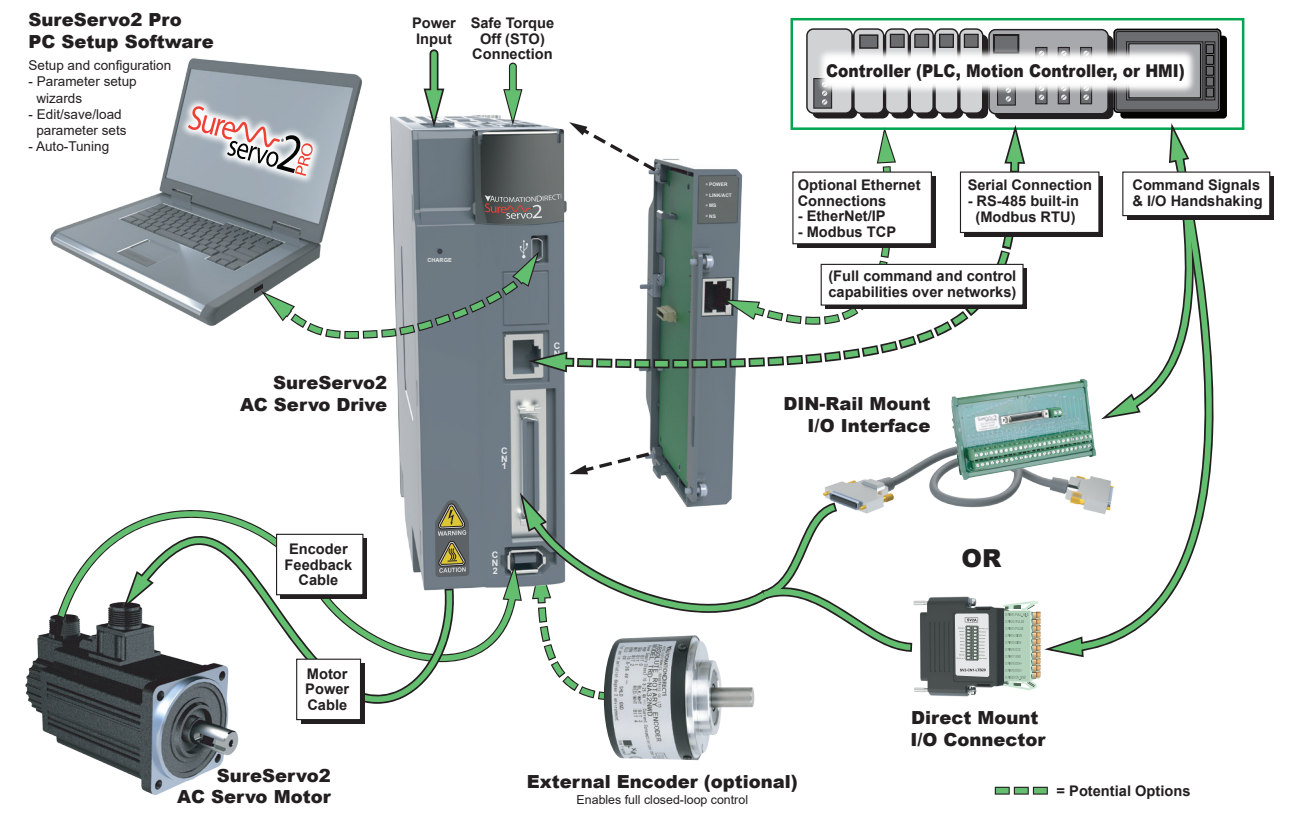
The SureServo2 servo systems provide the highest possible level of performance for precise control of position, velocity, and torque. Compared to lower cost stepping systems, or lower featured servo systems, the SureServo2 products provide:

- More torque at higher speeds (up to 6,000 rpm)
- Broader range of power (up to 15kW)
- Higher response with closed-loop control (high hit rate without stalling or lost position)



- 13 different power ratings
- Support for 110VAC and 220VAC single-phase input power on systems 2kW and below
- Support for 220VAC three-phase input power on systems from 100W to 15kW
- Support for 460VAC three-phase input power on systems from 400W to 15kW
- Control via analog speed or torque signal, high-speed pulse train (up to 4MHz), internal indexing, or with serial or Ethernet communications (Modbus TCP and Ethernet/IP)
- Professionally manufactured cables for motor power, encoder feedback, and brake (optional)
- Compatible with most AutomationDirect PLCs; or any other host controller or HMI
- Servo drives feature on-board motion controller with registration, electronic camming, and event-based logic control
- Option modules for networking capability
- Absolute Encoder functionality
- External (secondary) encoder support for Full Closed Loop Control
- Servo drives feature Safe Torque Off (STO)
- Free set-up software includes graphing/trending oscilloscope and the ability to generate a custom Ethernet/IP EDS file (define exactly what is transferred via Implicit Messaging)

AC Servo Systems SureServo2



mMS2-6 SureServo

1-800-633-0405

Click Here
 Use our configuration tool to configure and order.

- Filter motors based on your criteria
- View/compare Torque-Speed Curves
- Pick matching accessories
- Get ALL the required parts on ONE order

Get Started FAST...
 With our FREE "quick start" videos



Click here to watch FREE videos!

