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 SureServo 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)

SureServo 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

SureServo 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.

SureServo 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.

SureGear® 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!

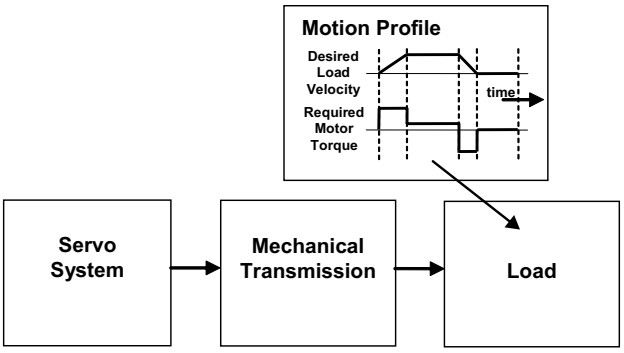
- Four gear ratios available (5, 10, 15, 25:1)
- Mounting hardware included for attaching to SureServo motors
- Industry-standard mounting dimensions
- Thread-in mounting style
- Best-in-class backlash (5 arc-min)
- 5-year warranty

How to select and apply SureServo 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.



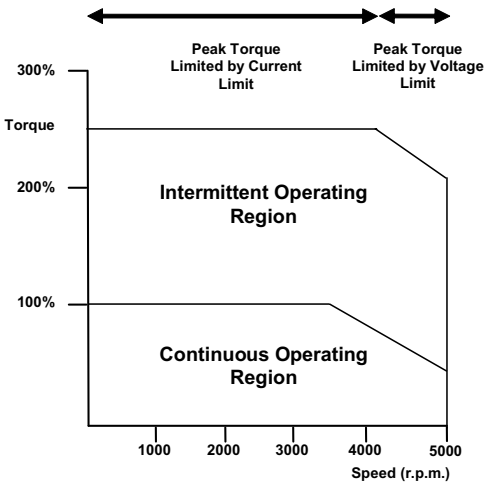
1. "Reflected" load inertia

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).



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 ZIPLink 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.

AC Servo System Configuration

SureServo 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:

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

SureServo AC servo drive, motor, and cable combinations

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

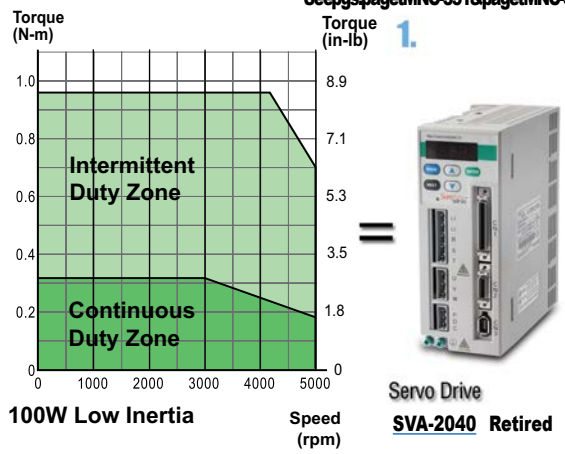
Note: **Each servo motor requires an encoder feedback cable and a power cable.**
The motor power cable includes brake power wires for the optional motor brake.

AC Servo System Configuration

For all systems:

Order programming software & programming cable if needed.
See pgs. pagetMNC-351 & pagetMNC-363.

100W Low Inertia System



100W Low Inertia

1. Servo Drive
SVA-2040 Retired

*Sure*Servo Motor

2.

SVL-201 Retired
SVL-201B (w/brake) Retired

Motor Power Cable (1)

3.

SVC-PFL-010 (10') $51.00
SVC-PFL-020 (20') $96.00
SVC-PFL-030 (30') $121.00
SVC-PFL-060 (60') $218.00

Motor Encoder Cable (1)

4.

SVC-EFL-010 (10') Retired
SVC-EFL-020 (20') $141.00
SVC-EFL-030 (30') $165.00
SVC-EFL-060 (60') $209.00

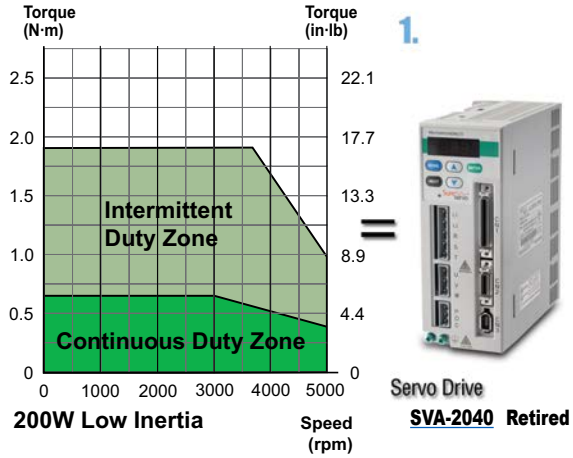
*ZIP*Link I/O Interface

5.

ZL-RTB50 $74.00
and one cable below:
ZL-SVC-CBL50 (0.5m) $48.50
ZL-SVC-CBL50-1 (1m) $51.00
ZL-SVC-CBL50-2 (2m) $58.00

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

200W Low Inertia System



200W Low Inertia

1. Servo Drive
SVA-2040 Retired

*Sure*Servo Motor

2.

SVL-202 Retired
SVL-202B (w/brake) Retired

Motor Power Cable (1)

3.

SVC-PFL-010 (10') $51.00
SVC-PFL-020 (20') $96.00
SVC-PFL-030 (30') $121.00
SVC-PFL-060 (60') $218.00

Motor Encoder Cable (1)

4.

SVC-EFL-010 (10') Retired
SVC-EFL-020 (20') $141.00
SVC-EFL-030 (30') $165.00
SVC-EFL-060 (60') $209.00

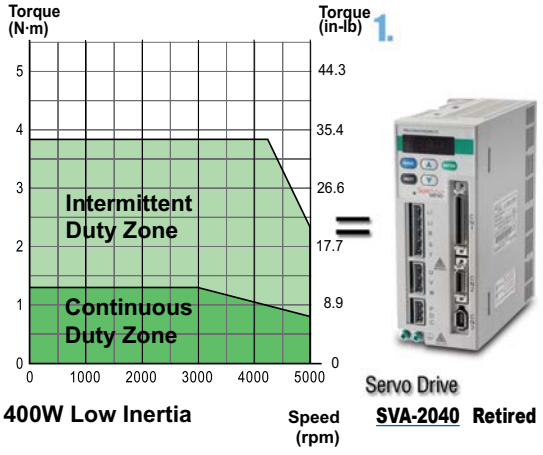
*ZIP*Link I/O Interface

5.

