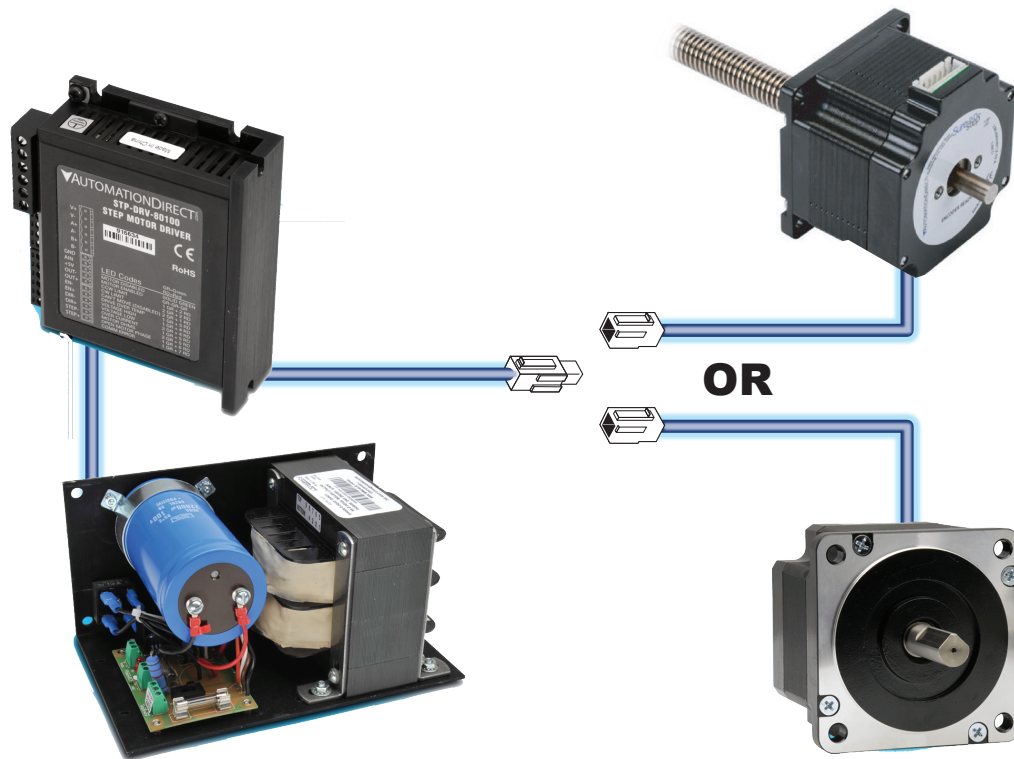# Stepper Systems

Complete SureStep system in 4 components: Power Supply, Stepper Drive, Motor Extension Cable, Motor. Standard Drives (pulse and direction input; DIP-switch configuration) and Advanced Drives (communication/analog control and setup) are available.

OR

Complete SureStep system in 2 components: Power Supply and Integrated Stepper Motor/Drive. Standard Motor/Drives (pulse and direction input; DIP-switch configuration) and Advanced Motor/Drives (communication/analog control and setup) are available.
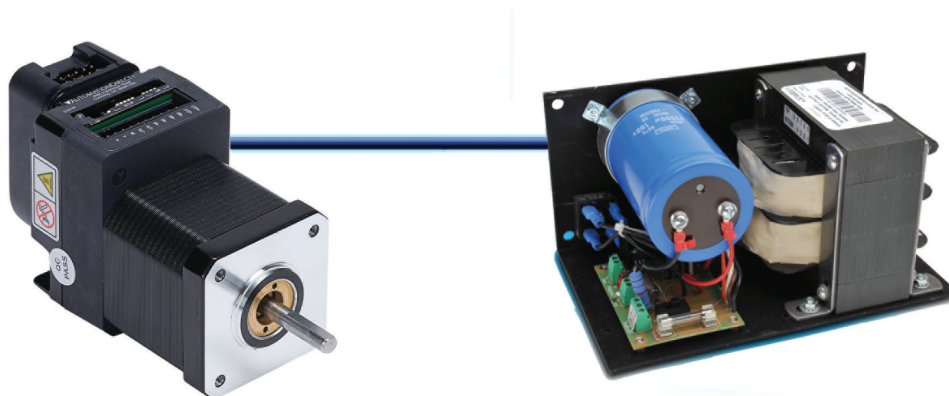
Surestep®

Stepping System Overview

High-performance microstepping drives with high-torque stepping motors

SureStep stepping systems provide simple and accurate control of position and speed. Pulses (or "step" and "direction" signals) from an AutomationDirect PLC or other indexer and motion controller 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 SureStep family has options for open loop control (no encoder), position monitoring (external encoder feedback), and inclusive position verfication (integrated motor/drives with internal encoder). Inclusive position verification provides for stall prevention and detection along with position completion after a temporary stall.

