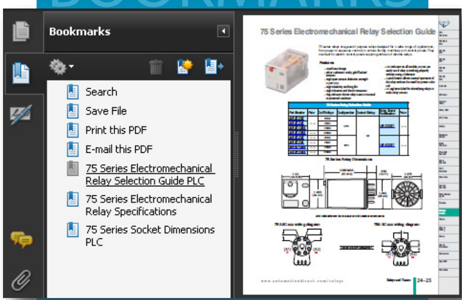
AUTOMATIONDIRECT.com

Motion Control

SureServo® SureStep® SureGear® SureMotion

BOOKMARKS



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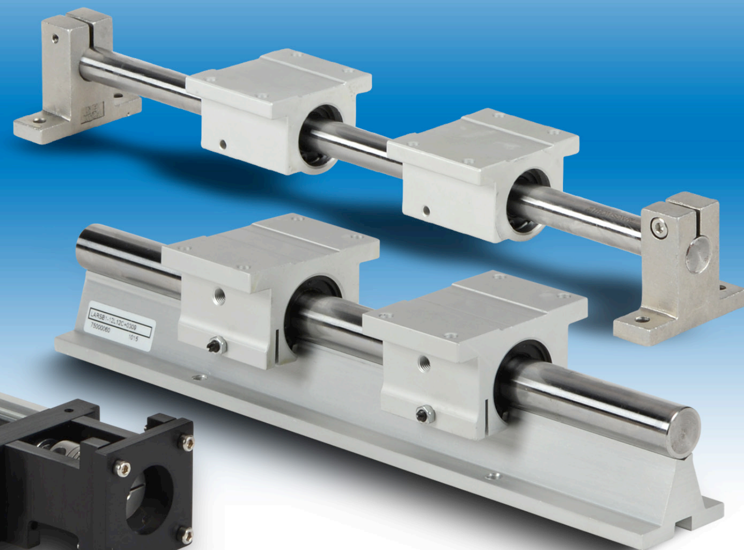
Linear Motion Slides and Components

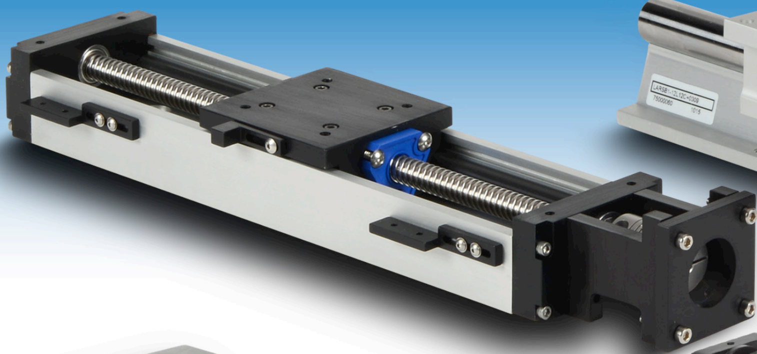
The three SureMotion families of linear slide actuators easily mate to SureStep motors and other NEMA motors. Everything you need to mount your SureStep motor is included!

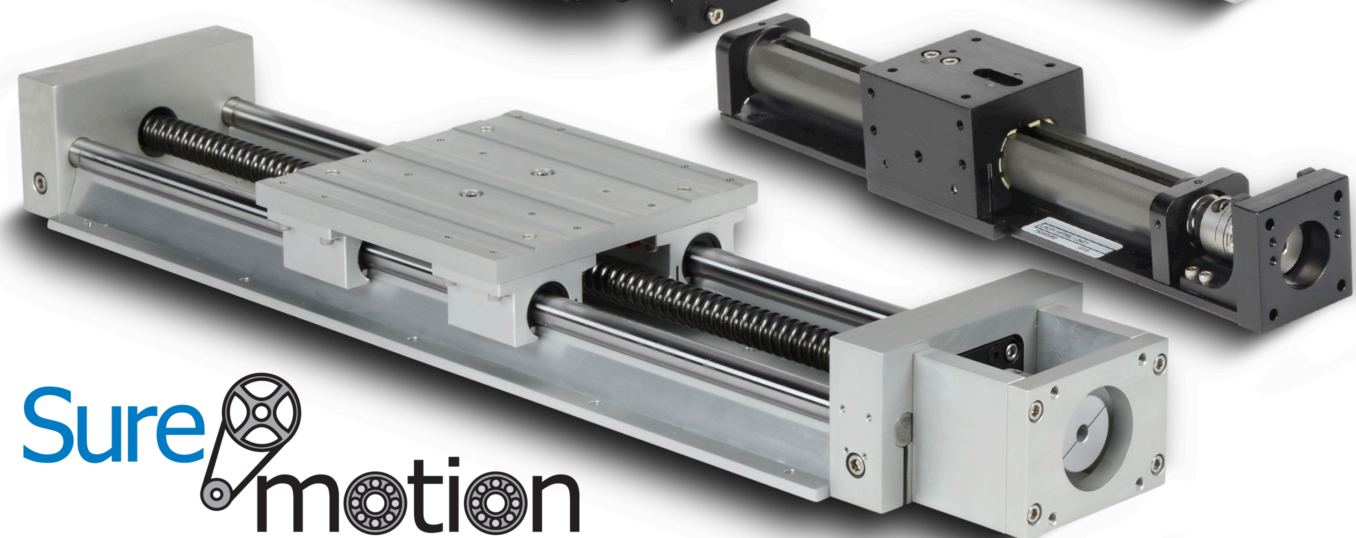
These units are an excellent solution for many applications such as pick and place, packaging, assembly automation and other motion control operations.

18 models, with travels from 6 to 36 inches

Ready to mount NEMA 17, 23 or 34 motors







SureMotion

Sliding components in a range of sizes to help you build larger sliding assemblies

NEMA Planetary Gearboxes

The SureGear PGCN series easily mates to SureStep motors, and other NEMA frame motors. Everything you need to mount your SureStep motor is included!

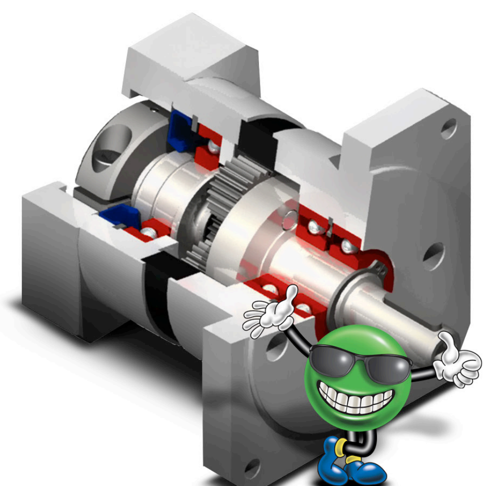
It is the perfect solution for applications such as material handling, pick and place, automation, packaging, and other motion control applications requiring a NEMA input/output interface.

Precision Gearboxes for Stepper Motors

15 models, five gear ratios available in NEMA 17, 23 and 34 frame sizes

SureGear®

Tough on the outside, precision quality on the inside



SureStep® Stepping System Overview

High-performance microstepping drives with high-torque stepping motors

SureStep stepping systems provide simple and accurate control of position and speed where open-loop control and cost are considerations. Pulses (or "step" and "direction" signals) from the DirectLOGIC family of PLCs or other indexers and motion controllers are "translated" by the microstepping drive into precise movement of the stepping motor shaft. The SureStep stepping motors use 2-phase technology with 200 full steps per revolution or 1.8° per full step. Older type stepping motor drives, which operate stepping motors in full step mode, can result in stalling or lost motion due to potential problems with low speed mechanical vibration (usually between 100 to 200 RPM). To minimize this vibration problem, the SureStep microstepping drives use advanced microstepping technology to smooth the motor motion and stepping response.

The STP-DRV-4035 has selectable microstep resolutions of 400 (half-step); 1,000 (each full step ÷5 microsteps); 2,000 (÷10); or 10,000 (÷50).

The STP-DRV-6575 has selectable resolutions of 200 (full-step); 400 (half-step); 2,000; 5,000; 12,800; or 20,000 steps per revolution.

The advanced drives (STP-DRV-4805, STP-DRV-80100) have software-selectable resolutions ranging from 200 (full step) to 51,200 (÷256) steps per revolution.

The advanced drives can operate with traditional high-speed inputs, but can also be commanded via 0–5V analog input. They have an internal indexer that can accomplish point-to-point moves controlled via ASCII communication.

Standards and Agency Approvals

CE

How fast can my system go?

Maximum Potential Speed Chart (rpm) *					
PLC		SureStep Drive Steps/Rev Selection **			
Model	Fastest Output	400 Steps/Rev	1000 Steps/Rev	2000 Steps/Rev	10,000 Steps/Rev
DL05, DL105	7kHz	1,050	420	210	42
DL06	10 kHz	1,500	600	300	60
H0/H2/H4/T1H -CTRIO	25 kHz	3,750	1,500	750	150
H2-CTRIO2	250 kHz	37,500	15,000	7,500	1,500
P3-HSO	1MHz	150,000	60,000	30,000	6,000

** These speeds are theoretical maximums. See torque curves of specific motors for their rpm limits.*

*** Full step (200 steps/rev) will allow higher top speed. Full stepping, however, can create vibration at low speed.*

FREE configuration software!

SureStep Pro configuration software is available that makes setting parameters a snap for the advanced drives (STP-DRV-4850 & STP-DRV-80100)! Download free from our website:

http://support.automationdirect.com/products/surestep.html

Stepping Motor RPM = (A÷B) x (60 seconds/minute)

Where: A = PLC output frequency (pulses per second)
B = microstepping resolution selection (steps/revolution)

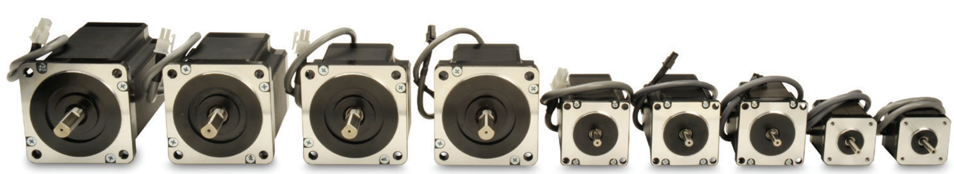
Maximum RPM =		Steps/Sec A		Steps/Rev B		Sec/Min
Example 1:	1,500 =	10,000	÷	400	X	60
DL06 with 10 kHz Built-in Pulse Output						
Example 2:	3,750 =	25,000	÷	400	X	60
Hx-CTRIO with 25 kHz Pulse Output						

Four components to make a complete system

Choose a drive, motor, motor extension cable and power supply

Microstepping Drives

NEMA Step Motors



Step Motor Extension Cables

Step Motor Power Supplies

SureStep® Stepping System Overview

Stepping System : Head to Head

AutomationDirect VS. Competition

Hey - I can do the math! - AutomationDirect

A complete 2-axis *Sure*Step™ Stepping System for less than just the competition's stepping drives.

***Sure*Step™ NEMA 23 System Long Stack**

$421
Complete
2 Axis System

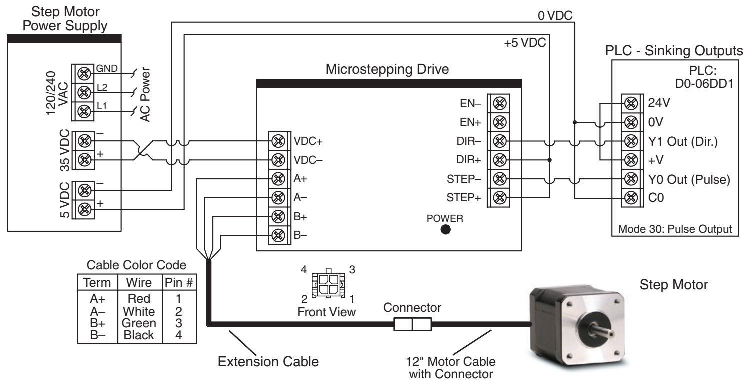
Ours includes:

- Two Microstepping Drives (STP-DRV-6575)
- Two Stepper Motors (STP-MTR-23079)
- One Power Supply (STP-PWR-3204)
- Two Extension Cables (STP-EXT-020)

VS. **Parker**

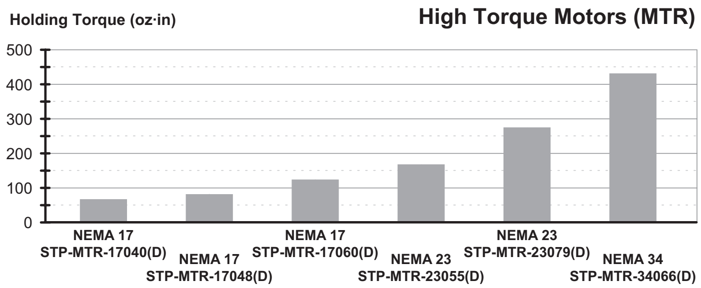
E-DC
$654
for 2 drives

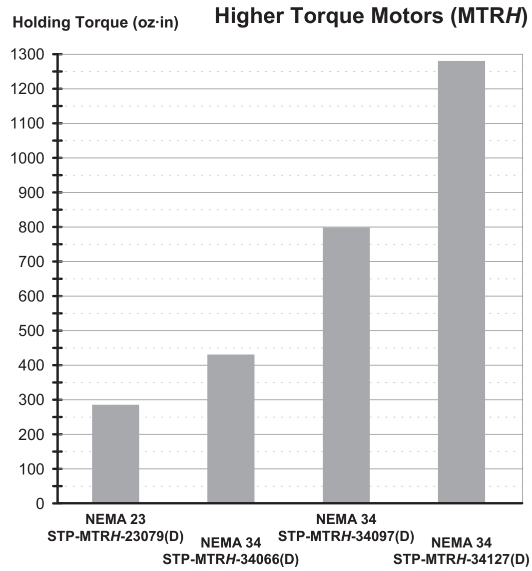
All prices are U.S. published prices. AutomationDirect prices as of June 2015 Price List. Parker prices are from http://buy.compumotor.com 5/14/2015.



High-torque stepping motors with 1-ft. cable and 4-wire locking connector

The SureStep stepping family has twenty high-torque motors to handle a wide range of automation applications such as woodworking, assembly, and test machines. The motors are available in both single-shaft and dual-shaft configurations. Our square frame or "high-torque" style stepping motors are the latest technology, resulting in the best torque to volume. We have NEMA 17, 23, and 34 mounting flanges and holding torque ranges from 61 to 1288 oz·in. Optional 20-foot extension cables with locking connectors are available to interface any of the stepping motors to the microstepping drive. The extension cables can be easily cut to length, if desired.





High-performance microstepping drive

*Sure*Step microstepping drives

(STP-DRV-4035 & STP-DRV-6575)

- Two models available
- Standard high-speed pulse input (pulse and direction)
- On-board or removable screw terminals for easy hook-up
- Optically-isolated inputs ready for +5VDC logic from *Direct*LOGIC PLCs, or 5–24 VDC (depending on model).
- No software or add-on resistors required for drive configuration; dipswitch and/or rotary-dial set-up
- Dipswitch used for built-in self-test, microstep resolution selection, current level selection, and optional idle current reduction.

*Sure*Step advanced microstepping drives

(STP-DRV-4850 & STP-DRV-80100)

All the features of the high-performance drive, plus:

- Software configurable
- 200 - 51,200 microsteps (software selectable)
- High-speed pulse input (Quadrature, cw/ccw, pulse/direction)
- Analog velocity mode (0-5v or potentiometer)
- Internal indexer (point-to-point moves via ASCII command)

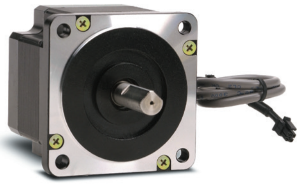
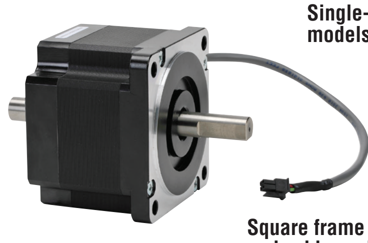
Linear power supplies

- 32V @ 4A, 48V @ 5A, 48V @ 10A, 70V @ 5A
- Input and output fuses included on power supplies
- Includes 5 VDC Logic supply for all low voltage signals

SureStep® Choose your SureStep System

1. Choose a motor

Determine the torque and speed required by your application. Then look at the motor speed-torque curves in the "SureStep Stepping System Motors" section of this catalog chapter. Choose a motor that can run your application with plenty of speed and torque reserve (most stepper systems should have a 100% safety margin for torque).

2. Choose a motor extension cable

Our 20-ft motor extension cables have a locking connector that mates up to the motor cable. The extension cables allow you to quickly connect the motor to the drive without having to splice wires or cut any cables.

If you chose an STP-MTR-xxxx motor, select an STP-EXT-020 cable.

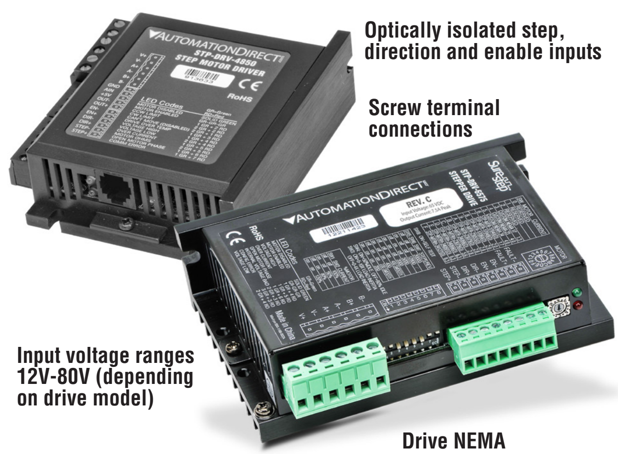
If you chose an STP-MTR**H**-xxxx motor, select an STP-EXT**H**-020 cable.

(The "**H**" motors and cable can handle higher motor current)

3. Choose a drive

This chart is a quick selection guide. For a full list of features, check out the Technical Info later in this chapter.

What you need	STP-DRV-4035	STP-DRV-4850	STP-DRV-6575	STP-DRV-80100
32V Speed-Torque Curve (from Step 1)	√	√	√	√
48V Speed-Torque Curve (from Step 1)	–	√	√	√
70V Speed-Torque Curve (from Step 1)	–	–	–	√
Pulse & Direction Input	√	√	√	√
More than 3.5A/motor phase	–	√	√	√
More than 5A/motor phase ("H" motors)	–	–	√	√
Internal Indexing (Drive can move from Point A to Point B with a serial communication command)	–	√	–	√
Analog Velocity Input	–	√	–	√



...in 4 easy steps

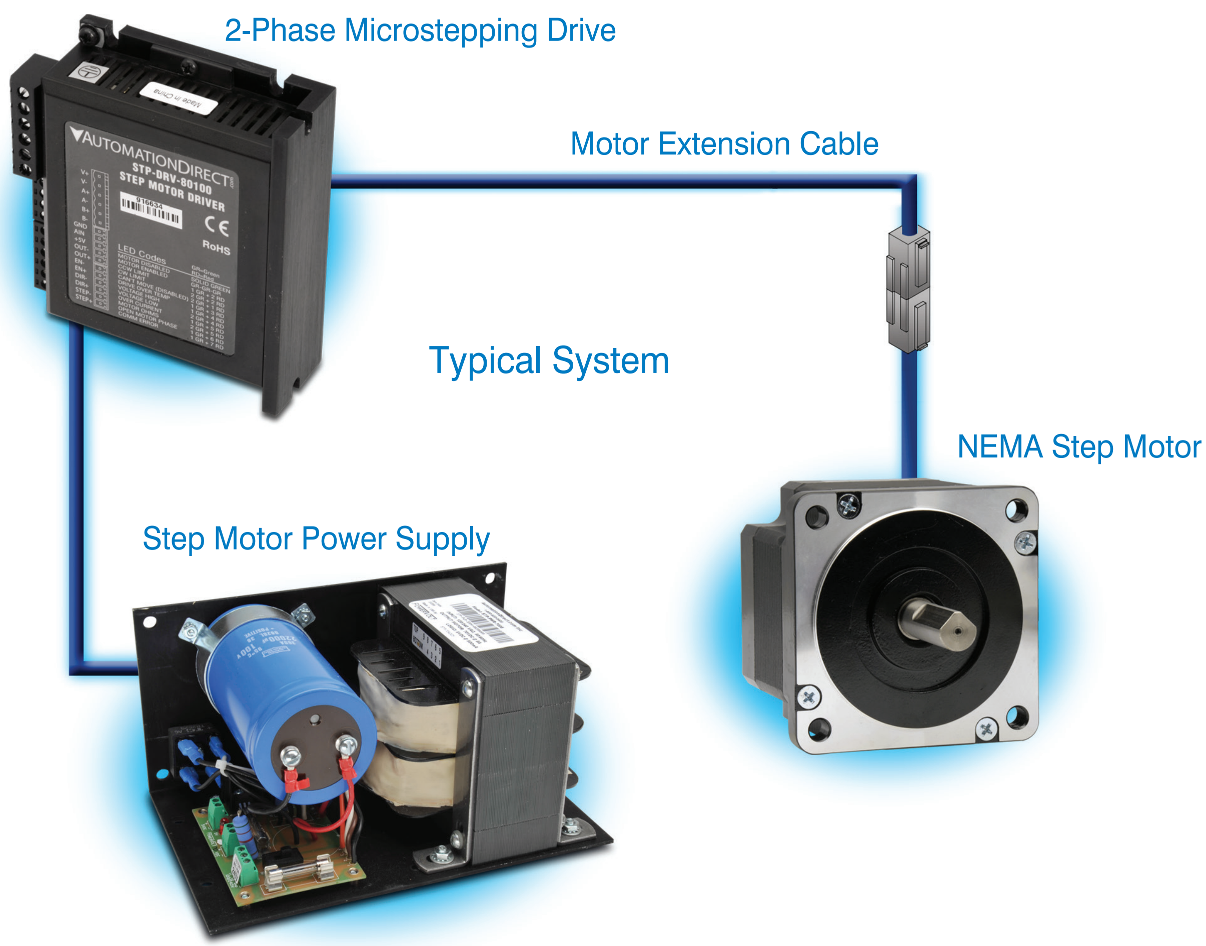
4. Choose a power supply

Since all SureStep motors can operate at 32V, 48V, and 70V, the selection of a power supply is dependent on the selected speed-torque curve of the motor and on the selection of drive. Choose a power supply that matches the desired speed-torque curve and stays within the voltage limit of the selected drive. Each power supply has incoming AC and outgoing DC fusing. There is also an electronically overload protected 5V supply for all your logic needs.

Permissible Drive/Power Supply Combinations

–	Power Supply			
Drive	STP-PWR-3204	STP-PWR-4805	STP-PWR-4810	STP-PWR-7005
STP-DRV-4035	√	–	–	–
STP-DRV-4850	√	√	√	–
STP-DRV-6575	√	√	√	–
STP-DRV-80100	√	√	√	√

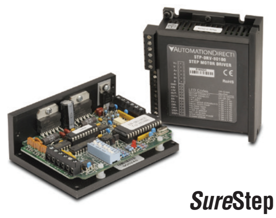
For systems that use multiple drives and only one power supply, please read our SureStep User Manual (under "Product Documentation") to properly size multiple systems.



SureStep® Stepping System Components

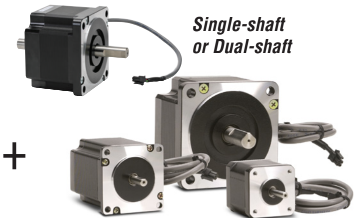
SureStep® System

Step Motor Power Supply



SureStep Microstepping Drive

SureStep Extension Cable



Single-shaft or Dual-shaft

SureStep Connectorized Step Motor

SureStep stepping system includes:

- Four step motor power supplies
- Two DIP-switch configurable microstepping drives
- Two software configurable advanced microstepping drives
- Two motor extension cables
- Twenty step motors (NEMA 17, 23, 34 frame sizes; single & dual shaft)

Standard stepper drive features

(STP-DRV-4035 & STP-DRV-6575)

- Low cost, digital step motor driver in compact package
- Operates from Step & Direction signals, or Step CW & Step CCW (jumper selectable)
- Fault output (-6575 only) & Enable input
- Optically isolated I/O
- Digital filters prevent position error from electrical noise on command signals; jumper selectable: 150 kHz or 2MHz (-6575 only)
- Rotary or DIP switch easily selects from many popular motors
- Electronic damping and anti-resonance (-6575 only)
- Automatic idle current reduction to reduce heat when motor is not moving; switch selectable: 50% or 90% of running current
- Switch selectable step resolution: (-DRV-4035) 400–10,000 steps per revolution; (-DRV-6575) 200–20,000 steps per revolution
- Switch selectable microstep emulation provides smoother, more reliable motion in full and half step modes
- Automatic self test (switch selectable)
- Operates from a 24–65 VDC or 12–40 VDC power supply, depending upon model
- Running current from 0.5–7.5A

Advanced stepper drive features

(STP-DRV-4850 & STP-DRV-80100)

- Max 5A, 48V and max 10A, 80V models available
- Software configurable
- Programmable microsteps
- Internal indexer (via ASCII commands)
- Self test feature
- Idle current reduction
- Anti-resonance
- Torque ripple smoothing
- Step, analog, & serial communication inputs
- Serial communications allow point-to-point positioning

Motor features

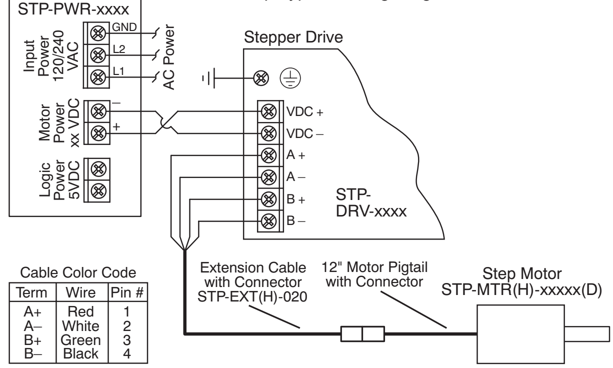
- High torque, 2-phase, bipolar, 1.8° per step, 4-lead
- Available in single-shaft and dual-shaft models
- Connectorized
- (6) NEMA 17 motors
- (6) NEMA 23 motors
- (8) NEMA 34 motors

Power supply features

- Linear, unregulated DC power supplies
- 120/240 VAC selectable input
- 32V, 48V, 70V DC output models available
- All models have additional 5VDC, 500mA regulated logic supply
- Fusing included for both incoming AC and outgoing DC
- 5V supply has electronic overload protection

Typical Wiring Diagram

*Sure*Step Typical Wiring Diagram



Cable Color Code

Term	Wire	Pin #
A+	Red	1
A–	White	2
B+	Green	3
B–	Black	4

SureStep Power Supply / Drive Compatibility

Drive(1)(2)	Recommended Power Supply(1)(2)			
Model #	STP-PWR -3204	STP-PWR -4805	STP-PWR -4810	STP-PWR -7005
STP-DRV-4035	√	No	No	No
STP-DRV-4850	√	√	√	No
STP-DRV-6575	√	√	√	No
STP-DRV-80100	√	√	√	√

1) Do NOT use a power supply that exceeds the drive's input voltage range. If using a non-STP linear power supply, ensure that the unloaded voltage does not float above the drive's maximum input range.

2) For best performance, use the lowest voltage power supply that supplies the required speed and torque.

SureStep Drive / Motor Compatibility

Motor(1)(2)			Recommended Drive(1)			
Model # (1)(2)	Rated Amps	Extension Cable(2)	STP-DRV -4035(1)	STP-DRV -4850(1)	STP-DRV -6575(1)	STP-DRV -80100(1)
STP-MTR-17040(D)	1.7	STP-EXT-020	√	√	√	–
STP-MTR-17048(D)	2.0		√	√	√	
STP-MTR-17060(D)	2.0		√	√	√	
STP-MTR-23055(D)	2.8		√	√	√	
STP-MTR-23079(D)	2.8		√	√	√	
STP-MTR-34066(D)	2.8		√	√	√	
STP-MTRH-23079(D)	5.6	STP-EXTH-020	–		√	√
STP-MTRH-34066(D)	6.3				√	√
STP-MTRH-34097(D)	6.3				√	√
STP-MTRH-34127(D)	6.3				√	√

1) The combinations above will perform according to the published speed/torque curves. However, any STP motor can be used with any STP drive. Using a motor with a current rating higher than the drive's output rating will proportionally limit the motor torque.

2) MTR motors have connectors compatible with the EXT extension cables. MTRH motors have connectors compatible with the EXTH extension cables.

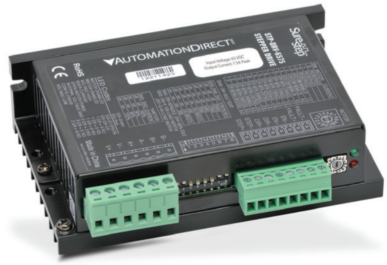
SureStep® Stepping System Drives

*Sure*Step® Microstepping Drives Overview

Sure Step Series – Microstepping Drives Features Comparison					
Drive Model		***Standard Microstepping Drives***		***Advanced Microstepping Drives***	
		STP-DRV-6575	***STP-DRV-4035***	***STP-DRV-4850***	***STP-DRV-80100***
Price		$89.00	$165.00	$230.00	$275.00
Drive Type		Microstepping drive with pulse input		Advanced microstepping drive with pulse or analog input, serial communication; includes programming/communication cable STP-232RJ11-CBL	
		enclosed	open-frame	enclosed	
Output Current		1.0–7.5 A/phase	0.4–3.5 A/phase	0.1–5 A/phase	0.1–10 A/phase
Input Voltage		nominal: 24–65 VDC range: 20–75 VDC	nominal: 12–32 VDC range: 12–42 VDC	nominal: 24–48 VDC range: 18– 53 VDC	nominal: 24–80 VDC range: 18–88 VDC
Configuration Method		rotary dial, dip switches, jumpers	dip switches	SureStep Pro software (included)	
Amplifier Type		MOSFET, dual H-bridge, 4-quadrant	MOSFET, dual H-bridge, bipolar chopper	MOSFET, dual H-bridge, 4-quadrant	
Current Control		4-state PWM @ 20 kHz	4-state PWM 20 kHz	4-state PWM @ 20 kHz	4-state PWM @ 20 kHz
Microstep Resolution		dipswitch selectable	dipswitch selectable	software selectable	software selectable
		200 to 20,000 steps/rev	400 to 10,000 steps/rev	200 to 51200 steps/rev	
Modes of Operation	***Step & Dir***	YES	YES	YES	YES
	CW/CCW	YES	n/a	YES	YES
	A/B Quad	n/a	n/a	YES	YES
	Oscillator	n/a	n/a	YES	YES
	Serial Indexing	n/a	n/a	YES	YES
Digital Input Signals	***Step/Pulse***	step & direction, CW/CCW step	step & direction	step & direction, CW/CCW step, A/B quadrature, run/stop & direction, jog CW/CCW, CW/CCW limits	
	Direction				
	Enable	motor disable	motor disable	motor enable, alarm reset, speed select (oscillator mode)	
Analog Input		n/a	n/a	speed control	
Output Signal		fault	n/a	fault, motion, tach	
Communication Interface		n/a	n/a	YES (programming/communication cable included)	
Non-volatile Memory Storage		n/a	n/a	YES	
Idle Current Reduction		YES	YES	YES	
Self Test		YES	YES	YES	
Additional Features		Load inertia (anti-resonance & damping feature to improve motor performance) Step pulse noise filter	n/a	Anti-resonance (Electronic Damping) Auto setup Microstep emulation Torque ripple smoothing (allows for fine adjustment of phase in the ra nge 0.25 to 1.5 rps) Waveform (command signal) smoothing	
Refer to Specifications Tables for detailed specifications					

SureStep® Stepping System Drives

*Sure*Step® Standard Microstepping Drives



Sure Step Series Specifications – Standard Microstepping Drives			
Microstepping Drive		***STP-DRV-6575***	***STP-DRV-4035***
Drive Type		Microstepping drive with pulse input	Microstepping drive with pulse input
Output Current		Selectable from 1.0–7.5 A/phase (peak of sine)	Selectable from 0.4 to 3.5 A/phase (maximum output power is 140W)
Input Voltage (external p/s required)		Nominal: 24–65 VDC Range: 20–75 VDC	Nominal: 12–32 VDC Range: 12–42 VDC (including ripple voltage)
Configuration Method		Rotary dial, DIP switches, jumpers	DIP switches
Amplifier Type		MOSFET, dual H-bridge, 4-quadrant	MOSFET, dual H-bridge, bipolar chopper
Current Control		4-state PWM @ 20 kHz	4-state PWM @ 20 kHz
Protection		n/a	n/a
Recommended Input Fusing		Fuse: 7A fast-acting; ADC #ACG7; Holder: ADC # DN-F6L110	Fuse: 4A fast-acting; ADC # ACG4; Holder: ADC # DN-F6L110
Input Signals	***Input Circuit***	5–24 VDC nominal (range: 4–30 VDC); optically isolated, differential.	Opto-coupler input with 440Ω resistance (5 to 15 mA input current); Logic Low is input 0.8 VDC or less; Logic High is input 4VDC or higher.
	Step/Pulse	Minimum pulse width = 0.25 µs. Maximum pulse frequency = 150 kHz or 2MHz (user selectable).	Motor steps on falling edge of pulse and minimum pulse width is 0.5 µs (1MHz)
	Direction	FUNCTIONS: step & direction, CW/CCW step	Needs to change at least 2 microseconds before a step pulse is sent
	Enable	FUNCTION: disable motor when closed	Logic 1 will disable current to the motor (current is enabled with no hook-up or logic 0)
	Analog	n/a	n/a
Output Signal		30 VDC / 80 mA max, optically isolated photodarlington, sinking or sourcing. Function = closes on drive fault.	n/a
Features	***Current Reduction***	Reduce power consumption and heat generation by limiting motor running current to 100%, 90%, or 80% of maximum. Current should be increased to 120% if microstepping. (Torque is reduced/increased by the same %.)	n/a
	Idle Current Reduction	90% or 50% of running current. (Holding torque is reduced by the same %.)	0% or 50% reduction (idle current setting is active if motor is at rest for 1 second or more)
	Microstep Resolution	20000, 12800, 5000, 2000, 400 smooth, 400, 200 smooth, or 200 steps/rev.	400 (200x2), 1,000 (200x5), 2,000 (200x10), or 10,000 (200x50) steps/rev
	Phase Current Setting	(1.3–6.3) x 80%–120% DIP switch selectable	0.4 to 3.5 A/phase with 32 selectable levels
	Self Test	Automatically rotates the motor back and forth two turns in each direction in order to confirm that the motor is operational	Uses half-step to rotate 1/2 revolution in each direction at 100 steps/second
	Step Pulse Noise Filter	Select 150 kHz or 2MHz	n/a
	Load Inertia	Set motor and load inertia range to 0–4x or 5–10x.	n/a
Connectors		Removable screw terminal blocks. Motor & Power Supply: 30–12 AWG; Signals: 30–14 AWG	Screw terminal blocks with AWG 18 maximum wire size
Maximum Humidity		90% non-condensing	90% non-condensing
Storage/Ambient Temperature		0 to 50 °C [32 to 122 °F] (mount to suitable heat sink)	-20 to 80 °C [-4 to 176 °F]
Operating Temperature		0 to 85 °C [32 to 185 °F] (interior of electronics section)	0 to 55 °C [32 to 131 °F] recommended; 70 °C [158 °F] maximum
Drive Cooling Method		Natural convection (mount drive to metal surface)	Natural convection (mount drive to metal surface to dissipate heat)
Mounting		(2) #6 screws to mount wide or narrow side to metal surface	(4) #4 screws to mount on wide side; (2) #4 screws to mount on narrow side
Weight		10.8 oz [306g] – (including mating connectors)	9.3 oz. [264 g]
Agency Approvals		CE (EMC & LVD); RoHS	CE (complies with EN55011A & EN50082-1 (1992)), RoHS

SureStep® Stepping System Drives

*Sure*Step® Advanced Microstepping Drives

Sure Step Series Specifications – Advanced Microstepping Drives			
	Microstepping Drive	***STP-DRV-4850***	***STP-DRV-80100***
	Drive Type	Advanced microstepping drive with pulse or analog input, serial communication (serial communication allows indexing capability)	
	Output Current	0.1-5.0 A/phase (in 0.01A increments)	0.1-10.0 A/phase (in 0.01A increments)
	Input Voltage (external p/s required)	24-48 VDC (nominal) (range: 18-53 VDC)	24-80 VDC (nominal) (range: 18-88 VDC)
	Configuration Method	*Sure*Step Pro software (included)	
	Amplifier Type	MOSFET, dual H-bridge, 4-quadrant	
	Current Control	4-state PWM @ 20 kHz	
	Protection	over-voltage, under-voltage, over-temperature, external output faults (phase-to-phase & phase-to-ground), inter-amplifier shorts	
	Recommended Input Fusing	Fuse: 4A 3AG delay (ADC #MDL4) Fuse Holder: ADC #DN-F6L110	Fuse: 6.25A 3AG delay (ADC #MDL6-25) Fuse Holder: ADC #DN-F6L110
Input Signals	***Input Circuit***	Opto-coupler input with 5 to 15 mA input current; Logic Low is input 0.8 VDC or less; Logic High is input 4 VDC or higher.	
	Step/Pulse	optically isolated, differential, 5V, 330Ω; min pulse width = 250 ns max pulse frequency = 2MHz adjustable bandwidth digital noise rejection feature FUNCTIONS: step & direction, CW/CCW step, A/B quadrature, run/stop & direction, jog CW/CCW, CW/CCW limits	
	Direction		
	Enable	Optically isolated, 5-12V, 680Ω; FUNCTIONS: motor enable, alarm reset, speed select (oscillator mode)	
	Analog	Range: 0–5 VDC; Resolution: 12 bit; FUNCTION: speed control	
	Output Signal	Optically isolated, 24V, 10mA max; FUNCTIONS: fault, motion, tach	
	Communication Interface	RS-232; RJ11 (6P4C) receptacle	
	Non-volatile Memory Storage	Configurations are saved in FLASH memory on-board the DSP.	
Features	***Idle Current Reduction***	Reduction range of 0-90% of running current after delay selectable in ms	
	Microstep Resolution	Software selectable from 200 to 51200 steps/rev in increments of 2 steps/rev	
	Modes of Operation	Step & direction, CW/CCW, A/B quadrature, oscillator, joystick, serial commands	
	Phase Current Setting	0.1-5.0 A/phase (in 0.01A increments)	0.1-10.0 A/phase (in 0.01A increments)
	Self Test	Checks internal & external power supply voltages, diagnoses open motor phases	
	Additional Features	Anti-resonance (Electronic Damping) Auto setup Microstep emulation Torque ripple smoothing (allows for fine adjustment of phase in the range 0.25 to 1.5 rps) Waveform (command signal) smoothing	
	Connectors	Communication: RJ11 (6P4C); programming/communication cable STP-232RJ11-CBL included Other: removable screw terminal blocks; Motor & Power Supply: 26–12 AWG; Signals: 28–16 AWG	
	Maximum Humidity	90% non-condensing	
	Storage Temperature	-20 to 80 °C [-4 to 176 °F]	
	Operating Temperature	0 to 55 °C [32 to 131 °F]; (mount to suitable heat sink)	
	Drive Cooling Method	Natural convection (mount to suitable heat sink)	
	Mounting	#6 mounting screws (mount to suitable heat sink)	
	Weight	8 oz [227g] (approximate)	
	Agency Approvals	CE, RoHS	

SureStep® Stepping System Drives

*Sure*Step® Microstepping Drives Accessories

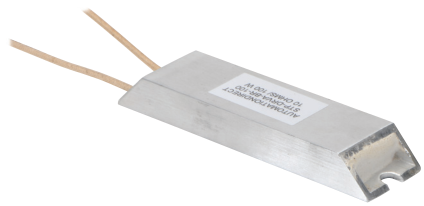
Braking Accessories

If you plan to use a regulated or switching power supply, you might encounter problems from regeneration. As a load rapidly decelerates from a high speed, much of the kinetic energy of that load is transferred back to the motor. This energy is then pushed back to the drive and power supply, resulting in increased system voltage. If there is enough overhauling load on the motor, the DC voltage will go above the drive and/or power supply limits.