ZL-RTB50 $74.00
and one cable below:
ZL-SVC-CBL50 (0.5m) $48.50
ZL-SVC-CBL50-1 (1m) $51.00
ZL-SVC-CBL50-2 (2m) $58.00

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

400W Low Inertia System



400W Low Inertia

1. Servo Drive
SVA-2040 Retired

*Sure*Servo Motor

2.

SVL-204 Retired
SVL-204B (w/brake) Retired

Motor Power Cable (1)

3.

SVC-PFL-010 (10') $51.00
SVC-PFL-020 (20') $96.00
SVC-PFL-030 (30') $121.00
SVC-PFL-060 (60') $218.00

Motor Encoder Cable (1)

4.

SVC-EFL-010 (10') Retired
SVC-EFL-020 (20') $141.00
SVC-EFL-030 (30') $165.00
SVC-EFL-060 (60') $209.00

*ZIP*Link I/O Interface

5.

ZL-RTB50 $74.00
and one cable below:
ZL-SVC-CBL50 (0.5m) $48.50
ZL-SVC-CBL50-1 (1m) $51.00
ZL-SVC-CBL50-2 (2m) $58.00

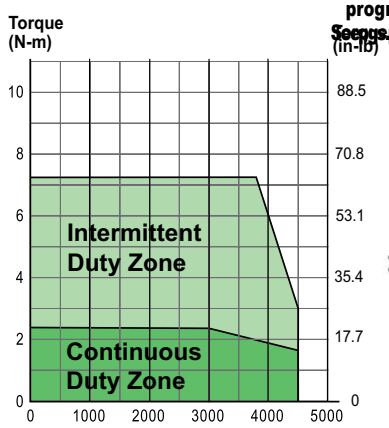
Jm= Motor Inertia =0.0003 lb-in-s2 (0 .000034 kg - m2)

AC Servo System Configuration

For all systems:

Order programming software & programming cable if needed. See page tMNC-351 & page tMNC-363.

750W Low Inertia System



750W Low Inertia

1. =

Servo Drive
SVA-2100 Retired

SureServo Motor

2.

SVL-207	Retired
SVL-207B (w/brake)	Retired

Motor Power Cable (1)

3.

SVC-PFL-010 (10')	$51.00
SVC-PFL-020 (20')	$96.00
SVC-PFL-030 (30')	$121.00
SVC-PFL-060 (60')	$218.00

Motor Encoder Cable (1)

4.

SVC-EFL-010 (10')	Retired
SVC-EFL-020 (20')	$141.00
SVC-EFL-030 (30')	$165.00
SVC-EFL-060 (60')	$209.00

*ZIP*Link I/O Interface

5.

ZL-RTB50 $74.00
and one cable below:

ZL-SVC-CBL50 (0.5m)	$48.50
ZL-SVC-CBL50-1 (1m)	$51.00
ZL-SVC-CBL50-2 (2m)	$58.00

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

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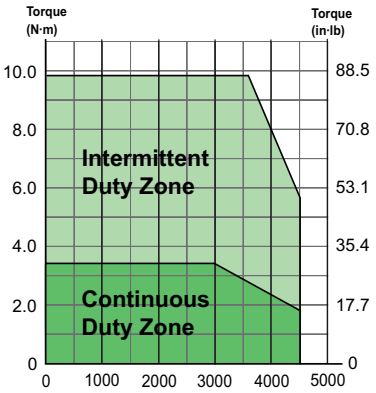
1 kW Low Inertia System



1 kW Low Inertia

1. =

Servo Drive
SVA-2100 Retired

SureServo Motor

2.

SVL-210	Retired
SVL-210B (w/brake)	Retired

Motor Power Cable (1)

3.

SVC-PHM-010 (10')	$160.00
SVC-PHM-020 (20')	Retired
SVC-PHM-030 (30')	$290.00
SVC-PHM-060 (60')	$343.00

Motor Encoder Cable (1)

4.

SVC-EHH-010 (10')	$153.00
SVC-EHH-020 (20')	$171.00
SVC-EHH-030 (30')	Retired
SVC-EHH-060 (60')	$250.00

*ZIP*Link I/O Interface

5.

ZL-RTB50 $74.00
and one cable below:

ZL-SVC-CBL50 (0.5m)	$48.50
ZL-SVC-CBL50-1 (1m)	$51.00
ZL-SVC-CBL50-2 (2m)	$58.00

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

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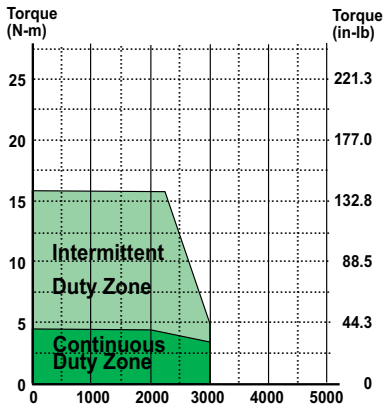
1 kW Medium Inertia System



1 kW Medium Inertia

1. =

Servo Drive
SVA-2100 Retired

SureServo Motor

2.

SVM-210	Retired
SVM-210B (w/brake)	Retired

Motor Power Cable (1)

3.

SVC-PHM-010 (10')	$160.00
SVC-PHM-020 (20')	Retired
SVC-PHM-030 (30')	$290.00
SVC-PHM-060 (60')	$343.00

Motor Encoder Cable (1)

4.

SVC-EHH-010 (10')	$153.00
SVC-EHH-020 (20')	$171.00
SVC-EHH-030 (30')	Retired
SVC-EHH-060 (60')	$250.00

*ZIP*Link I/O Interface

5.