SureStep stepper drives support a wide range of selectable microstep resolutions, from 200 steps per revolution (full step) to 51,200 (full step ÷ 256) steps per revolution, depending on model.

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.

FREE configuration software!

SureMotion Pro software is available that makes setting parameters a snap for the advanced drives and advanced integrated motor/drives! SureMotion Pro replaces SureStep Pro configuration software. Download free from our website:

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

Standards and Agency Approvals $C\epsilon$

How fast can my system go?

Maximum Potential Speed Chart (rpm) *					
PLC		**SureStep Drive Steps/Rev Selection ** **			
Model	**Max Output (kHz)**	**400 Steps/Rev**	**1000 Steps/Rev**	**2000 Steps/Rev**	**10,000 Steps/Rev**
DL05, DL105	7	1,050	420	210	42
DL06	10	1,500	600	300	60
H0/H2/H4/T1H -CTRIO	25	>2,500***	1,500	750	150
H2-CTRIO2	250	>2,500***			1,500
P2-HSO	1000	>2,500***			
P3-HSO	1000	>2,500***			
BRX	2000	>2,500***			

* 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.
*** Typical stepper systems do not run faster than 2500 rpm.
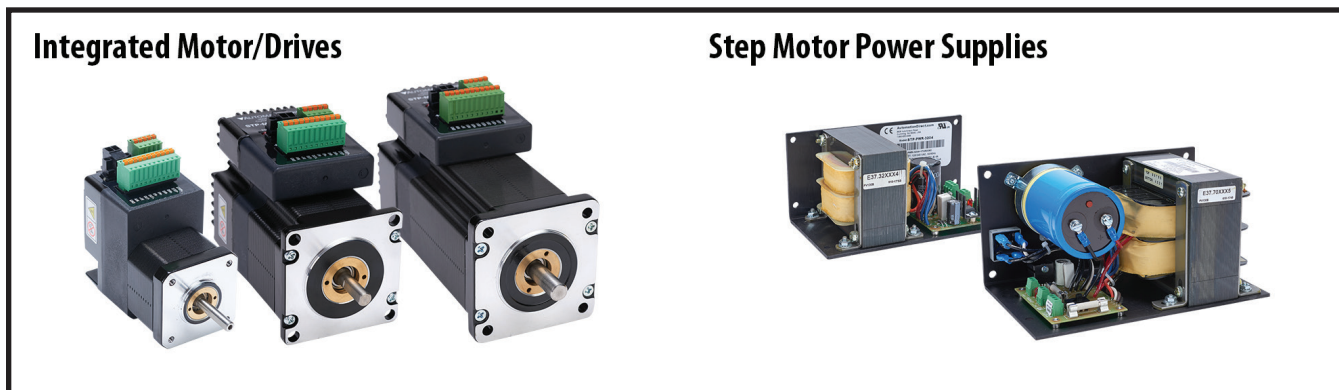
Stepping Motor RPM = (A÷B) x (60 seconds/minute)