This can trip the overvoltage protection of a switching power supply or a drive, and cause it to shut down.

To solve this problem, AutomationDirect offers a regeneration clamp and a braking resistor as optional accessories. The regen clamp has a built-in 50W braking resistor. For additional braking power (larger overhauling loads), an optional 100W braking resistor is also available.

Regeneration Clamp



Braking Resistor

Regeneration Clamp Description

As with most stepper systems, a clamp circuit is often required to limit increased power supply bus voltage when the motor is decelerating under load. This is commonly referred to as "regeneration," which is what happens when DC motors are driven by their load. During regeneration, the DC motor can produce enough voltage to actually exceed the input power supply voltage.

With a Regen Clamp, one or more stepper drives can be protected from "Over Voltage" conditions by placing the clamp module between the power supply and the drive. The clamp tracks the input power supply, and will operate from 24 to 80 volts. No adjustments are needed.

The Regen Clamp is designed to handle a wide range of conditions. The voltage input matches the needs of the SureStep stepper drives by providing 24 to 80 VDC capabilities, and external power resistors can be added for even greater continuous power requirements. The clamp modules are small and compact to minimize impact on the system design. More than one stepper drive can be connected to the clamp module with the potential to handle an entire multi-axis sytem.

Regeneration Clamp Features

- Built-in 50W power resistor for more continuous current handling (optional 100W resistor is also available)
- Mounted on a heat sink
- Voltage range: 24–80 VDC; no user adjustments required
- Power: 50W continuous; 800W peak
- Wire connection: 6-pin screw terminal block; 12–18 AWG wire.
- Indicators (LED):
  Green = power supply voltage is present
  Red = clamp is operating (usually when stepper is decelerating)
- Protection: The external power supply is internally connected to an "Input Diode" in the regen clamp that protects the power supply from high regeneration voltages. This diode protects the system from connecting the power supply in reverse. If the clamp circuit fails, the diode will continue to protect the power supply from over-voltage.
- RoHS

Sure Step Series Specifications – Microstepping Drives Optional Accessories		
Part Number	***Price***	***Description***
STP-DRVA-RC-050 *	$99.00	Regen Clamp: use with DC-powered stepper & servo drives; 50W, 24–80 VDC
STP-DRVA-BR-100	$49.00	Braking Resistor: use with STP-DRV-RC-050 regen clamp; 100W, 10Ω
*** Do not use the regeneration clamp in an atmosphere containing corrosive gases.***		

SureStep® Stepping System Drives

*Sure*Step® Microstepping Drives Accessories

*Sure*Step Pro Drive Configuration Software - for Advanced Stepper Drives

Free Download

SureStep Pro configuration software is available as a free download from our website for SureStep advanced drives (STP-DRV-4850 & -80100).

- Used for easy configuration and setup of the drive, including drive, motion control mode, I/O, motor.
- Serial command language for motor drive control via serial port; eliminates the need for separate motion controllers or indexers; provides easy interface to other industrial devices such as PCs, PLCs and HMIs.
- Easily use the ASCII output commands from most of our PLCs to enable indexing capability.
- Help files include technical data, application information, advanced setup, serial command instructions.
- Runs on 32-bit/64-bit Windows 7 and XP operating systems.

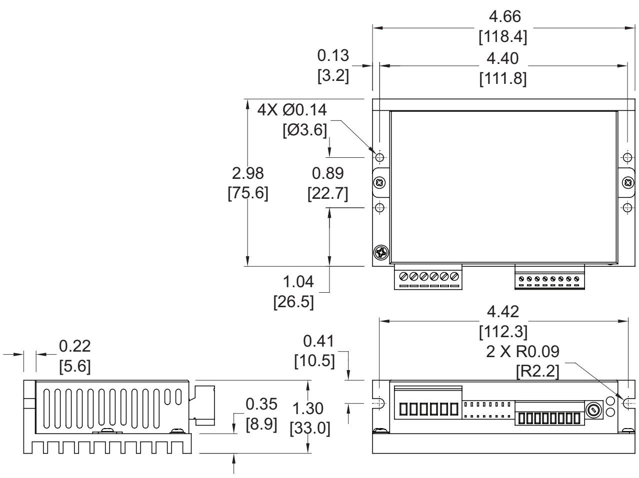
SureStep Drive Configuration Software - for Advanced Stepper Drives		
Part Number	***Price***	***Description***
STP-PRO *	$9.00	Windows-based configuration software for use with *Sure*Step STP-DRV-4850 and STP-DRV-80100 advanced stepper drives. Requires Windows XP or Windows 7 (32 or 64-bit) operating system, minimum 12MB hard drive space, and RS-232 port (software also compatible with USB-RS232 adapter).
** Available for purchase on CD or can be downloaded for free from AutomationDirect Web site (www.AutomationDirect.com).*		

SureStep® Stepping System Drives

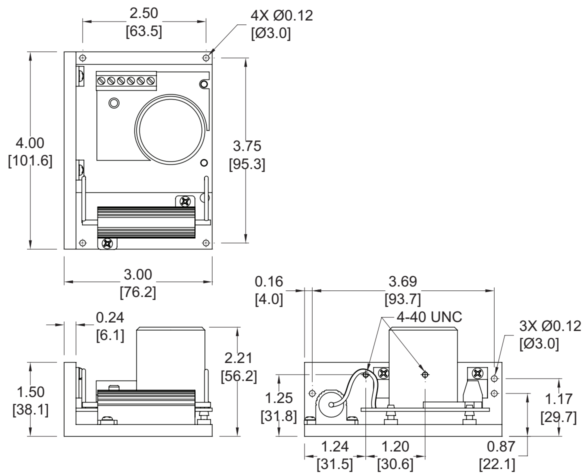
*Sure*Step® Microstepping Drives Dimensions

Dimensions = in [mm]

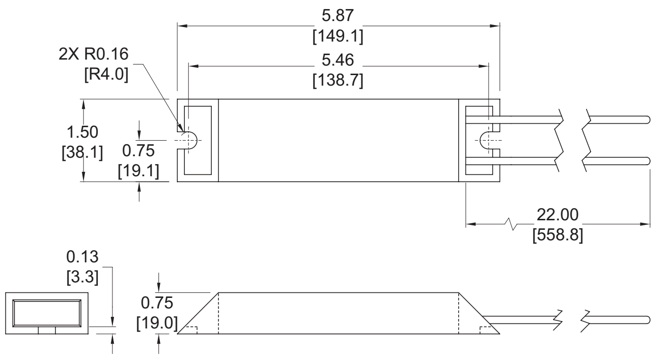
STP-DRV-6575



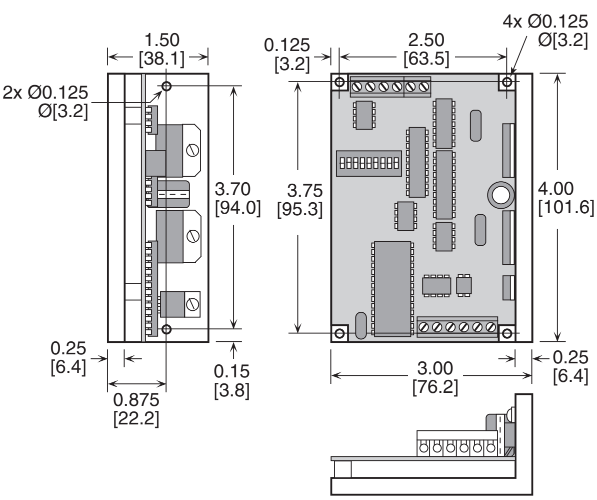
STP-DRVA-RC-050



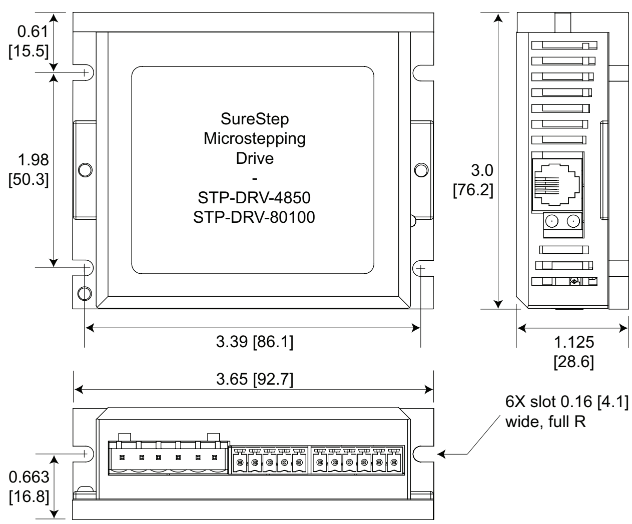
STP-DRVA-BR-100



STP-DRV-4035



STP-DRV-4850 & -80100



SureStep® Stepping System Motors

*Sure*Step® Stepping Motors

SureStep Series Part Numbers – Connectorized Bipolar Stepping Motors																				
	High Torque Motors												Higher Torque Motors							
Bipolar Stepping Motors	STP-MTR-17040	STP-MTR-17040D	STP-MTR-17048	STP-MTR-17048D	STP-MTR-17060	STP-MTR-17060D	STP-MTR-23055	STP-MTR-23055D	STP-MTR-23079	STP-MTR-23079D	STP-MTR-34066	STP-MTR-34066D	STP-MTRH-23079	STP-MTRH-23079D	STP-MTRH-34066	STP-MTRH-34066D	STP-MTRH-34097	STP-MTRH-34097D	STP-MTRH-34127	STP-MTRH-34127D
Price	$18.00	$22.00	$22.00	$26.00	$35.50	$39.50	$35.50	$40.00	$46.50	$51.00	$111.00	$126.00	$51.50	$56.00	$124.00	$139.00	$140.00	$155.00	$167.00	$167.00
Shaft	single	dual	single	dual	single	dual	single	dual	single	dual	single	dual	single	dual	single	dual	single	dual	single	dual

SureStep Series Specifications – Connectorized Bipolar Stepping Motors											
Bipolar Stepping Motors		High Torque Motors						Higher Torque Motors			
		STP-MTR-17040(D)	STP-MTR-17048(D)	STP-MTR-17060(D)	STP-MTR-23055(D)	STP-MTR-23079(D)	STP-MTR-34066(D)	STP-MTRH-23079(D)	STP-MTRH-34066(D)	STP-MTRH-34097(D)	STP-MTRH-34127(D)
NEMA Frame Size		17	17	17	23	23	34	23	34	34	34
**** Maximum Holding Torque***	(lb·in)	3.81	5.19	7.19	10.37	17.25	27.12	17.87	27.12	50.00	80.50
	(oz·in)	61	83	115	166	276	434	286	434	800	1288
	(N·m)	0.43	0.59	0.81	1.17	1.95	3.06	2.02	3.06	5.65	9.12
Rotor Inertia	($oz \cdot in^2$)	0.28	0.37	0.56	1.46	2.60	7.66	2.60	7.66	14.80	21.90
	($kg \cdot cm^2$)	0.05	0.07	0.10	0.27	0.48	1.40	0.48	1.40	2.71	4.01
Rated Current (A/phase)		1.7	2.0	2.0	2.8	2.8	2.8	5.6	6.3	6.3	6.3
Resistance (Ω/phase)		1.6	1.4	2.0	0.8	1.1	1.1	0.4	0.3	0.3	0.5
Inductance (mH/phase)		3.0	2.7	3.3	2.4	3.8	6.6	1.2	1.5	2.1	4.1
Insulation Class		130°C [266°F] Class B; 300V rms									
Basic Step Angle		1.8°									
Shaft Runout (in)		0.002 in [0.051 mm]									
Max Shaft Radial Play @ 1lb load		0.001 in [0.025 mm]									
Perpendicularity		0.003 in [0.076 mm]									
Concentricity		0.002 in [0.051 mm]									
**** Maximum Radial Load (lb [kg])***		6.0 [2.7]			15.0 [6.8]		39.0 [17.7]	15.0 [6.8]	39.0 [17.7]		
**** Maximum Thrust Load (lb [kg])***		6.0 [2.7]			13.0 [5.9]		25.0 [11.3]	13.0 [5.9]	25.0 [11.3]		
Storage Temperature Range		-20°C to 100°C [-4°F to 212°F]									
Operating Temperature Range		-20°C to 50°C [-4°F to 122°F] (motor case temperature should be kept below 100°C [212 °F])									
Operating Humidity Range		55% to 85% non-condensing									
Product Material		steel motor case; stainless steel shaft(s)									
Environmental Rating		IP40									
Weight (lb [kg])		0.6 [0.3]	0.7 [0.3]	0.9 [0.4]	1.5 [0.7]	2.2 [1.0]	3.9 [1.7]	2.4 [1.1]	3.9 [1.7]	5.9 [2.7]	8.4 [3.8]
Agency Approvals		CE (complies with EN55014-1 (1993) and EN60034-1.5.11)									
Design Tips		Allow sufficient time to accelerate the load and size the step motor with a 100% torque safety factor. DO NOT disassemble step motors because motor performance will be reduced and the warranty will be voided. DO NOT connect or disconnect the step motor during operation. Mount the motor to a surface with good thermal conductivity, such as steel or aluminum, to allow heat dissipation. Use a flexible coupling with “clamp-on” connections to both the motor shaft and the load shaft to prevent radial and thrust loading on bearings from minor misalignment.									
Accessory Extension Cable		STP-EXT-020						STP-EXT**H**-020			

***** For dual-shaft motors (STP-MTR-xxxxxD):***
*The sum of the front and rear Torque Loads, Radial Loads, and Thrust Loads must not exceed the applicable Torque, Radial, and Thrust load ratings of the motor.***

*Sure*Step® Stepping Motors Mounting Accessory

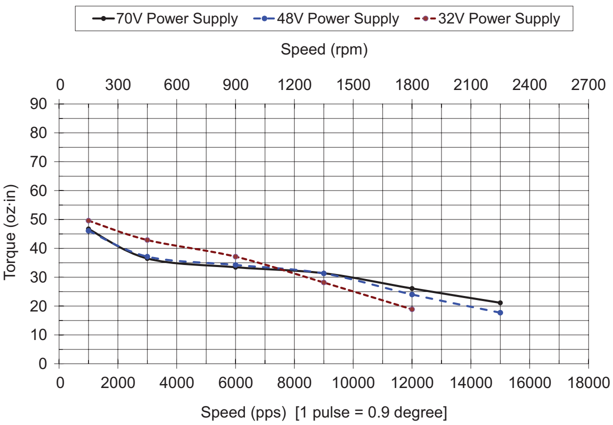
Mounting Accessory – for NEMA 17 SureStep Series Bipolar Stepping Motors		
Part Number	Price	Description
STP-MTRA-RB-85	$8.00	Reducer bushing, 8mm OD to 5mm ID, 16mm length, aluminum alloy. Connects NEMA size 17 stepper motors to Koyo TRD-NH and TRD-SH hollow shaft encoders.

SureStep® Stepping System Motors

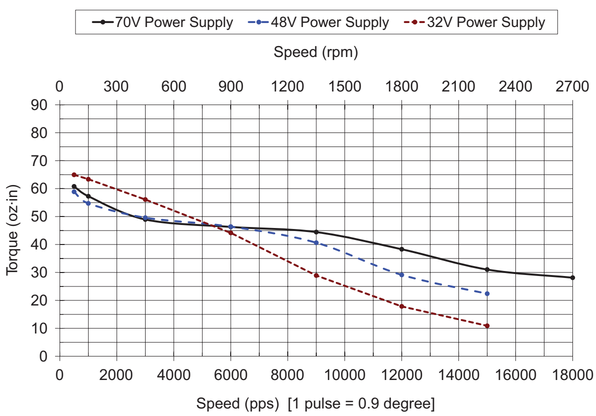
*Sure*Step® Motor Torque vs. Speed Charts

STP-MTR-17xxx(D) NEMA 17 Step Motors

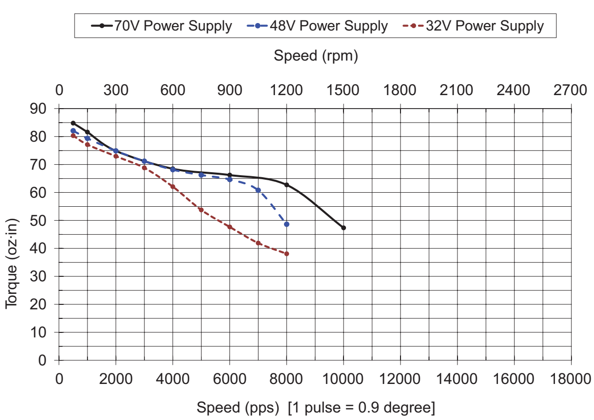
STP-MTR-17040(D) Torque vs Speed (1.8° step motor; 1/2 stepping)



STP-MTR-17048(D) Torque vs Speed (1.8° step motor; 1/2 stepping)

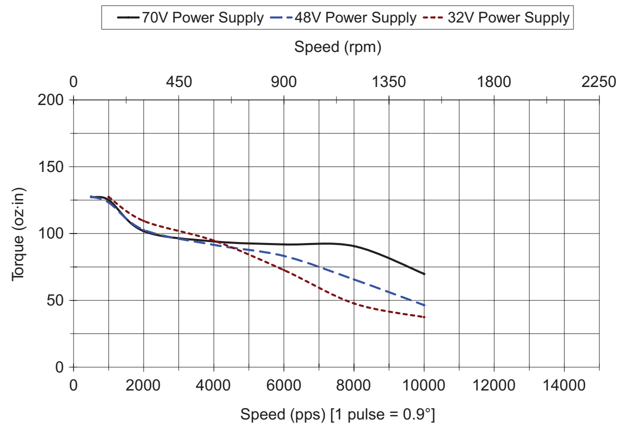


STP-MTR-17060(D) Torque vs Speed (1.8° step motor; 1/2 stepping)

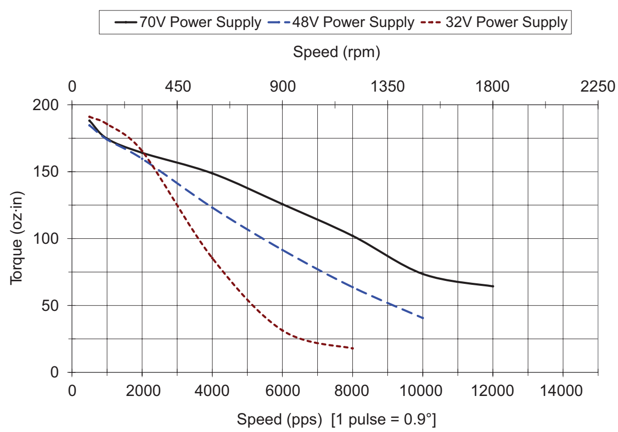


STP-MTR(H)-23xxx(D) NEMA 23 Step Motors

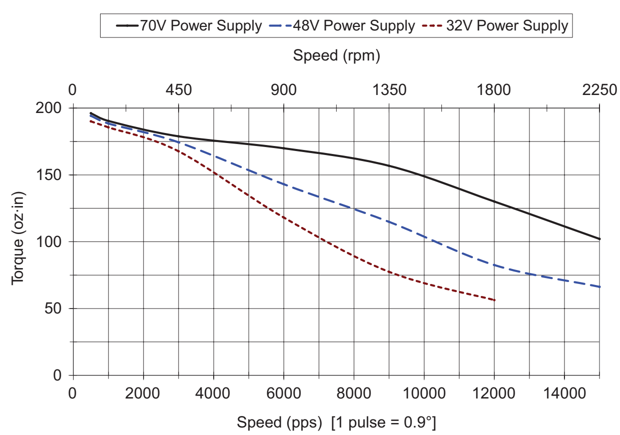
STP-MTR-23055(D) Torque vs Speed (1.8° step motor; 1/2 stepping)



STP-MTR-23079(D) Torque vs Speed (1.8° step motor; 1/2 stepping)



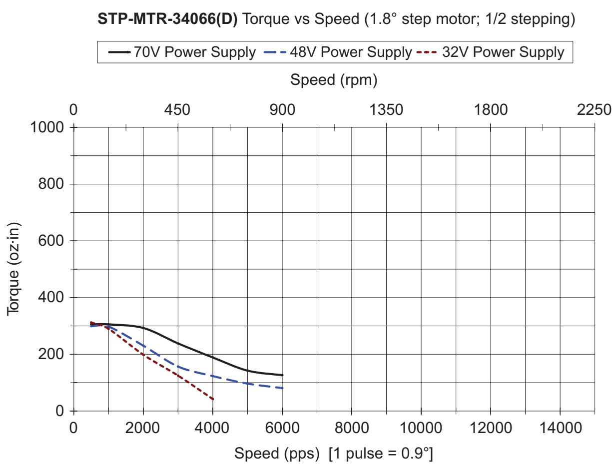
STP-MTR*H*-23079(D) Torque vs Speed (1.8° step motor; 1/2 stepping)

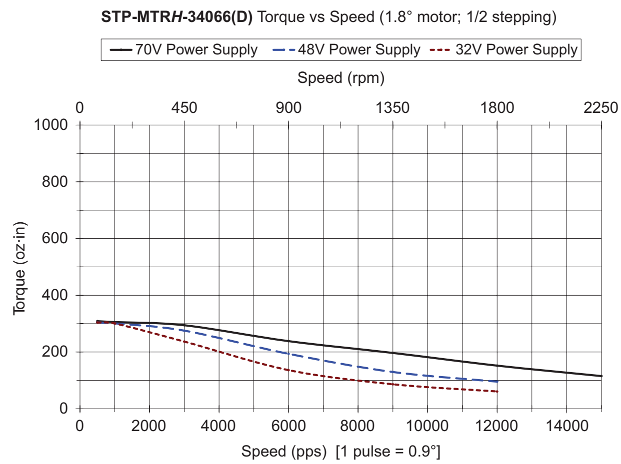


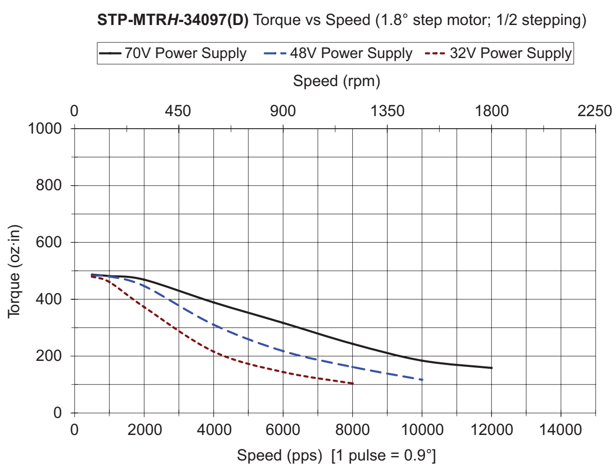
SureStep Stepping System Motors

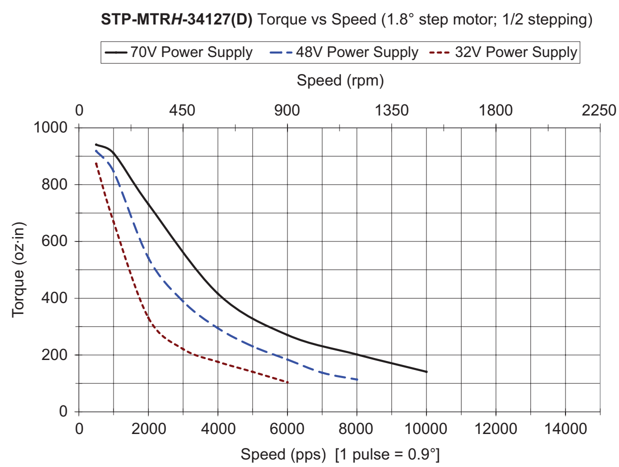
*Sure*Step® Motor Torque vs. Speed Charts (continued)

STP-MTR(H)-34xxx(D) NEMA 34 Step Motors





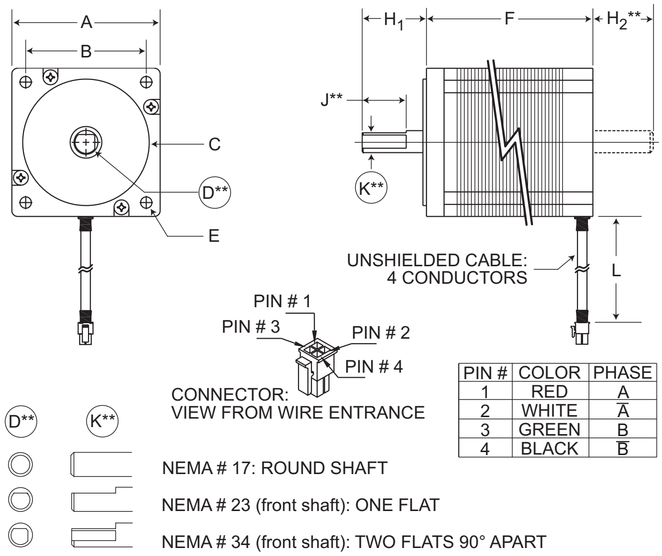




SureStep® Stepping System Motors

*Sure*Step® Motor Dimensions and Cabling

STP-MTR(H)-xxxx(D) Motors



PIN #	COLOR	PHASE
1	RED	A
2	WHITE	$\overline{A}$
3	GREEN	B
4	BLACK	$\overline{B}$

** Dimension H_2 applies only to dual-shaft STP-xxxxxD motors.
** Dimension D is the same for both front and rear shafts of dual-shaft motors.
** Dimensions J & K do NOT apply to rear shafts of dual-shaft motors (all rear shafts are round style).

SureStep Series Dimensions & Cabling – Connectorized Bipolar Stepping Motors

Dimen-sions* (in [mm]*)	High Torque Motors						Higher Torque Motors			
	STP-MTR -17040(D)	STP-MTR -17048(D)	STP-MTR -17060(D)	STP-MTR -23055(D)	STP-MTR -23079(D)	STP-MTR -34066(D)	STP-MTRH -23079(D)	STP-MTRH -34066(D)	STP-MTRH -34097(D)	STP-MTRH -34127(D)
A	1.67 [42.3]			2.25 [57.2]		3.39 [86.1]	2.25 [57.2]	3.39 [86.1]		
B	1.22 [31.0]			1.86 [47.2]		2.74 [69.6]	1.86 [47.2]	2.74 [69.6]		
C	Ø 0.87 [22.1]			Ø 1.50 [38.1]		Ø 2.88 [73.0]	Ø 1.50 [38.1]	Ø 2.88 [73.0]		
D**	Ø 0.20 [5.0]			Ø 0.25 [6.4]		Ø 0.50 [12.7]	Ø 0.25 [6.4]	Ø 0.50 [12.7]		
E	M3 x 0.5 thread 0.15 [3.8] min depth			Ø 0.20 [5.1] through		Ø 0.26 [6.6] through	Ø 0.20 [5.1] through	Ø 0.26 [6.6] through		
F	1.58 [40.1]	1.89 [48.0]	2.34 [59.5]	2.22 [56.4]	3.10 [78.7]	2.64 [67.1]	3.10 [78.7]	2.64 [67.1]	3.82 [97.0]	5.00 [127.0]
H_1	0.94 [24.0]			0.81 [20.6]		1.46 [37.1]	0.81 [20.6]	1.46 [37.1]		
H_2**	0.39 [9.9]			0.63 [16.0]		1.13 [28.7]	0.63 [16.0]	1.13 [28.7]		
J**	n/a			0.59 [15.0]		0.98 [25.0]	0.59 [15.0]	0.98 [25.0]		
K**	n/a			0.23 [5.8]		0.45 [11.4]	0.23 [5.8]	0.45 [11.4]		
L	12.0 [305]						12 [305]			
Conductor	(4) #20 AWG						(4) #18 AWG			
Connector	Molex # 43025-0400						Molex # 39-01-3042			
Pin	Molex # 43030-0007						Molex # 39-00-0039			

** mm dimensions are for reference purposes only.*

*** Dimension H_2 applies only to dual-shaft STP-xxxxxD motors.*
Dimension D (shaft diameter) is the same for both front and rear shafts of dual-shaft motors.
Dimensions J & K do NOT apply to rear shafts of dual-shaft motors (all rear shafts are round style).

Stepping System Cables

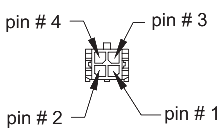
SureStep® Cables

Sure Step Series – Stepping System Cables					
Cable	**Price**	**Purpose**	**Length**	**Use With**	**Cable End Connectors**
STP-EXT-020	$15.00	motor to drive extension	20 ft	STP-MTR-xxxxx(D)	pigtail / Molex 43020-0401 connector
STP-EXTH-020	$30.00	motor to drive extension	20 ft	STP-MTR**H**-xxxxx(D)	pigtail / Molex 39-01-2041 connector
STP-232RJ11-CBL *	$9.00	programming/communication	10 ft	STP-DRV-4850 STP-DRV-80100	DB9 female / RJ11(6P4C)
STP-232HD15-CBL-2 **	$10.00	communication	6.6 ft	STP-DRV-4850 STP-DRV-80100	HD 15-pin male / RJ12 6-pin plug
STP-232RJ12-CBL-2 **	$5.50	communication	6.6 ft	STP-DRV-4850 STP-DRV-80100	RJ12 6-pin plug / RJ12 6-pin plug

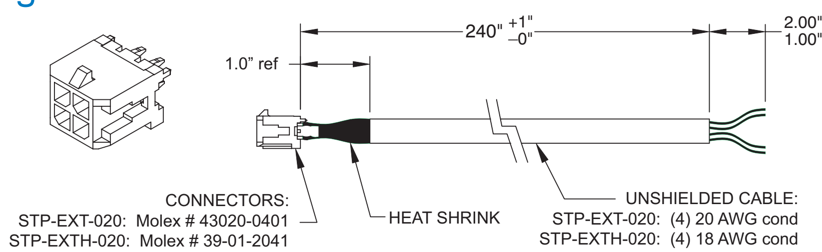
** Programming/communication cable STP-232RJ11-CBLis available for spare or replacement purposes. (One cable is included with each software programmable drive.)*

*** Refer to the ZIPLinks Wiring Solutions section for complete information regarding cables STP-232HD15-CBL-2 and STP-232RJ12-CBL-2.*

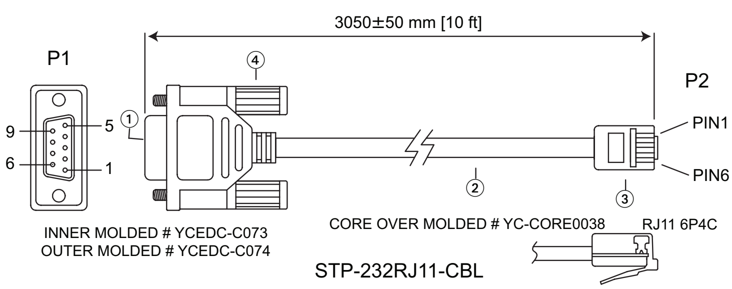
Extension Cable Wiring Diagram



PIN #	COLOR
1	red
2	white
3	green
4	black



Programming Cable Wiring Diagram



WIRE CONNECTION

(DB9) P1			P2 (RJ11 6P4C)
2	RX	TX	3
3	TX	RX	5
4	nc	nc	4
5	GND	GND	2

1	DB 9P FEMALE CONNECTOR SHELL: FRONT NICKEL BACK TIN INSULATOR COLOR: BLACK
2	CABLE: CAT-5 UTP 24AWG (7/0.203BA*2PR) 100MHz COLOR: BLACK OD: 4.5mm
3	RJ11 6P4C PLATED GOLD 3U"
4	SCREW: #4-40UNC PD40*175TNP COLOR: BLACK

SureStep® Stepping System Power Supplies

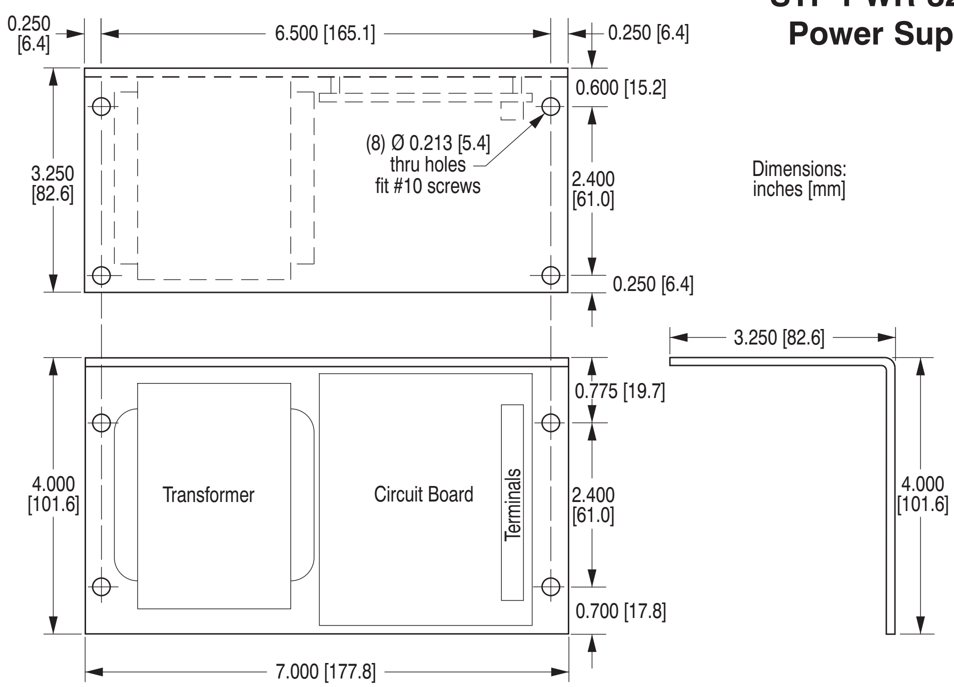
*Sure*Step® Power Supplies

Sure Step Series Specifications – Stepping System Power Supplies				
Power Supply	**STP-PWR-3204**	**STP-PWR-4805**	**STP-PWR-4810**	**STP-PWR-7005**
Price	$120.00	$140.00	$178.00	$178.00
Input Power (fuse protected *)	1-phase, 120/240 VAC, 50/60 Hz, 150 VA Fuse*: 3A	1-phase, 120/240 VAC, 50/60 Hz, 350 VA Fuse*: 5A	1-phase, 120/240 VAC, 50/60 Hz, 650 VA Fuse*: 8A	1-phase, 120/240 VAC, 50/60 Hz, 500 VA Fuse*: 7A
Input Voltage Range (switch selectable)	120/240 VAC ±10% (Voltage range switch is set to 240 VAC from factory)			
Inrush Current	120 VAC < 12 A / 240 VAC < 14 A	120 VAC < 20A / 240 VAC < 24A	120 VAC < 40A / 240 VAC < 50A	
Motor Supply Output (linear unregulated, fuse protected *, and power on LED indicator)	32 VDC @ 4A (fully loaded) 35 VDC @ 1A load 41 VDC @ no load Fuse*: 6A (Electrically isolated from Logic Supply Output)	46.5 VDC @ 5A (fully loaded) 52 VDC @ 1A load 57.5 VDC @ no load Fuse*: 8A	46.5 VDC @ 10A (fully loaded) 50 VDC @ 1A load 57.5 VDC @ no load Fuse*: 15A	70 VDC @ 5A (fully loaded) 79 VDC @ 1A load 86.5 VDC @ no load Fuse*: 8A
Logic Supply Output (regulated and power on LED indicator)	5 VDC ±5% @ 500 mA (Electronically Overload Protected) (Electrically isolated from Motor Supply Output)			
Watt Loss	13W	25W	51W	42W
Storage Temperature Range	-55 to 85 °C [-67 to 185 °F]			
Operating Temperature Range	0 to 50 °C [32 to 122 °F] full rated; derate current 1.1% per degree above 50°C; 70 °C [158 °F] maximum			
Humidity	95% (non-condensing) relative humidity maximum			
Cooling Method	Natural convection (mount power supply to metal surface if possible)			
Dimensions (in [mm])	4.00 x 7.00 x 3.25 [101.6 x 177.8 x 82.6]	5.00 x 8.10 x 3.88 [127.0 x 205.7 x 98.6]	5.62 x 9.00 x 4.62 [142.7 x 228.6 x 117.3]	
Mounting	Mount on either wide or narrow side with machine screws per dimension diagrams			
Weight (lb [kg])	6.5 [2.9]	11 [4.9]	18 [8.3]	16 [7.2]
Connections	Screw Terminals			
Agency Approvals	UL (file # E181899), CSA, CE			