SureServo2[®] System Selector

Units: Imperial Metric

Select Torque Required from Motor (N-m): Rated Torque Max Torque

Holding Brake: Without Integral Holding Brake With Integral Holding Brake

Input Power: 230 VAC 3 Phase 220 VAC Single Phase 110 VAC Single Phase

Filtered Results (Expand rows to view Torque-Speed curves. Then select motor and choose accessories on page 2):

Rated Power	Rated Torque (N-m)	Max Torque (N-m)	Rated Speed (RPM)	Max Speed (RPM)	Rotor Inertia (N·m ²)	Frame Size (mm)	Motor Part Number	System Price
1.5kW	7.16	14.9	2000	3000	11.2	130	SV2M-215N	\$1344
2kW	9.55	24.5	2000	3000	34.7	180	SV2M-220N	\$1632
3kW	17.6	48.3	1700	3000	55	180	SV2M-230N	\$1861
4.5kW	28.6	71.6	1500	3000	77.75	180	SV2H-245N	\$2460
5.5kW	35	87.5	1500	3000	99.78	180	SV2H-255N	\$2755
7.5kW	47.7	119	1500	3000	142.7	180	SV2H-275N	\$3237
11kW	70	175	1500	2000	338	220	SV2H-280N	\$4484
15kW	95.4	224	1500	2000	451	220	SV2H-2F0N	\$4909

www.automationdirect.com/servos

SureServo mMS2-7

SureServo2 More Features ... and 26% Lower Cost

(than SureServo1)

For the latest prices, please check AutomationDirect.com.



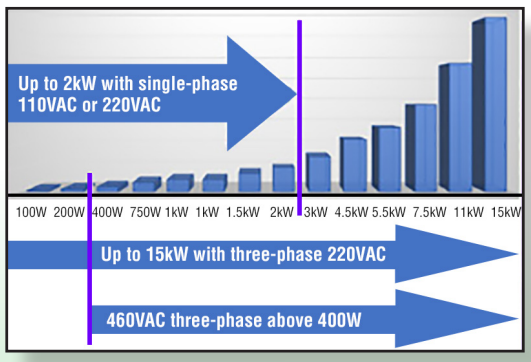
Complete Systems start at \$811
For set of components that include motor, drive, I/O module, and cable set.

- Wide range of system sizes (From 100W up to 15kW!)
- All motors available with and without holding brake
 - Low, medium & high inertia motors
 - Smaller drive footprint saves cabinet space
 - 20-40% lower cost than SureServo1

Single-Phase 110/220VAC up to 2kW

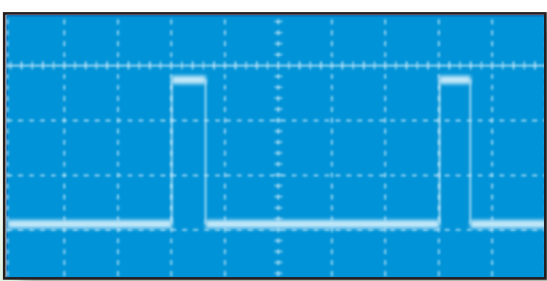
Flexible voltage options

- 110VAC or 220VAC single-phase from 100W to 2kW
- 220VAC three-phase from 100W to 15kW
- 460VAC three-phase from 400W to 15kW



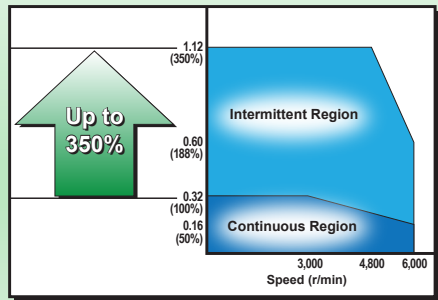
Professionally Manufactured Cable Sets:

- For Motor, Encoder, & Brake (optional)
- Maintains IP rating of motor
- Standard or continuous flexing versions
- 3m, 5m, 10m, or 20m lengths



5µs High-Speed Capture (inputs)

- Enables highly accurate registration operations
- Near instant move triggering
- Fast reaction to real world events



Higher Peak Torque

- Larger intermittent duty zone
- Speeds up to 6,000 rpm
- Allows faster accels/decels
- Handles intermittent load increases (get product moving quickly)



24-bit Absolute Encoder

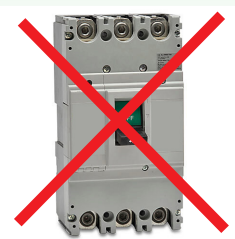
16,777,216 Pulses Per Rev (PPR)...
...That's 46,603 pulses for ONE degree!

- SureServo2 supports any input resolution you desire (you don't have to supply 16M pulses for control)
- Internally, all motion is scaled to this high resolution, so your application always benefits from this extreme accuracy
- Use battery backup to turn the encoder into an absolute encoder.
- No loss of position, even when power is disconnected to the drive
- Homing is not required on every power up sequence



Safe Torque Off (STO)

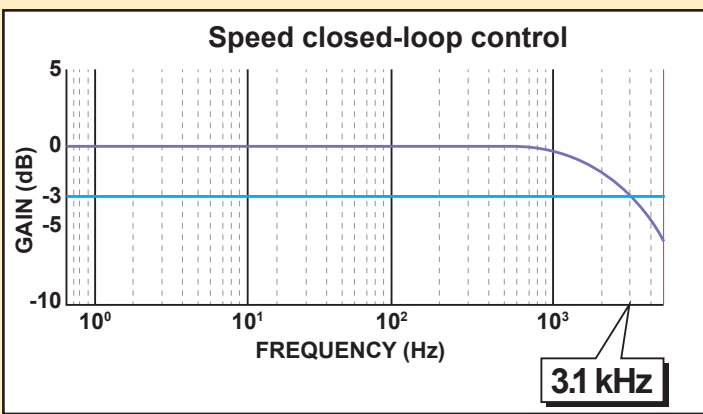
SureServo2 systems support Safe Torque Off (STO). STO allows stopping all torque to the motor and eliminates the need for a large external contactor to disconnect the power circuit.