ZL-RTB50 $74.00
and one cable below:

ZL-SVC-CBL50 (0.5m)	$48.50
ZL-SVC-CBL50-1 (1m)	$51.00
ZL-SVC-CBL50-2 (2m)	$58.00

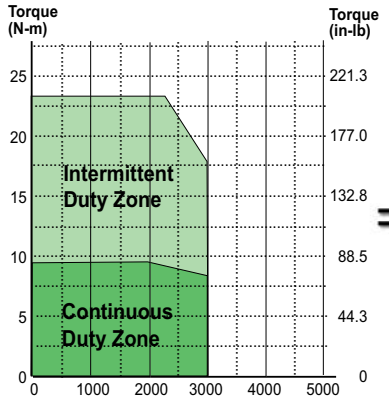
Jm= Motor Inertia = .0053 lb-in-s2 (0.000598 kg - m2)

AC Servo System Configuration

For all systems:

2 kW Medium Inertia System

Order programming software & programming cable if needed.
See pgs. pagetMNC-351 & pagetMNC-363.



2 kW Medium Inertia

1.

Servo Drive
SVA-2300 Retired

SureServo Motor

2.

SVM-220	**$1,000.00**
SVM-220B (w/brake)	**$1,367.00**

Motor Power Cable (1)

3.

SVC-PHH-010 (10')	**$192.00**
SVC-PHH-020 (20')	**$253.00**
SVC-PHH-030 (30')	**$312.00**
SVC-PHH-060 (60')	**Retired**

Motor Encoder Cable (1)

4.

SVC-EHH-010 (10')	**$153.00**
SVC-EHH-020 (20')	**$171.00**
SVC-EHH-030 (30')	**Retired**
SVC-EHH-060 (60')	**$250.00**

*ZIP*Link I/O Interface

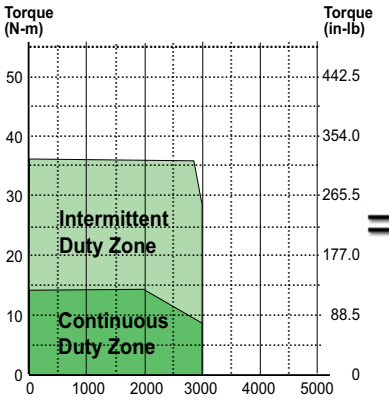
5.

ZL-RTB50 $74.00
and one cable below:

ZL-SVC-CBL50 (0.5m)	**$48.50**
ZL-SVC-CBL50-1 (1m)	**$51.00**
ZL-SVC-CBL50-2 (2m)	**$58.00**

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

3 kW Medium Inertia System



3 kW Medium Inertia

1.

Servo Drive
SVA-2300 Retired

SureServo Motor

2.

SVM-230	**Retired**
SVM-230B (w/brake)	**$1,741.00**

Motor Power Cable (1)

3.

SVC-PHH-010 (10')	**$192.00**
SVC-PHH-020 (20')	**$253.00**
SVC-PHH-030 (30')	**$312.00**
SVC-PHH-060 (60')	**Retired**

Motor Encoder Cable (1)

4.

SVC-EHH-010 (10')	**$153.00**
SVC-EHH-020 (20')	**$171.00**
SVC-EHH-030 (30')	**Retired**
SVC-EHH-060 (60')	**$250.00**

*ZIP*Link I/O Interface

5.

ZL-RTB50 $74.00
and one cable below:

ZL-SVC-CBL50 (0.5m)	**$48.50**
ZL-SVC-CBL50-1 (1m)	**$51.00**
ZL-SVC-CBL50-2 (2m)	**$58.00**

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

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

SureServo Communications Cables for Muti-drop Networks

Product	Price	Description
SVC-MDCOM-CBL	$43.00	RS-422/485 serial communication cable for use with multidrop networks; 3ft length; IEEE 1394 plug to unterminated wires; compatible with all SureServo systems. Facilitates connection between the SureServo drive serial port and host controllers.
SVC-232RJ12-CBL-2 *	$12.50	ZIPLink 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 SureServo amplifiers.
SVC-485RJ12-CBL-2 *	$15.00	ZIPLink 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-RJ12xxx distribution module can access a compatible RS-485 device network.
SVC-485HD15-CBL-2 *	$13.50	ZIPLink 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 SureServo amplifiers.

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

AC Servo System Software

SureServo 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, $37.50) 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

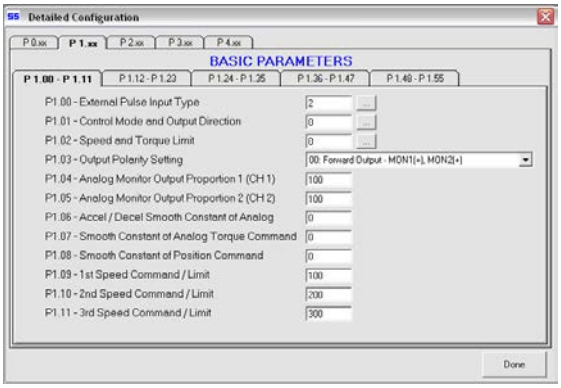
- Quick Start - The basic setup when you have limited time and just want to get up and running ASAP.
- Maintenance keypad allows the user to operate the servo system from the PC. This is a great aid during start-up to allow the servo to perform some basic motion and to check the I/O.
- Detailed - The 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

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



SureServo Software and Configuration Cables

Product	Price	Description
SV-PRO	Free	SureServo Pro configuration software for use with all SureServo servo systems. FREE download from www.sureservo.com or www.automationdirect.com websites.
SVC-PCCFG-CBL	$37.50	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	$18.50	ZIPLink SureServo 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.**