**** Fuses to be replaced by qualified service personnel only. Use (1-1/4 x 1/4 in) ceramic fast-acting fuses (Edison type ABC from AutomationDirect, or equivalent).***

Power Supply Dimensions

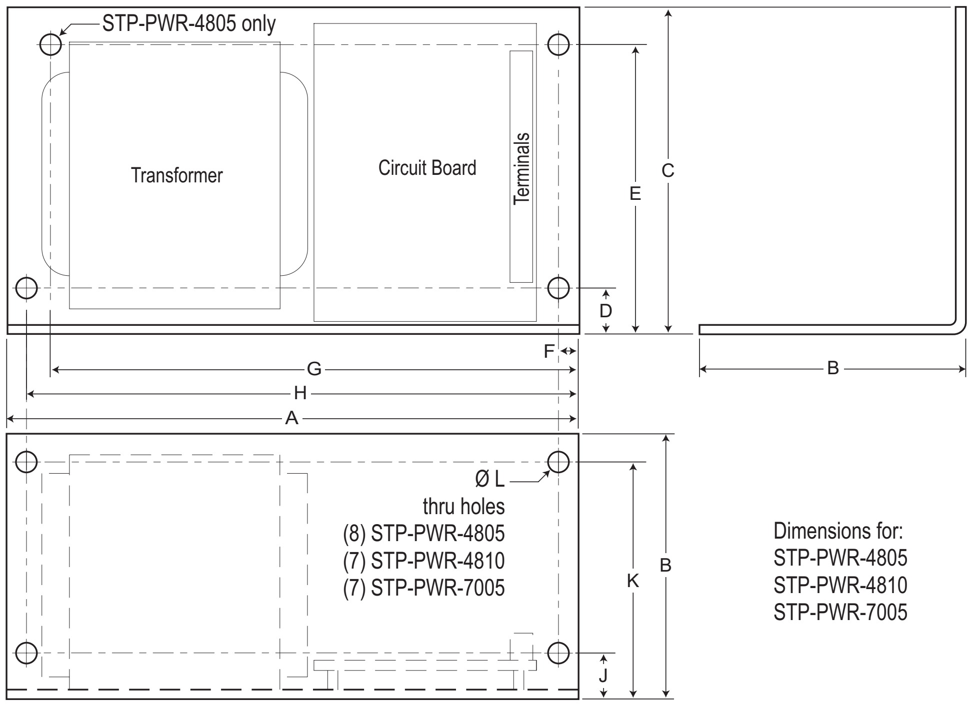
STP-PWR-3204 Power Supply



SureStep® Stepping System Power Supplies

*Sure*Step® Power Supply Dimensions (continued)

STP-PWR-4805, -4810, -7005 Power Supplies



SureStep Series Dimensions – 48V & 70V Power Supplies												
Power Supply Part Number	Dimensions* (in [mm]*)											Mtg Screw
	A	B	C	D	E	F	G	H	J	K	L	
STP-PWR-4805	8.10 [205.7]	3.88 [98.6]	5.00 [127.0]	0.87 [22.1]	4.67 [118.6]	0.25 [6.4]	7.15 [181.6]	7.75 [196.9]	0.50 [12.7]	3.53 [89.7]	0.200 [5.1]	#10
STP-PWR-4810 ***STP-PWR-7005***	9.00 [228.6]	4.62 [117.3]	5.62 [142.7]	1.56 [39.6]	4.06 [103.1]	0.35 [8.9]	n/a	8.59 [218.2]	0.50 [12.7]	4.27 [108.5]	9/32 [7.1]	1/4
** mm dimensions are for reference purposes only.*												

SureStep® Stepping Systems with PLCs

Controller Compatibility

Motion Control with AutomationDirect PLCs* and SureStep® Stepping Systems			
PLC Series	*Starting at $199.00*	*Starting at $125.00*	*Starting at $251.00*
	1 axis control**	1-2 axis control***	1-5 axis control***
	DL105	**DL05***	**DL06***
Built-In PLC Pulse Outputs	1 axis pulse output included with the PLC base unit.		
Maximum Pulse Rate Output	7,000 pulses/sec		10,000 pulses/sec
Target Pulse Range	-8,388,608 to +8,388,607 pulses		
Minimum Velocity	40 pulses/sec		
Velocity Resolution	10 pulses/sec		
Accel/Decel Range	0.1 to 10 sec		
Position Control	Trapezoidal Profiles		
Velocity Control	Velocity Levels		
I/O Modules Pulse Outputs	Not Applicable for DL105	**H0-CTRIO (1 axis per module)**	
Maximum Pulse Rate Output		25,000 pulses/sec	
Target Pulse Range		+ / – 2.1 billion pulses (31 bits plus sign)	
Minimum Velocity		40 pulses/sec	
Velocity Resolution		10 pulses/sec	
Accel/Decel Range		0.1 to 10 sec	
Position Control		Trapezoidal Profiles (linear & S-curve ramps)	
Velocity Control		Dynamic Velocity (controlled accel/decel)	
Maximum Number of Modules		1	4

** Any AutomationDirect PLC capable of RS-232 ASCII communication can write serial commands to the SureStep Advanced Microstepping Drives (STP-DRV-4850 & -80100). These PLCs include DirectLOGIC series DL 05, 06, 250-1, 260, 350, & 450, as well as CLICK, Do-more and P3000 series. However, we strongly recommend using DL06, DL260, Do-more, CLICK, or Productivity3000 PLCs for serial commands due to their more advanced ASCII instruction set which includes PRINTV and VPRINT commands.*

*** When using DC output models only. *** When using either DC output model or H0-CTRIO option module.*

Motion Control with AutomationDirect PLCs* and SureStep™ Stepping Systems				
1–16 axis control depending on base size and power supply budget **				
PLC Series	*CPUs starting at $230.00*		*CPUs starting at $299.00*	
	DL205*		**Do-more**	
I/O Modules Pulse Outputs	**D2-CTRINT (1 axis per module)**	**H2-CTRIO (2 axes)**	**T1H-CTRIO (2 axes per module)**	**H2-CTRIO2 (2 axes)**
Maximum Pulse Rate Output	5,000 pulses/sec	25,000 pulses/sec	25,000 pulses/sec	250,000 pulses/sec
Target Pulse Range	-8,388,608 to +8,388,607 pulse	+ / - 2.1 billion pulses		
Minimum Velocity	40 pulses/sec	25 pulses/sec		
Velocity Resolution	10 pulses/sec	1 pulse/sec		
Accel/Decel Range	0.1 to 10 sec			
Position Control	Trapezoidal Profiles (linear and S-curve ramps)			
Velocity Control	Dynamic Velocity (controlled accel/decel)			
Maximum Number of Modules	1	1-8		

** Any AutomationDirect PLC capable of RS-232 ASCII communication can write serial commands to the SureStep Advanced Microstepping Drives (STP-DRV-4850 & -80100). These PLCs include DirectLOGIC series DL 05, 06, 250-1, 260, 350, & 450, as well as CLICK, Do-more and P3000 series. However, we strongly recommend using DL06, DL260, Do-more, CLICK, or Productivity3000 PLCs for serial commands due to their more advanced ASCII instruction set which includes PRINTV and VPRINT commands. ** Using D2-CTRINT or Hx-CTRIO modules.*

SureStep® Stepping Systems with PLCs

Controller Compatibility (continued)

Motion Control with PC-based Control and Sure Step® Stepping Systems			
*1–16 axis control depending on base size and power supply budget **			
Controller Series	PC-based motion control with Think & Do on your **Windows PC**		
I/O Modules Pulse Outputs	**H2-CTRIO (2 axes per module)**	**T1H-CTRIO (2 axes per module)**	**H2-CTRIO2 (2 axes)**
Maximum Pulse Rate Output	25,000 pulses/sec	25,000 pulses/sec	250,000 pulses/sec
Target Pulse Range	+ / - 2.1 billion pulses		
Minimum Velocity	25 pulses/sec		
Velocity Resolution	1 pulse/sec		
Accel/Decel Range	0.1 to 10 sec		
Position Control	Trapezoidal Profiles (linear and S-curve ramps)		
Velocity Control	Dynamic Velocity (controlled accel/decel)		
Maximum Number of Modules	1-8		
** Using Hx-CTRIO modules*			

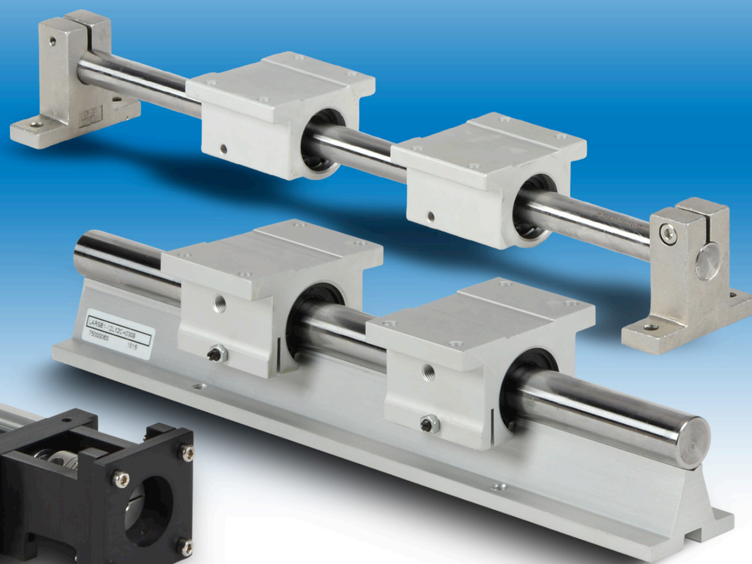
Linear Motion Slides and Components

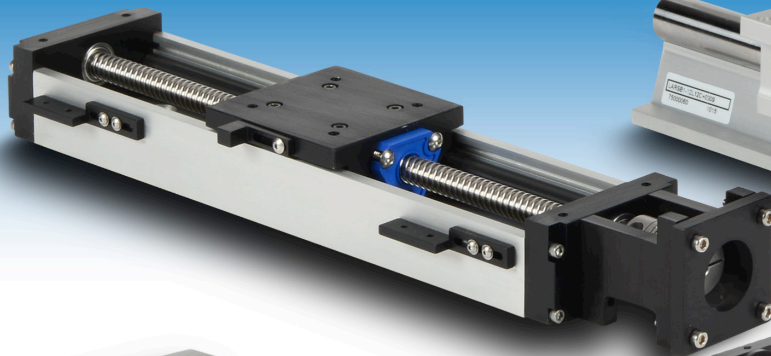
The three SureMotion families of linear slide actuators easily mate to SureStep motors and other NEMA motors. Everything you need to mount your SureStep motor is included!

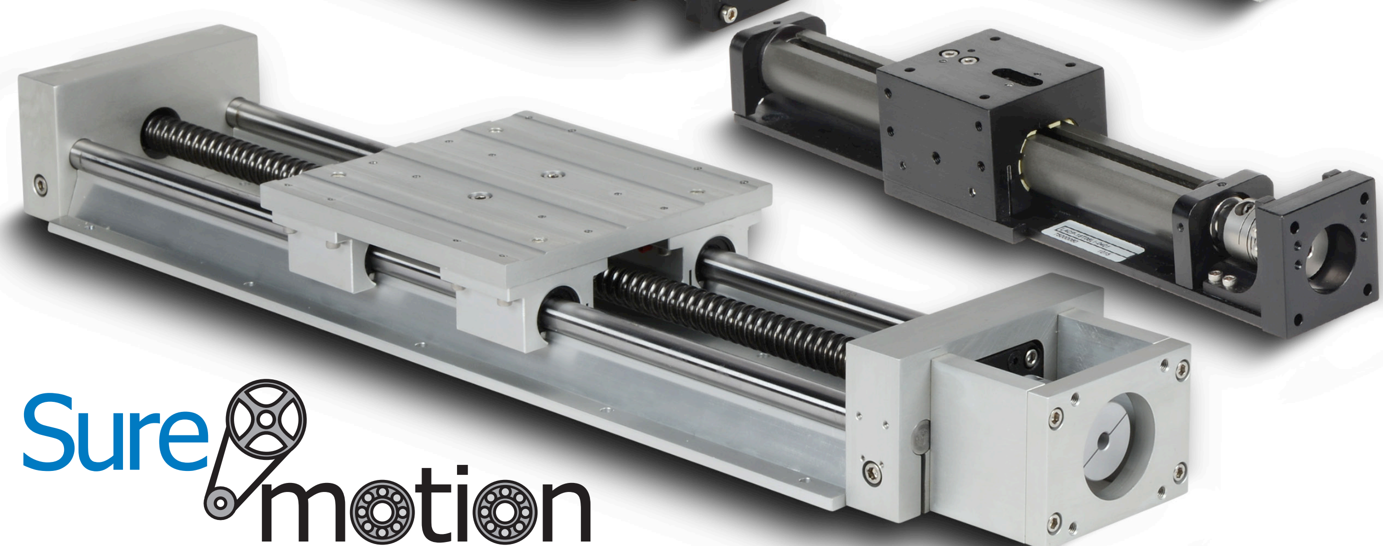
These units are an excellent solution for many applications such as pick and place, packaging, assembly automation and other motion control operations.

18 models, with travels from 6 to 36 inches

Ready to mount NEMA 17, 23 or 34 motors





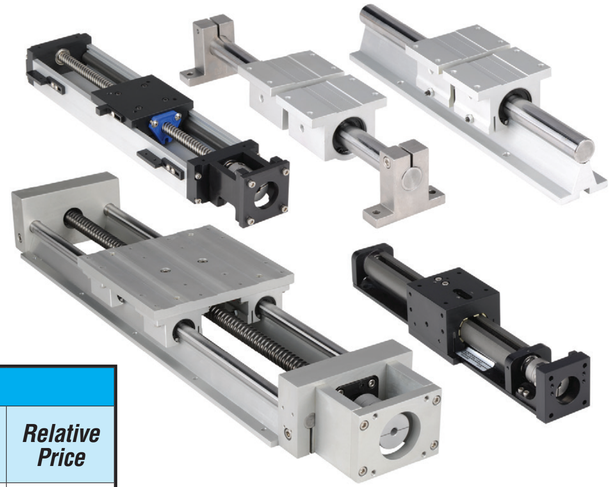


Sliding components in a range of sizes to help you build larger sliding assemblies

SureMotion

Linear Motion Products

Product Overview



Actuator Overview

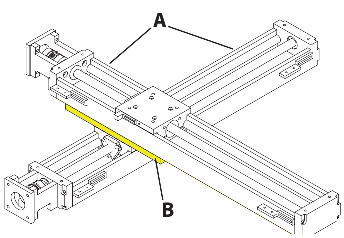
SureMotion linear motion offers both motor-ready actuator assemblies, and a nice assortment of sliding components and accessories to provide a wide variety of motion control solutions.

Linear Slide Actuator Comparisons

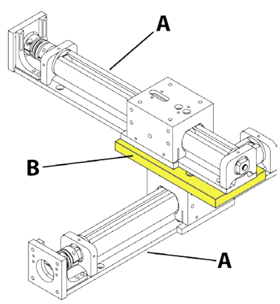
Actuator Series Comparisons						
Actuator Series	Actuator Type	Drive Type	Max Load Capacity (lb)	Max Speed (in/s)	Travel (in)	Relative Price
LARSD2	Twin Round Shaft	Ball Screw	920	6	12, 24	$$$$
LACP	Compact Slide	Lead Screw	125	20	6, 12, 24, 36	$$
LAVL	Value Slide	Lead Screw	110	15	6, 12, 18, 24	$

Available Multi-Axis Configurations

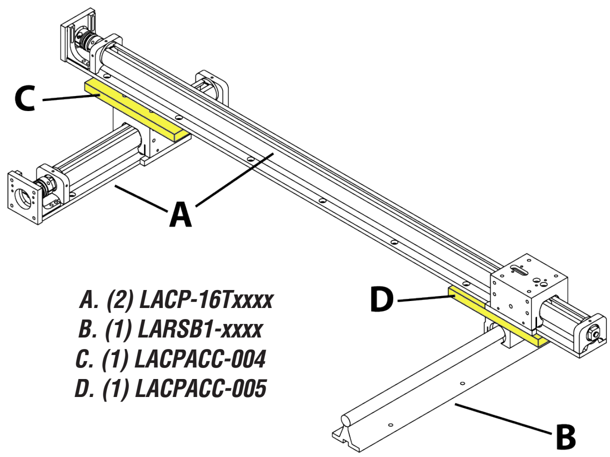
X-Y Axis Configurations



A. (2) LAVL-60Txxxx
B. (1) LAVLACC-004

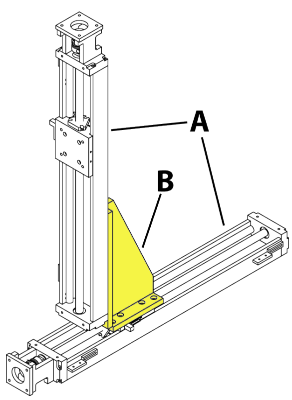


A. (2) LACP-16Txxxx
B. (1) LACPACC-004



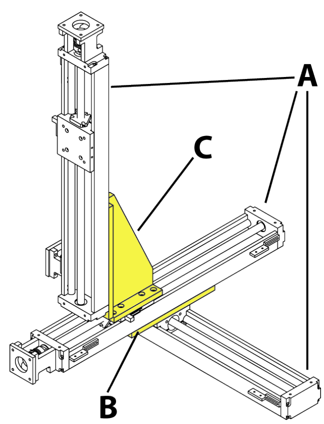
A. (2) LACP-16Txxxx
B. (1) LARSB1-xxxx
C. (1) LACPACC-004
D. (1) LACPACC-005

X-Z Axis Configuration



A. (2) LAVL-60Txxxx
B. (1) LAVLACC-005

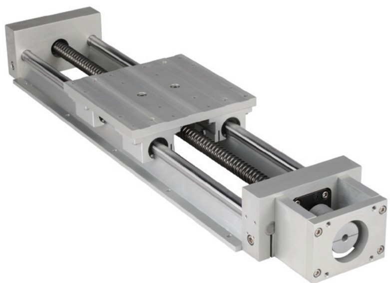
X-Y-Z Axis Configuration



A. (3) LAVL-60Txxxx
B. (1) LAVLACC-004
C. (1) LAVLACC-005

Linear Motion Products

Twin Round Shaft Slide Actuators



LARSD2-08T12BP2C

Description

Continuously-supported round rail slide with ball screw actuation provides a very robust precision linear motion. Units are complete except for a drive motor.

Features

- High-accuracy ball screw
- Continuously-supported guide rails
- Replacement components available
- Ready for NEMA 23 motor
- AISI 1566 Carbon Steel, 60 RC Round Shafts
- AISI 1045 Carbon Steel , 56 RC Ball Screw

Applications

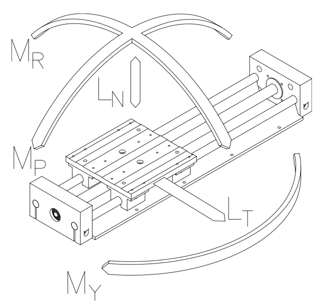
- Positioning systems
- Heavy loads

Twin Round Shaft Slide Actuator Specifications									
Part Number	Price	Drive Type	Drive Pitch	Drive Screw Efficiency (%)	Payload Inertia Factor (in^2)	Constant System Inertia (lb_m-in^2)	Travel	Weight (lb)	Fits Motor
LARSD2-08T12BP2C	$2,399.00	Ball screw	0.2 in	90	0.001	0.11	12in	10.5	NEMA 23
LARSD2-08T24BP2C	$2,589.00					0.16	24in	14.0	

System Inertia Calculation:

To calculate the inertia reflected to the motor in a particular actuator, multiply the carriage payload by the payload inertia factor and then add the constant system inertia value for that actuator. The constant system inertia value for each system includes the inertia of the shaft coupler, carriage, and lead/ball screw.

- The payload must be in units of lb_m.



Load rating diagram

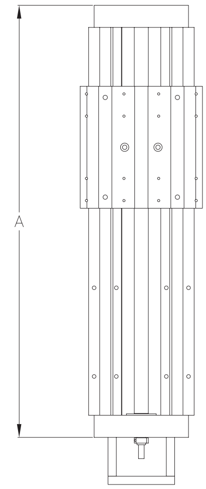
Twin Round Shaft Slide Actuator Load/Moment Ratings							
Part Number	Load (lb)				Moment (lb·in)		
	Actuator Thrust	Normal – L_N		Transverse	Roll	Pitch	Yaw
		Down	Up	L_T	M_R	M_P	M_Y
LARSD2-08TxxBP2C	200	920	644	920	1046	1210	1730

SureMotion

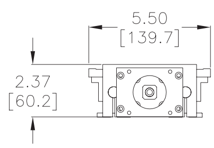
Linear Motion Products

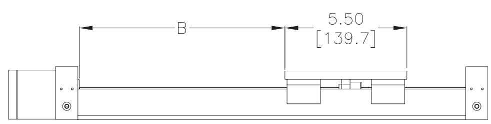
Twin Round Shaft Slide Actuators

Dimensions (in [mm])



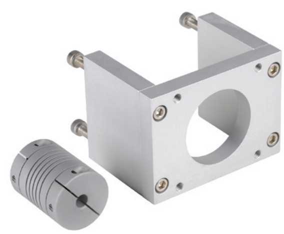
PART NUMBER	A	B (TRAVEL)
LARSD2–08T12BP2C	19.50 [495.3]	12.00 [304.9]
LARSD2–08T24BP2C	31.5 [800.1]	24.00 [609.8]





LARSD2-08TxxBP2C

See our website www.AutomationDirect.com for complete Engineering drawings.



Accessories

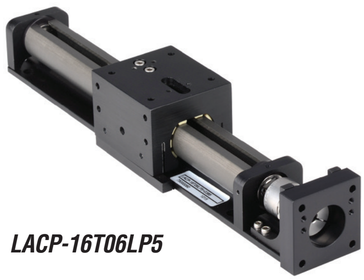
LARSACC-015(16)

LARSACC-013(014)

Twin Round Shaft Slide Actuator Accessories			
Part Number	***Price***	***Description***	***Weight (lb)***
LARSACC-010	$24.00	SureMotion linear ball bushing, open type, 1/2 inch inside diameter, with seals, self-aligning.	0.5
LARSACC-013*	$639.00	SureMotion repair kit, for use with LARSD2-08T12BP2C actuators. Ballscrew, ballnut, end bearings and grease tube included.	3.0
LARSACC-014*	$849.00	SureMotion repair kit, for use with LARSD2-08T24BP2C actuators. Ballscrew, ballnut, end bearings and grease tube included.	5.0
LARSACC-015*	$239.00	SureMotion motor adapter, NEMA 23 frame. For use with LARSD2-08 series actuators. 1/4 x 1/4 inch coupler included.	1.0
LARSACC-016*	$289.00	SureMotion motor adapter, NEMA 34 frame. For use with LARSD2-08 series actuators. 1/2 x 1/4 inch coupler included.	1.0
**** Repair kits and NEMA 23/34 motor adapter contain replacement components that are the same as the original components in the actuator assemblies.***			

Linear Motion Products

Compact Slide Actuators



LACP-16T06LP5

Description

Self-contained linear actuator designed for light loads in harsh or wet conditions in a very small package. A stainless steel lead screw is embedded in a hard-coated aluminum shaft specially machined to match sliding elements.

Features

- Compact design
- Replacement components available
- Ready for NEMA 17 motor
- End-of-travel switch mounts
- AISI 6061-T6 Aluminum Alloy, Hard Anodized Slide Shaft. Hard Anodizing Depth .0005 - .004, 60 - 65 RC
- AISI 303 Stainless Steel Lead Screw

Applications

- Space-limiting applications
- Harsh or wet environments
- Light loads
- Speeds up to 20 inches per second

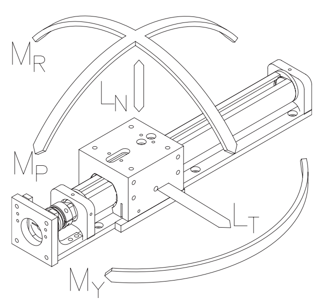
Compact Slide Actuator Specifications

Part Number	Price	Drive Type	Drive Pitch	Drive Screw Efficiency (%)	Payload Inertia Factor (in^2)	Constant System Inertia (lb_m-in^2)	Travel	Weight (lb)	Fits Motor
LACP-16T06LP5	$1,129.00	Lead screw	0.5 in	80	0.0063	0.018	6in	1.8	NEMA 17
LACP-16T12LP5	$1,189.00					0.02	12in	2.3	
LACP-16T24LP5	$1,569.00					0.023	24in	3.5	
LACP-16T36LP5	$1,869.00					0.026	36in	4.5	
LACP-16T06L1	$1,129.00		1in	81	0.025	0.032	6in	1.8	
LACP-16T12L1	$1,189.00					0.034	12in	2.3	
LACP-16T24L1	$1,569.00					0.037	24in	3.5	
LACP-16T36L1	$1,869.00					0.04	36in	4.5	

System Inertia Calculation:

To calculate the inertia reflected to the motor in a particular actuator, multiply the carriage payload by the payload inertia factor and then add the constant system inertia value for that actuator. The constant system inertia value for each system includes the inertia of the shaft coupler, carriage, and lead/ball screw.

- The payload must be in units of lb_m.



Load rating diagram

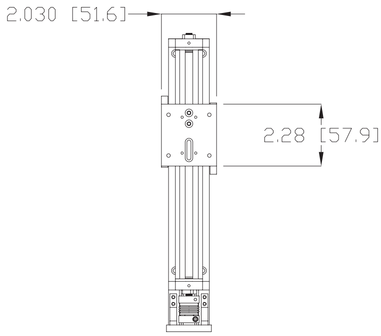
Compact Slide Actuator Load/Moment Ratings

Part Number	Load (lb)				Moment (lb·in)		
	Actuator Thrust	Normal – L_N		Transverse	Roll	Pitch	Yaw
		Down	Up	L_T	M_R	M_P	M_Y
LACP-16TxxLP5	51	125	60	125	12	15	33
LACP-16TxxL1	28	125	60	125	12	15	33

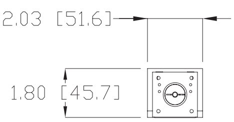
Linear Motion Products

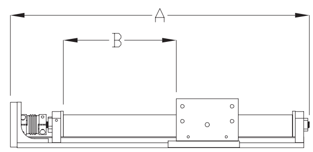
Compact Slide Actuators

Dimensions (in [mm])



PART NUMBER	A	B (TRAVEL)
LACP-16T06LP5	11.20 [284.5]	6.20 [157.5]
LACP-16T12LP5	17.20 [436.9]	12.20 [309.9]
LACP-16T24LP5	29.20 [741.7]	24.20 [614.7]
LACP-16T36LP5	41.20 [1046.5]	36.20 [919.5]
LACP-16T06L1	11.20 [284.5]	6.20 [157.5]
LACP-16T12L1	17.20 [436.9]	12.20 [309.9]
LACP-16T24L1	29.20 [741.7]	24.20 [614.7]
LACP-16T36L1	41.20 [1046.5]	36.20 [919.5]





LACP-16TxxLxx

See our website www.AutomationDirect.com for complete Engineering drawings.

Accessories

LACPACC-001

LACPACC-002(003)

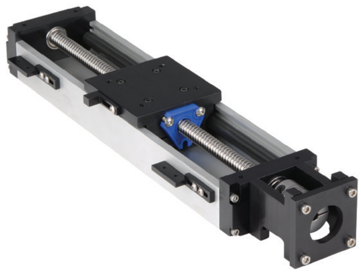
LACPACC-004(005)

Compact Slide Actuator Accessories			
Part Number	***Price***	***Description***	***Weight (lb)***
LACPACC-001	$355.00	SureMotion motor adapter, NEMA 23 frame. For use with LACP-16 series actuators. 1/4 inch x 4mm coupler included.	0.5
LACPACC-002*	$650.00	SureMotion repair kit, for use with LACP-16TxxLP5 actuators. Nut, bushings, end bearings and oil syringe included.	0.5
LACPACC-003*	$650.00	SureMotion repair kit, for use with LACP-16TxxL1 actuators. Nut, bushings, end bearings and oil syringe included.	0.5
LACPACC-004	$73.00	SureMotion mounting plate, XY type. For use with LACP-16 series actuators.	0.5
LACPACC-005	$94.00	SureMotion mounting plate, XY type. For use with LACP-16 and LARSB1 series actuators.	0.5

**** Repair kits contain replacement components that are the same as the original components in the actuator assemblies.***

Linear Motion Products

Value Linear Slide Actuators



LAVL-60T06LP2

Description

Low-cost linear actuator using the latest in sliding element technology; hard-coated aluminum guide shafts. This versatile unit can be mounted horizontally, vertically, or inverted without loss of load capacity.

Features

- Small footprint
- Adjustable carriage pre-load
- Hard-coated aluminum slides
- Replacement components available
- Ready for NEMA 17 motor
- End-of-travel switch mounts
- AISI 6061-T6 Aluminum Alloy, Hard Anodized Slide Shaft. Hard Anodizing Depth .0005 - .004, 60 - 65 RC
- AISI 304 Stainless Steel Lead Screw

Applications

- Harsh or wet environments
- X-Y-Z positioning systems

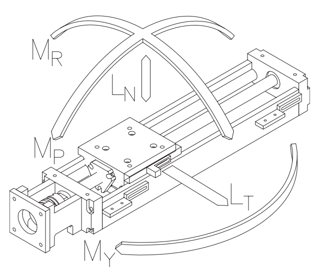
Value Linear Slide Actuator Specifications

Part Number	Price	Drive Type	Drive Pitch	Drive Screw Efficiency (%)	Payload Inertia Factor (in^2)	Constant System Inertia (lb_m-in^2)	Travel	Weight (lb)	Fits Motor
LAVL-60T06LP2	$789.00	Lead screw	0.2 in	56	0.001	0.017	6in	2.0	NEMA 17
LAVL-60T12LP2	$989.00					0.02	12in	2.8	
LAVL-60T18LP2	$1,199.00					0.024	18in	3.5	
LAVL-60T24LP2	$1,399.00				0.0063	0.027	24in	4.2	
LAVL-60T06LP5	$789.00		0.5 in	71	0.0063	0.02	6in	2.0	
LAVL-60T12LP5	$989.00					0.023	12in	2.8	
LAVL-60T18LP5	$1,199.00					0.026	18in	3.5	
LAVL-60T24LP5	$1,399.00					0.03	24in	4.2	

System Inertia Calculation:

To calculate the inertia reflected to the motor in a particular actuator, multiply the carriage payload by the payload inertia factor and then add the constant system inertia value for that actuator. The constant system inertia value for each system includes the inertia of the shaft coupler, carriage, and lead/ball screw.

- The payload must be in units of lb_m.



Load rating diagram

Value Linear Slide Actuator Load/Moment Ratings

Part Number	Load (lb)				Moment (lb·in)		
	Actuator Thrust	Normal – L_N		Transverse	Roll	Pitch	Yaw
		Down	Up	L_T	M_R	M_P	M_Y
LAVL-60TxxLP2	70	110	110	110	50	32	32
LAVL-60TxxLP5	50	110	110	110	50	32	32

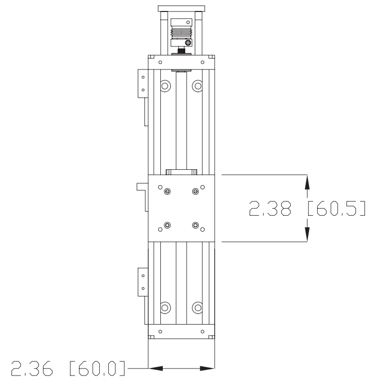
SureMotion

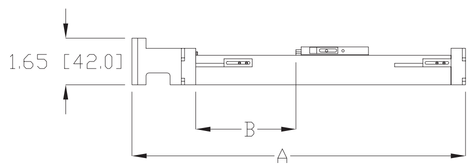
Linear Motion Products

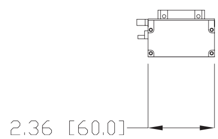
Value Linear Slide Actuators

Dimensions (in [mm])

PART NUMBER	A	B (TRAVEL)
LAVL–60T06LP2	11.82 [300.3]	6.00 [152.4]
LAVL–60T12LP2	17.82 [452.8]	12.00 [304.8]
LAVL–60T18LP2	23.82 [605.3]	18.00 [457.2]
LAVL–60T24LP2	29.82 [757.7]	24.00 [609.6]
LAVL–60T06LP5	11.82 [300.3]	6.00 [152.4]
LAVL–60T12LP5	17.82 [452.8]	12.00 [304.8]
LAVL–60T18LP5	23.82 [605.3]	18.00 [457.2]
LAVL–60T24LP5	29.82 [757.7]	24.00 [609.6]





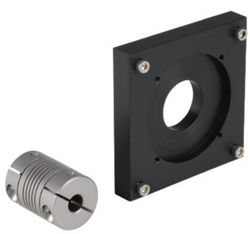


LAVL-60TxxLPx

See our website www.AutomationDirect.com for complete Engineering drawings.

Accessories

LAVLACC-005



LAVLACC-003

LAVLACC-001(002)

LAVLACC-004

Value Linear Slide Actuator Accessories

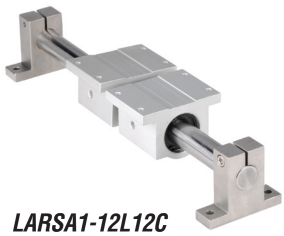
Part Number	*Price*	*Description*	*Weight (lb)*
LAVLACC-001*	$289.00	SureMotion repair kit, for use with LAVL-60TxxLP2 actuators. Nut, bushings, end bearings and oil syringe included.	0.5
LAVLACC-002*	$289.00	SureMotion repair kit, for use with LAVL-60TxxLP5 actuators. Nut, bushings, end bearings and oil syringe included.	0.5
LAVLACC-003	$239.00	SureMotion motor adapter, NEMA 23 frame. For use with LAVL-60 series actuators. 1/4 inch x 5 mm coupler included.	1.0
LAVLACC-004	$112.00	SureMotion mounting plate, XY type. For use with LAVL-60 series actuators.	0.5
LAVLACC-005	$252.00	SureMotion mounting plate, XZ type. For use with LAVL-60 series actuators.	1.0

**** Repair kits contain replacement components that are the same as the original components in the actuator assemblies.***

SureMotion

Linear Motion Products

Round-Shaft Slide Elements



LARSA1-12L12C

LARSB1-12L12C

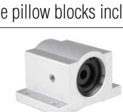
Description

Round-shaft sliding elements can be combined with other elements to build a huge variety of machine mechanisms. Available in both end- and continuously-supported shafts.