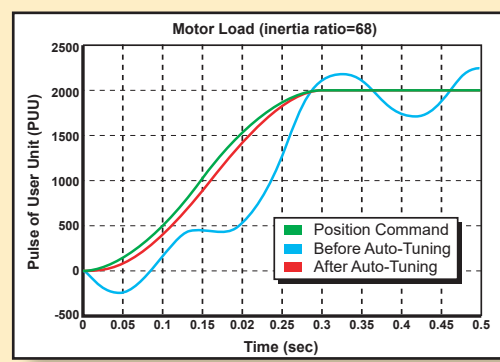
- STO immediately removes power (and thus torque) to the motor
- Keeps the other electronics "alive" for troubleshooting
- Compatible with most dual-channel safety relays
- Certified by TUV, the international safety standards organization

High 3.1kHz Bandwidth

- Faster response times
- Shorter settling times
- Better / more accurate auto-tuning
- 600% Improvement in inertia mismatch
- Five notch filters (avoid vibration/instability at specific speeds)



**Over 50:1 inertia mismatches are now possible...
...and Auto-Tune handles it all!**



AC Servo Systems SureServo2



Click Here

Use our configuration tool to configure and order.

- Filter motors based on your criteria
- View/compare Torque-Speed Curves
- Pick matching accessories
- Get ALL the required parts on ONE order

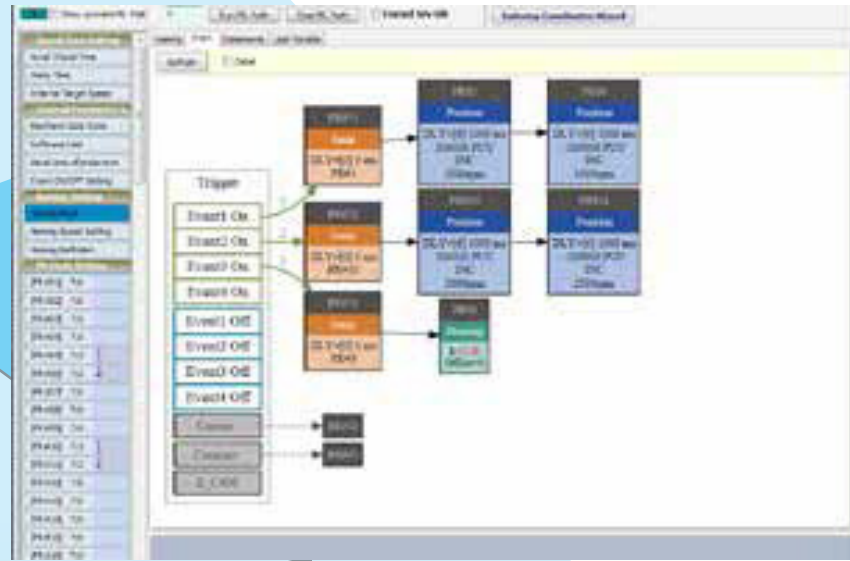
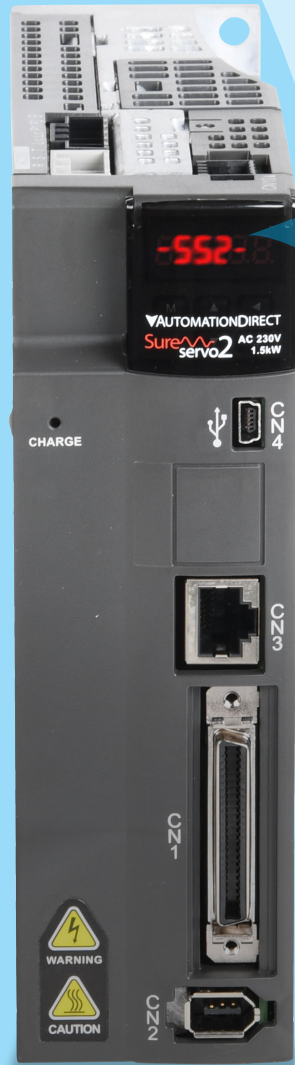
Click Here

Want to learn more?

Our In-Depth pages are loaded with tons of photos, videos, and more information

SureServo2

Built-in control for ALL your motion needs . . .

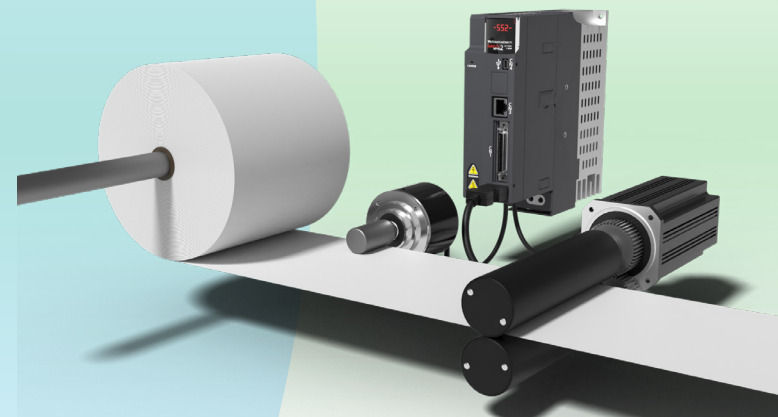


Define up to 99 Move Segments

- Graphical user interface offers simple setup and programming
- Allows arithmetic operations and branching logic
- Homing, position and speed commands are available
- Supports blended moves, and on-the-fly changes

Auxiliary Encoder Feedback Option

- Full closed-loop control
- Compensate for slippage and other advanced control schemes



Braking Options

- **Dynamic braking** can stop the motor when it is disabled, overloaded or when a fault occurs.
- **Regen braking** is used during normal operation and can take advantage of a regen resistor (either built-in or external) to maximize deceleration.
- **The Magnetic brake** (holding brake) is used to hold position while the servo system is stopped, disabled, or when power is disconnected.