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

Servo Motor	Gear Ratio	SureGear 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·cm2	lb·in·s2
SV2L-201(x) APMC-FAL01xxx	5:1	PGD047-05A1	47	0.32	2.83	1.52	13.44	600	1200.00	6.76	0.006
		PGA050-05A1	50							6.94	0.006
		PGA070-05A1	70							5.91	0.005
		PGB070-05A1	70			1.49	13.16			1.59**	0.001**
	10:1	PGD047-10A1	47			3.04	26.89	300	600.00	28.15	0.025
		PGA050-10A1	50							28.35	0.025
		PGA070-10A1	70							25.75	0.023
		PGB070-10A1	70			2.98	26.32			8.35**	0.007**
	15:1	PGA050-15A1	50			4.32	38.21	200	400.00	62.66	0.055
		PGA070-15A1	70							58.16	0.051
		PGB070-15A1	70			4.22	37.36			54.11	0.048
	25:1	PGD047-25A1	47			7.20	63.68	120	240.00	174.69	0.155
		PGA050-25A1	50							174.69	0.155
		PGA070-25A1	70							162.81	0.144
		PGB070-25A1	70			7.04	62.26			151.56	0.134
	50:1	PGD064-50A1	64			14.40	127.35	60	120.00	661.25	0.585
SV2L-202(x)	5:1	PGD064-05A2	64	0.64	5.7	3.04	27.08	600	1200.00	28.75	0.025
		PGA070-05A2	70							29.33	0.026
		PGB070-05A2	70			2.98	26.51			25.00	0.022
	10:1	PGD064-10A2	64			6.08	54.15	300	600.00	118.80	0.105
		PGA070-10A2	70							119.40	0.106
		PGB070-10A2	70			5.95	53.01			102.00	0.090
	15:1	PGA070-15A2	70			8.64	76.95	200	400.00	268.88	0.238
		PGB070-15A2	70			8.45	75.24			264.83	0.234
		PGB090-15A2	90							204.75	0.181
	25:1	PGD064-25A2	64			14.40	128.25	120	240.00	747.50	0.662
		PGA070-25A2	70							748.13	0.662
		PGB070-25A2	70			14.08	125.40			736.88	0.652
		PGB090-25A2	90							581.25	0.514
		PGD090-25A2	90			14.40	128.25			700.00	0.620
	50:1	PGD090-50A2	90			28.80	256.50	60	120.00	2875.00	2.544
		PGD110-50A2	110							2125.00	1.881
SV2L-204(x)	5:1	PGD064-05A2	64	1.27	11.2	6.03	53.20	600	1200.00	53.75	0.048
		PGA070-05A2	70							54.33	0.048
		PGB070-05A2	70			5.91	52.08			50.00	0.044
	10:1	PGD064-10A2	64			12.07	106.40	300	600.00	218.80	0.194
		PGA070-10A2	70							219.40	0.194
		PGB070-10A2	70			11.81	104.16			202.00	0.179
	15:1	PGA070-15A2	70			17.15	151.20	200	400.00	493.88	0.437
		PGB070-15A2	70			16.76	147.84			489.83	0.433
		PGB090-15A2	90							429.75	0.380
	25:1	PGD064-25A2	64			28.58	252.00	120	240.00	1372.50	1.215
		PGA070-25A2	70							1373.13	1.215
		PGB070-25A2	70			27.94	246.40			1361.88	1.205
		PGB090-25A2	90							1206.25	1.068
		PGD090-25A2	90			28.58	252.00			1325.00	1.173
	50:1	PGD090-50A2	90			57.15	504.00	60	120.00	5375.00	4.757
		PGD110-50A2	110							4625.00	4.093

*** 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.**

Precision Servo Gearboxes

SureGear® Servo Gearbox Selection

Servo Motor	Gear Ratio	SureGear 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·cm2	lb·in·s2
SV2L-207(x)	5:1	PGA070-05A3	70	2.39	21.2	11.35	100.70	600	1200.00	186.83	0.165
		PGB090-05A3	90			11.11	98.58			143.75	0.127
		PGD090-05A3	90			11.35	100.70			174.25	0.154
	10:1	PGA090-10A3	90			22.71	201.40	300	600.00	726.00	0.643
		PGB090-10A3	90			22.23	197.16			586.00	0.519
		PGD090-10A3	90			22.71	201.40			722.00	0.639
	15:1	PGA090-15A3	90			32.27	286.20	200	400.00	1669.50	1.478
		PGB090-15A3	90			31.55	279.84			1622.25	1.436
	25:1	PGA090-25A3	90			53.78	477.00	120	240.00	4643.75	4.110
		PGB090-25A3	90			52.58	466.40			4518.75	3.999
		PGD110-25A3	110			53.78	477.00			4281.25	3.789
	50:1	PGD110-50A3	110			107.55	954.00	60	120.00	17875.00	15.819
SV2L-210(x)	5:1	PGA090-05A4	90	3.18	28.15	15.11	133.69	600	1000.00	321.25	0.284
		PGB090-05A4	90			14.79	130.88			286.25	0.253
		PGD090-05A4	90			15.11	133.69			319.25	0.283
	10:1	PGA090-10A4	90			30.21	267.38	300	500.00	1296.00	1.147
		PGB090-10A4	90			29.57	261.75			1156.00	1.023
		PGD090-10A4	90			30.21	267.38			1292.00	1.143
	15:1	PGA120-15A4	120			42.93	379.96	200	333.33	2884.50	2.553
		PGB120-15A4	120			41.98	371.52			2475.00	2.190
	25:1	PGD110-25A4	110			71.55	633.27	120	200.00	7843.75	6.942
		PGA120-25A4	120							8043.75	7.119
		PGB120-25A4	120			69.96	619.20			6918.75	6.123
	50:1	PGD110-50A4	110			143.10	1266.54	60	100.00	32125.00	28.431
SV2M-210(x)	5:1	PGA090-05A5	90	4.77	42.22	22.66	200.54	400.00	600.00	1041.25	0.922
		PGD090-05A5	90							1039.25	0.920
		PGB120-05A5	120			22.18	196.31			925.75	0.819
	10:1	PGA090-10A5	90			45.32	401.07	200.00	300.00	4176.00	3.696
		PGD110-10A5	110							4172.00	3.692
		PGB120-10A5	120			44.36	392.63			3759.00	3.327
	15:1	PGA120-15A5	120			64.40	569.94	133.33	200.00	9364.50	8.288
		PGB120-15A5	120			62.96	557.28			8955.00	7.925
	25:1	PGD110-25A5	110			107.33	949.91	80.00	120.00	25843.75	22.872
		PGA120-25A5	120							26043.75	23.049
		PGB120-25A5	120			104.94	928.80			24918.75	22.053
	35:1	PGD110-35A5	110			150.26	1329.87	57.14	85.71	50653.75	44.829