Features

- Linear ball bearings
- High quality clear anodized aluminum blocks
- AISI 1566 Carbon Steel, 60 RC Round Shafts

Slide Rail Systems Load Ratings			
Part Number	Normal (lb)		Transverse (lb)
	Down	Up	
Pillow Blocks / Bushings for LARSA1			
LARSACC-001/007	230		
LARSACC-002/008	470		
LARSACC-003/009	850		
LARSA1 Linear Slide Assemblies			
LARSA1-08LxxC	460		
LARSA1-12LxxC	940		
LARSA1-16LxxC	1700		
Pillow Blocks / Bushings for LARSB1			
LARSACC-004/010	230	161	230
LARSACC-005/011	470	268	470
LARSACC-006/012	850	485	850
LARSB1 Linear Slide Assemblies			
LARSB1-08LxxC	460	322	460
LARSB1-12LxxC	940	536	940
LARSB1-16LxxC	1700	970	1700

End-Supported Slide Rail Systems and Accessories			
Part Number	Price	Description	Weight (lb)
LARSA1-08L12C	$269.00	SureMotion, linear slide assembly, end supported, round shaft, 1/2 in diameter, 12 inch length, carbon steel. (2) single pillow blocks included.	1.5
LARSA1-08L24C	$279.00	SureMotion, linear slide assembly, end supported, round shaft, 1/2 in diameter, 24 inch length, carbon steel. (2) single pillow blocks included.	2.0
LARSA1-08L36C	$299.00	SureMotion, linear slide assembly, end supported, round shaft, 1/2 in diameter, 36 inch length, carbon steel. (2) single pillow blocks included.	2.7
LARSA1-12L12C	$339.00	SureMotion, linear slide assembly, end supported, round shaft, 3/4 in diameter, 12 inch length, carbon steel. (2) single pillow blocks included.	3.0
LARSA1-12L24C	$359.00	SureMotion, linear slide assembly, end supported, round shaft, 3/4 in diameter, 24 inch length, carbon steel. (2) single pillow blocks included.	4.5
LARSA1-12L36C	$379.00	SureMotion, linear slide assembly, end supported, round shaft, 3/4 in diameter, 36 inch length, carbon steel. (2) single pillow blocks included.	6.0
LARSA1-16L12C	$454.00	SureMotion, linear slide assembly, end supported, round shaft, 1 in diameter, 12 inch length, carbon steel. (2) single pillow blocks included.	6.0
LARSA1-16L24C	$484.00	SureMotion, linear slide assembly, end supported, round shaft, 1 in diameter, 24 inch length, carbon steel. (2) single pillow blocks included.	8.5
LARSA1-16L36C	$509.00	SureMotion, linear slide assembly, end supported, round shaft, 1 in diameter, 36 inch length, carbon steel. (2) single pillow blocks included.	11.0
LARSACC-001*	$55.00	SureMotion single pillow block, closed type, linear ball bushing, 1/2 in inside diameter. 	0.5
LARSACC-002*	$67.00	SureMotion single pillow block, closed type, linear ball bushing, 3/4 in inside diameter.	1.0
LARSACC-003*	$96.00	SureMotion single pillow block, closed type, linear ball bushing, 1 in inside diameter.	1.5
LARSACC-007*	$20.00	SureMotion linear ball bushing, closed type, 1/2 in inside diameter, with seals, self-aligning. 	0.5
LARSACC-008*	$24.00	SureMotion linear ball bushing, closed type, 3/4 in inside diameter, with seals, self-aligning.	0.5
LARSACC-009*	$39.00	SureMotion linear ball bushing, closed type, 1 in inside diameter, with seals, self-aligning.	0.5
Continuously-Supported Slide Rail Systems and Accessories			
LARSB1-08L12C	$279.00	SureMotion, linear slide assembly, continuously supported, round shaft, 1/2 in diameter, 12 in length, carbon steel. (2) single pillow blocks included.	2.0
LARSB1-08L24C	$347.00	SureMotion, linear slide assembly, continuously supported, round shaft, 1/2 in diameter, 24 in length, carbon steel. (2) single pillow blocks included.	3.0
LARSB1-08L36C	$431.00	SureMotion, linear slide assembly, continuously supported, round shaft, 1/2 in diameter, 36 in length, carbon steel. (2) single pillow blocks included.	4.5
LARSB1-12L12C	$348.00	SureMotion, linear slide assembly, continuously supported, round shaft, 3/4 in diameter, 12 in length, carbon steel. (2) single pillow blocks included.	4.0
LARSB1-12L24C	$454.00	SureMotion, linear slide assembly, continuously supported, round shaft, 3/4 in diameter, 24 in length, carbon steel. (2) single pillow blocks included.	6.2
LARSB1-12L36C	$556.00	SureMotion, linear slide assembly, continuously supported, round shaft, 3/4 in diameter, 36 in length, carbon steel. (2) single pillow blocks included.	9.0
LARSB1-16L12C	$451.00	SureMotion, linear slide assembly, continuously supported, round shaft, 1 in diameter, 12 in length, carbon steel. (2) single pillow blocks included.	6.5
LARSB1-16L24C	$583.00	SureMotion, linear slide assembly, continuously supported, round shaft, 1 in diameter, 24 in length, carbon steel. (2) single pillow blocks included.	10.5
LARSB1-16L36C	$703.00	SureMotion, linear slide assembly, continuously supported, round shaft, 1 in diameter, 36 in length, carbon steel. (2) single pillow blocks included.	14.5
LARSACC-004*	$58.00	SureMotion single pillow block, open type, linear ball bushing, 1/2 in inside diameter. 	0.5
LARSACC-005*	$74.00	SureMotion single pillow block, open type, linear ball bushing, 3/4 in inside diameter.	1.0
LARSACC-006*	$103.00	SureMotion single pillow block, open type, linear ball bushing, 1 in inside diameter.	1.5
LARSACC-010*	$24.00	SureMotion linear ball bushing, open type, 1/2 in inside diameter, with seals, self-aligning. 	0.5
LARSACC-011*	$30.00	SureMotion linear ball bushing, open type, 3/4 in inside diameter, with seals, self-aligning.	0.5
LARSACC-012*	$51.00	SureMotion linear ball bushing, open type, 1 in inside diameter, with seals, self-aligning.	0.5

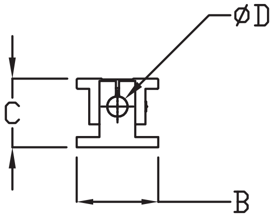
* Bushings and pillow blocks are replacement components that are the same as the original components in the slide assemblies.

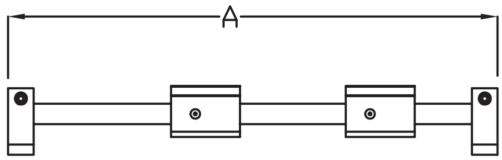
SureMotion

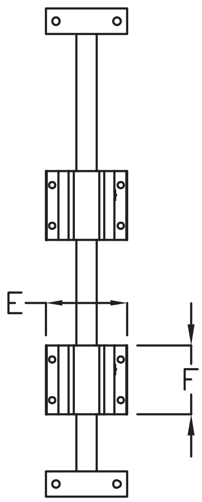
Linear Motion Products

Round-Shaft Slide Elements

Dimensions (in [mm])







PART #	A	B	C	ØD	E	F
LARSA1-08L12C	12.0 [304.8]					
LARSA1-08L24C	24.0 [609.6]	2.00 [50.8]	1.70 [42.9]	0.50 [12.7]	2.00 [50.8]	1.69 [42.9]
LARSA1-08L36C	36.0 [914.4]					
LARSA1-12L12C	12.0 [304.8]					
LARSA1-12L24C	24.0 [609.6]	2.50 [63.5]	2.19 [55.6]	0.75 [19.0]	2.75 [69.9]	2.06 [52.4]
LARSA1-12L36C	36.0 [914.4]					
LARSA1-16L12C	12.0 [304.8]					
LARSA1-16L24C	24.0 [609.6]	3.06 [77.8]	2.69 [68.3]	1.00 [25.4]	3.25 [82.6]	2.81 [71.5]
LARSA1-16L36C	36.0 [914.4]					
LARSB1-08L12C*	12.0 [304.8]					
LARSB1-08L24C*	24.0 [609.6]	1.50 [38.1]	1.81 [46.0]	0.50 [12.7]	2.00 [50.8]	1.50 [38.1]
LARSB1-08L36C*	36.0 [914.4]					
LARSB1-12L12C*	12.0 [304.8]					
LARSB1-12L24C*	24.0 [609.6]	1.75 [44.5]	2.44 [61.9]	0.75 [19.0]	2.75 [69.9]	1.88 [47.6]
LARSB1-12L36C*	36.0 [914.4]					
LARSB1-16L12C*	12.0 [304.8]					
LARSB1-16L24C*	24.0 [609.6]	2.13 [54.0]	2.94 [74.6]	1.00 [25.4]	3.25 [82.6]	2.63 [66.7]
LARSB1-16L36C*	36.0 [914.4]					
***LARSA1-xxLxxC is shown in drawing. LARSB1-xxLxxC has different appearance, but same dimensions as shown in this table.**						

LARSA1-xxLxxC
& LARSB1-xxLxxC*

See our website www.AutomationDirect.com for complete Engineering drawings.

NEMA Planetary Gearboxes

The SureGear PGCN series easily mates to SureStep motors, and other NEMA frame motors. Everything you need to mount your SureStep motor is included!

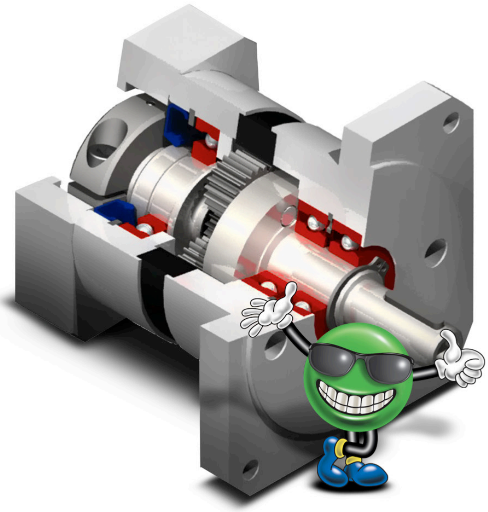
It is the perfect solution for applications such as material handling, pick and place, automation, packaging, and other motion control applications requiring a NEMA input/output interface.

Precision Gearboxes for Stepper Motors

15 models, five gear ratios available in NEMA 17, 23 and 34 frame sizes

SureGear®

Tough on the outside, precision quality on the inside



Planetary Gearboxes for NEMA Motors

SureGear® Planetary Gear Reducers for NEMA Motors – Overview

The SureGear PGCN series is a great gearbox (gear reducer) value for servo, stepper, and other motion control applications requiring a NEMA size input/output interface. It offers the best quality available for the price point.

Features

- Wide range of ratios (5, 10, 25, 50, and 100:1)
- Low backlash of 30 arc-min or less
- 20,000 hour service life
- Maintenance free; requires no additional lubrication
- NEMA sizes 17, 23, and 34
- Includes hardware for mounting to SureStep stepper motors
- Optional shaft bushings available for mounting to other motors

Applications

- Material handling
- Pick and place
- Automation
- Packaging
- Other motion control applications requiring a NEMA input/output

SureGear® NEMA Planetary Gearboxes

Model-Specific Specifications

Part Number	Price	Ratio	NEMA Frame Size	Nominal Output Torque (N·m [lb·in])	Maximum Acceleration Torque (N·m [lb·in])	Emergency Stop Torque (N·m [lb·in])	Standard Output Backlash (arc-min)	Allowable Radial Load (N [lb])	Allowable Axial Load (N [lb])	Torsional Stiffness (N·m/arc-min [lb·in/arc-min])	Mass Moment of Ingertia (kg-cm² [lb-in²])	Efficiency (%)	Approx Weight (kg [lb])	Fits SureStep Stepper Motor
PGCN17-055M	$209.00	5:1		6.5 [58]	13 [115]	26 [230]	<25			0.8 [7.5]	0.0096 [0.003]	94	0.45 [1.0]	
PGCN17-105M	$214.00	10:1		5.0 [44]	10 [89]	20 [177]	<25			0.5 [4.4]	0.0078 [0.003]	94	0.45 [1.0]	
PGCN17-255M	$267.00	25:1	17	16 [142]	20 [177]	32 [283]	<30			0.8 [7.5]	0.0096 [0.003]	92	0.55 [1.2]	STP-MTR-170xx(D)
PGCN17-505M	$267.00	50:1		16 [142]	20 [177]	32 [283]	<30			0.8 [7.5]	0.0078 [0.003]	92	0.55 [1.2]	
PGCN17-1005M	$267.00	100:1		5.0 [44]	10 [89]	20 [177]	<30	361 [81]	298 [67]	0.5 [4.4]	0.0078 [0.003]	92	0.55 [1.2]	
PGCN23-0525	$285.00	5:1		6.5 [58]	13 [115]	26 [230]	<20			0.9 [8.0]		94	0.45 [1.0]	
PGCN23-1025	$285.00	10:1		5.0 [44]	10 [89]	20 [177]	<20			0.6 [5.3]		94	0.45 [1.0]	
PGCN23-2525	$310.00	25:1	23	16 [142]	20 [177]	32 [283]	<25			0.9 [8.0]	0.04 [0.014]	92	0.55 [1.2]	STP-MTR(H)-230xx(D)
PGCN23-5025	$310.00	50:1		16 [142]	20 [177]	32 [283]	<25			0.9 [8.0]		92	0.55 [1.2]	
PGCN23-10025	$310.00	100:1		5.0 [44]	10 [89]	20 [177]	<25			0.6 [5.3]		92	0.55 [1.2]	
PGCN34-0550	$335.00	5:1		26 [230]	44 [389]	84 [743]	<15			2.4 [21.2]	0.36 [0.123]	94	1.1 [2.4]	
PGCN34-1050	$335.00	10:1		16 [142]	24 [212]	62 [549]	<15			1.3 [11.5]	0.34 [0.116]	94	1.1 [2.4]	
PGCN34-2550	$394.00	25:1	34	42 [372]	52 [460]	84 [743]	<20	476 [107]	425 [96]	2.4 [21.2]	0.36 [0.123]	92	1.4 [3.1]	STP-MTR(H)-34xxx(D)
PGCN34-5050	$394.00	50:1		42 [372]	52 [460]	84 [743]	<20			2.4 [21.2]	0.34 [0.116]	92	1.4 [3.1]	
PGCN34-10050	$394.00	100:1		16 [142]	24 [212]	62 [549]	<20			1.3 [11.5]	0.34 [0.116]	92	1.4 [3.1]	

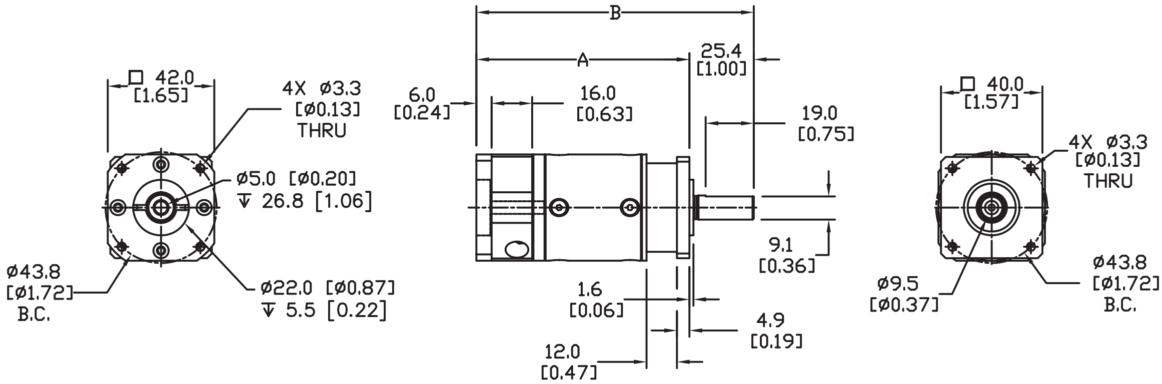
Specifications Applicable to All PGCN Gearboxes

Nominal Speed (rpm)	3500
Maximum Input Speed (rpm)	6000
Mounting Orientation	can be mounted in any orientation
Environmental Rating	IP64
Operating Temperature	-20 to 90 °C [-4 to 194 °F]
Lubrication	Mineral Grease EPO
Service Life (hrs)	>20,000

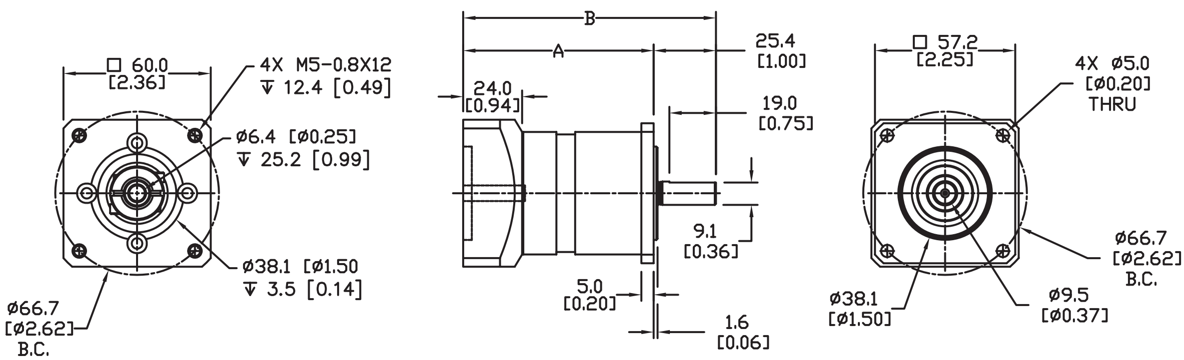
NOTE: SureGear PGCN gearboxes (gear reducers) are not designed for back driving.

SureGear Planetary Gearboxes for NEMA Motors

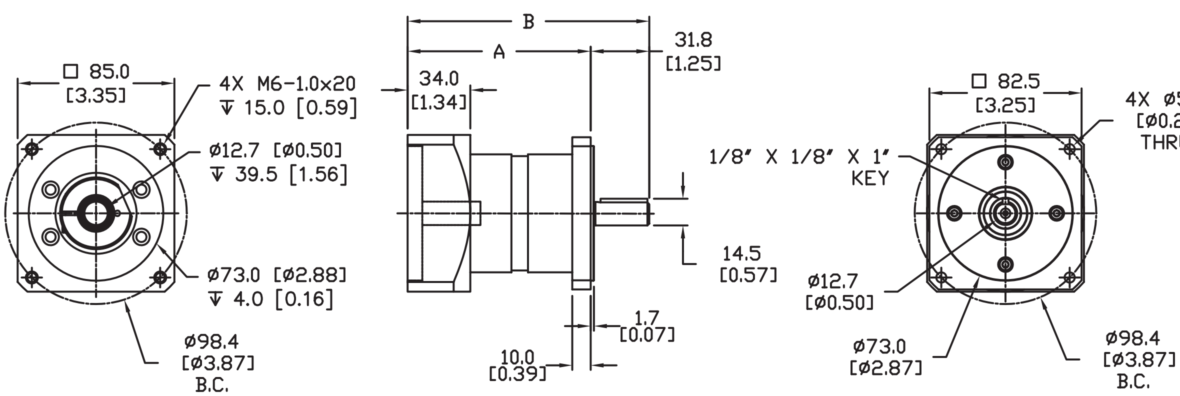
Dimensions (dimensions = mm [in])



PGCN17-xxxx SureGear Dimension Drawing



PGCN23-xxxx SureGear Dimension Drawing



PGCN34-xxxx SureGear Dimension Drawing

SureGear® NEMA Planetary Gearbox Dimensions (dimensions = mm [in])					
NEMA-17 Part Number	***PGCN17-055M***	***PGCN17-105M***	***PGCN17-255M***	***PGCN17-505M***	***PGCN17-1005M***
Dimension A	84.0 [3.31]		99.8 [3.93]		
Dimension B	109.4 [4.31]		125.2 [4.93]		
NEMA-23 Part Number	***PGCN23-0525***	***PGCN23-1025***	***PGCN23-2525***	***PGCN23-5025***	***PGCN23-10025***
Dimension A	77.6 [3.06]		95.2 [3.75]		
Dimension B	103.0 [4.06]		120.6 [4.75]		
NEMA-34 Part Number	***PGCN34-0550***	***PGCN34-1050***	***PGCN34-2550***	***PGCN34-5050***	***PGCN34-10050***
Dimension A	99.3 [3.91]		121.3 [4.78]		
Dimension B	131.1 [5.16]		153.0 [6.02]		

SureGear Planetary Gearboxes for NEMA Motors

Accessories

Typical PGCN Accessory Bushings

Typical PGCN Accessory Screws

SureGear® NEMA Planetary Gearbox Accessories			
Part Number	**Price**	**Description**	**Fits SureGear NEMA Planetary Gearbox**
PGCN17-SK	$3.00	Mounting screws, replacement, for SureGear NEMA size 17 gearboxes (Package of 4)	PGCN17-xxxx
PGCN17-BSH5M	$6.00	Motor shaft bushing for SureGear NEMA size 17 gearboxes, fits 5mm diameter motor shaft	
PGCN17-BSH8M	$6.00	Motor shaft bushing for SureGear NEMA size 17 gearboxes, fits 8mm diameter motor shaft	
PGCN17-BSH9M	$6.00	Motor shaft bushing for SureGear NEMA size 17 gearboxes, fits 9mm diameter motor shaft	
PGCN17-BSH25	$6.00	Motor shaft bushing for SureGear NEMA size 17 gearboxes, fits 1/4 inch diameter motor shaft	
PGCN23-SK	$3.00	Mounting screws, replacement, for SureGear NEMA size 23 gearboxes (Package of 4)	PGCN23-xxxx
PGCN23-BSH8M	$6.00	Motor shaft bushing for SureGear NEMA size 23 gearboxes, fits 8mm diameter motor shaft	
PGCN23-BSH9M	$6.00	Motor shaft bushing for SureGear NEMA size 23 gearboxes, fits 9mm diameter motor shaft	
PGCN23-BSH25	$6.00	Motor shaft bushing for SureGear NEMA size 23 gearboxes, fits 1/4 inch diameter motor shaft	
PGCN23-BSH37	$6.00	Motor shaft bushing for SureGear NEMA size 23 gearboxes, fits 3/8 inch diameter motor shaft	
PGCN34-SK	$3.00	Mounting screws, replacement, for SureGear NEMA size 34 gearboxes (Package of 4)	PGCN34-xxxx
PGCN34-BSH9M	$6.00	Motor shaft bushing for SureGear NEMA size 34 gearboxes, fits 9mm diameter motor shaft	
PGCN34-BSH11M	$6.00	Motor shaft bushing for SureGear NEMA size 34 gearboxes, fits 11mm diameter motor shaft	
PGCN34-BSH37	$6.00	Motor shaft bushing for SureGear NEMA size 34 gearboxes, fits 3/8 inch diameter motor shaft	
PGCN34-BSH50	$6.00	Motor shaft bushing for SureGear NEMA size 34 gearboxes, fits 1/2 inch diameter motor shaft	

SureServo® AC Servo Systems

*Sure*Servo® AC servo systems

The SureServo family of brushless servo systems from AutomationDirect is fully digital and offers a rich set of features at dynamite prices. Choose from eight standard servo motors that are used in combination with one of three standard servo drives.

- Eight standard systems from 100W to 3kW
- Use with any AutomationDirect PLC; or any other host controller
- Drives feature on-board indexer and adaptive tuning modes
- Free setup software
- 30-day money-back guarantee
- Two year warranty

*Sure*Servo family

The SureServo family is designed for flexibility and quick implementation. SureServo drives accept a wide range of command sources:

- Built-in motion controller w/preset position, velocity or torque
- Select presets with switch inputs and/or the multi-drop Modbus serial interface
- Position commands with “pulse and direction” or “count up and down” format
- Analog voltage Velocity or Torque command
- Encoder follower

For configuration, tuning and diagnostics, use the drive’s integrated keypad / display or take advantage of the free SureServo Pro® PC-based software. Tune the system easily with adaptive auto-tuning selections or a manual mode.

Adapt to diverse applications with configurable I/O, including eight digital inputs, five digital outputs, two analog monitors and a scalable encoder output.

Why use a servo?

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

- More torque at higher speeds (up to 5,000 rpm)
- Broader range of power (up to 3kW)
- Higher response with closed-loop control (high hit rate without stalling or lost position)

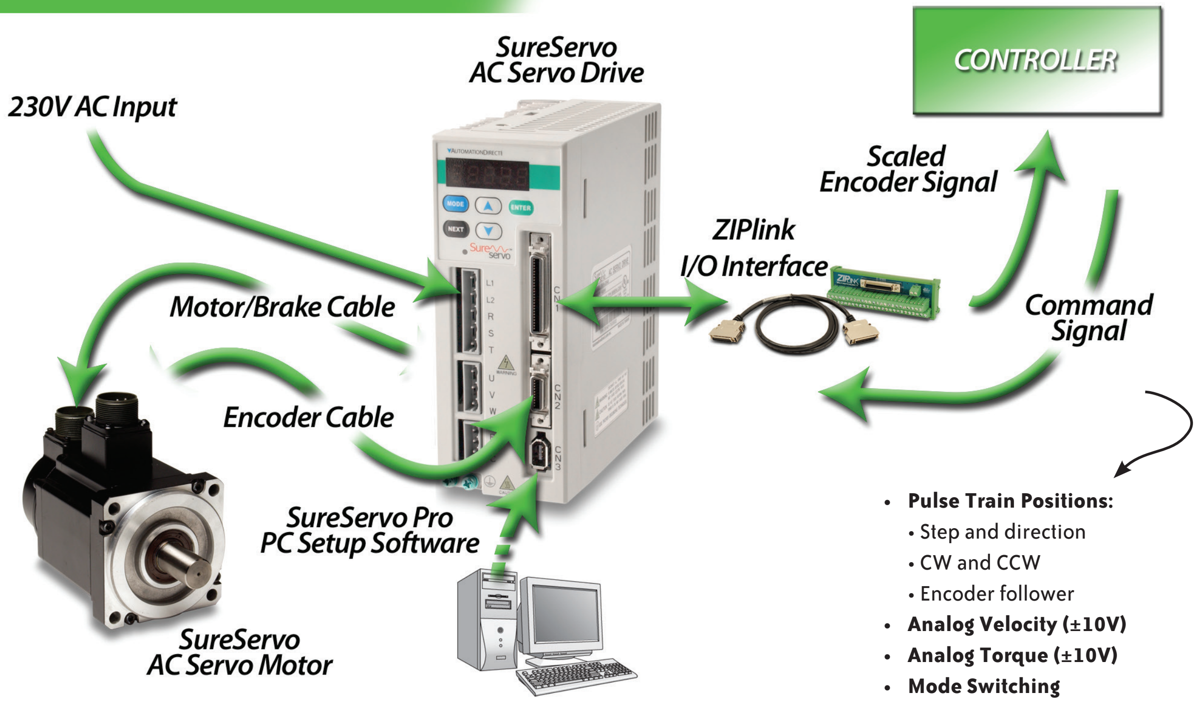
Servo Systems	AutomationDirect Price/Part Number	VS.	Allen-Bradley Price/Part Number
Digital Servo Drive	$488.00 SVA-2040		$1,370.00 2098-DSD-005
100W Servo Motor with connectorized Leads	$325.00 SVL-201		$575.00 TLY-A130T-HK62AA
Breakout Board Kit for CN1 Control Interface	$94.00 ASD-BM-50A		$268.00 2090-U3BK-D4401
10’ Motor Feedback Cable	$49.50 SVC-EFL-010		$91.80 2090-CFBM6DF-CBAA03
10’ Motor Power Cable	$29.50 SVC-PFL-010		$103.00 2090-CPBM6DF-16AA03
Configuration Software	FREE SV-PRO*		$75.00 2098-UWCPRG
Complete 1-axis 100W System	$986.00		$2,482.80

*SureServo Pro software is FREE when downloaded and is also available for $9.00 on a CD

All prices are U.S. list prices, AutomationDirect prices as of 4/27/2016.
The Allen-Bradley 100W system consists of part numbers shown in table above with prices from www.wernerelectric.com, www.todaycomponents.com 4/18/2016.

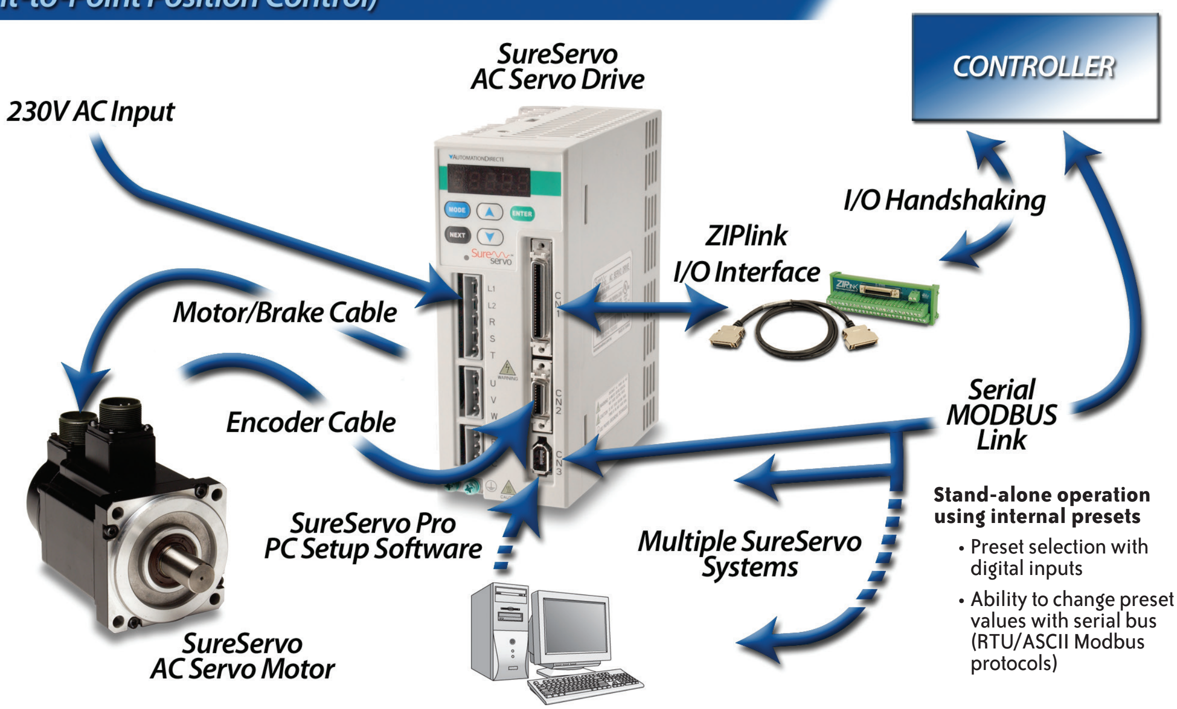
SureServo® AC Servo Systems

Traditional Command Sources



- **Pulse Train Positions:**
  - Step and direction
  - CW and CCW
  - Encoder follower
- **Analog Velocity (±10V)**
- **Analog Torque (±10V)**
- **Mode Switching**
- **"On-the-Fly" Control Mode Switching**

Built-in Indexer
(Point-to-Point Position Control)



Stand-alone operation using internal presets
- Preset selection with digital inputs
- Ability to change preset values with serial bus (RTU/ASCII Modbus protocols)

The SureGear PGA, PGB and PGD series easily mates to SureServo motors. Everything you need to mount your SureServo motor is included!

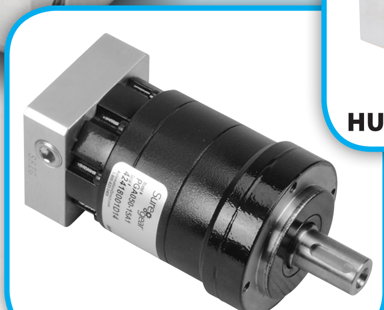
It is the perfect solution for applications such as gantries, injection-molding machines, pick-and-place automation, and linear slides.

Quickly and easily configure a system online: http://www.sureservo.com/gearbox/selector

SureGear® Precision Gearboxes for Servo motors

Sure gear®

HUB-STYLE



IN-LINE

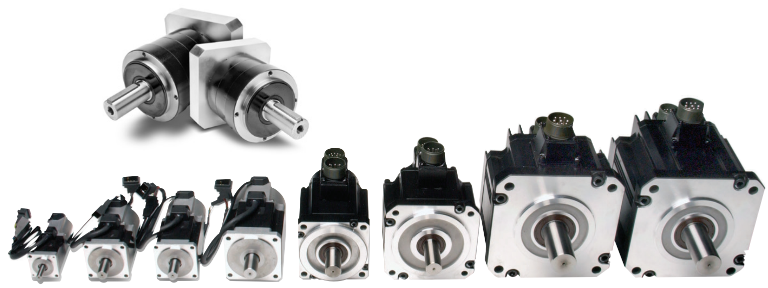
RIGHT ANGLE

81 models, four gear ratios available

Tough on the outside, precision quality on the inside

SureServo AC Servo Systems

3 Standard Drives ... 8 Standard Motors ... 100W to 3kW ... over 50 gearboxes (both inline and right angle) with four ratios



Drive features

- **Main Power and Control Power Inputs**
  - Main Power: 230 VAC 1-phase/3-phase (2kW and 3kW systems are 3-phase only)
  - Control Power: 230 VAC Single Phase; 50/60 Hz
- **Fully digital with up to 450 Hz velocity loop response**
- **Easy setup and diagnostics with built-in keypad/display or the *Sure*Servo Pro PC-based software**
- **Five-in-one command options include:**
  - ± 10V torque or velocity command
  - Pulse train or master encoder position command (accepts line driver or open collector) with electronic gearing
  - Built-in indexer for position control using 8 preset positions and/or position setpoint with serial Modbus
- **Tuning aids include inertia estimation and easy tuning for up to 10 levels of response**
- **Optically isolated digital inputs (8) and outputs (5), analog outputs for monitor signals (2), and line driver output for encoder (with scalable resolution)**

Motor features

- **Low inertia models:**
  - 100W, 200W, 400W, 750W and 1kW
  - Speeds up to 5,000 rpm.
- **Medium inertia models:**
  - 1kW, 2kW and 3kW
  - Speeds up to 3,000 rpm.
- **Square flange mounting with metric dimensions:**
  - 40, 60, 80, 100, 130 and 180 mm flanges
- **Permanent magnet 3-phase synchronous motor**
- **Keyless drive shafts support clamp-on style coupling**
- **Integrated encoder with 2,500 (x4) pulses/revolution plus marker pulse (once per revolution)**
- **Optional 24 VDC spring-set holding brakes**
- **Standard hook-up cables for motor power/brake and encoder**
- **Standard DIN-rail mounted ZIPLink break-out kit for the drive's CN1 connector (with screw terminal connections)**

*Sure*Servo tuning technology

The SureServo drive closes the loop on current, velocity, and position (depending on control mode selection). Proportional gain, integral gain, feed forward compensation, command low pass filter, and a notch filter for resonance suppression are available. There are three tuning modes:

1. "Manual Mode" for user-defined adjustments
2. "Easy Mode" for default settings over a wide range of programmed inertia with 10 response levels
3. "Auto Mode" for automatic adjustment using an estimated (or measured) value of inertia

*Sure*Servo built-in motion controller

While the SureServo drives can accept traditional commands from host controls, they can also provide their own internal motion control. For example, up to eight index moves can be pre-defined and stored in the drive and then selected and executed using up to three discrete inputs. The predefined index profiles can also be changed via serial communications. The motion can be incremental or absolute (homing routines are available in the drive) and acceleration can be linear or S-curve.

Multiple drives can be daisy-chained and addressed separately using the drive's serial port. This allows very simple yet powerful control of multi-axis processes that do not need precise path control but only precise starting and stopping points. 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.

*Sure*Servo Optional Holding Brake

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

*Sure*Gear® Precision Gearboxes for Servo motors

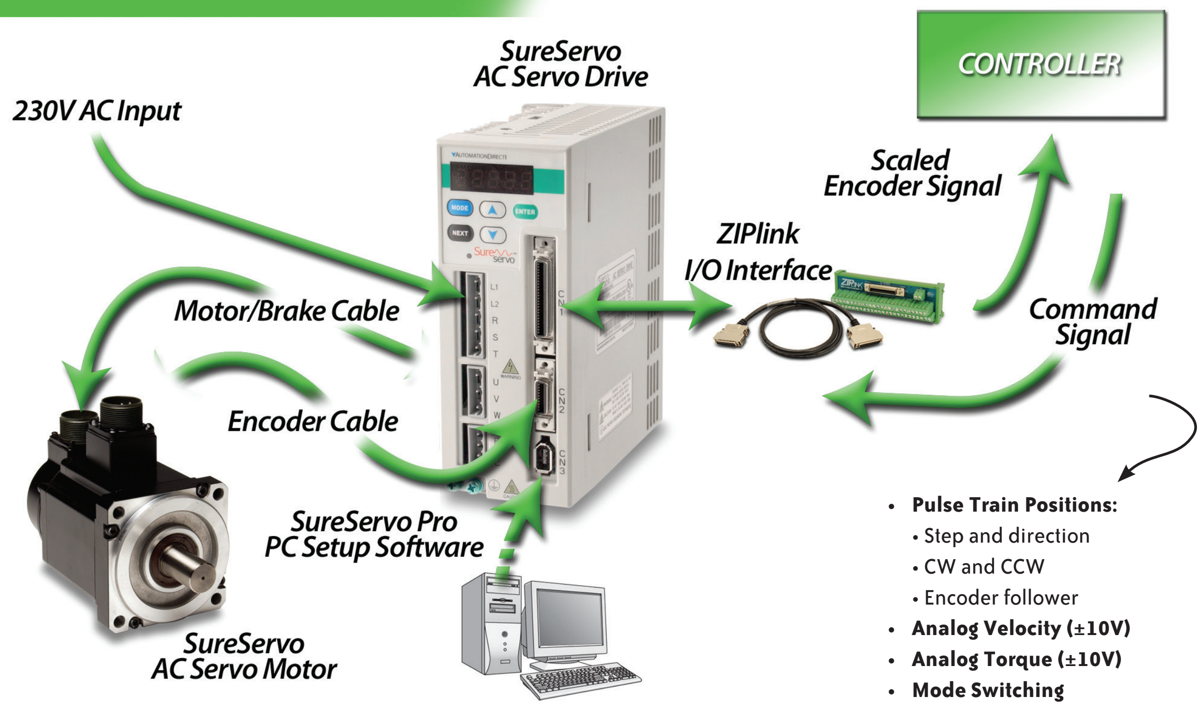
Inertia balancing issue in your design?