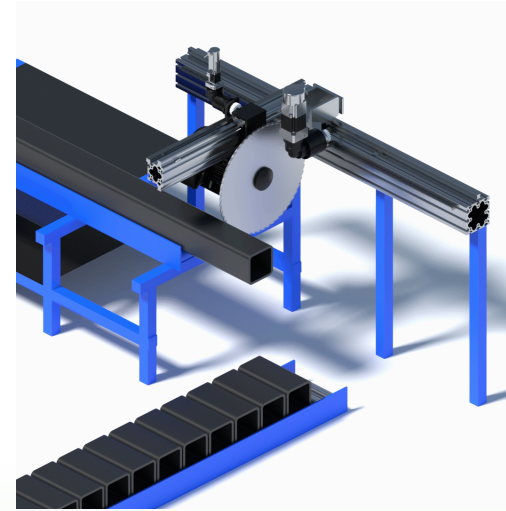
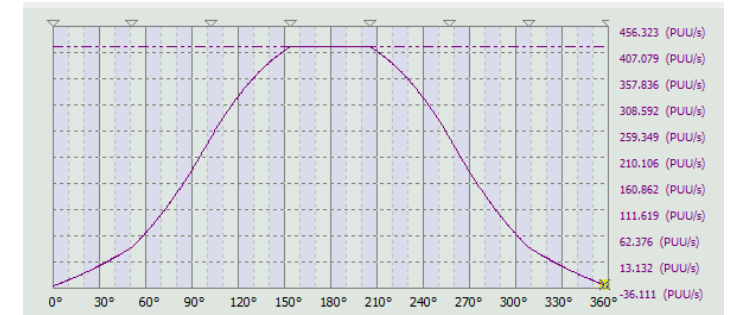
Analog Positioning

- Use a potentiometer to control a rotary table (for example)
- Use a potentiometer to fine tune setup or position parts

Click here to watch FREE videos on these features! (and more)

Electronic Camming

Import a table of custom positions from a spreadsheet or other source to set up epicyclic motion.



Flying Shear

Traverse axis tracks motion of material feed to make cuts "on the fly"

Electronic Gearing

- Create up to 4 gear ratios
- Switch ratios "on the fly"
- Use your own pulse per rev (ppr) units

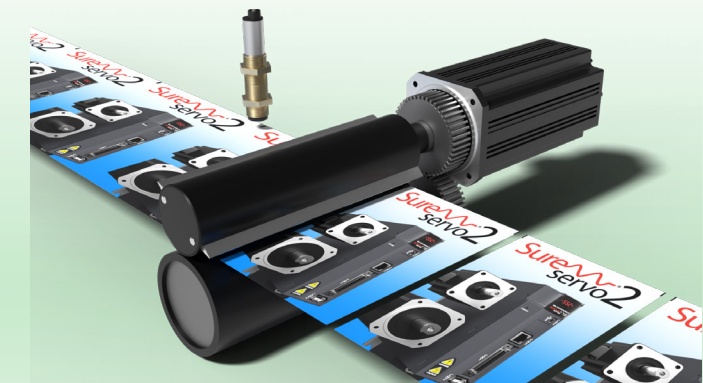
Capture and Compare (Registration)

Set up precise registration corrections with a sensor input, and automatically correct for inconsistencies and variations

Create Rotary Shear Table			
Unit	mm		
Gear Ratio:	A = 1	:	B = 1
Knife No.:	2		
Knife diameter (d1):	599.995 mm	circum.:	1884.940 mm
Encoder diameter (d2):	250 mm	circum.:	785.398 mm
Encoder pulse No.	10000	pulse/rev	<input type="checkbox"/> Manual input P5.084
Motor PUU No. per rev.	100000	PUU/rev	Setting...
Cutting length (L)	2000 mm	(65.973~2356.175)	
Speed Compensation	0	% (-20%~20%)	

Rotary Shear

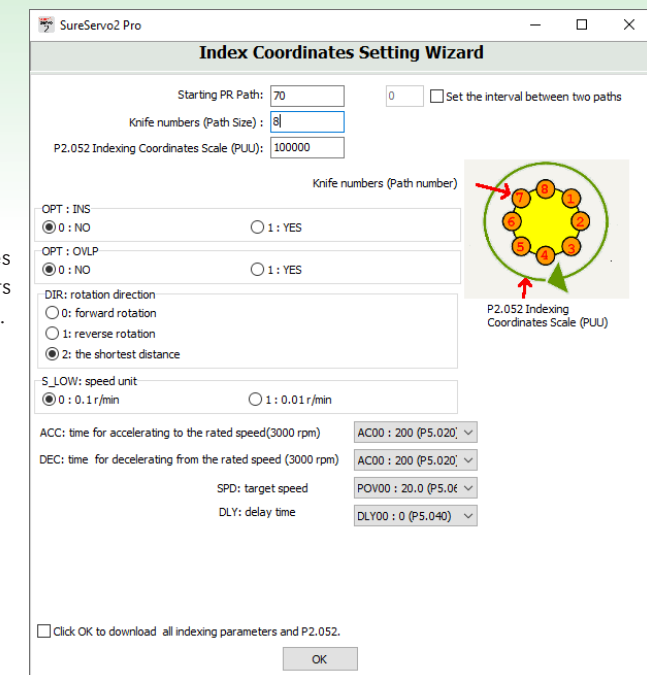
Enter a few dimensions of your knife and set up epicyclic motion in seconds!