*** 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.**

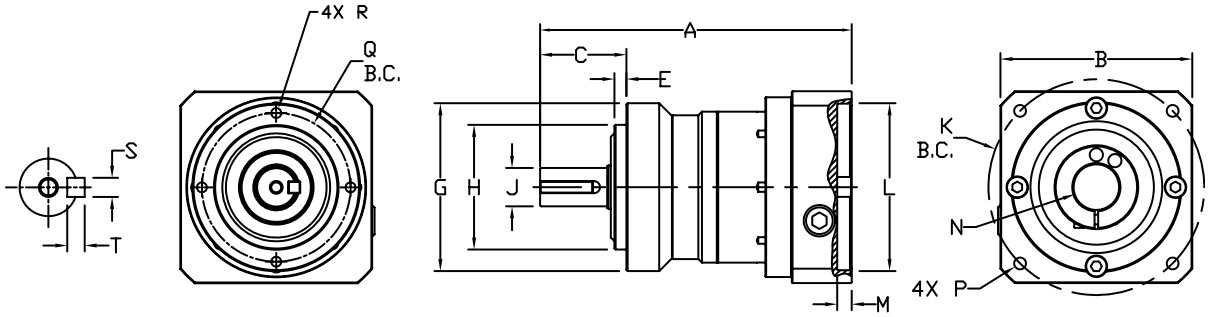
Precision Servo Gearboxes

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 (SV & SV2)
PGA050-05A1	$465.00	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	SV(2)L-201(B)
PGA050-10A1	$490.00		10:1	single	6 [53]	12 [106]	30 [266]				360 [81]	450 [101]	0.030					
PGA050-15A1	$672.00		15:1	double	6 [53]	12 [106]	30 [266]	7			410 [92]	540 [121]	0.035	90		0.8 [1.8]		
PGA050-25A1	$672.00		25:1	double	9 [80]	18 [159]	35 [310]				490 [110]	640 [144]	0.034					
PGA070-05A1	$465.00	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	$490.00		10:1	single	18 [159]	35 [310]	80 [708]				640 [144]	530 [119]	0.056					
PGA070-15A1	$672.00		15:1	double	18 [159]	35 [310]	80 [708]				740 [166]	630 [142]	0.055	90		1.7 [3.7]		
PGA070-25A1	$672.00		25:1	double	27 [239]	50 [443]	100 [885]				870 [196]	790 [178]	0.053					
PGA070-05A2	$508.00		5:1	single	27 [239]	50 [443]	100 [885]				510 [115]	390 [88]	0.160	95		1.5 [3.3]		SV(2)L-202(B) SV(2)L-204(B)
PGA070-10A2	$508.00		10:1	single	18 [159]	35 [310]	80 [708]				640 [144]	530 [119]	0.140					
PGA070-15A2	$696.00		15:1	double	18 [159]	35 [310]	80 [708]				740 [166]	630 [142]	0.140	90		1.7 [3.7]		
PGA070-25A2	$696.00		25:1	double	27 [239]	50 [443]	100 [885]				870 [196]	790 [178]	0.130					
PGA070-05A3	$508.00		5:1	single	27 [239]	50 [443]	100 [885]				510 [115]	390 [88]	0.360	95		1.5 [3.3]		SV(2)L-207(B)
PGA090-10A3	$601.00	90	10:1	single	50 [443]	80 [708]	200 [1770]				1200 [270]	1600 [360]	0.750			3.5 [7.7]		
PGA090-15A3	$794.00		15:1	double	50 [443]	80 [708]	200 [1770]				1400 [315]	1900 [427]	0.720	90		4.0 [8.8]		
PGA090-25A3	$794.00		25:1	double	75 [664]	125 [1106]	250 [2213]				1600 [360]	2200 [495]	0.710					
PGA090-05A4	$600.00		5:1	single	75 [664]	125 [1106]	250 [2213]				960 [216]	1200 [270]	2.900	95		3.5 [7.7]		SV(2)L-210(B)
PGA090-10A4	$600.00		10:1	single	50 [443]	80 [708]	200 [1770]				1200 [270]	1600 [360]	2.800					
PGA090-05A5	$600.00		5:1	single	75 [664]	125 [1106]	250 [2213]				960 [216]	1200 [270]	2.900			3.5 [7.7]		SV(2)M-210(B)
PGA090-10A5	$600.00		10:1	single	50 [443]	80 [708]	200 [1770]				1200 [270]	1600 [360]	2.800					
PGA120-15A4	$997.00	120	15:1	double	120 [1062]	225 [1991]	500 [4425]				2300 [517]	3000 [674]	2.800	90		8.7 [19.2]		SV(2)L-210(B)
PGA120-25A4	$997.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				2700 [607]	3700 [832]	2.800					
PGA120-15A5	$997.00		15:1	double	120 [1062]	225 [1991]	500 [4425]				2300 [517]	3000 [674]	2.800			8.7 [19.2]		SV(2)M-210(B)
PGA120-25A5	$997.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				2700 [607]	3700 [832]	2.800					
PGA120-05A6	$795.00		5:1	single	180 [1593]	330 [2921]	625 [5532]				1600 [360]	1900 [427]	11.000	95		7.8 [17.2]		SV(2)M-220(B) SV(2)M-230(B)
PGA120-10A6	$795.00		10:1	single	120 [1062]	225 [1991]	500 [4425]				2000 [450]	2500 [562]	11.000					
PGA155-10A6	$982.00	155	10:1	single	240 [2124]	470 [4160]	1000 [8851]		2000	4000	4700 [1057]	4100 [922]	11.000	95		16 [35.3]		
PGA155-15A6	$1,336.00		15:1	double	240 [2124]	470 [4160]	1000 [8851]				5400 [1214]	4900 [1102]	11.000	90		18 [40.0]		
PGA155-25A6	$1,336.00		25:1	double	360 [3186]	700 [6196]	1250 [11063]				6400 [1439]	6100 [1371]	11.000					

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 [Ø1.73]	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 [Ø1.73]	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.