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

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

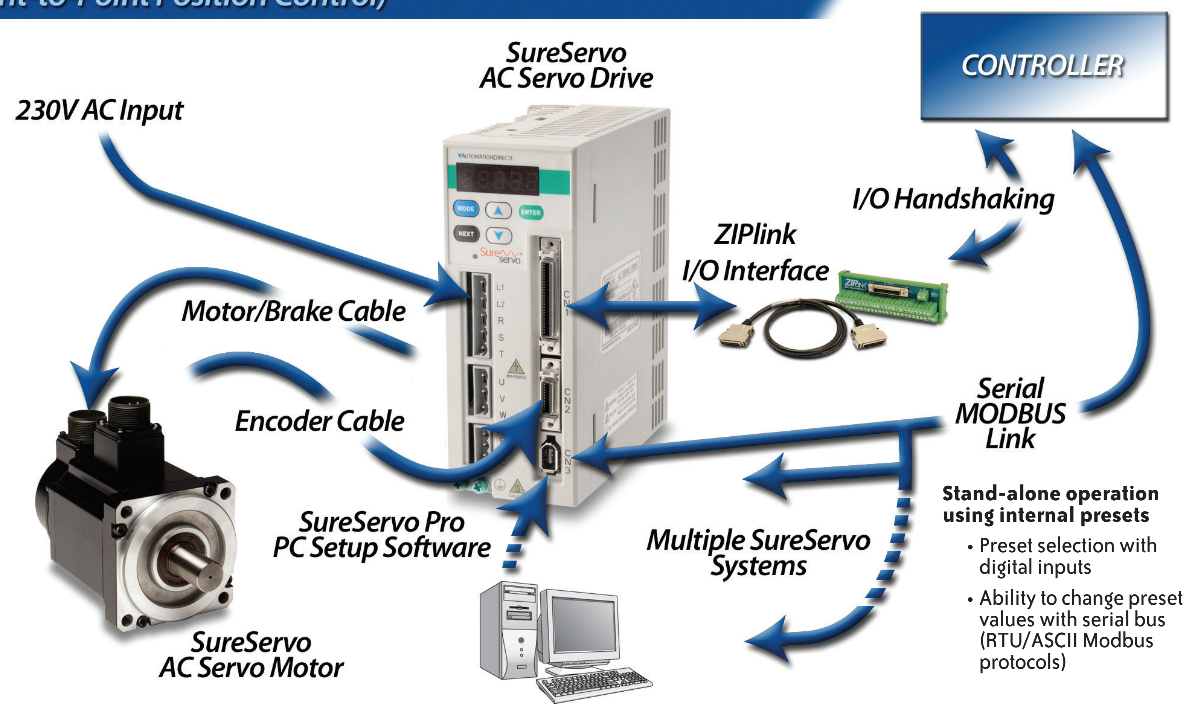
SureServo AC Servo Systems

Traditional Command Sources



- **Pulse Train Positions:**
  - Step and direction
  - CW and CCW
  - Encoder follower
- **Analog Velocity (±10V)**
- **Analog Torque (±10V)**
- **Mode Switching**
- **"On-the-Fly" Control Mode Switching**

Built-in Indexer
(Point-to-Point Position Control)



Stand-alone operation using internal presets
- Preset selection with digital inputs
- Ability to change preset values with serial bus (RTU/ASCII Modbus protocols)

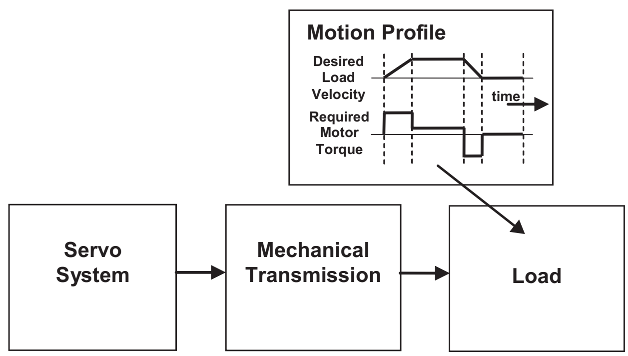
SureServo AC Servo Systems

How to select and apply *Sure*Servo systems

The primary purpose of the AC servo system is to precisely control the motion of the load. The most fundamental considerations in selecting the servo system are "reflected" load inertia, servo system maximum speed requirement, servo system continuous torque requirement, and servo system peak torque requirement. In a retrofit application, select the largest torque SureServo system that most closely matches these parameters for the system being replaced. In a new application, these parameters should be determined through calculation and/or measurement.

AutomationDirect has teamed with Copperhill Technologies to provide free servo-sizing software. "VisualSizer-SureServo" software will assist in determining the correct motor and drive for your application by calculating the reflected load inertia and required speed and torque based on the load configuration. "VisualSizer-SureServo" software can be downloaded from www.sureservo.com/downloads.htm.

Information for selecting SureServo systems is also included in Appendix B of the SureServo User Manual, which can be downloaded from the AutomationDirect.com website.



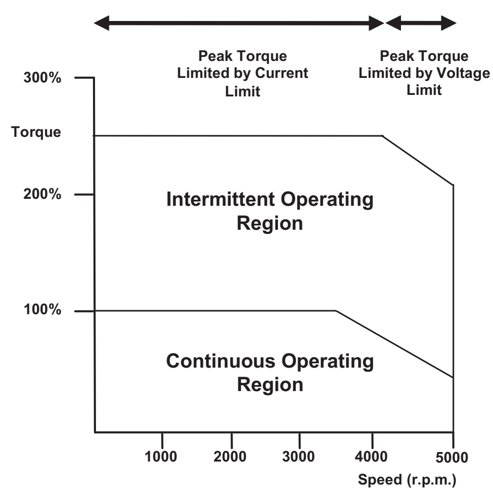
1. "Reflected" load inertia

The inertia of everything attached to the servo motor driveshaft needs to be considered and the total "reflected" inertia needs to be determined. This means that all elements of any mechanical transmission and load inertia need to be translated into an equivalent inertia as if attached directly to the motor driveshaft. The ratio of "reflected" load inertia to motor inertia needs to be carefully considered when selecting the servo system.

In general, applications that need high response or bandwidth will benefit from keeping the ratio of load inertia to motor inertia as low as possible and ideally under 10:1. Systems with ratios as high as 200:1 can be implemented, but corresponding lower bandwidth or responsiveness must be accepted. The servo response including the attached load inertia is determined by the servo tuning. SureServo systems may be tuned manually, adaptively with measurement of the load inertia, or set with default tuning based on a programmed value of load inertia.

2. Torque and speed

With knowledge of the motion profile and any mechanical transmission between the motor and load, calculations can be made to determine the required servo motor continuous torque, peak torque, and maximum motor speed. The required amount of continuous torque must fall inside the continuous operating region of the system torque-speed curve (you can check the continuous torque at the average speed of the motion profile). The required amount of peak torque must also fall within the servo system's intermittent operating region of the system torque-speed curve (you need to check this value at the required maximum speed).



SureServo® AC Servo Systems

Application tip - coupling considerations

The SureServo motors have keyless shafts that are designed for use with clamp-on or compression style couplings. Couplings using keys and/or set screws should NOT be used with SureServo motors as they are likely to come loose or damage the motor shaft. "Servo-grade" clamp-on or compression style couplings are usually the best choice when you consider the stiffness, torque rating, and inertia. Higher stiffness (lb-in/radian) is needed for better response but there is a trade-off between the stiffness and the added inertia of the coupling. Concerning the torque rating of the coupling, use a safety factor of 1.25 over the SureServo peak torque requirement of your application.

Coupling Suppliers: **www.sureservo.com/couplingconsiderations.htm**

Mechanical transmissions

Common mechanical transmissions include leadscrews, rack & pinion mechanisms, conveyors, gears, and timing belts. The use of leadscrew, rack & pinion, or conveyor are common ways to translate the rotary motion of the servo motor into linear motion of the load. The use of a speed reducer such as a gearbox or timing belt can be very beneficial as follows:

1. Reduction of reflected load inertia

As a general rule, it is beneficial to keep the reflected load inertia as low as possible while using the full range of servo speed. SureServo systems can go up to 5,000 rpm for the low inertia motors and up to 3,000 rpm for the medium inertia motors.

Example: A gearbox reduces the required torque by a factor of the gear ratio, and reduces the reflected load inertia by a factor of the gear ratio squared. A 10:1 gearbox reduces output speed to 1/10, increases output torque 10 times, and decreases reflected inertia to 1/100.

However, when investigating the effect of different speed reduction ratios DO NOT forget to include the added inertia of couplings, gearbox, or timing belt pulleys. These added inertias can be significant, and can negate any inertia reduction due to the speed reduction.

2. Low speed and high torque applications

If the application requires low speed and high torque then it is common to introduce a speed reducer so that the servo system can operate over more of the available speed range. This could also have the added benefit of reducing the servo motor torque requirement which could allow you to use a smaller and lower cost servo system. Additional benefits are also possible with reduction in reflected inertia, increased number of motor encoder counts at the load, and increased ability to reject load disturbances due to mechanical advantage of the speed reducer.

3. Space limitations and motor orientation

SureServo motors can be mounted in any orientation, but the shaft seal should not be immersed in oil (open-frame gearbox, etc.). Reducers can possibly allow the use of a smaller motor or allow the motor to be repositioned. For example, some reducers would allow for in-line, right angle, or parallel mounting of the motor.

For more information, refer to the website listed below.

www.sureservo.com/mechanical_trans.htm

Ordering guide instructions

The following four pages are your ordering guide for the eight standard SureServo systems. Each of the eight standard systems has a torque-speed curve including the motor inertia for reference. This is the fundamental information that you need to select the servo drive and matching motor for your application.

Don't forget the cables and *ZIP*Link break-out board kit!

Included in the ordering guide are the available connection cables from the drive to motor in standard lengths from 10 to 60 feet. The break-out board kit includes a 0.5m (19 inch) cable for the CN1 I/O interface, and is listed for your convenience. We highly recommend all five items per system as a minimum. All cables are 100% factory tested to make your system installation as easy and quick as possible. See the Accessories section for regeneration resistors, AC line filters, fuses, contactors, and RF noise filters.

SureServo® AC Servo System Configuration

*Sure*Servo series drives and motors part numbering system

SV A - 2 04 0

Series
SV: *Sure*Servo AC servo

Component Type
A: Drive
L: Low inertia motor
M: Medium inertia motor

Component Option
0: Drive
Blank: Motor without brake
B: Motor with brake

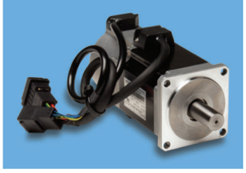
Rated Output Power
01: 100W
02: 200W
04: 400W
07: 750W
10: 1000W
20: 2000W
30: 3000W

Nominal Input Voltage
2: 230VAC; 50/60 Hz

Here is what you will need to order a complete servo system:

1. Servo Drive

2. Servo Motor



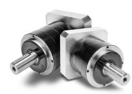
3. Motor Power Cable

4. Motor Encoder Cable

5. ZIPLink I/O Interface

NOTE: Unit can be programmed via keypad.
Optional programming software (free download) and optional programming cable available.

NOTE: If you need a gear box for your configuration, you can do it easily online:
http://www.sureservo.com/gearbox/selector



*Sure*Servo AC servo drive, motor, and cable combinations

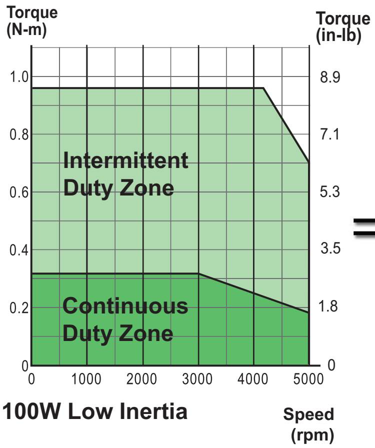
<table>
<tr><th colspan="2">Inertia & Power</th><th colspan="3">Drive and Motor</th><th colspan="4">Power Cables (from Drive to Motor)</th><th colspan="4">Encoder Feedback Cables</th><th colspan="2">Miscellaneous</th></tr>
<tr><th>Inertia</th><th>Power</th><th>Servo Drive</th><th>Servo Motor without brake (note)</th><th>Servo Motor with brake (note)</th><th>10 ft</th><th>20 ft</th><th>30 ft</th><th>60 ft</th><th>10 ft</th><th>20 ft</th><th>30 ft</th><th>60 ft</th><th>ZIPLink I/O Interface</th><th>RS-422/485 Serial Communication Cable</th></tr>
<tr><td rowspan="5">Low inertia</td><td>100W</td><td rowspan="3">SVA-2040</td><td>SVL-201</td><td>SVL-201B</td><td rowspan="4">SVC-PFL-010</td><td rowspan="4">SVC-PFL-020</td><td rowspan="4">SVC-PFL-030</td><td rowspan="4">SVC-PFL-060</td><td rowspan="4">SVC-EFL-010</td><td rowspan="4">SVC-EFL-020</td><td rowspan="4">SVC-EFL-030</td><td rowspan="4">SVC-EFL-060</td><td rowspan="8">ZL-RTB50
and
ZL-SVC-CBL50
or
ZL-SVC-CBL50-1
or
ZL-SVC-CBL50-2</td><td rowspan="8">SVC-MDCOM-CBL</td></tr>
<tr><td>200W</td><td>SVL-202</td><td>SVL-202B</td></tr>
<tr><td>400W</td><td>SVL-204</td><td>SVL-204B</td></tr>
<tr><td>750W</td><td rowspan="3">SVA-2100</td><td>SVL-207</td><td>SVL-207B</td></tr>
<tr><td>1000W</td><td>SVL-210</td><td>SVL-210B</td><td rowspan="2">SVC-PHM-010</td><td rowspan="2">SVC-PHM-020</td><td rowspan="2">SVC-PHM-030</td><td rowspan="2">SVC-PHM-060</td><td rowspan="4">SVC-EHH-010</td><td rowspan="4">SVC-EHH-020</td><td rowspan="4">SVC-EHH-030</td><td rowspan="4">SVC-EHH-060</td></tr>
<tr><td rowspan="3">Medium inertia</td><td>1000W</td><td>SVM-210</td><td>SVM-210B</td></tr>
<tr><td>2000W</td><td rowspan="2">SVA-2300</td><td>SVM-220</td><td>SVM-220B</td><td rowspan="2">SVC-PHH-010</td><td rowspan="2">SVC-PHH-020</td><td rowspan="2">SVC-PHH-030</td><td rowspan="2">SVC-PHH-060</td></tr>
<tr><td>3000W</td><td>SVM-230</td><td>SVM-230B</td></tr>
</table>

NOTE: Each servo motor requires an encoder feedback cable and a power cable.
The motor power cable includes brake power wires for the optional motor brake.

SureServo® AC Servo System Configuration

For all systems:
Order programming software & programming cable if needed. **See pgs. tMN2-6 & 45.**

100W Low Inertia System



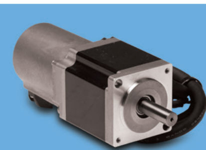
1. =

Servo Drive
SVA-2040 $488.00

J_m= Motor Inertia = 0.000027 lb-in-s² (0.000003 kg - m²)

*Sure*Servo Motor

2.



SVL-201 $325.00
SVL-201B (w/brake) $525.00

Motor Power Cable (1)

3.

SVC-PFL-010 (10') $29.50
SVC-PFL-020 (20') $52.00
SVC-PFL-030 (30') $63.00
SVC-PFL-060 (60') $115.00

Motor Encoder Cable (1)

4.

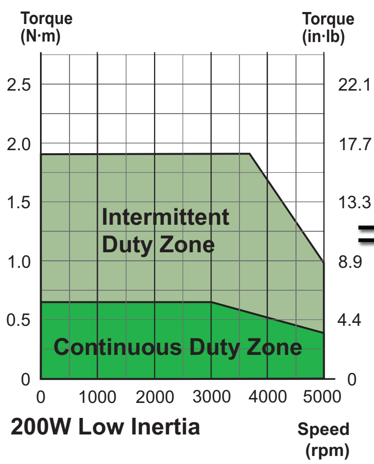
SVC-EFL-010 (10') $49.50
SVC-EFL-020 (20') $73.00
SVC-EFL-030 (30') $87.00
SVC-EFL-060 (60') $113.00

*ZIP*Link I/O Interface

5.

ZL-RTB50 $45.50
and one cable below:
ZL-SVC-CBL50 (0.5m) $33.50
ZL-SVC-CBL50-1 (1m) $34.50
ZL-SVC-CBL50-2 (2m) $36.50

200W Low Inertia System



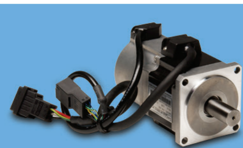
1. =

Servo Drive
SVA-2040 $488.00

J_m= Motor Inertia = 0.00016 lb-in-s² (0.000018 kg - m²)

*Sure*Servo Motor

2.



SVL-202 $393.00
SVL-202B (w/brake) $581.00

Motor Power Cable (1)

3.

SVC-PFL-010 (10') $29.50
SVC-PFL-020 (20') $52.00
SVC-PFL-030 (30') $63.00
SVC-PFL-060 (60') $115.00

Motor Encoder Cable (1)

4.

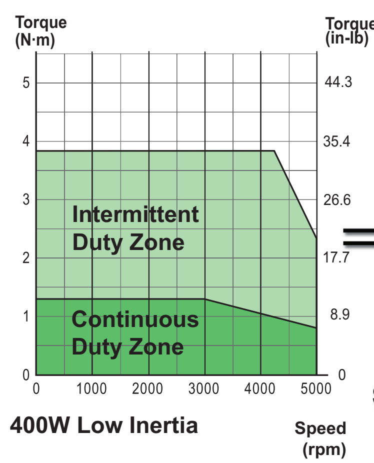
SVC-EFL-010 (10') $49.50
SVC-EFL-020 (20') $73.00
SVC-EFL-030 (30') $87.00
SVC-EFL-060 (60') $113.00

*ZIP*Link I/O Interface

5.

ZL-RTB50 $45.50
and one cable below:
ZL-SVC-CBL50 (0.5m) $33.50
ZL-SVC-CBL50-1 (1m) $34.50
ZL-SVC-CBL50-2 (2m) $36.50

400W Low Inertia System



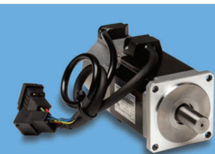
1. =

Servo Drive
SVA-2040 $488.00

J_m= Motor Inertia =0.0003 lb-in-s² (0 .000034 kg - m²)

*Sure*Servo Motor

2.



SVL-204 $481.00
SVL-204B (w/brake) $678.00

Motor Power Cable (1)

3.

SVC-PFL-010 (10') $29.50
SVC-PFL-020 (20') $52.00
SVC-PFL-030 (30') $63.00
SVC-PFL-060 (60') $115.00

Motor Encoder Cable (1)

4.

SVC-EFL-010 (10') $49.50
SVC-EFL-020 (20') $73.00
SVC-EFL-030 (30') $87.00
SVC-EFL-060 (60') $113.00

*ZIP*Link I/O Interface

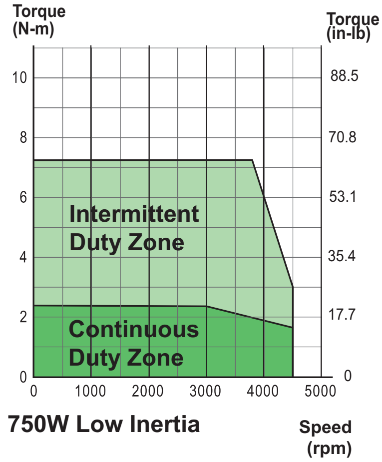
5.

ZL-RTB50 $45.50
and one cable below:
ZL-SVC-CBL50 (0.5m) $33.50
ZL-SVC-CBL50-1 (1m) $34.50
ZL-SVC-CBL50-2 (2m) $36.50

SureServo® AC Servo System Configuration

750W Low Inertia System

For all systems:
Order programming software & programming cable if needed.
See pgs. tMN2-7 & 45.



750W Low Inertia

J_m= Motor Inertia = .00096 lb-in-s² (0.000108 kg - m²)

1.

=

Servo Drive
SVA-2100 $632.00

*Sure*Servo Motor

2.

SVL-207	$514.00
SVL-207B (w/brake)	$734.00

Motor Power Cable (1)

3.

SVC-PFL-010 (10')	$29.50
SVC-PFL-020 (20')	$52.00
SVC-PFL-030 (30')	$63.00
SVC-PFL-060 (60')	$115.00

Motor Encoder Cable (1)

4.

SVC-EFL-010 (10')	$49.50
SVC-EFL-020 (20')	$73.00
SVC-EFL-030 (30')	$87.00
SVC-EFL-060 (60')	$113.00

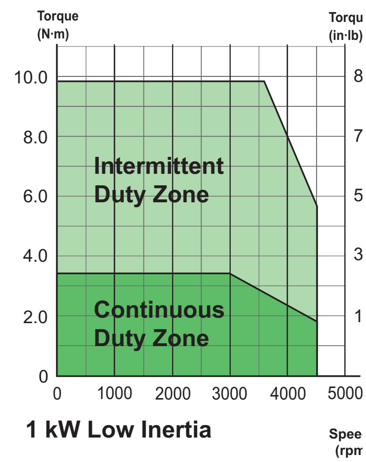
*ZIP*Link I/O Interface

5.

ZL-RTB50 $45.50
and one cable below:

ZL-SVC-CBL50 (0.5m)	$33.50
ZL-SVC-CBL50-1 (1m)	$34.50
ZL-SVC-CBL50-2 (2m)	$36.50

1 kW Low Inertia System



1 kW Low Inertia

J_m= Motor Inertia = .0023 lb-in-s² (0.00026 kg - m²)

1.

=

Servo Drive
SVA-2100 $632.00

*Sure*Servo Motor

2.

SVL-210	$613.00
SVL-210B (w/brake)	$919.00

Motor Power Cable (1)

3.

SVC-PHM-010 (10')	$85.00
SVC-PHM-020 (20')	$95.00
SVC-PHM-030 (30')	$139.00
SVC-PHM-060 (60')	$181.00

Motor Encoder Cable (1)

4.

SVC-EHH-010 (10')	$81.00
SVC-EHH-020 (20')	$93.00
SVC-EHH-030 (30')	$104.00
SVC-EHH-060 (60')	$134.00

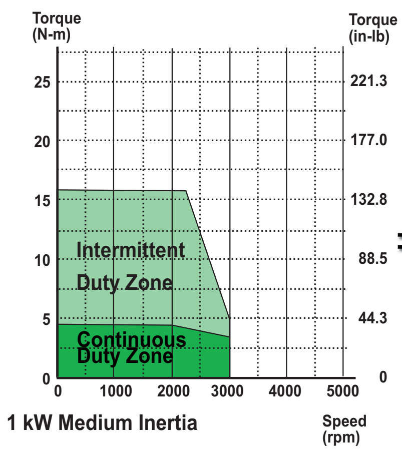
*ZIP*Link I/O Interface

5.

ZL-RTB50 $45.50
and one cable below:

ZL-SVC-CBL50 (0.5m)	$33.50
ZL-SVC-CBL50-1 (1m)	$34.50
ZL-SVC-CBL50-2 (2m)	$36.50

1 kW Medium Inertia System



1 kW Medium Inertia

J_m= Motor Inertia = .0053 lb-in-s² (0.000598 kg - m²)

1.

=

Servo Drive
SVA-2100 $632.00

*Sure*Servo Motor

2.

SVM-210	$788.00
SVM-210B (w/brake)	$1,095.00

Motor Power Cable (1)

3.

SVC-PHM-010 (10')	$85.00
SVC-PHM-020 (20')	$95.00
SVC-PHM-030 (30')	$139.00
SVC-PHM-060 (60')	$181.00

Motor Encoder Cable (1)

4.

SVC-EHH-010 (10')	$81.00
SVC-EHH-020 (20')	$93.00
SVC-EHH-030 (30')	$104.00
SVC-EHH-060 (60')	$134.00

*ZIP*Link I/O Interface

5.

ZL-RTB50 $45.50
and one cable below:

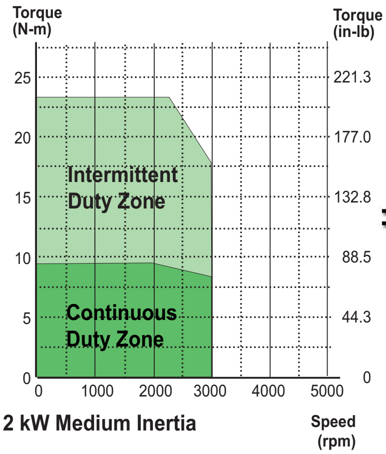
ZL-SVC-CBL50 (0.5m)	$33.50
ZL-SVC-CBL50-1 (1m)	$34.50
ZL-SVC-CBL50-2 (2m)	$36.50

SureServo®

AC Servo System Configuration

For all systems:
Order programming software & programming cable if needed.
See pgs. 44 & 45.

2 kW Medium Inertia System



J_m = Motor Inertia = .014 lb-in-s² = (0.00158 kg - m²)

1. =

Servo Drive
SVA-2300 $1,054.00

*Sure*Servo Motor

2.

SVM-220	$832.00
SVM-220B (w/brake)	$1,138.00

Motor Power Cable (1)

3.

SVC-PHH-010 (10')	$103.00
SVC-PHH-020 (20')	$133.00
SVC-PHH-030 (30')	$165.00
SVC-PHH-060 (60')	$265.00

Motor Encoder Cable (1)

4.

SVC-EHH-010 (10')	$81.00
SVC-EHH-020 (20')	$93.00
SVC-EHH-030 (30')	$104.00
SVC-EHH-060 (60')	$134.00

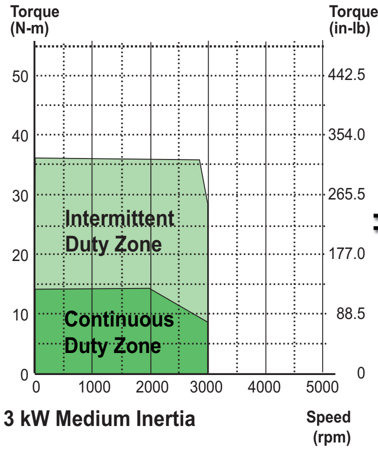
*ZIP*Link I/O Interface

5.

ZL-RTB50 $45.50
and one cable below:

ZL-SVC-CBL50 (0.5m)	$33.50
ZL-SVC-CBL50-1 (1m)	$34.50
ZL-SVC-CBL50-2 (2m)	$36.50

3 kW Medium Inertia System



J_m = Motor Inertia = 0.038 lb-in-s² = (0.00433 kg - m²)

1. =

Servo Drive
SVA-2300 $1,054.00

*Sure*Servo Motor

2.

SVM-230	$1,270.00
SVM-230B (w/brake)	$1,449.00

Motor Power Cable (1)

3.

SVC-PHH-010 (10')	$103.00
SVC-PHH-020 (20')	$133.00
SVC-PHH-030 (30')	$165.00
SVC-PHH-060 (60')	$265.00

Motor Encoder Cable (1)

4.

SVC-EHH-010 (10')	$81.00
SVC-EHH-020 (20')	$93.00
SVC-EHH-030 (30')	$104.00
SVC-EHH-060 (60')	$134.00

*ZIP*Link I/O Interface

5.

ZL-RTB50 $45.50
and one cable below:

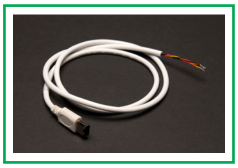
ZL-SVC-CBL50 (0.5m)	$33.50
ZL-SVC-CBL50-1 (1m)	$34.50
ZL-SVC-CBL50-2 (2m)	$36.50

NOTE: All Motor Power Cables include brake power wires for the optional motor brake.

*Sure*Servo Communications Cables for Muti-drop Networks

Product	Price	Description
SVC-MDCOM-CBL	$18.00	RS-422/485 serial communication cable for use with multidrop networks; 3ft length; IEEE 1394 plug to unterminated wires; compatible with all *Sure*Servo systems. Facilitates connection between the *Sure*Servo drive serial port and host controllers.
SVC-232RJ12-CBL-2 *	$7.00	*ZIP*Link SureServo Drives cable with 6-pin RJ12 connector to a 6-pin IEEE 1394 connector, shielded, twisted pair, 2.0 meter (6.6 ft.) length. For RS-232 connection to all *Sure*Servo amplifiers.
SVC-485RJ12-CBL-2 *	$9.00	*ZIP*Link SureServo amplifier communication cable, RJ12 male to 6-pin IEEE 1394 connector, shielded, twisted pair, 2.0 meter (6.6 ft.) length. Cable used in conjunction with *ZL-CDM-RJ12*xxx distribution module can access a compatible RS-485 device network.
SVC-485HD15-CBL-2 *	$7.50	*ZIP*Link SureServo Drives cable with a HD 15-pin male to a 6-pin IEEE 1394 connector, shielded, twisted pair, 2.0 meter (6.6 ft.) length. For RS-485 connection to all *Sure*Servo amplifiers.

*** Refer to the ZIPLinks Wiring Solutions section for complete information regarding the ZIPLink cables.***



SureServo AC Servo System Software

*Sure*Servo Pro configuration software

SureServo Pro is an optional free downloadable configuration software package for the SureServo drives. With SureServo Pro installed, the personal computer may be directly connected to the servo drive's serial port via the PC's RS-232 serial port*. A six-foot configuration cable (SVC-PCCFG-CBL, $18.00) is available to make the connection between the drive serial port and PC DB-9 serial port simple.

***Note: Use our USB-RS232 converter cable in conjunction with the SVC-PCCFG-CBL cable on PCs having only USB ports.**

Features

- Quick Start - The basic setup when you have limited time and just want to get up and running ASAP.
- Maintenance keypad 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.
- Detailed - 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 future use.
- Edit the drive setup
- View all drive faults
- Trend drive variables in real time

System Requirements

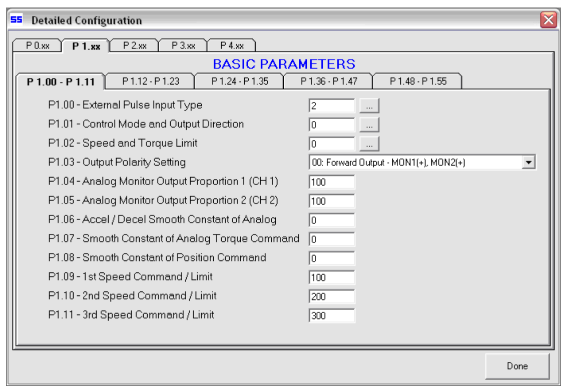
- Windows 7, Windows 2000, XP Pro
- 24 MB of RAM
- 16 MB hard disk
- RS232 serial port or USB port
- Internet Explorer 4.0 or higher (for HTML help support)

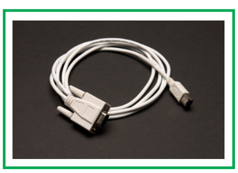
Parameter views

The SureServo Pro configuration tool logically organizes over 165 servo drive parameters into five tabbed groups. 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 options or setting ranges displayed. Tuning modes and parameters can also be changed using SureServo 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.

Parameter View Example Screen - Basic Parameters





*Sure*Servo Software and Configuration Cables

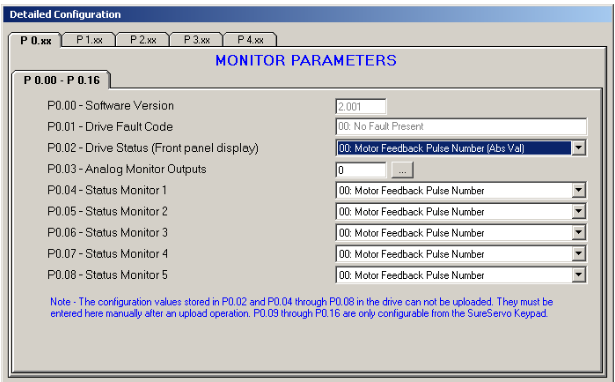
Product	Price	Description
SV-PRO	Free	*Sure*Servo Pro configuration software for use with all *Sure*Servo servo systems. FREE download from www.sureservo.com or www.automationdirect.com websites.
SV-PRO	$9.00	CD with *Sure*Servo Pro configuration software
SVC-PCCFG-CBL	$18.00	Six-foot RS-232 communications cable; connects servo drive serial port to PC DB-9 serial port. *For PCs having only USB ports, use our USB-RS232 converter cable in conjunction with the SVC-PCCFG-CBL cable.*
SVC-485CFG-CBL-2 *	$10.00	*ZIP*Link *Sure*Servo amplifier configuration cable, 6-pin IEEE 1394 connector to RJ45 connector, shielded, twisted pair, 2.0 meter (6.6 ft.) length. *Use this cable in conjunction with our USB-485M serial adapter to connect any SureServo amplifier to a PC. Eliminates the need to reprogram networked servo drives from RS485 to RS232 when connecting to a PC.*

**** Refer to the ZIPLinks Wiring Solutions section for complete information regarding ZIPLink cable SVC-485CFG-CBL-2.***

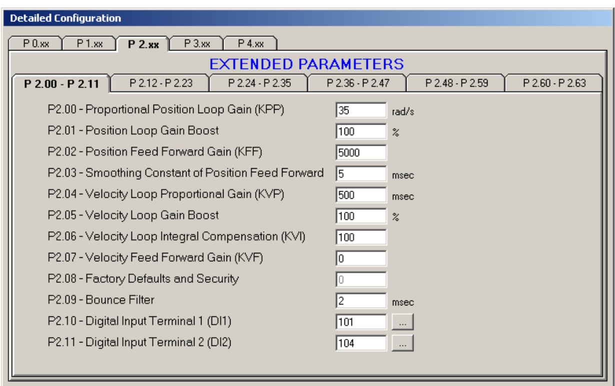
SureServo AC Servo System Software

*Sure*Servo Pro configuration software - Parameter views (continued)

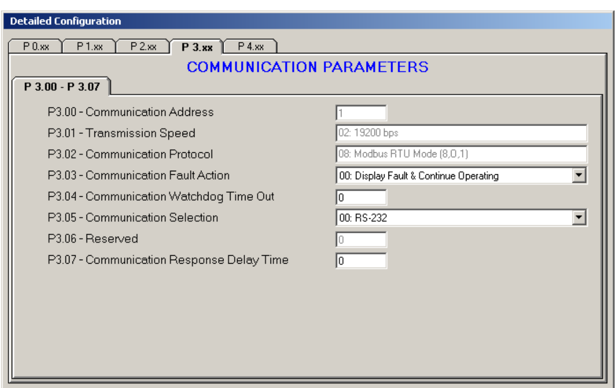
Parameter View Example Screen - Monitor Parameters



Parameter View Example Screen - Extended Parameters

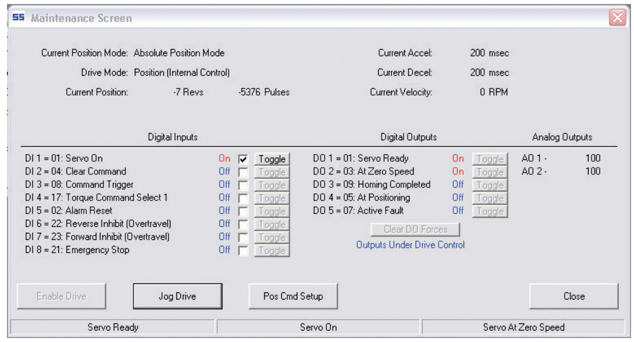


Parameter View Example Screen - Communication Parameters



Maintenance screen

A maintenance keypad 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.



Scope

SureServo Pro includes a powerful scope function that allows the user to have as many as three channels of data displayed simultaneously. Each channel has a drop-down table to select the data to be displayed. The scope also has a trigger mode and timebase selection. This function is a valuable tool for tuning SureServo drives.