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

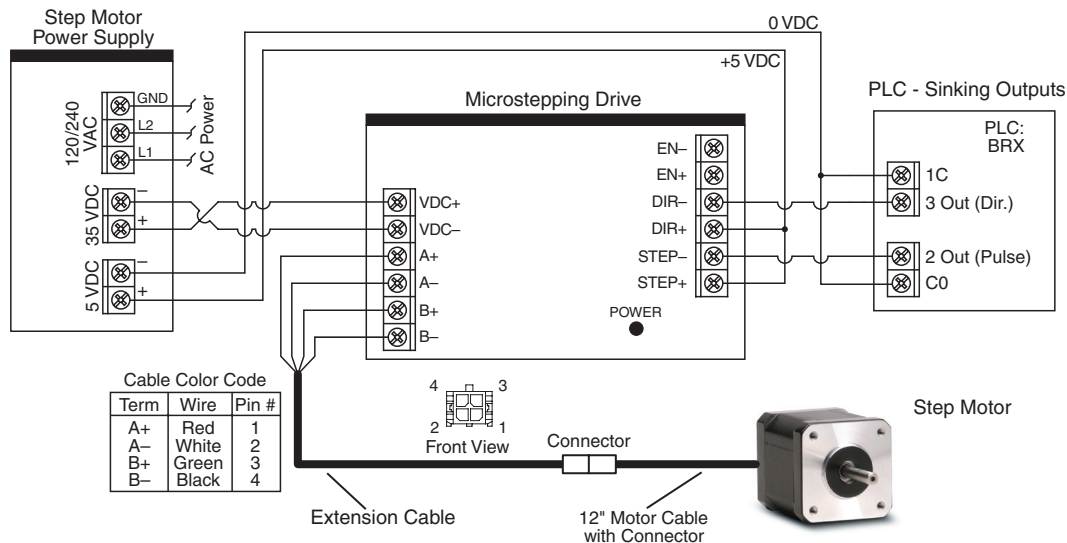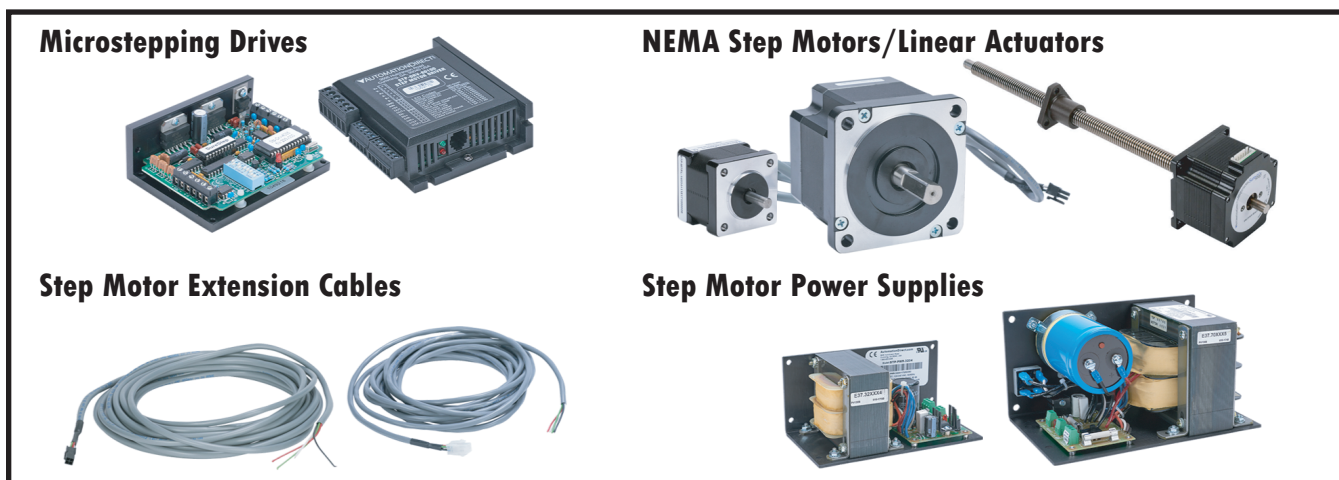| **Maximum RPM =**		**Steps/Sec A**		**Steps/Rev B**		**Sec/Min**
Example 1:	1,500 =	10,000	÷	400	x	60
DL06 with 10 kHz Built-in Pulse Output						
Example 2:	3,750 =	25,000	÷	400	x	60
Hx-CTRIO with 25 kHz Pulse Output						

For the latest prices, please check AutomationDirect.com.

Surestep®

Stepping System Overview

Two or Four components to make a complete system

Choose an integrated motor/drive and power supply

Integrated Motor/Drives

Step Motor Power Supplies

OR . . .