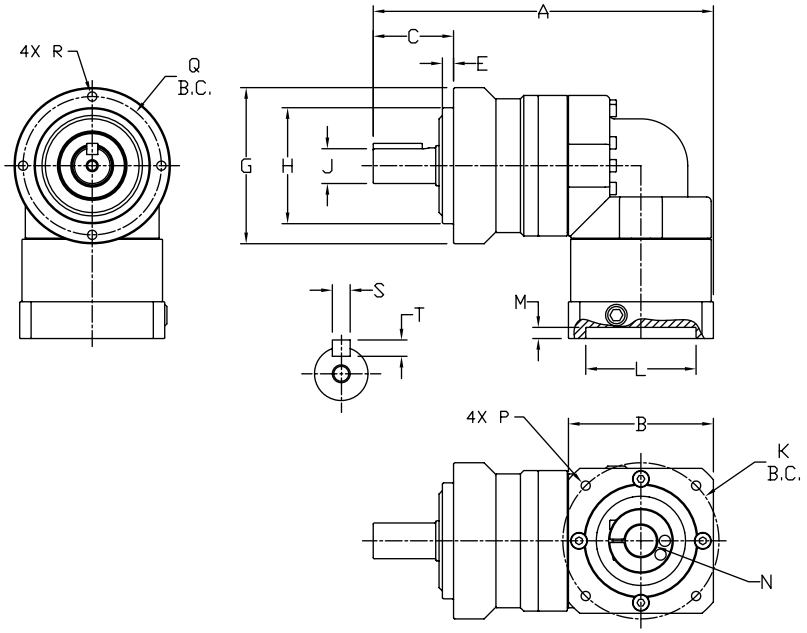
Precision Servo Gearboxes

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 (SV & SV2)
PGB070-05A1	$788.00	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	SV(2)L-201(B)
PGB070-10A1	$788.00		10:1	double	16 [142]	32 [283]	65 [575]				640 [144]	530 [119]	0.230					
PGB070-15A1	$997.00		15:1	triple	16 [142]	32 [283]	65 [575]	9			740 [166]	630 [142]	0.073	88		1.7 [3.7]		
PGB070-25A1	$997.00		25:1	triple	24 [212]	45 [398]	90 [797]				870 [196]	790 [178]	0.071					
PGB070-05A2	$788.00		5:1	double	22 [195]	40 [354]	80 [708]	6			510 [115]	390 [88]	0.320	93		1.9 [4.2]		SV(2)L-202(B) SV(2)L-204(B)
PGB070-10A2	$788.00		10:1	double	16 [142]	32 [283]	65 [575]				640 [144]	530 [119]	0.300					
PGB070-15A2	$997.00		15:1	triple	16 [142]	32 [283]	65 [575]	9			740 [166]	630 [142]	0.118	88		1.7 [3.7]		SV(2)L-202(B)
PGB070-25A2	$997.00		25:1	triple	24 [212]	45 [398]	90 [797]				870 [196]	790 [178]	0.115					
PGB090-15A2	$1,217.00	90	15:1	triple	45 [398]	65 [575]	170 [1505]	9			1400 [314]	1900 [427]	0.410	88		4.3 [9.5]		SV(2)L-202(B) SV(2)L-204(B)
PGB090-25A2	$1,217.00		25:1	triple	65 [575]	110 [974]	220 [1947]				1600 [360]	2200 [495]	0.400					
PGB090-05A3	$932.00		5:1	double	65 [575]	90 [797]	220 [1947]	6			960 [216]	1200 [270]	2.130	93		4.9 [10.8]		SV(2)L-207(B)
PGB090-10A3	$932.00		10:1	double	45 [398]	65 [575]	170 [1505]				1200 [270]	1600 [360]	2.020					
PGB090-15A3	$1,217.00		15:1	triple	45 [398]	65 [575]	170 [1505]	9			1400 [314]	1900 [427]	0.600	88		4.3 [9.5]		
PGB090-25A3	$1,217.00		25:1	triple	65 [575]	110 [974]	220 [1947]				1600 [360]	2200 [495]	0.590					
PGB090-05A4	$932.00		5:1	double	65 [575]	90 [797]	220 [1947]	6			960 [216]	1200 [270]	4.260	93		4.9 [10.8]		SV(2)L-210(B)
PGB090-10A4	$932.00		10:1	double	45 [398]	65 [575]	170 [1505]				1200 [270]	1600 [360]	4.150					
PGB120-15A4	$1,512.00	120	15:1	triple	110 [974]	200 [1770]	450 [3983]	9			2300 [517]	3000 [674]	4.700	88		10 [22]		
PGB120-25A4	$1,512.00		25:1	triple	150 [1328]	300 [2655]	550 [4868]				2700 [607]	3700 [832]	4.640					
PGB120-05A5	$1,217.00		5:1	double	120 [1062]	240 [2124]	500 [4425]	6			1600 [360]	1900 [427]	6.610	93		10.2 [22.5]		SV(2) M-210(B)
PGB120-10A5	$1,217.00		10:1	double	110 [974]	200 [1770]	450 [3983]				2000 [450]	2500 [562]	6.050					
PGB120-15A5	$1,512.00		15:1	triple	110 [974]	200 [1770]	450 [3983]	9			2300 [517]	3000 [674]	4.700	88		10 [22]		
PGB120-25A5	$1,512.00		25:1	triple	150 [1328]	300 [2655]	550 [4868]				2700 [607]	3700 [832]	4.640					
PGB120-05A6	$1,217.00		5:1	double	120 [1062]	240 [2124]	500 [4425]	6			1600 [360]	1900 [427]	13.690	93		10.2 [22.5]		SV(2)M-220(B) SV(2)M-230(B)
PGB120-10A6	$1,217.00		10:1	double	110 [974]	200 [1770]	450 [3983]				2000 [450]	2500 [562]	13.120					
PGB155-15A6	$1,770.00	155	15:1	triple	200 [1770]	400 [3540]	750 [6638]	9	2000	4000	5400 [1214]	4900 [1102]	15.070	88		20.4 [45.0]		SV(2)M-220(B)
PGB155-25A6	$1,770.00		25:1	triple	300 [2655]	600 [5310]	1100 [9736]				6400 [1439]	6100 [1371]	14.820					
PGB155-05A6	$1,401.00		5:1	double	200 [1770]	400 [3540]	1100 [9736]	6			3800 [854]	3000 [674]	21.280	93		19.8 [43.7]		SV(2)M-220(B) SV(2)M-230(B)
PGB155-10A6	$1,401.00		10:1	double	200 [1770]	400 [3540]	750 [6638]				4700 [1057]	4100 [922]	19.030					