SureServo AC Servo Drive Specifications

Servo drive overview

Keypad
Five Function keys:

MODE: Press to select or change mode
NEXT: Press to shift left
UP: Press to increase values
DOWN: Press to decrease values
ENTER: Press to enter value

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

Power On LED
Main power is ON

Control Power Terminal
Single-phase power 230 VAC, 50/60 Hz is connected to L1 and L2

Main Power Terminal
Three-phase power 230 VAC, 50/60 Hz is connected to R, S and T (Single-phase power 230 VAC 50/60 Hz may be connected to R and S for the low inertia systems)

Motor Output Terminal
The servo motor power cable is connected to U, V and W. Use our factory made and tested cables available in 10, 20, 30 or 60 foot lengths for easy connection.

Regenerative Resistor Terminal
1. When the internal regenerative resistor is used, the P and D terminal are connected together while the P and C connection is left open.
2. When an external regenerative resistor is used, it is connected across the P and C terminals while the P and D connection is left open. Use our factory approved resistors for "sure" results.

Ground Terminals

I/O Interface
50-pin connector for interfacing the host controller (such as *Direct*LOGIC PLC) and other types of I/O signals.

Use our *ZIP*Link kit which provides DIN-rail mounted screw terminals for easy connection.

- Command inputs:
  - Pulse and Direction
  - Encoder Follower
  - Analog Velocity/Torque
- (8) Digital Inputs
- (5) Digital Outputs
- (2) Analog Monitors
- Encoder Output (scalable)
  A+, A-, B+, B-, Z+, Z-

Encoder Interface
20-pin connector for interfacing the servo motor encoder.
Use our factory-made and tested cable available in 10, 20, 30 or 60 foot lengths for easy connection.

Serial Communication Interface
6-pin RS-485/422/232 interface to personal computer with *Sure*Servo Pro set-up software or host controller with Modbus RTU/ASCII protocol. Use our factory-made cables for easy connection to the PC or the host controller.

*Sure*Servo systems run "out-of-the-box"… but may be reconfigured for many applications!

The SureServo drives are fully digital and include over 165 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 parameters.

All parameters have commonly used default values which allow you to operate the SureServo system "out-of-the-box". However, the programmability and large variety of parameters make the SureServo 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.

SureServo® AC Servo Drive Specifications

Servo drive specifications

General Drive Specifications	
Permissible Frequency	50/60 Hz ±5%
Encoder Resolution / Feedback Resolution	2500 lines / 10000 ppr
Control of Main Circuit	SVPWM (Space Vector Pulse Width Modulation) Control
Tuning Modes	Easy / Auto / Manual
Dynamic Brake	Built-in control
Analog Monitor Outputs (2)	Monitor signal can be set by parameters (Output voltage range: ±8V; Resolution: 12.8 mV/count)
8 Programmable Digital Inputs (45 selectable functions)	Servo enable, Alarm reset, Gain switching, Pulse counter clear, Fault stop, CW/CCW over-travel
	Internal parameter selection, Torque limit activation, Velocity limit activation, Control mode selection
Scalable Encoder Output	Encoder signal output A, /A, B, /B, Z /Z, Line Driver
5 Programmable Outputs (9 selectable indicators)	Servo ready, Servo On, Low velocity, Velocity reached, In Position, Torque limiting, Servo fault, Electromagnetic brake control, Home search completed
Communication Interface	RS-232 / RS-485 / RS-422 / Modbus ASCII & RTU up to 115k Baud
Protective Functions	Overcurrent, Overvoltage, Undervoltage, Overload, Excessive velocity/position error, Encoder error, Regeneration error, Communication error
Installation Site	Indoor location (free from direct sunlight), no corrosive liquid and gas (far away from oil mist, flammable gas, dust)
Altitude	1000m [3281 ft] above sea level – maximum
Operating Temperature	0 to 55 °C [32 to 131 °F] (If operating temperature is above 55°C, forced cooling is required). For long-term reliability, the ambient temperature of *Sure*Servo systems should be under 45°C (113°F).
Storage Temperature	-20° to 65°C (-4° to 149°F)
Humidity	0 to 90% (non-condensing)
Vibration	9.81 m/s^2 (1G) less than 20Hz, 5.88 m/s^2 (0.6G) 20 to 50 Hz
Protection	IP 20
Agency Approvals	CE; UL listed (U.S. and Canada)

SureServo® AC Servo Drive Specifications

Servo drive specifications (continued)

<table>
<tr><th colspan="11">Model and Mode Specific Drive Specifications</th></tr>
<tr><td rowspan="14"></td><td colspan="2">AC Servo Model</td><td colspan="3">SVA-2040</td><td colspan="3">SVA-2100</td><td colspan="2">SVA-2300</td></tr>
<tr><td colspan="2">Price</td><td colspan="3">$488.00</td><td colspan="3">$632.00</td><td colspan="2">$1,054.00</td></tr>
<tr><td colspan="2">Voltage Phase</td><td colspan="6">Single-phase or Three-phase</td><td colspan="2">Three-phase</td></tr>
<tr><td colspan="2">Voltage and Frequency Range</td><td colspan="6">3-phase: 170~255 VAC @ 50/60 Hz ±5%;
1-phase: 200~255 VAC @ 50/60 Hz ±5%</td><td colspan="2">170~255 VAC @ 50/60 Hz ±5%</td></tr>
<tr><td rowspan="2">Main Circuit Input Current</td><td>Single Phase</td><td colspan="3">3.4A @ 400W</td><td colspan="3">8.0A @ 1kW</td><td colspan="2">–</td></tr>
<tr><td>Three Phase</td><td colspan="3">2.6A @ 400W</td><td colspan="3">6.2A @ 1kW</td><td colspan="2">13.6A @ 3kW</td></tr>
<tr><td colspan="2">Main Circuit Inrush Current</td><td colspan="3">44A</td><td colspan="3">77A</td><td colspan="2">87A</td></tr>
<tr><td colspan="2">Main Circuit Power Cycling</td><td colspan="8">Maximum 1 power cycle per minute</td></tr>
<tr><td colspan="2">Control Circuit Current and Voltage</td><td colspan="8">43 mA @ 200~255 VAC, 1 phase</td></tr>
<tr><td colspan="2">Control Circuit Inrush Current</td><td colspan="8">32A maximum</td></tr>
<tr><td colspan="2">Cooling System</td><td colspan="3">Natural Air Circulation</td><td colspan="5">Internal Cooling Fan</td></tr>
<tr><td rowspan="2">Drive Heat Loss *</td><td>Motor driven *</td><td>SVL-201(B)</td><td>SVL-202(B)</td><td>SVL-204(B)</td><td>SVL-207(B)</td><td>SVL-210(B)</td><td>SVM-210(B)</td><td>SVM-220(B)</td><td>SVM-230(B)</td></tr>
<tr><td>Heat Loss</td><td>12W</td><td>15W</td><td>20W</td><td>35W</td><td>45W</td><td>50W</td><td>75W</td><td>80W</td></tr>
<tr><td colspan="2">Weight</td><td colspan="3">1.5 kg [3.3 lb]</td><td colspan="3">2kg [4lb]</td><td colspan="2">3kg [7lb]</td></tr>
<tr><td rowspan="7">Position Control Mode</td><td colspan="2">Max. Input Pulse Frequency</td><td colspan="8">Max. 500 kpps (Line driver); Max. 200 kpps (Open collector)</td></tr>
<tr><td colspan="2">Pulse Type</td><td colspan="8">Pulse + Direction, A phase + B phase Quadrature, CCW pulse + CW pulse</td></tr>
<tr><td colspan="2">Command Source</td><td colspan="8">External pulse train / Onboard indexer</td></tr>
<tr><td colspan="2">Smoothing Strategy</td><td colspan="8">Low-pass and P-curve filter</td></tr>
<tr><td colspan="2">Electronic Gear</td><td colspan="8">Electronic gear N/M multiple; N: 1~32767, M: 1~32767(1/50<N/M<200)</td></tr>
<tr><td colspan="2">Torque Limit Operation</td><td colspan="8">Set by parameters or by analog input</td></tr>
<tr><td colspan="2">Feed Forward Compensation</td><td colspan="8">Set by parameters</td></tr>
<tr><td rowspan="12">Velocity Control Mode</td><td rowspan="4">Analog Input Command</td><td>Voltage Range</td><td colspan="8">Bipolar ±10 VDC</td></tr>
<tr><td>Input Resistance</td><td colspan="8">10 k</td></tr>
<tr><td>Time Constant</td><td colspan="8">2.2 µs</td></tr>
<tr><td>Resolution</td><td colspan="8">(Varies with input voltage) 13 bits @ 0V~1V; 13~10 bits @ 1V~2V; 10 bits @ 2V~10V</td></tr>
<tr><td colspan="2">Speed Control Range</td><td colspan="8">1:5000</td></tr>
<tr><td colspan="2">Command Source</td><td colspan="8">External analog signal / Onboard indexer</td></tr>
<tr><td colspan="2">Smoothing Strategy</td><td colspan="8">Low-pass and S-curve filter</td></tr>
<tr><td colspan="2">Torque Limit Operation</td><td colspan="8">Set by parameters or via analog input</td></tr>
<tr><td colspan="2">Frequency Response Characteristic</td><td colspan="8">Maximum 450 Hz</td></tr>
<tr><td colspan="2" rowspan="3">Speed Accuracy (at rated rotation speed)</td><td colspan="8">0.01% or less at 0 to 100% load fluctuation</td></tr>
<tr><td colspan="8">0.01% or less at ±10% power fluctuation</td></tr>
<tr><td colspan="8">0.01% or less at 0 to 50°C ambient temperature fluctuation</td></tr>
<tr><td rowspan="8">Torque Control Mode</td><td rowspan="4">Analog Input Command</td><td>Voltage Range</td><td colspan="8">Bipolar ±10 VDC</td></tr>
<tr><td>Input Resistance</td><td colspan="8">10 kΩ</td></tr>
<tr><td>Time Constant</td><td colspan="8">2.2 µs</td></tr>
<tr><td>Resolution</td><td colspan="8">10 bits</td></tr>
<tr><td colspan="2">Permissible Time for Overload</td><td colspan="8">8 sec. under 200% rated output</td></tr>
<tr><td colspan="2">Command Source</td><td colspan="8">External analog signal / Onboard indexer</td></tr>
<tr><td colspan="2">Smoothing Strategy</td><td colspan="8">Low-pass filter</td></tr>
<tr><td colspan="2">Speed Limit Operation</td><td colspan="8">Set by parameters or via analog input</td></tr>
<tr><td colspan="11">* Drive heat loss varies depending upon which motor is connected to the drive.</td></tr>
</table>

SureServo® AC Servo Motor Specifications

Servo motor overview

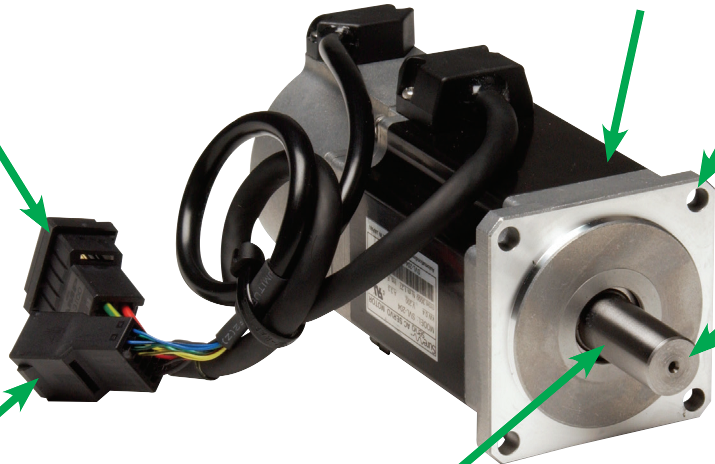
750W and below

Motor Power and Brake Connector
1-foot cable with 6-position connector (Not liquid tight)

IP65 Housing

Low Inertia Motors
- 100W 40 mm flange
- 200W 60 mm flange
- 400W 60 mm flange
- 750W 80 mm flange

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



Encoder Connector
1-foot cable with 9-position connector (Not liquid tight)

***Without* Shaft Seal**
(not liquid tight)

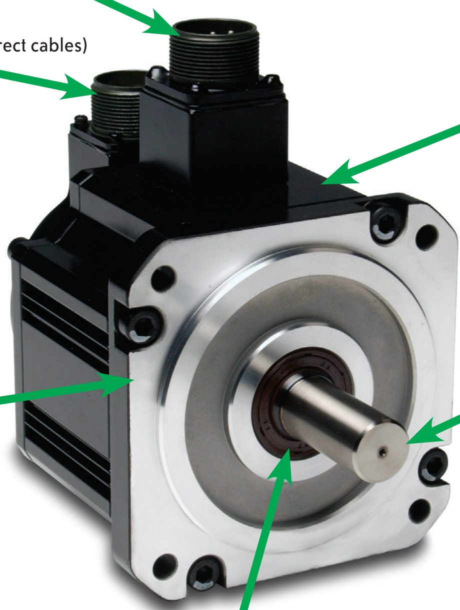
All SureServo motors have keyless shafts for use with servo-grade clamp or compression couplings.

1 kW and above

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

Encoder Connector
(Liquid tight when using AutomationDirect cables)

IP65 Housing



Low and Medium Inertia Motors

Low Inertia Model
- 1 kW 100 mm flange

Medium Inertia Models
- 1 kW 130 mm flange
- 2 kW 180 mm flange
- 3 kW 180 mm flange

Keyless Shafts

Low Inertia Model
- 1 kW 22 mm diameter

Medium Inertia Models
- 1 kW 22 mm diameter
- 2 kW 35 mm diameter
- 3 kW 35 mm diameter

***With* Shaft Seal**
(liquid tight)

SureServo® AC Servo Motor Specifications

Motor Specifications									
Inertia Range		Low					Medium		
Model Name: Sxx-xxx		SVL-201	SVL-202	SVL-204	SVL-207	SVL-210	SVM-210	SVM-220	SVM-230
Price		$325.00	$393.00	$481.00	$514.00	$613.00	$788.00	$832.00	$1,270.00
Model with brake: Sxx-xxxB		SVL-201B	SVL-202B	SVL-204B	SVL-207B	SVL-210B	SVM-210B	SVM-220B	SVM-230B
Price		$525.00	$581.00	$678.00	$734.00	$919.00	$1,095.00	$1,138.00	$1,449.00
Rated output power	*W*	100	200	400	750	1000	1000	2000	3000
Rated torque	*N·m*	0.32	0.64	1.27	2.39	3.3	4.8	9.4	14.3
	lb·in	2.8	5.7	11.2	21.2	29.2	42.5	83.2	126.6
Maximum torque	*N·m*	0.95	1.91	3.82	7.16	9.9	15.7	23.5	35.8
	lb·in	8.4	16.9	33.8	63.4	87.6	138.9	208.0	316.8
Rated speed	*rpm*	3000					2000		
Max. speed	*rpm*	5000			4500		3000		
Rated current	*A*	1.1	1.7	3.3	5.0	6.8	5.6	13.1	17.4
Max. current	*A*	3.0	4.9	9.3	14.1	18.7	17.6	31.4	42.3
Drive input current	*1 phase A*	1.0	1.7	3.4	5.9	8.0	8.0	-	-
	3 phase A	0.8	1.3	2.6	4.7	6.2	6.2	9.1	13.6
Max. radial shaft load	*N*	78.4	196		343	490		784	
	lb	18	44		77	110		176	
Max. thrust shaft load	*N*	39.2	68.6		98			392	
	lb	9	15		22			88	
Brake *Voltage*	*VDC*	24							
Brake *Current*	*ADC*	0.21	0.38		0.4	0.75	0.83	1.45	1.67
Brake *Holding Torque*	*N·m*	0.32	1.27		2.55	9.3	7.5	32.0	50.0
	lb·in	2.83	11.24		22.57	82.3	66.38	283.2	442.5
Rotor inertia w/o brake	*kg·m²*	0.03E-4	0.18E-4	0.34E-4	1.08E-4	2.6E-4	5.98E-4	15.8E-4	43.3E-4
	lb·in·s²	0.27E-4	1.59E-4	3.0E-4	9.56E-4	23.0E-4	52.9E-4	139.8E-4	383.2E-4
Rotor inertia with brake	*kg·m²*	0.06E-4	0.28E-4	0.44E-4	1.32E-4	3.1E-4	8.8E-4	27.8E-4	56.3E-4
	lb·in·s²	0.53E-4	2.48E-4	3.9E-4	11.7E-4	27.4E-4	77.9E-4	246.0E-4	498.3E-4
Mechanical time constant	*ms*	0.6	0.9	0.7	0.6	1.7	1.4	1.6	0.9
Static friction torque	*N·m*	0.02	0.04		0.08	0.49	0.29	0.98	
Torque constant-KT	*N·m/A*	0.32	0.39	0.4	0.5	0.56	0.91	0.77	0.86
Voltage constant-KE	*V/rpm*	33.7E-3	41.0E-3	41.6E-3	52.2E-3	58.4E-3	95.71E-3	81.1E-3	90.5E-3
Armature resistance	Ω	20.3	7.5	3.1	1.3	2.052	1.98	0.6	0.162
Armature inductance	*mH*	32	24	11	6.3	8.4	13.2	6.1	2.3
Electrical time constant	*ms*	1.6	3.2	3.2	4.8	4.1	6.7	10.1	14.2
Motor Type		Brushless, AC, permanent magnet [Neodymium (Nd), Iron (Fe), Boron (B)]							
Insulation class		Class F							
Insulation resistance		>100 MΩ , 500 VDC							
Insulation strength		1500 VAC, 50 Hz, 60 seconds							
Ambient temperature range		0 to 40°C (32°F to 104°F)							
Operating temperature (measured case temperature)		70°C (158°F)							
Maximum operating temperature (measured case temperature)		70°C + 40°C = 110°C (230°F)							
Storage temperature		-20 to 65°C (-4 to 149°F)							
Operating humidity		20 to 90% RH (non-condensing)							
Storage humidity		20 to 90% RH (non-condensing)							
Vibration / Shock		2.5G / 5.0G							
Environmental rating		IP65 motor body; IP40 shaft; IP20 connector				IP65 (requires *Sure*Servo cables)			
Weight without brake	*kg*	0.5	0.9	1.3	2.5	4.7	4.8	12.0	17.0
	lb	1.1	1.98	2.87	5.5	10.36	10.58	26.46	37.48
Weight with brake	*kg*	0.7	1.4	1.8	3.4	6.3	7.5	19.0	24.0
	lb	1.54	3.09	3.97	7.5	13.89	16.53	41.89	52.9
Agency Approvals		CE; UL recognized (U.S. and Canada)							

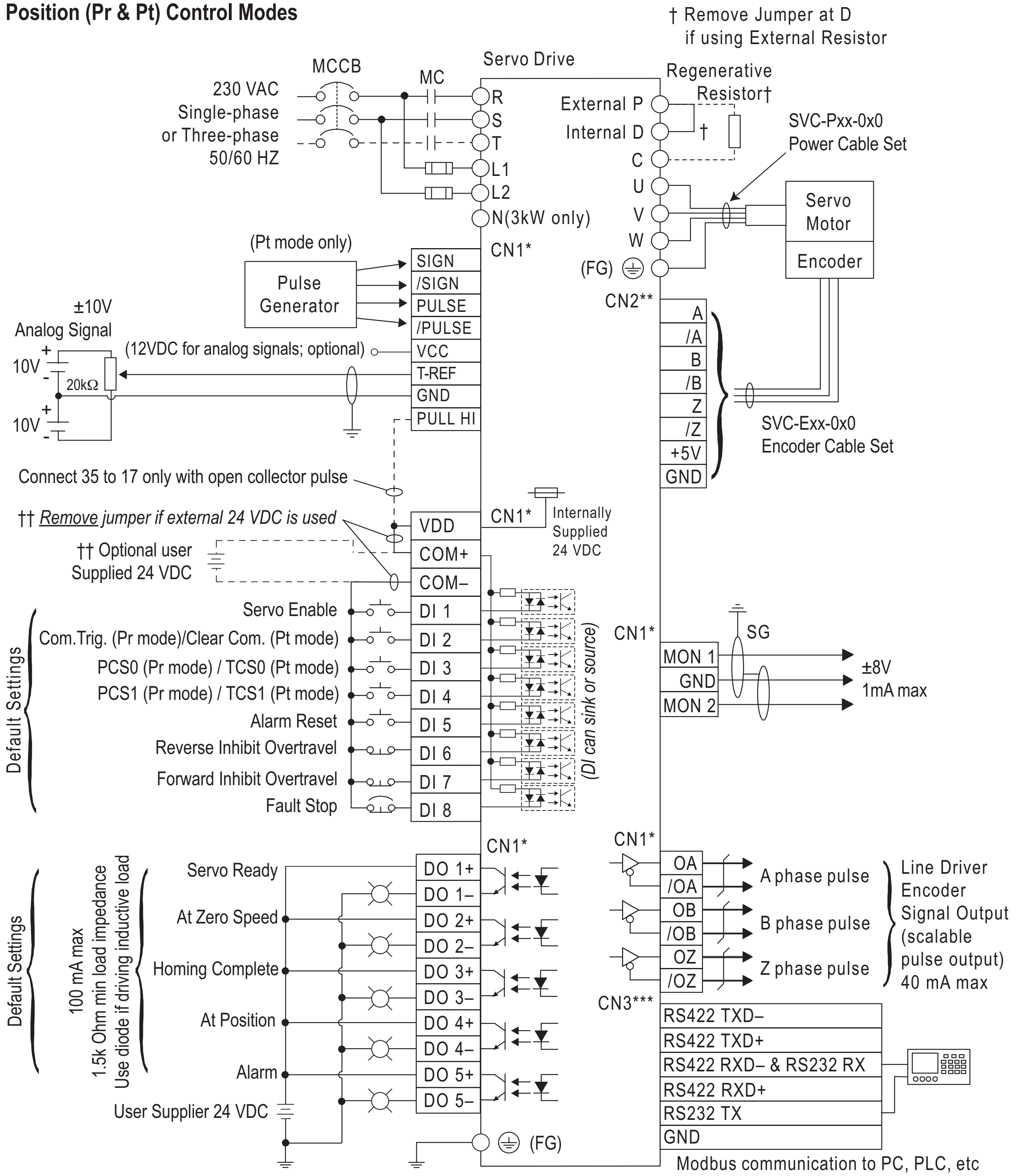
NOTE: U.S. customary units are for reference only.

SureServo® AC Servo System Wiring

Standard wiring examples

This wiring diagram shows basic wiring only, and additional wiring configurations are possible for some I/O. Refer to the "Installation and Wiring" chapter of the User Manual for more detailed wiring information.

Position (Pr & Pt) Control Modes



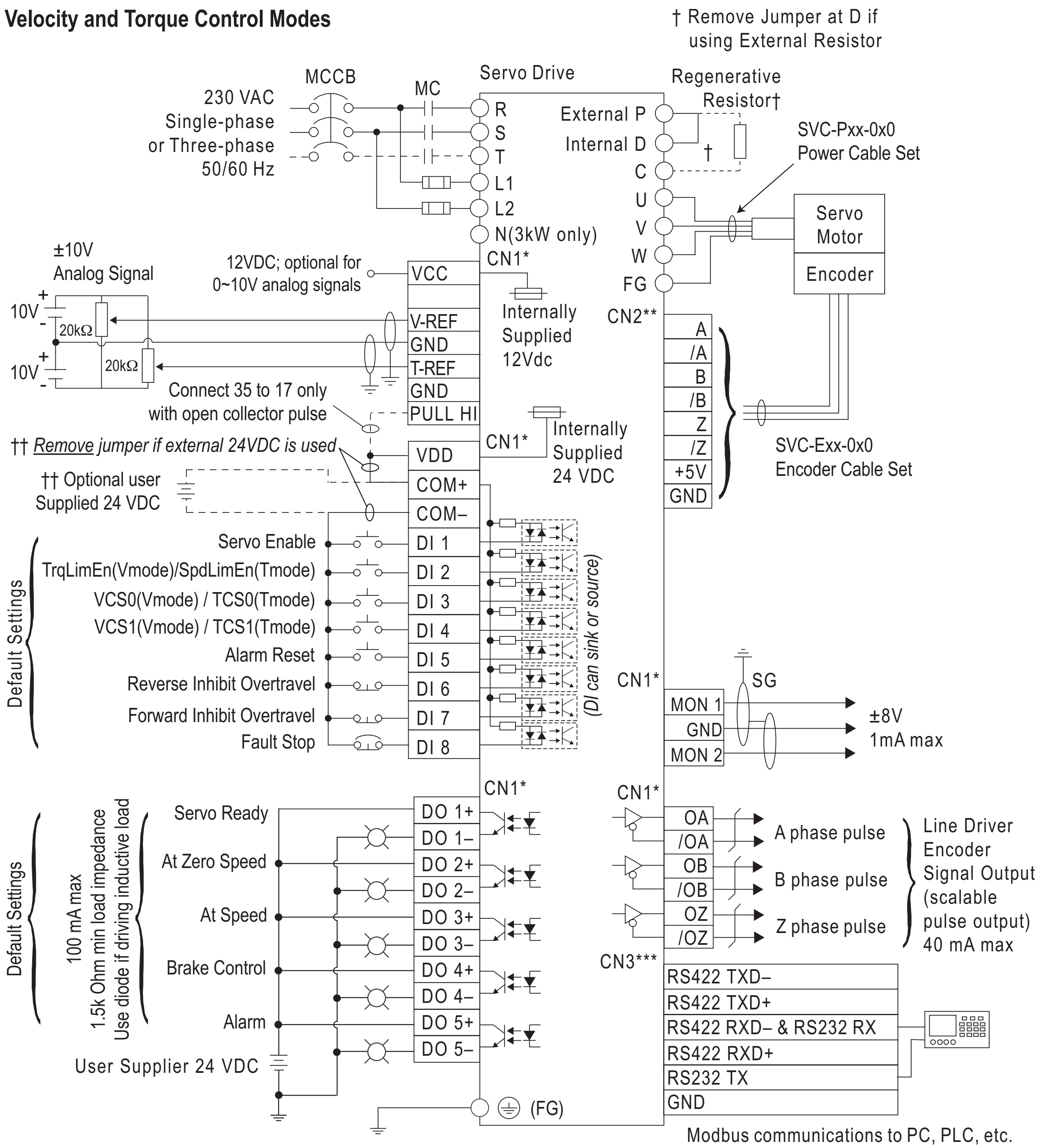
* Use connection kit part #s ZL-RTB50 & ZL-SVC-CBL-50(-x) for CN1 terminal connections.
** Use cable part # SVC-Exx-0x0 for CN2 terminal connections.
*** Use cable part # SVC-MDCOM-CBL for CN3 terminal Modbus network connections.

SureServo® AC Servo System Wiring

Standard wiring examples (continued)

THIS WIRING DIAGRAM SHOWS BASIC WIRING ONLY, AND ADDITIONAL WIRING CONFIGURATIONS ARE POSSIBLE FOR SOME I/O. REFER TO THE "INSTALLATION AND WIRING" CHAPTER OF THE USER MANUAL FOR MORE DETAILED WIRING INFORMATION.

Velocity and Torque Control Modes



* Use connection kit part #s ZL-RTB50 & ZL-SVC-CBL-50(-x) for CN1 terminal connections.
** Use cable part # SVC-Exx-0x0 for CN2 terminal connections.
*** Use cable part # SVC-MDCOM-CBL for CN3 terminal Modbus network connections.

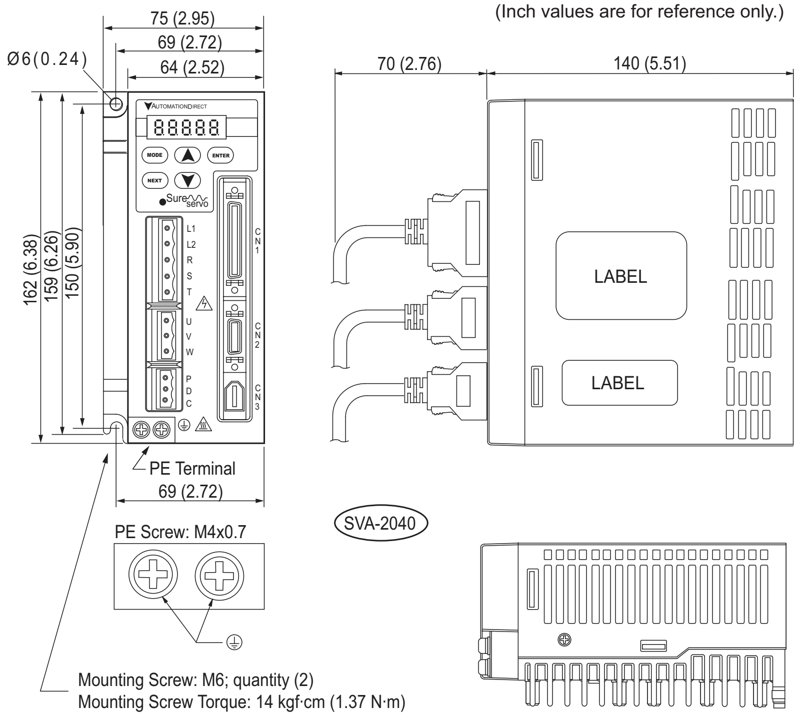
SureServo® AC Servo System Dimensions

Servo drive dimensions

SVA-2040

Recommended user supplied mounting screw is M6. Tighten to 14 kgf·cm (1.37 N·m).

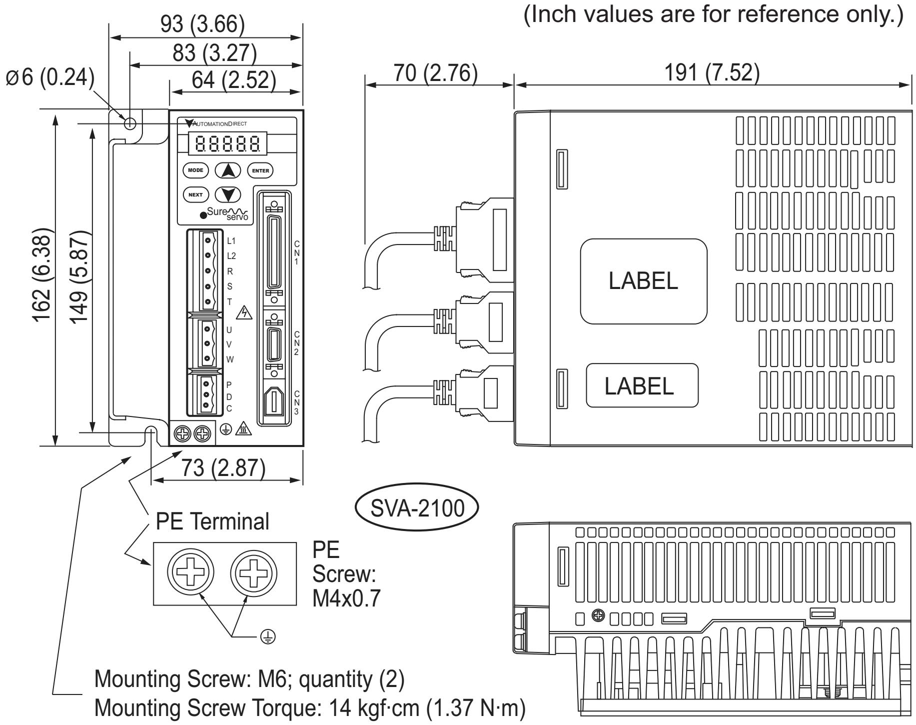
UNITS: mm (in)
(Inch values are for reference only.)



SVA-2100

Recommended user supplied mounting screw is M6. Tighten to 14 kgf·cm (1.37 N·m).

UNITS: mm (in)
(Inch values are for reference only.)



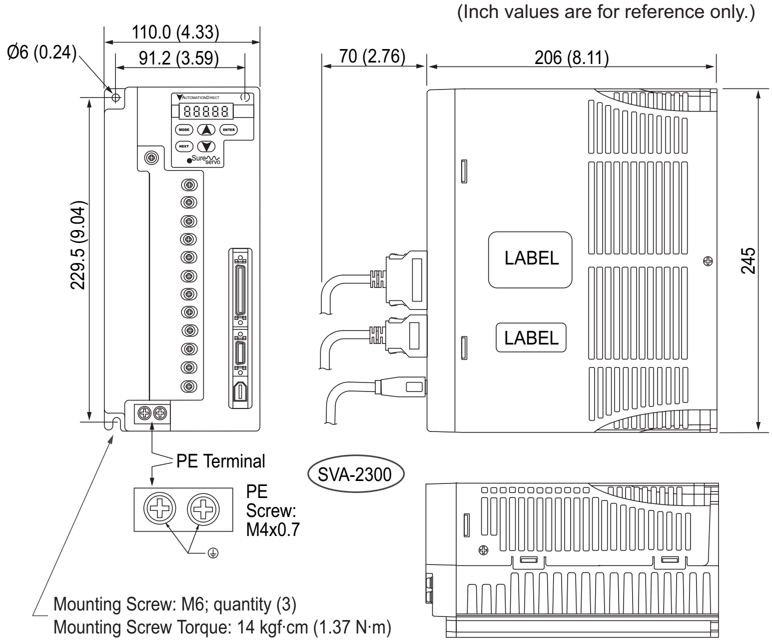
SureServo® AC Servo System Dimensions

Servo drive dimensions (continued)

SVA-2300

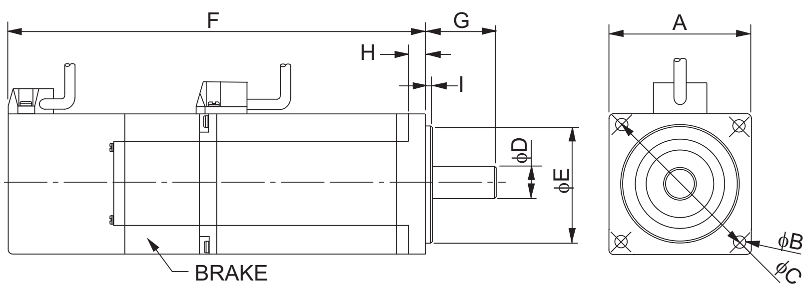
NOTE: RECOMMENDED USER SUPPLIED MOUNTING SCREW IS M6. TIGHTEN TO 14 KGF·CM (1.37 N·M).

UNITS: mm (in)
(Inch values are for reference only.)



Servo motor dimensions

Low inertia models SVL-201(B), SVL-202(B), SVL-SVL-204(B), SVL-207(B)

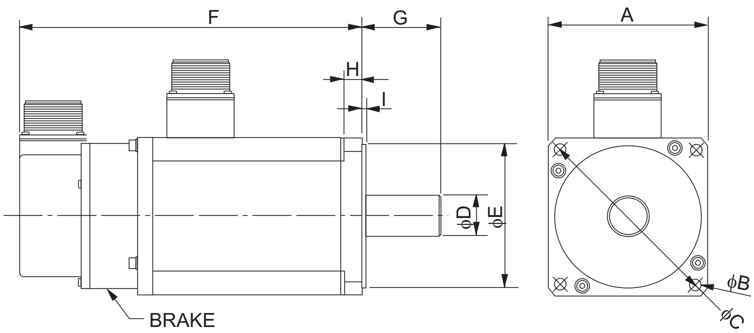


*Sure*Servo® Motor Dimensions – 100W-750W Low Inertia				
Dimension	SVL-201(B)	SVL-202(B)	SVL-204(B)	SVL-207(B)
A	40 [1.575]	60 [2.362]		80 [3.15]
B	4.5 [0.1772]	5.5 [0.2165]		6.6 [0.2598]
C	46 [1.811]	70 [2.756]		90 [3.543]
D	8 +0.0/-0.009 (8h6)	14 +0.0/-0.011 (14h6)		19 +0.0 -0.013 (19h6)
E	30 +0.0/-0.021 (30h7)	50 +0.0/-0.025 (50h7)		70 +0.0/-0.030 (70h7)
F (w/o brake)	100.1 [3.941]	102.4 [4.032]	124.4 [4.898]	135 [5.315]
F (with brake)	135.7 [5.343]	137 [5.394]	159 [6.26]	171.6 [6.756]
G	25 [0.98]	30 [1.18]		35 [1.38]
H	5 [0.197]	6 [0.236]		8 [0.315]
I	2.5 [0.098]	3 [0.118]		
Cable length	300mm (12 inches)			
UNITS: mm [in]. (Inches are for reference only; not included on diameter dimensions for accuracy.)				