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

Microstepping Drives

NEMA Step Motors/Linear Actuators

Step Motor Extension Cables

Step Motor Power Supplies

Step Motor Power Supply

Microstepping Drive

PLC - Sinking Outputs

0 VDC
+5 VDC

120/240 VAC — GND, L2, L1 — AC Power
35 VDC — –, +
5 VDC — –, +

VDC+, VDC–, A+, A–, B+, B–

EN–, EN+, DIR–, DIR+, STEP–, STEP+

POWER

PLC: BRX
1C
3 Out (Dir.)
2 Out (Pulse)
C0

Cable Color Code

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

Front View

Connector

Extension Cable

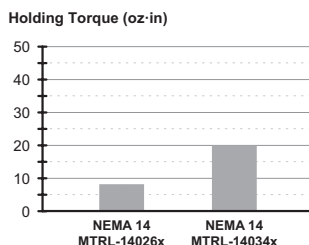12" Motor Cable with Connector

Step Motor

Stepping System Overview

NEMA frame stepping motors

The SureStep stepping family has a wide variety of 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, with or without an encoder. Our square frame or "high-torque" style stepping motors are the latest in bipolar technology, resulting in very high torque to volume ratios. We have NEMA 14, 17, 23, 34, and 42 size motors with holding torque ranging from 8 to 4532 oz·in. Wash down "W" motors (IP65) are also available. Optional 6, 10, or 20-foot extension cables with locking connectors are available to interface any of the stepping motors to the microstepping drive, except the NEMA 23 and NEMA 34 STP-MTRAC-x motors. Those MTRAC motors have an integrated 10-foot pigtail cable. The

extension cables can be easily cut to length, if desired. Integrated motor/drives and separate motors with an "E" in their part number include an encoder for position feedback. The MTRAC motors are designed to work with 115 or 230 VAC powered drives and can withstand high voltages. This allows higher torque, especially at higher speeds.

Low Voltage Low Torque Motors (MTRL)

Holding Torque (oz·in)

Low Voltage High Torque Motors (MTR)
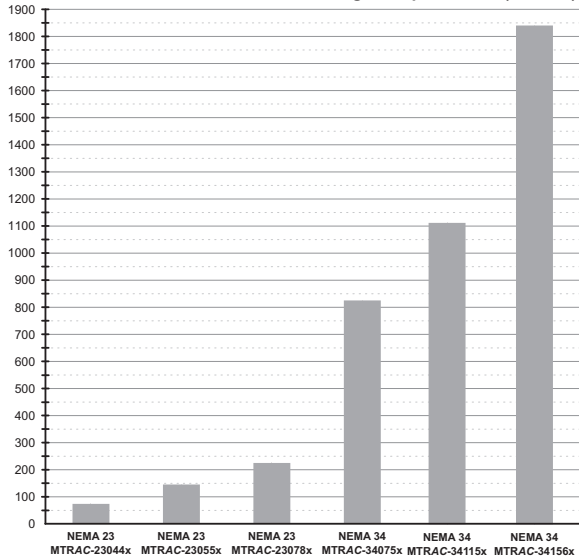
Holding Torque (oz·in)

Low Voltage Higher Torque Motors (MTR*H*)
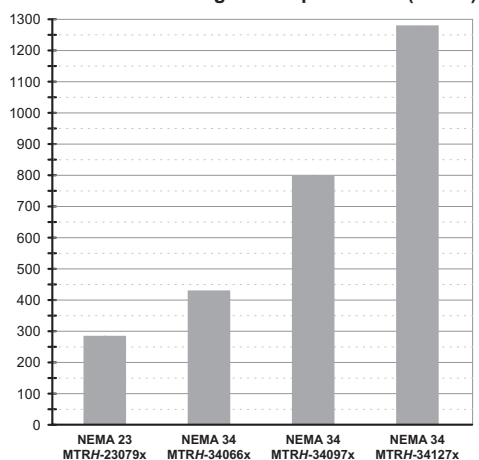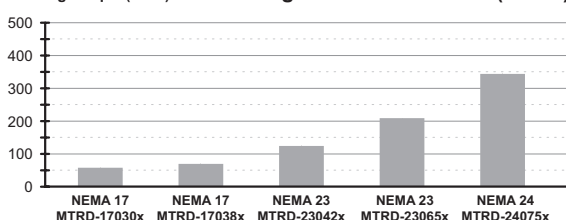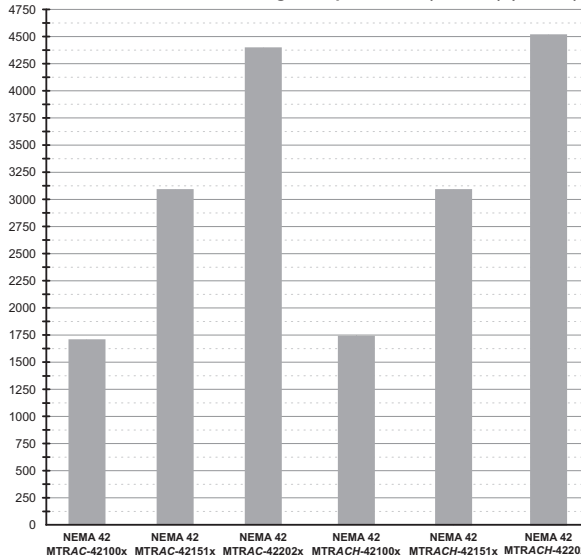
Holding Torque (oz·in)
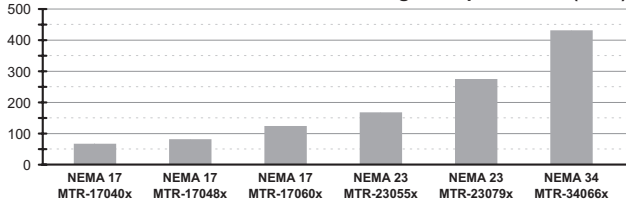
Note that the integrated motor/drive systems have a lower maximum torque due to heat constraints with the drive connected to the motor. For solutions requiring the highest torque, use the systems with our NEMA MTRH (low voltage, higher torque) or MTRAC (high voltage, high torque) motors.