Rotary Indexing Wizard:

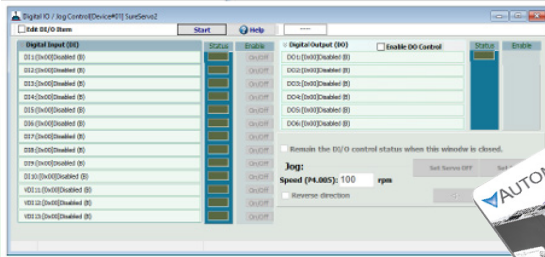
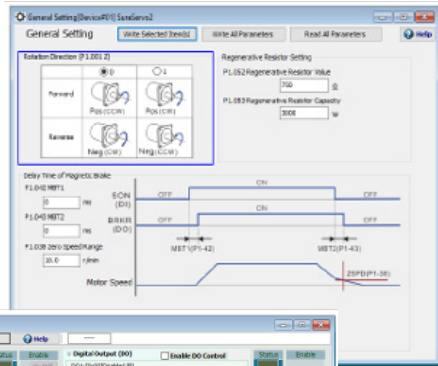
For applications with fixed distances/angles between "stations", this configuration wizard lets you program all the indexes on one simple screen.

- Send simple "Go to Station X" commands and the drive coordinates all movement
- Specify a fixed rotation direction or shortest distance
- For indexing tables, tool changers, volumetric feeders, etc.





*FREE download, or software on USB device just \$21

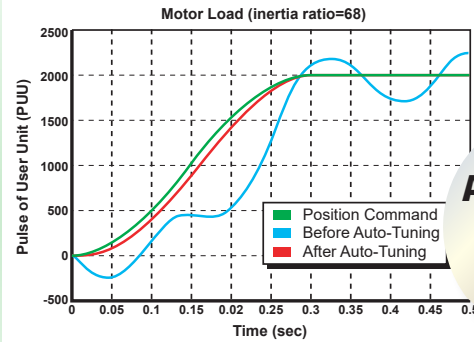


Parameter Setup Wizards

- Organizes all parameters into logical groups
- Define your own parameter groups for fast access
- Upload, edit, save, archive parameters
- Off-line mode allows editing without a drive present



The USB connection provides the drive's CPU with power and allows configuration of drives "on the bench" without connection of AC power to the drive. And a USB power isolator is provided with the configuration cable to defeat this feature if desired.



Auto Tuning for the real world!

Communication Options

- Host controller can initiate predefined moves in the drive
- Download dynamic/new motion profiles for future execution
- Exchange parameters and other data with a PLC, motion controller or HMI

RS-485 Built-in (MODBUS RTU)



- Use the handy 2-into-1 connector to daisy chain multiple drives

MODBUS TCP Option Card



EtherNet/IP Option Card

EDS File Generation

Ethernet/IP support includes Implicit and/or Explicit messaging. And the software can generate a custom EDS file to transfer the exact data required between the PLC/controller and servo drive.

Field Upgradeable Firmware

Ensures the drive and Ethernet cards can always be upgraded to the latest firmware.

Click here to watch FREE videos on these features! (and more)

Multiple Tuning Modes:

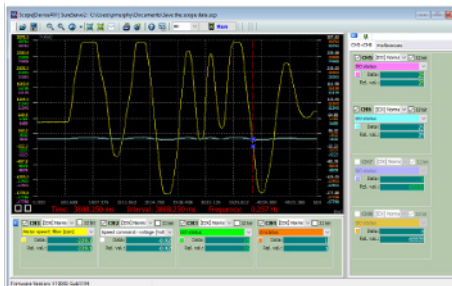
- One Touch Auto Tuning** – the drive tunes the motor without any motion (static motor/system analysis)
- Normal Auto Tuning** – the drive tunes the load while an external controller or the drive's internal indexer provides point-to-point moves
- Assisted Tuning** – three modes where the drive tunes the motor while moving. The user can adjust responsiveness while the drive is analyzing the system.
- Manual Tuning** – more than 20 parameters are available to give power users the ultimate flexibility to tune their systems.

Inertia Estimator

The SureServoPro2 software includes an inertia estimator to help determine the inertia of your load, and to help size the servo motor as precisely as possible.

Built-in Oscilloscope

- Display up to eight channels of data
- Auto range function "zooms in" to find your signals
- Overlay disparate scales to see multiple traces at full resolution
- Scroll back and forth "in time" and save/capture traces
- Compare commanded position to actual position, then tweak parameters and watch as response improves



SureServo2

AC Servo Systems

Drive features

- Power:
 - 1 phase 110VAC: 100W-2kW
 - 1 phase 220VAC: 100W-2kW
 - 3 phase 220VAC: 100W-15kW
 - 3 phase 460VAC: 400W-15kW
- Fully digital with up to 3.1 kHz bandwidth velocity loop response
- Easy setup and diagnostics with built-in keypad/display or the SureServo2 Pro PC-based software
- Field upgradeable firmware ensures the drive can always be upgraded to the latest operating system
- Communications include:
 - Serial Modbus (native/built-in)
 - Optional Modbus TCP card
 - Optional Ethernet/IP card (this card can use implicit and explicit messaging. SureServo2 Pro software can generate an EDS file to transfer custom data between PLC and drive)
- Command options include:
 - \pm 10V torque or velocity command
 - Pulse train or master encoder position command (accepts line driver or open collector) with electronic gearing
 - Powerful built-in motion controller for position control using 99 preset positions (enter these during development, or send them through the communications options above during runtime)
 - Internal sequencing for position/speed



commands, registration (capture/compare), electronic camming, homing (10 different options), Jumps, and arithmetic statements.