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]							
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]				Ø22.0 * [Ø0.87]	M8-1.25x17	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]	8.0 [0.31]						
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]															

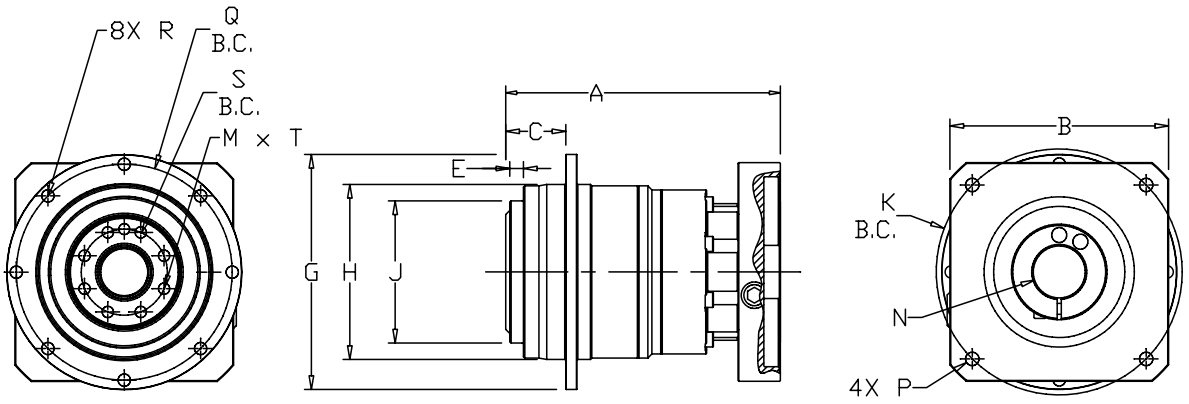
*** Dimension with supplied bushing**
NOTE: See our website: www.AutomationDirect.com for complete engineering drawings.

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·cm2)	Efficiency (%)	Max. Housing Temperature	Approx Weight (kg [lb])	Ingress Protection (IP) Rating	Fits SureServo Servo Motor
PGD047-05A1	$843.00	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	SV(2)L-201(B)
PGD047-10A1	$843.00		10:1	single	6 [53]	12 [106]	30 [266]				370 [83]	450 [101]	0.032					
PGD047-25A1	$1,056.00		25:1	double	9 [80]	18 [159]	35 [310]	≤ 5			510 [115]	550 [124]	0.034	90		0.8 [1.8]		
PGD064-50A1	$1,277.00	64	50:1	double	27 [239]	50 [443]	100 [885]	≤ 3	3000	6000	850 [191]	750 [169]	0.049	90		1.6 [3.5]		SV(2)L-202(B) SV(2)L-204(B)
PGD064-05A2	$1,090.00		5:1	single	27 [239]	50 [443]	100 [885]				400 [90]	390 [88]	0.1	95		1.4 [3.1]		
PGD064-10A2	$1,090.00		10:1	single	18 [159]	35 [310]	80 [708]				500 [112]	530 [119]	0.062	95		1.4 [3.1]		
PGD064-25A2	$1,277.00		25:1	double	27 [239]	50 [443]	100 [885]				680 [153]	750 [169]	0.054	90		1.6 [3.5]		
PGD090-25A2	$1,464.00	90	25:1	double	75 [664]	125 [1106]	250 [2213]				1300 [292]	1400 [315]	0.130	90		4 [8.8]		
PGD090-50A2	$1,464.00		50:1	double	75 [664]	125 [1106]	250 [2213]				1700 [382]	1700 [382]	0.099	90		4 [8.8]		
PGD090-05A3	$1,277.00		5:1	single	75 [664]	125 [1106]	250 [2213]				780 [175]	680 [153]	0.580	95		3.6 [7.9]		SV(2)L-207(B)
PGD090-10A3	$1,277.00		10:1	single	50 [443]	80 [708]	200 [1770]				980 [220]	920 [207]	0.330	95		3.6 [7.9]		
PGD090-05A4	$1,277.00		5:1	single	75 [664]	125 [1106]	250 [2213]				780 [175]	680 [153]	0.580	95		3.6 [7.9]		SV(2)L-210(B)
PGD090-10A4	$1,277.00		10:1	single	50 [443]	80 [708]	200 [1770]				980 [220]	920 [207]	0.330	95		3.6 [7.9]		
PGD090-05A5	$1,277.00		5:1	single	75 [664]	125 [1106]	250 [2213]				780 [175]	680 [153]	0.580	95		3.6 [7.9]		SV(2)M-210(B)
PGD110-50A2	$1,868.00	110	50:1	double	180 [1593]	330 [2921]	625 [5532]				10000 [2248]	6800 [1529]	0.400	90		8.6 [19]		SV(2)L-202(B) SV(2)L-204(B)
PGD110-25A3	$1,868.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				8200 [1843]	5500 [1236]	0.700	90		8.6 [19]		SV(2)L-207(B)
PGD110-50A3	$1,868.00		50:1	double	180 [1593]	330 [2921]	625 [5532]				10000 [2248]	6800 [1529]	0.400	90		8.6 [19]		
PGD110-25A4	$1,868.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				8200 [1843]	5500 [1236]	0.700	90		8.6 [19]		SV(2)L-210(B)
PGD110-50A4	$1,868.00		50:1	double	180 [1593]	330 [2921]	625 [5532]				10000 [2248]	6800 [1529]	0.400	90		8.6 [19]		
PGD110-10A5	$1,588.00		10:1	single	120 [1062]	225 [1991]	500 [4425]				6200 [1394]	4200 [944]	1.100	95		7.8 [17.2]		SV(2)M-210(B)
PGD110-25A5	$1,868.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				8200 [1843]	5500 [1236]	0.700	90		8.6 [19]		
PGD110-35A5	$1,868.00		35:1	double	180 [1593]	330 [2921]	625 [5532]				9000 [2023]	6100 [1371]	0.700	90		8.6 [19]		
PGD110-05A6	$1,588.00		5:1	single	180 [1593]	330 [2921]	625 [5532]				5000 [1124]	3400 [427]	2.300	95		7.8 [17.2]		SV(2)M-220(B) SV(2)M-230(B)
PGD110-10A6	$1,588.00		10:1	single	120 [1062]	225 [1991]	500 [4425]				6200 [1394]	4200 [944]	1.100	95		7.8 [17.2]		