SureServo® AC Servo System Dimensions

Servo motor dimensions (continued)

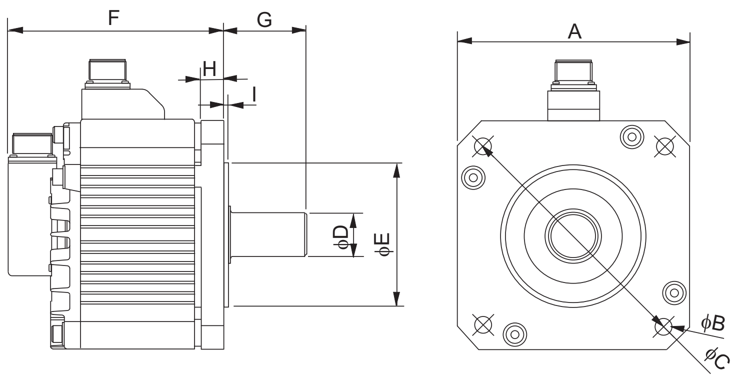
Low inertia models SVL-210(B)



*Sure*Servo® Motor Dimensions -1000W Low Inertia	
Dimension	**SVL-210(B)**
A	100 [3.937]
B	9 [0.3543]
C	115 +0.2/-0.2 [4.528]
D	22 +0.0/-0.013 (22h6)
E	95 +0.0/-0.035 (95h7)
F (w/o brake)	158 [6.22]
F (with brake)	190 [7.48]
G	45 [1.77]
H	17 [0.669]
I	7 [0.28]

UNITS: mm [in] (Inches are for reference only; not included on diameter dimensions for accuracy.)

Medium inertia models SVM-210(B), SVM-220(B), SVM-230(B)



*Sure*Servo® Motor Dimensions -1000W-3000W Medium Inertia			
Dimension	**SVM-210(B)**	**SVM-220(B)**	**SVM-230(B)**
A	130 [5.118]	180 [7.087]	
B	9 [0.3543]	13.5 [0.5315]	
C	145 +0.2/-0.2 [5.709]	200 +0.2/-0.2 [7.874]	
D	22 +0.0/-0.013 (22h6)	35 +0.0/-0.016 (35h6)	
E	110 +0.0/-0.035 (110h7)	114.3 +0/-0.035 (114.3h7)	
F (w/o brake)	143 [5.63]	164 [6.457]	212 [8.35]
F (with brake)	181 [7.126]	213 [8.386]	258 [10.16]
G	55 [2.17]	75 [2.95]	
H	15 [0.591]	20 [0.787]	
I	4 [0.157]		

UNITS: mm [in] (Inches are for reference only; not included on diameter dimensions for accuracy.)

SureServo® AC Servo System Accessories

Accessories

External Regeneration Resistors

Use external resistors to provide additional regenerative capacity and to dissipate heat away from the servo drive.

Part Number	Resistance	SureServo Drives	Price
GS-25P0-BR	40Ω	***SVA-2040***	$75.00
GS-2010-BR-ENC	20Ω	***SVA-2100, SVA-2300***	$223.00

Resistor GS-25P0-BR

AC Line Filters

Input EMI filters reduce electromagnetic interference or noise on the input side of the servo drive. They are required for CE compliance and recommended for installations prone to or sensitive to electromagnetic interference.

SureServo® Drives	AC Input Power	EMI Filter Rating	EMI Filter Part Number	Price
SVA-2040	Single-Phase	250V, 1-phase, 20A	***20DRT1W3S***	$76.00
	Three-Phase	250V, 3-phase, 10A	***10TDT1W4C***	$81.00
SVA-2100	Single-Phase	250V, 1-phase, 20A	***20DRT1W3S***	$76.00
	Three-Phase	250V, 3-phase, 10A	***10TDT1W4C***	$81.00
SVA-2300	Three-Phase	250V, 3-phase, 26A	***26TDT1W4C***	$113.00

NOTE: These EMI Filters are electrically compatible with the SureServo drives. However, they are intended to be mounted next to the servo drive. Do not mount the filter under the drive. The drive mounting holes on these units are intended to be used only with AutomationDirect's line of VFDs.

AC Line Filter 10TD1W4C

Edison Fuses & Fuji Contactors

SureServo® Drives	Input Type	Input Voltage	Edison Fuse - Class CC	Price*	Contactor**	Price
SVA-2040	Main Input Power	230V 3-Phase	***HCTR4***	$89.00	***SC-E02-xxx***	varies
SVA-2100			***HCTR7-5***	$102.00	***SC-E03-xxx***	varies
SVA-2300			***HCTR15***	$83.00	***SC-E04-xxx***	varies
SVA-2040		230V 1-phase	***HCTR4***	$89.00	***SC-E02-xxx***	varies
SVA-2100			***HCTR10***	$90.00	***SC-E03-xxx***	varies
SVA-2040 SVA-2100 SVA-2300	Control Input Power	230V 1-phase	***HCTR2-5***	$93.00		

** Fuses are sold in packages of 10.*

*** Note: For contactors, xxx = coil voltage (for example, SC-E02-220VAC).*

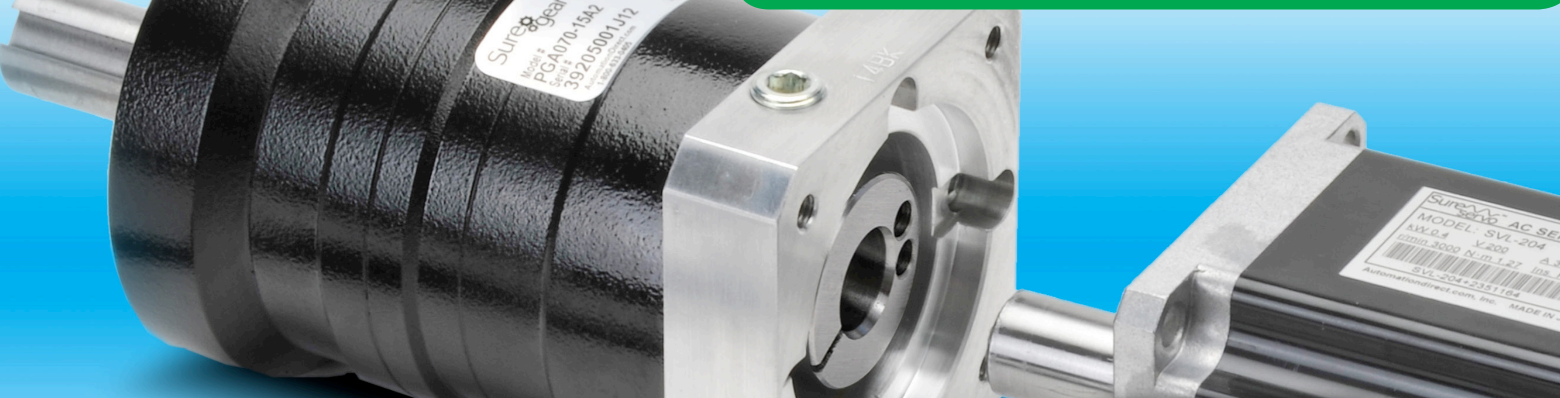
Fuji Contactor SC-E02-xxx

Edison Fuse HCTRx

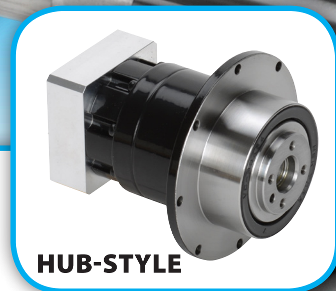
The SureGear PGA, PGB and PGD series easily mates to SureServo motors. Everything you need to mount your SureServo motor is included!

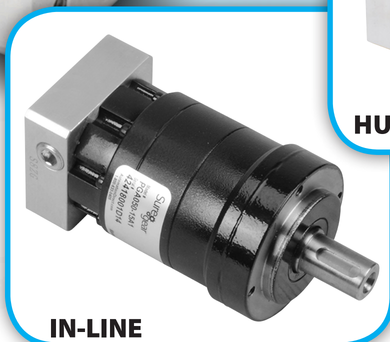
It is the perfect solution for applications such as gantries, injection-molding machines, pick-and-place automation, and linear slides.

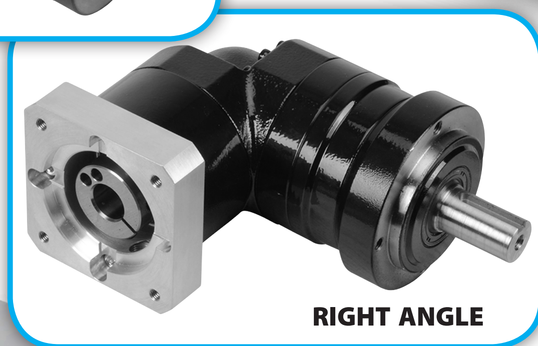
Quickly and easily configure a system online: http://www.sureservo.com/gearbox/selector

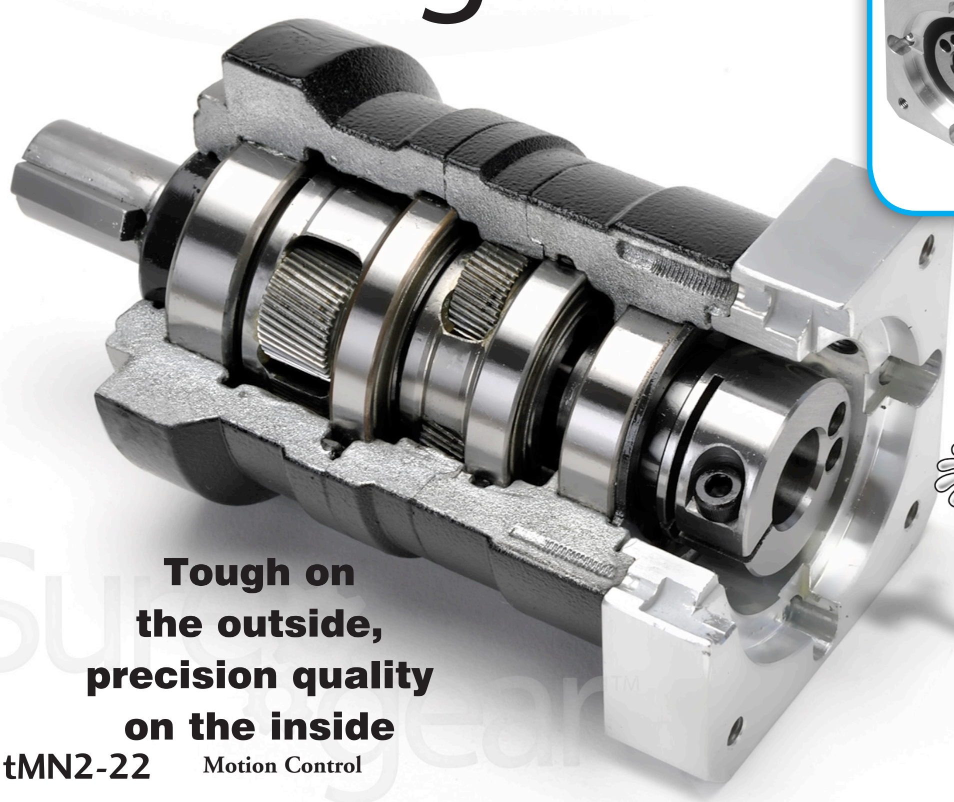


SureGear® Precision Gearboxes for Servo motors

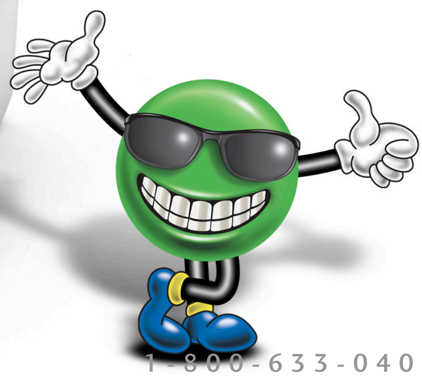








81 models, four gear ratios available



Tough on the outside, precision quality on the inside

SureGear

Precision Servo Gearboxes

SureGear® Servo Gearbox Overview

PGA In-line Series

The SureGear PGA series of high-precision servo gear reducers is an excellent choice for applications that require good accuracy and reliability at an exceptional value. This in-line planetary gear reducer has a thread-in mounting style, along with a level of precision and torque capacity that is best in its class. Offered in a concentric shaft design with a maximum seven arc-min backlash rating, the SureGear PGA series is an accurate, high-performance, and cost effective solution for any OEM.

The machining quality of the SureGear PGA helical planetary gears provides a very quiet and more efficient reducer than other competitive products that are similarly priced. The SureGear PGA series easily mates to SureServo motors, and is the perfect solution for applications such as gantries, injection-molding machines, pick-and-place automation, and linear slides.

SureGear
PGA Gearbox

PGB Right-angle Series

The SureGear PGB series of high-precision right-angle servo gear reducers is an excellent choice for applications that require a more compact footprint.

The PGB right-angle planetary gear reducers offer similar technical specifications to the PGA series in-line gear reducers, and provides the customer with an excellent solution when space and clearance requirements are limited.

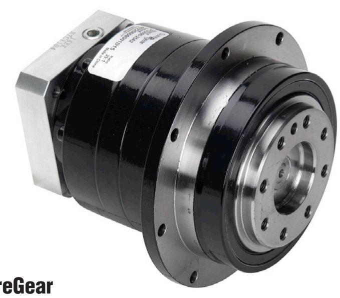
Offered with a six arc-min backlash rating for 2-stage and nine arc-min backlash for 3-stage, the SureGear PGB series performs to OEMs' demanding expectations.

SureGear PGB Gearbox

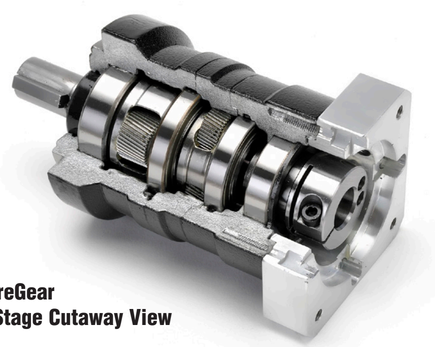
PGD Hub Style In-line Series

The SureGear PGD series sets a new standard in applications requiring extremely high-torque ratings and rigidity. The compact design and hub-style output is ideal for equipment that requires high-speed, high-precision indexing movement. The remarkable torsion stiffness and the low backlash of the planetary gearing combine to provide outstanding positioning accuracy.

With a backlash rating less than 3 arc-minutes and exceptional torque handling capabilities, the PGD series offers a high performance robust planetary solution for OEM customers. The PGD reducer is often used for larger indexing applications and dial tables commonly found in packaging and filling equipment and assembly automation systems.



SureGear
Hub Style PGD Gearbox



SureGear
2-Stage Cutaway View

Features

- Thread-in mounting style
- Best-in-class backlash
- Four gear ratios available (5:1, 10:1, 15:1, 25:1), Two additional for PGD models (35:1 and 50:1)
- Mounting hardware included for attaching to SureServo motors
- Helical-cut planetary gears for quiet operation and reduced vibration
- Right-angle reducer utilizes a spiral bevel gear; motor can be located at a 90° position from the reducer, providing a more compact footprint
- Uncaged needle roller bearings for high rigidity and torque
- Adapter bushing connection for simple and effective attachment to most servo motors
- High-viscosity, anti-separation grease does not migrate away from the gears; no leakage through the seal
- Maintenance free: No need to replace the grease for the life of the unit
- At nominal speed, service life is 20,000 hours
- Can be positioned in any orientation
- IP55 environmental rating
- 5-year warranty

Applications

- Gantries
- Injection-molding machines
- Pick-and-place automation
- Linear slides
- Packaging machines
- Conveyors

Precision Servo Gearboxes

SureGear® Servo Gearbox Selection

Sure Servo Motor	Gear Ratio	*Sure*Gear Gearbox	Frame Size (mm)	Motor Nominal Output Torque		Combo Nominal Output Torque		Nominal Output Speed (rpm)	Max Output Speed (rpm)	Available Load Inertia @ 5:1 Mismatch *	
				N·m	lb·in	N·m	lb·in			$kg \cdot cm^2$	$lb \cdot in \cdot s^2$
SVL-201(B)	5:1	PGD047-05A1	47	0.32	2.83	1.52	13.44	600	1,000	2.68	0.002
		PGA050-05A1	50							2.85	0.003
		PGA070-05A1	70							1.83	0.002
		PGB070-05A1	70			1.49	13.16			-2.50**	-0.002**
	10:1	PGD047-10A1	47			3.04	26.89	300	500	11.80	0.010
		PGA050-10A1	50							12.00	0.011
		PGA070-10A1	70							9.40	0.008
		PGB070-10A1	70			2.98	26.32			-8.00**	-0.007**
	15:1	PGA050-15A1	50			4.32	38.21	200	333	25.88	0.023
		PGA070-15A1	70							21.38	0.019
		PGB070-15A1	70			4.22	37.36			17.33	0.015
	25:1	PGD047-25A1	47			7.20	63.68	120	200	72.50	0.064
		PGA050-25A1	50							72.50	0.064
		PGA070-25A1	70							60.63	0.054
		PGB070-25A1	70			7.04	62.26			49.38	0.044
	50:1	PGD064-50A1	64			14.40	127.35	60	100	252.50	0.223
SVL-202(B)	5:1	PGD064-05A2	64	0.64	5.7	3.04	27.08	600	1,000	20.00	0.018
		PGA070-05A2	70							20.58	0.018
		PGB070-05A2	70			2.98	26.51			16.25	0.014
	10:1	PGD064-10A2	64			6.08	54.15	300	500	83.80	0.074
		PGA070-10A2	70							84.40	0.075
		PGB070-10A2	70			5.95	53.01			67.00	0.059
	15:1	PGA070-15A2	70			8.64	76.95	200	333	190.13	0.168
		PGB070-15A2	70			8.45	75.24			186.08	0.165
		PGB090-15A2	90							126.00	0.112
	25:1	PGD064-25A2	64			14.40	128.25	120	200	528.75	0.468
		PGA070-25A2	70							529.38	0.468
		PGB070-25A2	70			14.08	125.40			518.13	0.459
		PGB090-25A2	90							362.50	0.321
		PGD090-25A2	90			14.40	128.25			481.25	0.426
	50:1	PGD090-50A2	90			28.80	256.50	60	100	2000.00	1.770
		PGD110-50A2	110							1250.00	1.106
SVL-204(B)	5:1	PGD064-05A2	64	1.27	11.2	6.03	53.20	600	1,000	40.00	0.035
		PGA070-05A2	70							40.58	0.036
		PGB070-05A2	70			5.91	52.08			36.25	0.032
	10:1	PGD064-10A2	64			12.07	106.40	300	500	163.80	0.145
		PGA070-10A2	70							164.40	0.145
		PGB070-10A2	70			11.81	104.16			147.00	0.130
	15:1	PGA070-15A2	70			17.15	151.20	200	333	370.13	0.328
		PGB070-15A2	70			16.76	147.84			366.08	0.324
		PGB090-15A2	90							306.00	0.271
	25:1	PGD064-25A2	64			28.58	252.00	120	200	1028.75	0.910
		PGA070-25A2	70							1029.38	0.911
		PGB070-25A2	70			27.94	246.40			1018.13	0.901
		PGB090-25A2	90							862.50	0.763
		PGD090-25A2	90			28.58	252.00			981.25	0.868
	50:1	PGD090-50A2	90			57.15	504.00	60	100	4000.00	3.540
		PGD110-50A2	110							3250.00	2.876
SVL-207(B)	5:1	PGA070-05A3	70	2.39	21.2	11.35	100.70	600	1000	133.08	0.118
		PGB090-05A3	90			11.11	98.58			90.00	0.080
		PGD090-05A3	90			11.35	100.70			120.50	0.107
	10:1	PGA090-10A3	90			22.71	201.40	300	500	511.00	0.452
		PGB090-10A3	90			22.23	197.16			371.00	0.328
		PGD090-10A3	90			22.71	201.40			507.00	0.449
	15:1	PGA090-15A3	90			32.27	286.20	200	333	1185.75	1.049
		PGB090-15A3	90			31.55	279.84			1138.50	1.008
	25:1	PGA090-25A3	90			53.78	477.00	120	200	3300.00	2.921
		PGB090-25A3	90			52.58	466.40			3175.00	2.810
		PGD110-25A3	110			53.78	477.00			2937.50	2.600
	50:1	PGD110-50A3	110			107.55	954.00	60	100	12500.00	11.063

** Available load inertia is calculated based on servo motor inertia using the formula: Available Inertia = (5 x Motor Inertia – Gearbox Inertia) x (Gear Ratio)^2*
A 5:1 inertia mismatch is a good target for design purposes. Systems with lower or higher mismatch may be possible, depending on operating conditions.

*** This gearbox is NOT a suitable choice at a 5:1 mismatch. If inertia balancing is a selection criteria for your end use, please use a mismatch of 8:1 to 10:1.*

SureGear Precision Servo Gearboxes

SureGear® Servo Gearbox Selection (continued)

SureGear® Servo Gearbox Selection											
Sure Servo Motor	Gear Ratio	*Sure*Gear Gearbox	Frame Size (mm)	Motor Nominal Output Torque		Combo Nominal Output Torque		Nominal Output Speed (rpm)	Max Output Speed (rpm)	Available Load Inertia @ 5:1 Mismatch *	
				N·m	lb·in	N·m	lb·in			$kg·cm^2$	$lb·in·s^2$
SVL-210(B)	5:1	PGA090-05A4	90	3.3	29.2	15.68	138.70	600	1000	315.00	0.279
		PGB090-05A4	90			15.35	135.78			280.00	0.248
		PGD090-05A4	90			15.68	138.70			313.00	0.277
	10:1	PGA090-10A4	90			31.45	277.40	300	500	1271.00	1.125
		PGB090-10A4	90			30.69	271.56			1131.00	1.001
		PGD090-10A4	90			31.35	277.40			1267.00	1.121
	15:1	PGA120-15A4	120			44.55	394.20	200	333	2828.25	2.503
		PGB120-15A4	120			43.56	385.44			2418.75	2.141
	25:1	PGD110-25A4	110			74.25	657.00	120	200	7687.50	6.803
		PGA120-25A4	120							7887.50	6.980
		PGB120-25A4	120			72.60	642.40			6762.50	5.985
	50:1	PGD110-50A4	110			148.50	1314.00	60	100	31500.00	27.878
SVM-210(B)	5:1	PGA090-05A5	90	4.8	42.5	22.80	201.88	600	1000	737.50	0.653
		PGD090-05A5	90							735.50	0.651
		PGB120-05A5	120			22.32	197.63			622.00	0.550
	10:1	PGA090-10A5	90			45.60	403.75	300	500	2961.00	2.620
		PGD110-10A5	110							2957.00	2.617
		PGB120-10A5	120			44.64	395.25			2544.00	2.251
	15:1	PGA120-15A5	120			64.80	573.75	200	333	6630.75	58.68
		PGB120-15A5	120			63.36	561.00			6221.25	5.506
	25:1	PGD110-25A5	110			108.00	956.25	120	200	18250.00	16.151
		PGA120-25A5	120							18450.00	16.328
		PGB120-25A5	120			105.60	935.00			17325.00	15.333
	35:1	PGD110-35A5	110			151.20	1338.75	86	143	35770.00	31.656
SVM-220(B)	5:1	PGD110-05A6	110	9.4	83.2	44.65	395.20	600	1000	5355.00	4.739
		PGA120-05A6	120							5372.50	4.755
		PGB120-05A6	120			43.71	386.88			5287.00	4.679
		PGB155-05A6	155							4989.75	4.416
	10:1	PGD110-10A6	110			89.30	790.40	300	500	21540.00	19.063
		PGA120-10A6	120							21555.00	19.076
		PGB120-10A6	120			87.42	773.76			21204.00	18.766
		PGB155-10A6	155							20184.00	17.863
	15:1	PGA155-15A6	155			126.90	1123.20	200	333	48420.00	42.852
		PGB155-15A6	155			124.08	1098.24			47272.50	41.836
	25:1	PGA155-25A6	155			211.50	1872.00	120	200	134625.00	119.143
		PGB155-25A6	155			206.80	1830.40			131468.75	116.350
SVM-230(B)	5:1	PGD110-05A6	110	14.3	12.6	67.93	601.35	600	1000	5355.00	4.739
		PGA120-05A6	120							5372.50	4.755
		PGB120-05A6	120			66.50	588.69			5287.00	4.679
	10:1	PGD110-10A6	110			135.85	1202.70	300	500	21540.00	19.063
		PGA120-10A6	120							21555.00	19.076
		PGB120-10A6	120			132.99	1177.38			21204.00	18.766
		PGB155-10A6	155							20184.00	17.863
	15:1	PGA155-15A6	155			193.05	1709.10	200	333	48420.00	42.852
		PGB155-15A6	155			188.76	1671.12			47272.50	41.836
	25:1	PGA155-25A6	155			321.75	2848.50	120	200	134625.00	119.143
		PGB155-25A6	155			314.60	2785.20			131468.75	116.350

** Available load inertia is calculated based on servo motor inertia using the formula: Available Inertia = (5 x Motor Inertia – Gearbox Inertia) x $(Gear Ratio)^2$*
A 5:1 inertia mismatch is a good target for design purposes. Systems with lower or higher mismatch may be possible, depending on operating conditions.

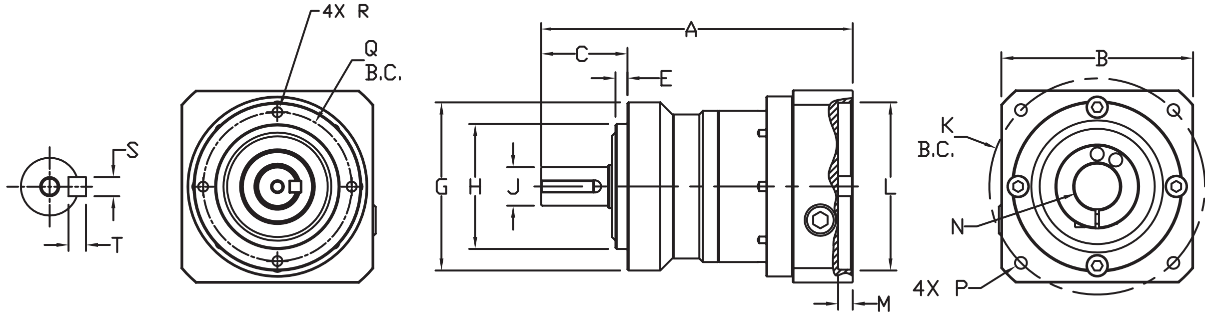
SureGear Precision Servo Gearboxes

Pricing & Specifications – In-Line Shaft PGA Series

SureGear® Precision Servo Gearboxes – In-Line Shaft PGA Series																			
Part Number	**Price**	**Frame Size (mm)**	**Ratio**	**Reduction**	**Nominal Output Torque (N·m [lb·in])**	**Max. Acceleration Torque (N·m [lb·in])**	**Emergency Stop Torque (N·m [lb·in])**	**Backlash (arc-min)**	**Nominal Input Speed (rpm)**	**Max. Input Speed (rpm)**	**Allowable Radial Load (N [lb])**	**Allowable Thrust Load (N [lb])**	**Moment of Inertia (kg·cm²)**	**Efficiency (%)**	**Max. Housing Temperature**	**Approx Weight (kg [lb])**	**Environmental Rating**	**Fits SureServo Servo Motor**
PGA050-05A1	$398.00	50	5:1	single	9 [80]	18 [159]	35 [310]	5	4000	8000	290 [65]	330 [74]	0.036	95	90 °C [194 °F]	0.7 [1.5]	IP55	SVL-201(B)
PGA050-10A1	$419.00		10:1	single	6 [53]	12 [106]	30 [266]				360 [81]	450 [101]	0.030					
PGA050-15A1	$574.00		15:1	double	6 [53]	12 [106]	30 [266]	7			410 [92]	540 [121]	0.035	90		0.8 [1.8]		
PGA050-25A1	$574.00		25:1	double	9 [80]	18 [159]	35 [310]				490 [110]	640 [144]	0.034					
PGA070-05A1	$398.00	70	5:1	single	27 [239]	50 [443]	100 [885]	5	3000	6000	510 [115]	390 [88]	0.077	95		1.5 [3.3]		
PGA070-10A1	$419.00		10:1	single	18 [159]	35 [310]	80 [708]				640 [144]	530 [119]	0.056					
PGA070-15A1	$574.00		15:1	double	18 [159]	35 [310]	80 [708]				740 [166]	630 [142]	0.055	90		1.7 [3.7]		
PGA070-25A1	$574.00		25:1	double	27 [239]	50 [443]	100 [885]				870 [196]	790 [178]	0.053					
PGA070-05A2	$434.00		5:1	single	27 [239]	50 [443]	100 [885]				510 [115]	390 [88]	0.160	95		1.5 [3.3]		SVL-202(B) SVL-204(B)
PGA070-10A2	$434.00		10:1	single	18 [159]	35 [310]	80 [708]				640 [144]	530 [119]	0.140					
PGA070-15A2	$595.00		15:1	double	18 [159]	35 [310]	80 [708]				740 [166]	630 [142]	0.140	90		1.7 [3.7]		
PGA070-25A2	$595.00		25:1	double	27 [239]	50 [443]	100 [885]				870 [196]	790 [178]	0.130					
PGA070-05A3	$434.00		5:1	single	27 [239]	50 [443]	100 [885]				510 [115]	390 [88]	0.360	95		1.5 [3.3]		SVL-207(B)
PGA090-10A3	$514.00	90	10:1	single	50 [443]	80 [708]	200 [1770]				1200 [270]	1600 [360]	0.750			3.5 [7.7]		
PGA090-15A3	$679.00		15:1	double	50 [443]	80 [708]	200 [1770]				1400 [315]	1900 [427]	0.720	90		4.0 [8.8]		
PGA090-25A3	$679.00		25:1	double	75 [664]	125 [1106]	250 [2213]				1600 [360]	2200 [495]	0.710					
PGA090-05A4	$513.00		5:1	single	75 [664]	125 [1106]	250 [2213]				960 [216]	1200 [270]	2.900	95		3.5 [7.7]		SVL-210(B)
PGA090-10A4	$513.00		10:1	single	50 [443]	80 [708]	200 [1770]				1200 [270]	1600 [360]	2.800					
PGA090-05A5	$513.00		5:1	single	75 [664]	125 [1106]	250 [2213]				960 [216]	1200 [270]	2.900			3.5 [7.7]		SVM-210(B)
PGA090-10A5	$513.00		10:1	single	50 [443]	80 [708]	200 [1770]				1200 [270]	1600 [360]	2.800					
PGA120-15A4	$852.00	120	15:1	double	120 [1062]	225 [1991]	500 [4425]				2300 [517]	3000 [674]	2.800	90		8.7 [19.2]		SVL-210(B)
PGA120-25A4	$852.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				2700 [607]	3700 [832]	2.800					
PGA120-15A5	$852.00		15:1	double	120 [1062]	225 [1991]	500 [4425]				2300 [517]	3000 [674]	2.800			8.7 [19.2]		SVM-210(B)
PGA120-25A5	$852.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				2700 [607]	3700 [832]	2.800					
PGA120-05A6	$680.00		5:1	single	180 [1593]	330 [2921]	625 [5532]				1600 [360]	1900 [427]	11.000	95		7.8 [17.2]		SVM-220(B) SVM-230(B)
PGA120-10A6	$680.00		10:1	single	120 [1062]	225 [1991]	500 [4425]				2000 [450]	2500 [562]	11.000					
PGA155-10A6	$840.00	155	10:1	single	240 [2124]	470 [4160]	1000 [8851]		2000	4000	4700 [1057]	4100 [922]	11.000	95		16 [35.3]		
PGA155-15A6	$1,142.00		15:1	double	240 [2124]	470 [4160]	1000 [8851]				5400 [1214]	4900 [1102]	11.000	90		18 [40.0]		
PGA155-25A6	$1,142.00		25:1	double	360 [3186]	700 [6196]	1250 [11063]				6400 [1439]	6100 [1371]	11.000					

SureGear Precision Servo Gearboxes

Dimensions – In-Line Shaft PGA Series



SureGear PGA Series In-Line Shaft Gearboxes Dimension Drawing

SureGear® Precision Servo Gearbox Dimensions – In-Line Shaft PGA Series (dimensions = mm [in])

Part Number	*A*	*B*	*C*	*E*	*G*	*H*	*J*	*K*	*L*	*M*	*N*	*P*	*Q*	*R*	*S*	*T*
PGA050-05A1 *PGA050-10A1*	88.5 [3.48]	42.0 [1.65]	24.5 [0.96]	4.0 [0.16]	Ø50.0 [Ø1.97]	Ø35.0 [Ø1.38]	Ø12.0 [Ø0.47]	Ø46.0 [Ø1.81]	Ø30.0 [Ø1.18]	5.0 [0.20]	Ø8.0 [Ø0.31]	M4- 0.7x9	Ø44.0 [Ø0.731]	M4- 0.7x8	4.0 [0.16]	4.0 [0.16]
PGA050-15A1 *PGA050-25A1*	105.0 [4.13]	42.0 [1.65]	24.5 [0.96]	4.0 [0.16]	Ø50.0 [Ø1.97]	Ø35.0 [Ø1.38]	Ø12.0 [Ø0.47]	Ø46.0 [Ø1.81]	Ø30.0 [Ø1.18]	5.0 [0.20]	Ø8.0 [Ø0.31]	M4- 0.7x9	Ø44.0 [Ø0.731]	M4- 0.7x8	4.0 [0.16]	4.0 [0.16]
PGA070-05A1 *PGA070-10A1*	112.0 [4.41]	52.0 [2.05]	36.0 [1.42]	5.0 [0.20]	Ø70.0 [Ø2.76]	Ø52.0 [Ø2.05]	Ø16.0 [Ø0.63]	Ø46.0 [Ø1.81]	Ø30.0 [Ø1.18]	5.0 [0.20]	Ø8.0 [Ø0.31]	M4- 0.7x9	Ø62.0 [Ø2.44]	M5- 0.8x10	5.0 [0.20]	5.0 [0.20]
PGA070-05A2 *PGA070-10A2*	115.0 [4.53]	65.0 [2.56]	36.0 [1.42]	5.0 [0.20]	Ø70.0 [Ø2.76]	Ø52.0 [Ø2.05]	Ø16.0 [Ø0.63]	Ø70.0 [Ø2.76]	Ø50.0 [Ø1.97]	5.0 [0.20]	Ø14.0 [Ø0.55]	M5- 0.8x11	Ø62.0 [Ø2.44]	M5- 0.8x10	5.0 [0.20]	5.0 [0.20]
PGA070-05A3	130.0 [5.12]	80.0 [3.15]	36.0 [1.42]	5.0 [0.20]	Ø70.0 [Ø2.76]	Ø52.0 [Ø2.05]	Ø16.0 [Ø0.63]	Ø90.0 [Ø3.54]	Ø70.0 [Ø2.76]	6.0 [0.24]	Ø19.0 [Ø0.75]	M6- 1.0x13	Ø62.0 [Ø2.44]	M5- 0.8x10	5.0 [0.20]	5.0 [0.20]
PGA070-15A1 *PGA070-25A1*	131.0 [5.16]	52.0 [2.05]	36.0 [1.42]	5.0 [0.20]	Ø70.0 [Ø2.76]	Ø52.0 [Ø2.05]	Ø16.0 [Ø0.63]	Ø46.0 [Ø1.81]	Ø30.0 [Ø1.18]	5.0 [0.20]	Ø8.0 [Ø0.31]	M4- 0.7x9	Ø62.0 [Ø2.44]	M5- 0.8x10	5.0 [0.20]	5.0 [0.20]
PGA070-15A2 *PGA070-25A2*	136.0 [5.35]	65.0 [2.56]	36.0 [1.42]	5.0 [0.20]	Ø70.0 [Ø2.76]	Ø52.0 [Ø2.05]	Ø16.0 [Ø0.63]	Ø70.0 [Ø2.76]	Ø50.0 [Ø1.97]	5.0 [0.20]	Ø14.0 [Ø0.55]	M5- 0.8x11	Ø62.0 [Ø2.44]	M5- 0.8x10	5.0 [0.20]	5.0 [0.20]
PGA090-10A3	153.0 [6.02]	80.0 [3.15]	46.0 [1.81]	7.0 [0.28]	Ø90.0 [Ø3.54]	Ø68.0 [Ø2.68]	Ø22.0 [Ø0.87]	Ø90.0 [Ø3.54]	Ø70.0 [Ø2.76]	6.0 [0.24]	Ø19.0 [Ø0.75]	M6- 1.0x13	Ø80.0 [Ø3.15]	M6- 1.0x12	6.0 [0.24]	6.0 [0.24]
PGA090-05A4 *PGA090-10A4*	170.0 [6.69]	100.0 [3.94]	46.0 [1.81]	7.0 [0.28]	Ø90.0 [Ø3.54]	Ø68.0 [Ø2.68]	Ø22.0 [Ø0.87]	Ø115.0 [Ø4.53]	Ø95.0 [Ø3.74]	8.0 [0.31]	Ø22.0 * [Ø0.87]	M8- 1.25x17	Ø80.0 [Ø3.15]	M6- 1.0x12	6.0 [0.24]	6.0 [0.24]
PGA090-05A5 *PGA090-10A5*	165.0 [6.50]	130.0 [5.12]	46.0 [1.81]	7.0 [0.28]	Ø90.0 [Ø3.54]	Ø68.0 [Ø2.68]	Ø22.0 [Ø0.87]	Ø145.0 [Ø5.71]	Ø110.0 [Ø4.33]	8.0 [0.31]	Ø22.0 * [Ø0.87]	M8- 1.25x17	Ø80.0 [Ø3.15]	M6- 1.0x12	6.0 [0.24]	6.0 [0.24]
PGA090-15A3 *PGA090-25A3*	175.0 [6.89]	80.0 [3.15]	46.0 [1.81]	7.0 [0.28]	Ø90.0 [Ø3.54]	Ø68.0 [Ø2.68]	Ø22.0 [Ø0.87]	Ø90.0 [Ø3.54]	Ø70.0 [Ø2.76]	6.0 [0.24]	Ø19.0 [Ø0.75]	M6- 1.0x13	Ø80.0 [Ø3.15]	M6- 1.0x12	6.0 [0.24]	6.0 [0.24]
PGA120-05A6 *PGA120-10A6*	225.0 [8.86]	180.0 [7.09]	70.0 [2.76]	9.0 [0.35]	Ø120.0 [Ø4.72]	Ø90.0 [Ø3.54]	Ø32.0 [Ø1.26]	Ø200.0 [Ø7.87]	Ø114.0 [Ø4.49]	8.0 [0.31]	Ø35.0 * [Ø1.38]	M12- 1.75x25	Ø108.0 [Ø4.25]	M8- 1.25x16	10.0 [0.39]	8.0 [0.31]
PGA120-15A4 *PGA120-25A4*	231.5 [9.11]	100.0 [3.94]	70.0 [2.76]	9.0 [0.35]	Ø120.0 [Ø4.72]	Ø90.0 [Ø3.54]	Ø32.0 [Ø1.26]	Ø115.0 [Ø4.53]	Ø95.0 [Ø3.74]	8.0 [0.31]	Ø22.0 * [Ø0.87]	M8- 1.25x17	Ø108.0 [Ø4.25]	M8- 1.25x16	10.0 [0.39]	8.0 [0.31]
PGA120-15A5 *PGA120-25A5*	231.5 [9.11]	130.0 [5.12]	70.0 [2.76]	9.0 [0.35]	Ø120.0 [Ø4.72]	Ø90.0 [Ø3.54]	Ø32.0 [Ø1.26]	Ø145.0 [Ø5.71]	Ø110.0 [Ø4.33]	8.0 [0.31]	Ø22.0 * [Ø0.87]	M8- 1.25x17	Ø108.0 [Ø4.25]	M8- 1.25x16	10.0 [0.39]	8.0 [0.31]
PGA155-10A6	264.0 [10.39]	180.0 [7.09]	97.0 [3.82]	12.0 [0.47]	Ø155.0 [Ø6.10]	Ø120.0 [Ø4.72]	Ø40.0 [Ø1.57]	Ø200.0 [Ø7.87]	Ø114.0 [Ø4.49]	8.0 [0.31]	Ø35.0 * [Ø1.38]	M12- 1.75x25	Ø140.0 [Ø5.51]	M10- 1.50x28	12.0 [0.47]	8.0 [0.31]
PGA155-15A6 *PGA155-25A6*	298.5 [11.75]	180.0 [7.09]	97.0 [3.82]	12.0 [0.47]	Ø155.0 [Ø6.10]	Ø120.0 [Ø4.72]	Ø40.0 [Ø1.57]	Ø200.0 [Ø7.87]	Ø114.0 [Ø4.49]	8.0 [0.31]	Ø35.0 * [Ø1.38]	M12- 1.75x25	Ø140.0 [Ø5.51]	M10- 1.50x28	12.0 [0.47]	8.0 [0.31]

** Dimension with supplied bushing*

NOTE: See our website: www.AutomationDirect.com for complete engineering drawings.