- The 3.1 kHz bandwidth allows for high-level automatic tuning. Several modes of tuning are available including Auto Tune that can estimate the load inertia and fine-tune the system when all the loads are attached.
- Optically isolated digital inputs (10) and outputs (6), analog outputs for monitor signals (2), and line driver output for encoder (with scalable resolution).
- Other Features:
 - Secondary/Auxiliary encoder feedback (for true closed loop control)
 - Registration ability
 - Analog positioning
 - Safe Torque Off (STO) included - so no need for large, bulky contactors to disconnect power from the drive in E-stop situations
 - Absolute Encoder operation (with optional encoder battery backup)
 - Electronic camming (you can define the cam with SureServo2 Pro software or you can import an Excel spreadsheet)
 - Advanced Scope feature that can monitor a variety of command and status signals, including output speed, torque, power, etc.

Motor features

- Low inertia models:
 - 100W, 200W, 400W, 750W, 1kW, 1.5 kW, and 2kW
 - Speeds up to 6,000 rpm
- Medium inertia models:
 - 1kW, 1.5 kW, 2kW, and 3kW
 - Speeds up to 3,000 rpm
- High inertia models:
 - 3kW, 4.5 kW, 5.5 kW, 7.5 kW, 11kW, and 15kW
 - Speeds up to 3,000 rpm
- Permanent magnet 3-phase synchronous motor
- Keyed drive shafts support clamp-on style couplings or key-style couplings
- Integrated encoder with 16,777,216 encoder pulses/revolution plus marker pulse (once per revolution)
- Optional 24 VDC spring-set holding brakes (xxxxB series motors)
- Standard hook-up cables for motor power, encoder, and brake (separate brake cable for brake motors 230V systems 5.5kW and larger or 460V systems 11kW and larger)
- Motor cables available in standard or flex-rated lengths of 3, 5, 10, and 20m
- Standard 50-pin DIN-rail mounted break-out kit for the drive's CN1 connector (with screw terminal connections), or 20-pin spring clamp terminal block (limited I/O) that mounts directly to the drive

SureServo2 tuning technology

The SureServo2 drive closes the loop on current, velocity, and position (depending on control mode selection). The 3.1 kHz bandwidth in the drive assures precise speed and current control and easy tuning. Proportional gain, integral gain and compensation, feed forward compensation, command low pass filter, and five (5) notch filters for resonance suppression are available. Auto Tuning has been greatly improved and can easily tune systems with as much as 60:1 inertia mismatch.

There is an inertia estimation function that analyzes the motor and load to measure how much inertia is coupled to the motor.

The drive has several tuning methods available:

- One Touch Auto Tuning—the drive tunes the motor without any motion (static motor/system analysis)
- Normal Auto Tuning—the drive tunes the load while an external controller or the drive's internal indexer provides point-to-point moves
- Assisted Tuning—3 modes where the drive tunes the motor while moving. The user can adjust responsiveness while the drive is analyzing the system
- Manual Tuning—20+ parameters are available to give power users the ultimate flexibility to tune their systems.

SureServo2 Built-in motion controller

While the SureServo2 drives can accept traditional commands from host controls, they can also provide their own internal motion control. For example, up to 99 index moves can be pre-defined and stored in the drive and then selected and executed using digital inputs (inputs as events or inputs used as a multiplexer) or communication (serial Modbus, Modbus TCP, or Ethernet/IP). The index profiles can also be changed while in-process with digital events or via comms. The internal motion can consist of incremental or absolute moves, and can be sequenced internally with delays in between the moves or moves can be linked together so they are processed one after the other.

Multi-axis systems can be controlled via digital inputs, or serial/Ethernet communication. The motion can be commanded from a powerful external controller that sends out high speed pulses to each drive, or the motion can be initiated by a low-level controller (the simple CLICK PLC) since each drive has a powerful motion controller inside. Applications include press feeds, auger fillers, rotary tables, robots for pick and place, test or assembly operations, drilling, cutting, tapping, and similar applications using simple index moves for single or multi-axis motion.

SureServo2

Optional Holding Brake

Each SureServo2 motor rating can be ordered with an optional 24VDC spring-set holding brake that holds the motor in place when power is removed.

SureGear® Precision Gearboxes for Servo motors

Inertia balancing issue in your design?

The SureGear PGA series easily mates to SureServo2 motors. Everything you need to mount your SureServo2 motor is included!



- Four gear ratios available (5, 10, 15, 25:1)
- Mounting hardware included for attaching to SureServo2 motors
- Industry-standard mounting dimensions
- Thread-in mounting style
- Best-in-class backlash (5 arc-min)
- 5-year warranty

Servo drive overview

Charge

LED is lit when DC bus is energized (may take several seconds for power to dissipate after incoming power is removed)

LED Display

The LED display has 5 full digits and is used to indicate servo status and alarms

Safe Torque Off (STO) Connector Port

Keypad

Five Function keys:

- MODE: Press to change mode
- SHIFT: Press to change parameter group or move cursor left
- UP: Press to increase values
- DOWN: Press to decrease values
- SET: Press to enter value

Control Power Terminal

220VAC drives: control power = 120 or 220 VAC single phase.

460VAC drives: control power = 24VDC

Main Power Terminal

- 1 phase 110VAC: 100W-2kW
- 1 phase 220VAC: 100W-2kW
- 3 phase 220VAC: 100W-15kW
- 3 phase 460VAC: 400W-15kW

Regenerative Resistor Terminal

1. When the internal regenerative resistor is used, the P3 and D terminal are connected together while the P3 and C connection is left open.
2. When an external regenerative resistor is used, it is connected across the P3 and C terminals while the P3 and D connection is left open. See the user manual for recommended resistance and power requirements for each system.

Motor Output Terminal

The servo motor power cable is connected to U, V and W. Use our factory made and tested cables available in 3, 5, 10, or 20 meter lengths for easy and trouble free connection.

Ground Terminals



High Density DB15 Connector

CN5: Auxiliary/Secondary Encoder input. Used for applications requiring Full Closed Loop, Linear Measurement, etc.