Dimensions – Hub Style In-Line PGD Series



SureGear PGD Series Hub Style In-Line Gearboxes Dimension Drawing

SureGear® Precision Servo Gearbox Dimensions – Hub Style In-Line PGD Series (dimensions = mm [in])

	Part Number	A*	B*	C	E	G	H	J	K	M	N**	P	Q	R	S	T
1	PGD047-05A1 PGD047-10A1	66.5 [2.62]	42.0 [1.65]	19.5 [0.7677]	3.0 [0.1181]	Ø72.0 [Ø2.83]	Ø47.0 [Ø1.85]	Ø28.0 [Ø1.102]	Ø46.0 [Ø1.811]	4	Ø8.0 [Ø0.31]	M4-0.7x9	Ø67.0 [Ø2.6378]	3.4 [0.13]	Ø20.0 [Ø0.7874]	M3-0.5x6.5
2	PGD047-25A1															
2	PGD064-50A1	98.0 [3.86]	52.0 [2.05]			Ø86.0 [Ø3.385]	Ø64.0 [Ø2.52]	Ø40.0 [Ø1.575]		8	Ø8.0 [Ø0.31]		Ø79.0 [Ø3.11]	4.5 [0.18]	Ø31.5 [Ø1.24]	M5-0.8x10
1	PGD064-05A2 PGD064-10A2	82.0 [3.228]	65.0 [2.56]						Ø70.0 [Ø2.756]		Ø14.0 [Ø0.55]	M5-0.8x11				M5-0.8x4
2	PGD064-25A2	103.0 [4.055]									Ø14.0 [Ø0.55]					M5-0.8x10
2	PGD090-25A2 PGD090-50A2	122.0 [4.803]		30.0 [1.1811]	6.0 [0.236]	Ø118.0 [Ø4.65]	Ø90.0 [Ø3.54]	Ø63.0 [Ø2.48]		8	Ø14.0 [Ø0.55]		Ø109.0 [Ø4.30]	5.5 [0.22]	Ø50.0 [Ø1.9685]	M6-1.0x12
1	PGD090-05A3 PGD090-10A3	110.0 [4.33]	80.0 [3.15]						Ø90.0 [Ø3.543]		Ø19.0 [Ø0.75]	M6-1.0x13				
1	PGD090-05A4 PGD090-10A4	127.0 [5.0]	100.0 [3.94]						Ø115.0 ±0.2 [Ø4.528]		Ø28.0 [Ø1.102]	M8-1.25x17				
1	PGD090-05A5		130.0 [5.12]						Ø145.0 ±0.2 [Ø5.709]							
2	PGD110-50A2	159.5 [6.28]	65.0 [2.56]	29.0 [1.142]		Ø145.0 [Ø5.70]	Ø110.0 [Ø4.33]	Ø80.0 [Ø3.15]	Ø70.0 [Ø2.756]	15	Ø14.0 [Ø0.55]	M5-0.8x11	Ø135.0 [Ø5.315]		Ø63.0 [Ø2.48]	
2	PGD110-25A3 PGD110-50A3	169.5 [6.673]	80.0 [3.15]						Ø90.0 [Ø3.543]		Ø19.0 [Ø0.75]	M6-1.0x13				
2	PGD110-25A4 PGD110-50A4	186.5 [7.3425]	100.0 [3.94]						Ø115.0 ±0.2 [Ø4.528]		Ø28.0 [Ø1.102]	M8-1.25x17				
1	PGD110-10A5	159.0 [6.26]	130.0 [5.12]						Ø145.0 ±0.2 [Ø5.709]							
2	PGD110-25A5 PGD110-35A5	186.5 [7.3425]														
1	PGD110-05A6 PGD110-10A6	180.0 [7.087]	180.0 [7.087]						Ø200.0 ±0.2 [Ø7.874]		Ø38.0 [Ø1.45]	M12-1.75x25				

*** Length will vary depending on motor**
**** Bushing will be inserted to adapt to motor shaft**
NOTE: See our website: www.AutomationDirect.com for complete engineering drawings.

Precision Servo Gearboxes

SureGear® Servo Gearbox Replacement Parts

SureGear® Precision Servo Gearboxes – Replacement Parts		
Part Number	***Price***	***Description***
PG050-KEY	$4.50	Output Shaft Key, replacement, 4 x 4 x 14 mm, for SureGear PGA050 series gearboxes.
PG070-KEY	$4.50	Output Shaft Key, replacement, 5 x 5 x 22 mm, for SureGear PGA070 and PGB070 series gearboxes.
PG090-KEY	$4.50	Output Shaft Key, replacement, 6 x 6 x 28 mm, for SureGear PGA090 and PGB090 series gearboxes.
PG120-KEY	$4.50	Output Shaft Key, replacement, 10 x 8 x 45 mm, for SureGear PGA120 and PGB120 series gearboxes.
PG155-KEY	$4.50	Output Shaft Key, replacement, 12 x 8 x 65 mm, for SureGear PGA155 and PGB155 series gearboxes.
PGA4-A5-BUSH	$22.50	Input Shaft Bushing, replacement, 28 x 22 x 30.5 mm, for all SureGear gearboxes using SV(2)L-210(B) and SV(2)M-210(B) SureServo motors.
PGA6-BUSH	$22.50	Input Shaft Bushing, replacement, 38 x 35 x 36 mm, for all SureGear gearboxes using SV(2)M-220(B) and SV(2)M-230(B) SureServo motors.