SureGear Precision Servo Gearboxes

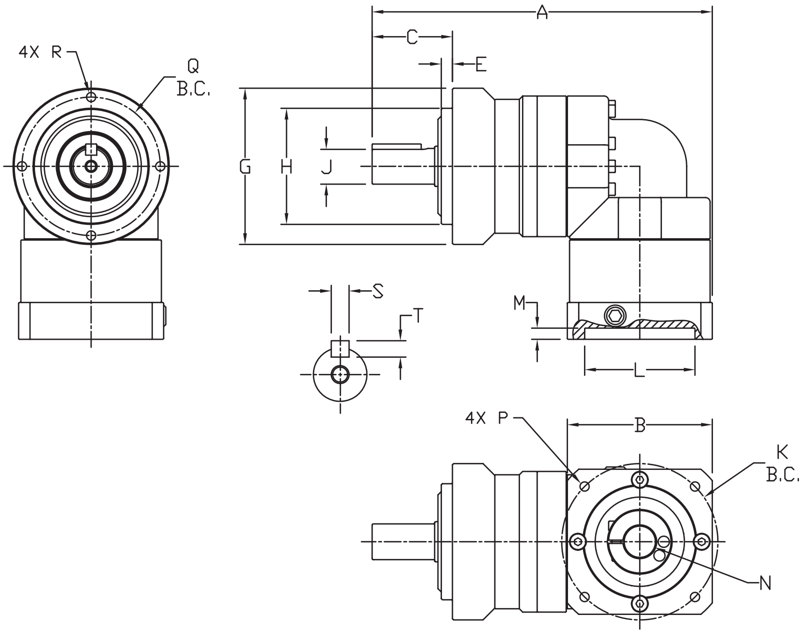
Pricing & Specifications – Right-Angle Shaft PGB Series

SureGear® Precision Servo Gearboxes – Right-Angle Shaft PGB Series

Part Number	Price	Frame Size (mm)	Ratio	Reduction	Nominal Output Torque (N·m [lb·in])	Max. Acceleration Torque (N·m [lb·in])	Emergency Stop Torque (N·m [lb·in])	Backlash (arc-min)	Nominal Input Speed (rpm)	Max. Input Speed (rpm)	Allowable Radial Load (N [lb])	Allowable Thrust Load (N [lb])	Moment of Inertia (kg·cm²)	Efficiency (%)	Max. Housing Temperature	Approx Weight (kg [lb])	Environmental Rating	Fits SureServo Servo Motor
PGB070-05A1	$674.00	70	5:1	double	22 [195]	40 [354]	80 [708]	6	3000	6000	510 [115]	390 [88]	0.250	93	90 °C [194 °F]	1.9 [4.2]	IP55	SVL-201(B)
PGB070-10A1	$674.00		10:1	double	16 [142]	32 [283]	65 [575]				640 [144]	530 [119]	0.230					
PGB070-15A1	$852.00		15:1	triple	16 [142]	32 [283]	65 [575]	9			740 [166]	630 [142]	0.073	88		1.7 [3.7]		
PGB070-25A1	$852.00		25:1	triple	24 [212]	45 [398]	90 [797]				870 [196]	790 [178]	0.071					
PGB070-05A2	$674.00		5:1	double	22 [195]	40 [354]	80 [708]	6			510 [115]	390 [88]	0.320	93		1.9 [4.2]		SVL-202(B) SVL-204(B)
PGB070-10A2	$674.00		10:1	double	16 [142]	32 [283]	65 [575]				640 [144]	530 [119]	0.300					
PGB070-15A2	$852.00		15:1	triple	16 [142]	32 [283]	65 [575]	9			740 [166]	630 [142]	0.118	88		1.7 [3.7]		SVL-202(B)
PGB070-25A2	$852.00		25:1	triple	24 [212]	45 [398]	90 [797]				870 [196]	790 [178]	0.115					
PGB090-15A2	$1,040.00	90	15:1	triple	45 [398]	65 [575]	170 [1505]	9			1400 [314]	1900 [427]	0.410	88		4.3 [9.5]		SVL-202(B) SVL-204(B)
PGB090-25A2	$1,040.00		25:1	triple	65 [575]	110 [974]	220 [1947]				1600 [360]	2200 [495]	0.400					
PGB090-05A3	$797.00		5:1	double	65 [575]	90 [797]	220 [1947]	6			960 [216]	1200 [270]	2.130	93		4.9 [10.8]		SVL-207(B)
PGB090-10A3	$797.00		10:1	double	45 [398]	65 [575]	170 [1505]				1200 [270]	1600 [360]	2.020					
PGB090-15A3	$1,040.00		15:1	triple	45 [398]	65 [575]	170 [1505]	9			1400 [314]	1900 [427]	0.600	88		4.3 [9.5]		
PGB090-25A3	$1,040.00		25:1	triple	65 [575]	110 [974]	220 [1947]				1600 [360]	2200 [495]	0.590					
PGB090-05A4	$797.00		5:1	double	65 [575]	90 [797]	220 [1947]	6			960 [216]	1200 [270]	4.260	93		4.9 [10.8]		SVL-210(B)
PGB090-10A4	$797.00		10:1	double	45 [398]	65 [575]	170 [1505]				1200 [270]	1600 [360]	4.150					
PGB120-15A4	$1,293.00	120	15:1	triple	110 [974]	200 [1770]	450 [3983]	9			2300 [517]	3000 [674]	4.700	88		10 [22]		
PGB120-25A4	$1,293.00		25:1	triple	150 [1328]	300 [2655]	550 [4868]				2700 [607]	3700 [832]	4.640					
PGB120-05A5	$1,040.00		5:1	double	120 [1062]	240 [2124]	500 [4425]	6			1600 [360]	1900 [427]	6.610	93		10.2 [22.5]		SVM-210(B)
PGB120-10A5	$1,040.00		10:1	double	110 [974]	200 [1770]	450 [3983]				2000 [450]	2500 [562]	6.050					
PGB120-15A5	$1,293.00		15:1	triple	110 [974]	200 [1770]	450 [3983]	9			2300 [517]	3000 [674]	4.700	88		10 [22]		
PGB120-25A5	$1,293.00		25:1	triple	150 [1328]	300 [2655]	550 [4868]				2700 [607]	3700 [832]	4.640					
PGB120-05A6	$1,040.00		5:1	double	120 [1062]	240 [2124]	500 [4425]	6			1600 [360]	1900 [427]	13.690	93		10.2 [22.5]		SVM-220(B) SVM-230(B)
PGB120-10A6	$1,040.00		10:1	double	110 [974]	200 [1770]	450 [3983]				2000 [450]	2500 [562]	13.120					
PGB155-15A6	$1,514.00	155	15:1	triple	200 [1770]	400 [3540]	750 [6638]	9	2000	4000	5400 [1214]	4900 [1102]	15.070	88		20.4 [45.0]		SVM-220(B)
PGB155-25A6	$1,514.00		25:1	triple	300 [2655]	600 [5310]	1100 [9736]				6400 [1439]	6100 [1371]	14.820					
PGB155-05A6	$1,198.00		5:1	double	200 [1770]	400 [3540]	1100 [9736]	6			3800 [854]	3000 [674]	21.280	93		19.8 [43.7]		SVM-220(B) SVM-230(B)
PGB155-10A6	$1,198.00		10:1	double	200 [1770]	400 [3540]	750 [6638]				4700 [1057]	4100 [922]	19.030					

SureGear Precision Servo Gearboxes

Dimensions – Right-Angle Shaft PGB Series



SureGear PGB Series Right-Angle Shaft Gearboxes Dimension Drawing

SureGear® Precision Servo Gearbox Dimensions – Right-Angle Shaft PGA Series (dimensions = mm [in])

Part Number	A	B	C	E	G	H	J	K	L	M	N	P	Q	R	S	T
PGB070-05A1 PGB070-10A1	151.5 [5.96]	52.0 [2.05]	36.0 [1.42]	5.0 [0.20]	Ø70.0 [Ø2.76]	Ø52.0 [Ø2.05]	Ø16.0 [Ø0.63]	Ø46.0 [Ø1.81]	Ø30.0 [Ø1.18]	5.0 [0.20]	Ø8.0 [Ø0.31]	M4- 0.7x9	Ø62.0 [Ø2.44]	M5- 0.8x10	5.0 [0.20]	5.0 [0.20]
PGB070-05A2 PGB070-10A2		65.0 [2.56]						Ø70.0 [Ø2.76]	Ø50.0 [Ø1.97]		Ø14.0 [Ø0.55]	M5- 0.8x11				
PGB070-15A1 PGB070-25A1	158.0 [6.22]	52.0 [2.05]						Ø46.0 [Ø1.81]	Ø30.0 [Ø1.18]		Ø8.0 [Ø0.31]	M4- 0.7x9				
PGB070-15A2 PGB070-25A2	163.5 [6.44]	65.0 [2.56]						Ø70.0 [Ø2.76]	Ø50.0 [Ø1.97]		Ø14.0 [Ø0.55]	M5- 0.8x11				
PGB090-15A2 PGB090-25A2	204.5 [8.05]		46.0 [1.81]	7.0 [0.28]	Ø90.0 [Ø3.54]	Ø68.0 [Ø2.68]	Ø22.0 [Ø0.87]						Ø80.0 [Ø3.15]	M6- 1.0x12	6.0 [0.24]	6.0 [0.24]
PGB090-05A3 PGB090-10A3	205.5 [8.09]	80.0 [3.15]						Ø90.0 [Ø3.54]	Ø70.0 [Ø2.76]	6.0 [0.24]	Ø19.0 [Ø0.75]	M6- 1.0x13				
PGB090-15A3 PGB090-25A3	210.5 [8.29]															
PGB090-05A4 PGB090-10A4	205.5 [8.09]	100.0 [3.94]						Ø115.0 [Ø4.53]	Ø95.0 [Ø3.74]	8.0 [0.31]	Ø22.0 * [Ø0.87]	M8- 1.25x17				
PGB120-15A4 PGB120-25A4	272.0 [10.71]		70.0 [2.76]	9.0 [0.35]	Ø120.0 [Ø4.72]	Ø90.0 [Ø3.54]	Ø32.0 [Ø1.26]						Ø108.0 [Ø4.25]	M8- 1.25x16	10.0 [0.39]	8.0 [0.31]
PGB120-05A5 PGB120-10A5	266.0 [10.47]	130.0 [5.12]						Ø145.0 [Ø5.71]	Ø110.0 [Ø4.33]							
PGB120-15A5 PGB120-25A5	272.0 [10.71]															
PGB120-05A6 PGB120-10A6	268.5 [10.57]	180.0 [7.09]						Ø200.0 [Ø7.87]	Ø114.0 [Ø4.50]		Ø35.0 * [Ø1.38]	M12- 1.75x25				
PGB155-05A6 PGB155-10A6	341.0 [13.43]		97.0 [3.82]	12.0 [0.47]	Ø155.0 [Ø6.10]	Ø120.0 [Ø4.72]	Ø40.0 [Ø1.57]						Ø140.0 [Ø5.51]	M10- 1.5x20	12.0 [0.47]	
PGB155-15A6 PGB155-25A6	364.0 [14.33]															

** Dimension with supplied bushing*

NOTE: See our website: www.AutomationDirect.com for complete engineering drawings.

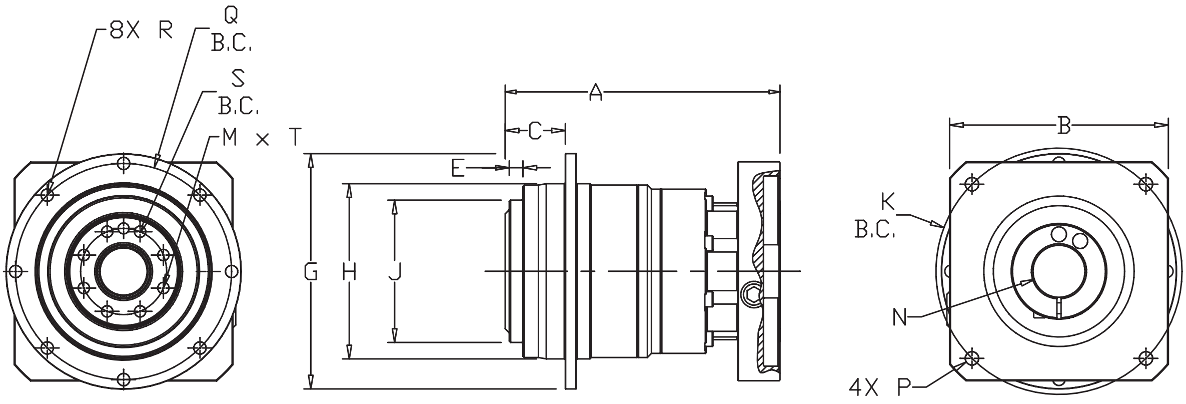
SureGear Precision Servo Gearboxes

Pricing & Specifications – Hub Style In-Line PGD Series

SureGear® Precision Servo Gearboxes – Hub Style In-Line PGD Series																		
Part Number	**Price**	**Frame Size (mm)**	**Ratio**	**Reduction**	**Nominal Output Torque (N·m [lb·in])**	**Max. Acceleration Torque (N·m [lb·in])**	**Emergency Stop Torque (N·m [lb·in])**	**Backlash (arc-min)**	**Nominal Input Speed (rpm)**	**Max. Input Speed (rpm)**	**Allowable Radial Load (N [lb])**	**Allowable Thrust Load (N [lb])**	**Moment of Inertia (kg·cm^2)**	**Efficiency (%)**	**Max. Housing Temperature**	**Approx Weight (kg [lb])**	**Environmental Rating**	**Fits SureServo Servo Motor**
PGD047-05A1	$722.00	47	5:1	single	9 [80]	18 [159]	35 [310]	≤ 3	4000	8000	300 [67]	330 [74]	0.043	95	90 °C [194 °F]	0.7 [1.5]	IP54 (IP65)	SVL-201(B)
PGD047-10A1	$722.00		10:1	single	6 [53]	12 [106]	30 [266]				370 [83]	450 [101]	0.032					
PGD047-25A1	$902.00		25:1	double	9 [80]	18 [159]	35 [310]	≤ 5			510 [115]	550 [124]	0.034	90		0.8 [1.8]		
PGD064-50A1	$1,092.00	64	50:1	double	27 [239]	50 [443]	100 [885]	≤ 3	3000	6000	850 [191]	750 [169]	0.049	90		1.6 [3.5]		
PGD064-05A2	$932.00		5:1	single	27 [239]	50 [443]	100 [885]				400 [90]	390 [88]	0.1	95		1.4 [3.1]		SVL-202(B) SVL-204(B)
PGD064-10A2	$932.00		10:1	single	18 [159]	35 [310]	80 [708]				500 [112]	530 [119]	0.062	95		1.4 [3.1]		
PGD064-25A2	$1,092.00		25:1	double	27 [239]	50 [443]	100 [885]				680 [153]	750 [169]	0.054	90		1.6 [3.5]		
PGD090-25A2	$1,252.00	90	25:1	double	75 [664]	125 [1106]	250 [2213]				1300 [292]	1400 [315]	0.130	90		4 [8.8]		
PGD090-50A2	$1,252.00		50:1	double	75 [664]	125 [1106]	250 [2213]				1700 [382]	1700 [382]	0.099	90		4 [8.8]		
PGD090-05A3	$1,092.00		5:1	single	75 [664]	125 [1106]	250 [2213]				780 [175]	680 [153]	0.580	95		3.6 [7.9]		SVL-207(B)
PGD090-10A3	$1,092.00		10:1	single	50 [443]	80 [708]	200 [1770]				980 [220]	920 [207]	0.330	95		3.6 [7.9]		
PGD090-05A4	$1,092.00		5:1	single	75 [664]	125 [1106]	250 [2213]				780 [175]	680 [153]	0.580	95		3.6 [7.9]		SVL-210(B)
PGD090-10A4	$1,092.00		10:1	single	50 [443]	80 [708]	200 [1770]				980 [220]	920 [207]	0.330	95		3.6 [7.9]		
PGD090-05A5	$1,092.00		5:1	single	75 [664]	125 [1106]	250 [2213]				780 [175]	680 [153]	0.580	95		3.6 [7.9]		SVM-210(B)
PGD110-50A2	$1,598.00	110	50:1	double	180 [1593]	330 [2921]	625 [5532]				10000 [2248]	6800 [1529]	0.400	90		8.6 [19]		SVL-202(B) SVL-204(B)
PGD110-25A3	$1,598.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				8200 [1843]	5500 [1236]	0.700	90		8.6 [19]		SVL-207(B)
PGD110-50A3	$1,598.00		50:1	double	180 [1593]	330 [2921]	625 [5532]				10000 [2248]	6800 [1529]	0.400	90		8.6 [19]		
PGD110-25A4	$1,598.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				8200 [1843]	5500 [1236]	0.700	90		8.6 [19]		SVL-210(B)
PGD110-50A4	$1,598.00		50:1	double	180 [1593]	330 [2921]	625 [5532]				10000 [2248]	6800 [1529]	0.400	90		8.6 [19]		
PGD110-10A5	$1,358.00		10:1	single	120 [1062]	225 [1991]	500 [4425]				6200 [1394]	4200 [944]	1.100	95		7.8 [17.2]		SVM-210(B)
PGD110-25A5	$1,598.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				8200 [1843]	5500 [1236]	0.700	90		8.6 [19]		
PGD110-35A5	$1,598.00		35:1	double	180 [1593]	330 [2921]	625 [5532]				9000 [2023]	6100 [1371]	0.700	90		8.6 [19]		
PGD110-05A6	$1,358.00		5:1	single	180 [1593]	330 [2921]	625 [5532]				5000 [1124]	3400 [427]	2.300	95		7.8 [17.2]		SVM-220(B) SVM-230(B)
PGD110-10A6	$1,358.00		10:1	single	120 [1062]	225 [1991]	500 [4425]				6200 [1394]	4200 [944]	1.100	95		7.8 [17.2]		

SureGear Precision Servo Gearboxes

Dimensions – Hub Style In-Line PGD Series



SureGear PGD Series Hub Style In-Line Gearboxes Dimension Drawing

<table>
<tr><th></th><th colspan="16">SureGear® Precision Servo Gearbox Dimensions – Hub Style In-Line PGD Series (dimensions = mm [in])</th></tr>
<tr><th></th><th>Part Number</th><th>A*</th><th>B*</th><th>C</th><th>E</th><th>G</th><th>H</th><th>J</th><th>K</th><th>M</th><th>N**</th><th>P</th><th>Q</th><th>R</th><th>S</th><th>T</th></tr>
<tr><td>1</td><td>PGD047-05A1
PGD047-10A1</td><td rowspan="2">66.5
[2.62]</td><td rowspan="2">42.0
[1.65]</td><td rowspan="5">19.5
[0.7677]</td><td rowspan="5">3.0
[0.1181]</td><td rowspan="2">Ø72.0
[Ø2.83]</td><td rowspan="2">Ø47.0
[Ø1.85]</td><td rowspan="2">Ø28.0
[Ø1.102]</td><td rowspan="3">Ø46.0
[Ø1.811]</td><td rowspan="2">4</td><td rowspan="2">Ø8.0
[Ø0.31]</td><td rowspan="3">M4-
0.7x9</td><td rowspan="2">Ø67.0
[Ø2.6378]</td><td rowspan="2">3.4
[0.13]</td><td rowspan="2">Ø20.0
[Ø0.7874]</td><td rowspan="2">M3-
0.5x6.5</td></tr>
<tr><td>2</td><td>PGD047-25A1</td></tr>
<tr><td>2</td><td>PGD064-50A1</td><td>98.0
[3.86]</td><td>52.0
[2.05]</td><td rowspan="3">Ø86.0
[Ø3.385]</td><td rowspan="3">Ø64.0
[Ø2.52]</td><td rowspan="3">Ø40.0
[Ø1.575]</td><td rowspan="3">8</td><td>Ø8.0
[Ø0.31]</td><td rowspan="3">Ø79.0
[Ø3.11]</td><td rowspan="3">4.5
[0.18]</td><td rowspan="3">Ø31.5
[Ø1.24]</td><td>M5-
0.8x10</td></tr>
<tr><td>1</td><td>PGD064-05A2
PGD064-10A2</td><td>82.0
[3.228]</td><td rowspan="3">65.0
[2.56]</td><td rowspan="3">Ø70.0
[Ø2.756]</td><td>Ø14.0
[Ø0.55]</td><td rowspan="3">M5-
0.8x11</td><td>M5-
0.8x4</td></tr>
<tr><td>2</td><td>PGD064-25A2</td><td>103.0
[4.055]</td><td>Ø14.0
[Ø0.55]</td><td>M5-
0.8x10</td></tr>
<tr><td>2</td><td>PGD090-25A2
PGD090-50A2</td><td>122.0
[4.803]</td><td rowspan="4">30.0
[1.1811]</td><td rowspan="10">6.0
[0.236]</td><td rowspan="4">Ø118.0
[Ø4.65]</td><td rowspan="4">Ø90.0
[Ø3.54]</td><td rowspan="4">Ø63.0
[Ø2.48]</td><td rowspan="4">8</td><td>Ø14.0
[Ø0.55]</td><td rowspan="4">Ø109.0
[Ø4.30]</td><td rowspan="10">5.5
[0.22]</td><td rowspan="4">Ø50.0
[Ø1.9685]</td><td rowspan="10">M6-
1.0x12</td></tr>
<tr><td>1</td><td>PGD090-05A3
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[4.33]</td><td>80.0
[3.15]</td><td>Ø90.0
[Ø3.543]</td><td>Ø19.0
[Ø0.75]</td><td>M6-
1.0x13</td></tr>
<tr><td>1</td><td>PGD090-05A4
PGD090-10A4</td><td rowspan="2">127.0
[5.0]</td><td>100.0
[3.93]</td><td>Ø115.0 ±0.2
[Ø4.528]</td><td rowspan="2">Ø28.0
[Ø1.102]</td><td rowspan="2">M8-
1.25x17</td></tr>
<tr><td>1</td><td>PGD090-05A5</td><td>130.0
[5.12]</td><td>Ø145.0 ±0.2
[Ø5.709]</td></tr>
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[6.28]</td><td>65.0
[2.56]</td><td rowspan="5">29.0
[1.142]</td><td rowspan="6">Ø145.0
[Ø5.70]</td><td rowspan="6">Ø110.0
[Ø4.33]</td><td rowspan="6">Ø80.0
[Ø3.15]</td><td>Ø70.0
[Ø2.756]</td><td rowspan="6">15</td><td>Ø14.0
[Ø0.55]</td><td>M5-
0.8x11</td><td rowspan="6">Ø135.0
[Ø5.315]</td><td rowspan="6">Ø63.0
[Ø2.48]</td></tr>
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PGD110-50A3</td><td>169.5
[6.673]</td><td>80.0
[3.15]</td><td>Ø90.0
[Ø3.543]</td><td>Ø19.0
[Ø0.75]</td><td>M6-
1.0x13</td></tr>
<tr><td>2</td><td>PGD110-25A4
PGD110-50A4</td><td>186.5
[7.3425]</td><td>100.0
[3.93]</td><td>Ø115.0 ±0.2
[Ø4.528]</td><td rowspan="3">Ø28.0
[Ø1.102]</td><td rowspan="3">M8-
1.25x17</td></tr>
<tr><td>1</td><td>PGD110-10A5</td><td>159.0
[6.26]</td><td rowspan="2">130.0
[5.12]</td><td rowspan="2">Ø145.0 ±0.2
[Ø5.709]</td></tr>
<tr><td>2</td><td>PGD110-25A5
PGD110-35A5</td><td>186.5
[7.3425]</td></tr>
<tr><td>1</td><td>PGD110-05A6
PGD110-10A6</td><td>180.0
[7.087]</td><td>180.0
[7.087]</td><td>130.0
[5.12]</td><td>Ø200.0 ±0.2
[Ø7.874]</td><td>Ø38.0
[Ø1.45]</td><td>M12-
1.75x25</td></tr>
<tr><td></td><td colspan="16">* Length will vary depending on motor
** Bushing will be inserted to adapt to motor shaft</td></tr>
<tr><td></td><td colspan="16">NOTE: See our website: www.AutomationDirect.com for complete engineering drawings.</td></tr>
</table>

Precision Servo Gearboxes

SureGear® Servo Gearbox Replacement Parts

SureGear® Precision Servo Gearboxes – Replacement Parts		
Part Number	**Price**	**Description**
PG050-KEY	$4.00	Output Shaft Key, replacement, 4 x 4 x 14 mm, for SureGear PGA050 series gearboxes.
PG070-KEY	$4.00	Output Shaft Key, replacement, 5 x 5 x 22 mm, for SureGear PGA070 and PGB070 series gearboxes.
PG090-KEY	$4.00	Output Shaft Key, replacement, 6 x 6 x 28 mm, for SureGear PGA090 and PGB090 series gearboxes.
PG120-KEY	$4.00	Output Shaft Key, replacement, 10 x 8 x 45 mm, for SureGear PGA120 and PGB120 series gearboxes.
PG155-KEY	$4.00	Output Shaft Key, replacement, 12 x 8 x 65 mm, for SureGear PGA155 and PGB155 series gearboxes.
PGA4-A5-BUSH	$19.00	Input Shaft Bushing, replacement, 28 x 22 x 30.5 mm, for all SureGear gearboxes using SVL-210(B) and SVM-210(B) SureServo motors.
PGA6-BUSH	$19.00	Input Shaft Bushing, replacement, 38 x 35 x 36 mm, for all SureGear gearboxes using SVM-220(B) and SVM-230(B) SureServo motors.

ZIPLink Wiring Solutions

Wiring Solutions using the *ZIP*Link Wiring System

*ZIP*Links eliminate the normally tedious process of wiring between devices by utilizing prewired cables and DIN rail mount connector modules. It's as simple as plugging in a cable connector at either end or terminating wires at only one end. Prewired cables keep installation clean and efficient, using half the space at a fraction of the cost of standard terminal blocks. There are several wiring solutions available when using the *ZIP*Link System ranging from PLC I/O-to-*ZIP*Link Connector Modules that are ready for field termination, options for connecting to third party devices, GS, DuraPulse and SureServo Drives, and specialty relay, transorb and communications modules. Pre-printed I/O-specific adhesive label strips for quick marking of *ZIP*Link modules are provided with *ZIP*Link cables. See the following solutions to help determine the best *ZIP*Link system for your application.

Solution 1: Do-more, *Direct*LOGIC, CLICK and Productivity Series I/O Modules to *ZIP*Link Connector Modules

When looking for quick and easy I/O-to-field termination, a *ZIP*Link connector module used in conjunction with a prewired *ZIP*Link cable, consisting of an I/O terminal block at one end and a multi-pin connector at the other end, is the best solution.

Using the PLC I/O Modules to *ZIP*Link Connector Modules selector tables located in this section,

1. Locate your I/O module/PLC.
2. Select a *ZIP*Link Module.
3. Select a corresponding *ZIP*Link Cable.

Solution 2: Do-more, *Direct*LOGIC, CLICK and Productivity Series I/O Modules to 3rd Party Devices

When wanting to connect I/O to another device within close proximity of the I/O modules, no extra terminal blocks are necessary when using the *ZIP*Link Pigtail Cables. *ZIP*Link Pigtail Cables are prewired to an I/O terminal block with color-coded pigtail with soldered-tip wires on the other end.

Using the I/O Modules to 3rd Party Devices selector tables located in this section,

1. Locate your PLC I/O module.
2. Select a *ZIP*Link Pigtail Cable that is compatible with your 3rd party device.

Solution 3: GS Series and DuraPulse Drives Communication Cables

Need to communicate via Modbus RTU to a drive or a network of drives?

*ZIP*Link cables are available in a wide range of configurations for connecting to PLCs and *SureServo*, *SureStep*, Stellar Soft Starter and AC drives. Add a *ZIP*Link communications module to quickly and easily set up a multi-device network.

Using the Drives Communication selector tables located in this section,

1. Locate your Drive and type of communications.
2. Select a *ZIP*Link cable and other associated hardware.

ZIPLink Wiring Solutions

Solution 4: Serial Communications Cables

*ZIP*Link offers communications cables for use with DirectLOGIC, CLICK, and Productivity3000 CPUs, that can also be used with other communications devices. Connections include a 6-pin RJ12 or 9-pin, 15-pin and 25-pin D-sub connectors which can be used in conjunction with the RJ12 or D-Sub Feedthrough modules.

Using the Serial Communications Cables selector table located in this section,

1. Locate your connector type
2. Select a cable.

Solution 5: Specialty *ZIP*Link Modules

For additional application solutions, *ZIP*Link modules are available in a variety of configurations including stand-alone relays, 24VDC and 120VAC transorb modules, D-sub and RJ12 feedthrough modules, communication port adapter and distribution modules, and *SureServo* 50-pin I/O interface connection.

Using the *ZIP*Link Specialty Modules selector table located in this section,

1. Locate the type of application.
2. Select a *ZIP*Link module.

Solution 6: *ZIP*Link Connector Modules to 3rd Party Devices

If you need a way to connect your device to terminal blocks without all that wiring time, then our pigtail cables with color-coded soldered-tip wires are a good solution. Used in conjunction with any compatible *ZIP*Link Connector Modules, a pigtail cable keeps wiring clean and easy and reduces troubleshooting time.

Using the Universal Connector Modules and Pigtail Cables table located in this section,

1. Select module type.
2. Select the number of pins.
3. Select cable.

ZIPLink Motor Controller Communication

Drive / Motor Controller (GS/DuraPulse/SureServo/SureStep/Stellar) ZIPLink Selector							
Drive / Motor Controller		**Communications**			**ZIPLink Cable**		
Controller	***Comm Port Type***	***Network/Protocol***	***Connects to***	***Comm Port Type***	***Cable (2 meter length)***	***Cable Connectors***	***Other Hardware Required***
GS1	RJ12	RS-485 Modbus RTU	DL06 PLCs	Port 2 (HD15)	**GS-485HD15-CBL-2**	RJ12 to HD15	N/A
			D2-260 CPU				
			GS-EDRV100	RJ12	**GS-EDRV-CBL-2**	RJ12 to RJ12	
			ZL-CDM-RJ12Xxx *	RJ12	**GS-485RJ12-CBL-2**		
			FA-ISOCON	5-pin Connector	**GS-ISOCON-CBL-2**	RJ12 to 5-pin plug	
GS2	RJ12	RS-232 Modbus RTU	CLICK PLCs	Port 2 (RJ12)	**GS-RJ12-CBL-2**	RJ12 to RJ12	N/A
			DL05 PLCs				
			DL06 PLCs	Port 2 (HD15)			**FA-15HD**
			D2-250-1 CPU				
			D2-260 CPU				
			D4-450 CPU	Port 3 (25-pin)			**FA-CABKIT**
			P3-550 CPU	Port 2 (RJ12)			N/A
		RS-485 Modbus RTU	DL06 PLCs	Port 2 (HD15)	**GS-485HD15-CBL-2**	RJ12 to HD15	
			D2-260 CPU				
			GS-EDRV100	RJ12	**GS-EDRV-CBL-2**	RJ12 to RJ12	
			ZL-CDM-RJ12Xxx *	RJ12	**GS-485RJ12-CBL-2**		
			FA-ISOCON	5-pin Connector	**GS-ISOCON-CBL-2**	RJ12 to 5-pin plug	
DuraPulse (GS3)	RJ12	RS-485 Modbus RTU	DL06 PLCs	Port 2 (HD15)	**GS-485HD15-CBL-2**	RJ12 to HD15	
			D2-260 CPU				
			GS-EDRV100	RJ12	**GS-EDRV-CBL-2**	RJ12 to RJ12	
			ZL-CDM-RJ12Xxx *	RJ12	**GS-485RJ12-CBL-2**		
			FA-ISOCON	5-pin Connector	**GS-ISOCON-CBL-2**	RJ12 to 5-pin plug	
Stellar (Soft Starter) SR44 Series	RJ45 * *	RS-485 Modbus RTU	DL06 PLCs	Port 2 (HD15)	**SR44-485HD15-CBL-2**	RJ45 to HD15	**SR44-RS485**
			D2-250-1 CPU				
			D2-260 CPU				
			ZL-CDM-RJ12Xxx *	RJ12	**SR44-485RJ45-CBL-2**	RJ45 to RJ12	
SureServo	IEEE 1394 (CN3)	RS-232 Modbus RTU	CLICK PLCs	Port 2 (RJ12)	**SVC-232RJ12-CBL-2**	6-pin IEEE to RJ12	N/A
			DL05 PLCs				
			DL06 PLCs	Port 2 (HD15)			**FA-15HD**
			D2-250-1 CPU				
			D2-260 CPU				
			D4-450 CPU	Port 3 (25-pin)			**FA-CABKIT**
			P3-550 CPU	Port 2 (RJ12)			N/A
		RS-485 Modbus RTU	DL06 PLCs	Port 2 (HD15)	**SVC-485HD15-CBL-2**	6-pin IEEE to HD15	
			D2-260 CPU				
			ZL-CDM-RJ12Xxx *	RJ12	**SVC-485RJ12-CBL-2**	6-pin IEEE to RJ12	
			USB-485M	RJ45	**SVC-485CFG-CBL-2**	6-pin IEEE to RJ45	
SureStep	RJ12	RS-232 ASCII	DL06 PLCs	Port 2 (HD15)	**STP-232HD15-CBL-2**	HD15-pin to RJ12	
			D2-250-1 CPU				
			D2-260 CPU (Port2)				
			DL05 PLCs	RJ12	**STP-232RJ12-CBL-2**	RJ12 to RJ12	
			CLICK PLCs				

** When using the ZL-CDM-RJ12Xxx ZIPLink Communication Distribution Module, replace the lowercase xx with the number of RJ12 ports, i.e. 4 for four ports or 10 for ten ports. (ex: ZL-CDM-RJ12X4 or ZL-CDM-RJ12X10)*

** * The SR44-RS485 Communications Adapter must be installed for RS-485 communications with the Stellar soft starters.*