USB Connector

Used to connect a PC for configuration with SureServo2 Pro software

Serial Communication Interface

RJ45 connectors for RS485 Modbus communication between drives and controllers. Modbus RTU/ASCII protocol. Use our factory-made cables for easy connection to the PC or the host controller.

I/O Interface

50-pin connector for interfacing the host controller and other types of I/O signals.

- CBL50 + RTB50 = Cable and remote DIN-rail mount module. All I/O pins available.
- LTB20 = Mounted and wired directly at CN1. Most commonly used pins available.
- Command inputs:
 - Pulse and Direction
 - Encoder Follower
 - Analog Velocity/Torque
- (10) Digital Inputs
- (6) Digital Outputs
- (2) Analog Monitors
- Encoder Output (scalable)

A+, A-, B+, B-, Z+, Z-

Encoder Interface

Connector for interfacing the servo motor encoder. Use our factory-made and tested cables available in 3, 5, 10, or 20 meter lengths for easy and trouble free connection.

SureServo2 systems run "out-of-the-box"... but may be reconfigured for many applications!

The SureServo2 drives are fully digital and include over 400 programmable parameters. For convenience, the parameters are grouped into five categories:

1. Monitor parameters
2. Basic parameters
3. Extended parameters
4. Communication parameters
5. Diagnostic and analog parameters
6. Motion control parameters
7. PATH definition parameters

All parameters have commonly used default values which allow you to operate the SureServo2 system "out-of-the-box". However, the programmability and large variety of parameters make the SureServo2 systems suitable for a very broad range of applications, including almost all types of general purpose industrial machinery such as assembly, test, packaging, machine tool, and robotics.

The SureServo2 Pro configuration software has Parameter Wizards to quickly and easily guide you through the most common setup routines.

AC Servo Motor Specifications

Servo motor overview

24-bit Encoder Connector
1-foot cable with 9-position connector
(Motor-mounted connector is IP67, end-of-cable connector is not liquid tight)

IP67 Housing

Low Inertia Motors

- 100W 40 mm flange
- 200W 60 mm flange
- 400W 60 mm flange
- 750W 80 mm flange

750W and below

Motor Power and Brake Connector
1-foot cable with 6-position connector
(Motor-mounted connector is IP67, end-of-cable connector is not liquid tight)

Keyed Shafts

- 100W 8 mm diameter
- 200W 14 mm diameter
- 400W 14 mm diameter
- 750W 19 mm diameter

With Shaft Seal (liquid tight)

All SureServo2 motors have keyed shafts for use with servo-grade clamp or compression couplings (recommended) or servo-grade keyed couplings.

Motor Power and Brake Connector
(Liquid tight when using AutomationDirect cables)

24-bit Encoder Connector
(Liquid tight when using AutomationDirect cables)

IP67 Housing (IP65 connectors)

1 kW and above

Low, Medium, and High Inertia Motors

- Low Inertia Model:
 - 1kW 100mm flange
 - 1.5 kW 130mm flange
 - 2kW 130mm flange
- Medium Inertia Models:
 - 1kW 130mm flange
 - 1.5kW 130mm flange
 - 2kW 180mm flange
 - 3kW 180mm flange
- High Inertia Models:
 - 3.0kW 180mm flange
 - 4.5kW 180mm flange
 - 5.5kW 180mm flange
 - 7.5kW 180mm flange
 - 11kW 220mm flange
 - 15kW 220mm flange

Keyed Shafts

- Low Inertia Model:
 - 1kW 22mm diameter
 - 1.5 kW 22mm diameter
 - 2kW 22mm diameter
- Medium Inertia Models:
 - 1kW 22mm diameter
 - 1.5kW 22mm diameter
 - 2kW 35mm diameter
 - 3kW 35mm diameter
- High Inertia Models:
 - 3.0kW 35mm diameter
 - 4.5kW 35mm diameter
 - 5.5kW 42mm diameter
 - 7.5kW 42mm diameter
 - 11kW 42mm diameter
 - 15kW 55mm diameter

With Shaft Seal (liquid tight)



AC Servo System Software



SureServo2 Pro configuration software

SureServo2 Pro is an optional free downloadable configuration software package for the SureServo2 drives. With SureServo2 Pro installed, a PC may be directly connected to the servo drive via a USB programming cable (part# SV2-PGM-USB15 or SV2-PGM-USB30).

Features

- Easy-to-use Parameter Wizards to guide you through the most common setup functions.
- Digital IO/Jog Control allows the user to operate the servo system from the PC. This is a great aid during start-up to allow the servo to perform some basic motion and to check the I/O.
- Parameter Editor - The complete setup for all the drive parameters
- Tune and check the servo response live using the scope feature.
- Upload and download the drive setup. Save the drive setup as a file for backup or future use.
- Edit the drive setup
- View all drive faults
- View drive variable trends in real time
- Create a custom EtherNet/IP EDS file for data transfer to a PLC using pull-down menus
- Motion Programming ability - the PR Window lets you configure the 99 "Paths" that store the motion and sequencing commands in the drive

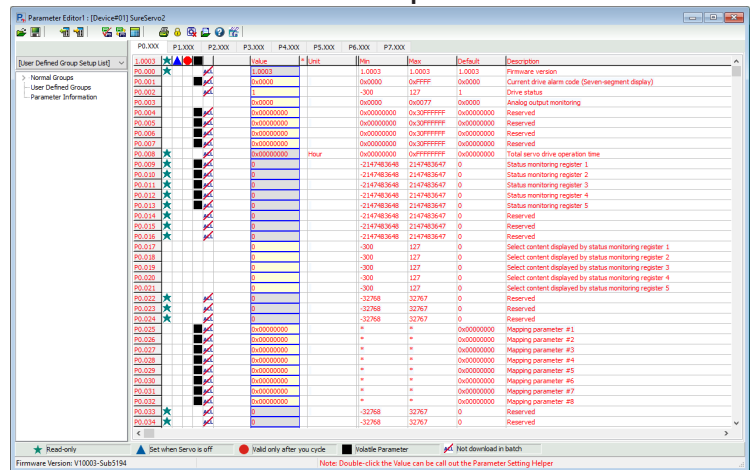
Parameter editor

The SureServo2 Pro configuration tool logically organizes all servo drive parameters for viewing and editing using the Parameter Editor screen. Each parameter has a factory default that usually allows the servo to run "out-of-the-box".