Integrated Motors/Drives (MTRD)

Holding Torque (oz·in)

High Voltage High Torque Motors (MTR*AC*)

Holding Torque (oz·in)

Higher Voltage High Torque Motors (MTR*AC(H)-42xxx*)

Holding Torque (oz·in)

*Note: While possessing similar holding torques, the MTRACH motors have much higher torque at high speeds than the MTRAC motors.*

Surestep ®

Stepping System Overview

NEMA frame stepping motors, continued

SureStep Stepper Linear Actuators combine all the great features of our stepper motors with a lead screw as the motor's shaft. NEMA 17 and 23 frame size motors are available with leads from 1.25mm/rev to 1inch/rev.

Thrust (lbs, @150rpm)

Linear Actuator Nominal Thrust (LExx)
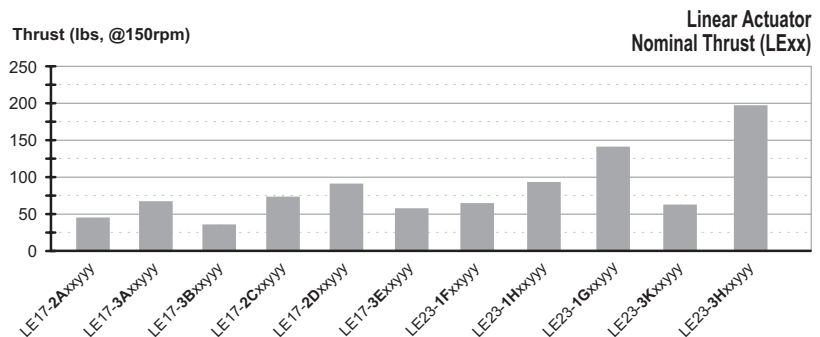
High-performance microstepping drives

SureStep microstepping drives
(STP-DRV-4035,-4830,-4845,-6575, & STP-MTRD-x)

- 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 AutomationDirect PLCs, or 5–24 VDC (depending on model)
- No software or add-on resistors required for drive configuration; dipswitch and/or rotary-dial setup
- Dipswitch used for built-in self-test, microstep resolution selection, current level selection, and optional idle current reduction.
- Optional external encoder feedback for integrated models

SureStep high bus voltage microstepping drives
(STP-DRVAC-24025)

- Auto-setup measures motor parameters and configures motor current control and anti-resonance gain settings
- Uses universal AC input 90 to 240 VAC, AC input voltage must be selected by switch
- Switch selectable microstep resolution, 16 settings from 200 to 25600 steps/rev
- Switch configurable running current, anti-resonance, input signal filter, step smoothing filter, and self test
- Motor selection via 16-bit rotary switch

SureStep advanced microstepping drives
(STP-DRV-4850, STP-DRV-80100, & STP-MTRD-xR)

All the features of the standard 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)
- AB quadrature/encoder following for all advanced models
- Advanced "E" integrated models contain a built-in encoder (encoder is not accessible and not available for signaling outside the drive)

Power supplies

- SureStep 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
- Switching power supplies also available (12V, 24V, 48V)

Sure**step**®

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 Motors and Standard Integrated and Advanced Integrated sections of this catalog chapter, or the thrust-speed curves for Linear Actuators. Choose a standalone or integrated motor or linear actuator that can run your application with plenty of speed and torque/thrust reserve (most stepper systems should have a 100% safety margin for torque/thrust). If encoder feedback is desired, be sure to choose a "D" or "E" model motor, or "ADJ" model actuator. If an IP65 rating is desired, choose a "W" motor (no IP65 linear actuator models available at this time).