The parameters can be easily changed with available setting ranges displayed. Tuning modes and parameters can also be changed using SureServo2 Pro. After the parameters have been defined, the complete setup can be stored and archived. Drive configurations can be uploaded, edited, saved, and downloaded as often as necessary.

SS2 Pro software even has an "Offline Mode" so you can configure your drive and program your motion without having to be connected to the drive.

Parameter Editor Example Screen



USB Programming Cables

Part Number	Price	Description	Length	Drawing	Compatible Drives
SV2-PGM-USB15	\$:47[o:	Programming cable, USB A to miniB-USB	1.5 m	PDF	All SureServo2 drives
SV2-PGM-USB30	\$:47[p:		3m	PDF	



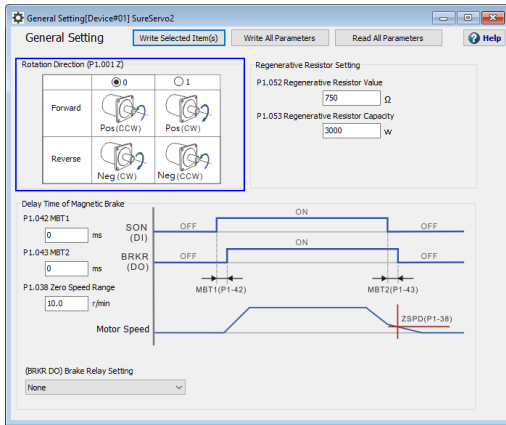
SV2-PGM-USB15



AC Servo System Software

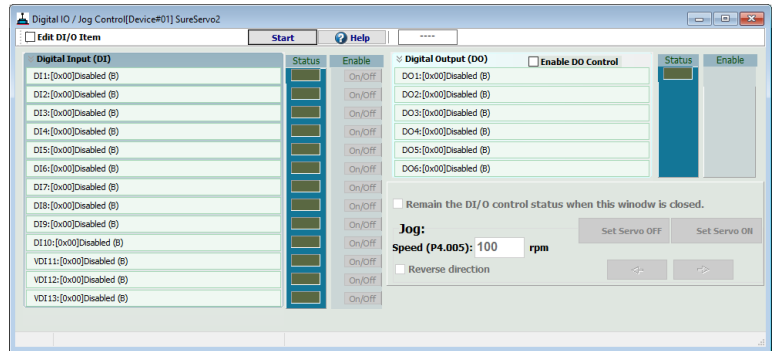
SureServo2 Pro configuration software - (continued)

General Setting Example Screen

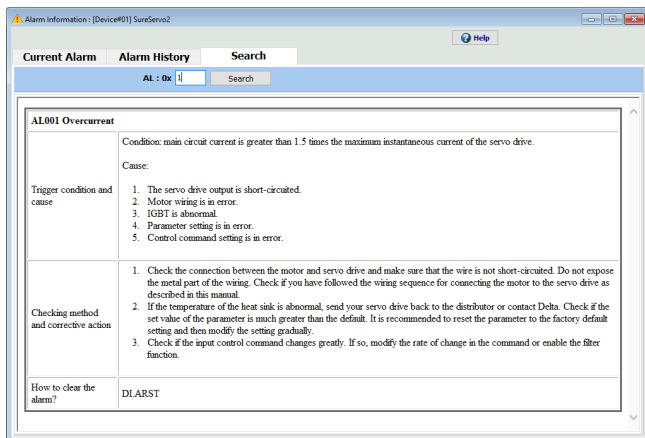


Digital IO/Jog Control screen

The Digital IO/Jog Control screen allows the user to operate the servo system from the PC. This is a great aid during start-up to allow the servo to perform some basic motion and to check the I/O.

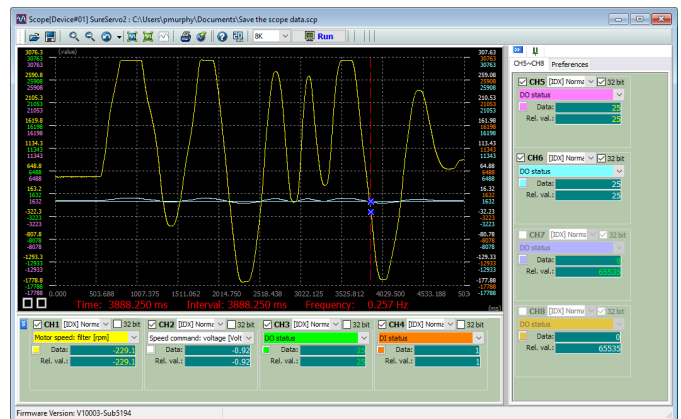


Alarm Information Example Screen



Scope

SureServo2 Pro includes a powerful scope function that allows the user to have as many as eight channels of data displayed simultaneously. Each channel has a drop-down table to select the data to be displayed. The scope has the ability to save traces to a file and load those traces for offline review/analysis. This function is a valuable tool for tuning SureServo2 drives.



PR Mode Setting Example Screen