Note: If you chose an Integrated motor/drive, you can skip to "Choose a Power Supply". If you chose an STP-MTRAC-23xxx or -34xxx motor, you are done. These motors use the STP-DRVAC-24025 drive, have no motor extension cable (10' leads on the motor), and require no power supply (the drive uses AC input power).
Note: The STP-MTRAC-42xxx motors cannot use the STP-DRVAC-24025 drive as it doesn't provide enough current.

NEMA 14, 17, 23, 34, and 42 mounting flanges

Variety of bipolar step motors to cover a wide range of applications

Holding torque ranges from 8 to 4532 oz·in

Single-shaft, Dual-shaft, IP65, high bus voltage, and encoder-mounted models available
(Linear series does not have high bus voltage or IP65 models)

1-ft cable with locking connector on the end
(not for linear actuators)
(NEMA 23/34 MTRAC motors have 10' leads)

Square frame style produces high torque and achieves best torque-to-volume ratio

NEMA 17, 23 and 24 integrated motor/drives
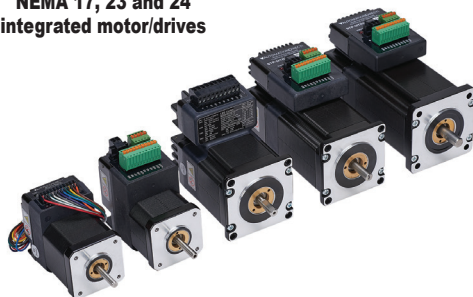
NEMA 17 and 23 linear actuators

NEMA 42 MTRAC(H)

2. Choose a motor extension cable

[If you chose an Integrated motor/drive in Step 1, skip to "Choose a Power Supply"; an extension cable is not required.]

Our 6-, 10-, and 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.

Note: All NEMA 23/34 STP-MTRAC-x motors have integrated 10-foot cables and don't need an extension cable.

20-foot extension cable with locking connector

| SureStep Motor / Cable Compatibility	
Motor	*Cable*
STP-LE17 series linear actuator	STP-LA-EXT17-xx
STP-LE23 series linear actuator	STP-LA-EXT23-xx
STP-MTR-xxxx	STP-EXT-0xx
STP-MTR-xxxxW	STP-EXTW-0xx
STP-MTRAC-23xxx/34xxx	None
STP-MTRAC-42xxx	STP-EXT42-0xx
STP-MTRACH-42xxx	STP-EXT42H-0xx
STP-MTRH-xxxx	STP-EXTH-0xx
STP-MTRH-xxxxW	STP-EXTHW-0xx
STP-MTRL-xxxx	STP-EXTL-0xx

Choose your SureStep System

3. Choose a drive

Note: If you chose an Integrated motor/drive in Step 1, skip to "Choose a Power Supply" . . . you have already chosen your drive. If you chose STP-MTRAC-23xxx or STP-MTRAC-34xxx, you are done - these motors use the STP-DRVAC-24025 drive and don't require an extension cable or DC power supply.

Note: The STP-MTRAC-42xxx motors cannot use the STP-DRVAC-24025 drive as it doesn't provide enough current.
The chart below is a quick selection guide. For a full list of features, check out the Technical Info later in this chapter. The requirements for what you will need from a drive are determined by your applications. Deciding whether you plan to operate the drive via high-speed pulses, analog control, encoder following, or communication commands is an important factor. The voltage supplied to the drive as determined by the speed torque curves is another important factor to consider when choosing a drive. If you need to select a drive based on RMS step motor phase current, please see the next page.

- Standard and Advanced Drives and Integrated Motor/Drives can accept high-speed pulse input control.
- Advanced Drives and some Integrated Motor/Drives can also accept serial communication control.
- STP-MTRAC-23xxx and -34xxx and STP-DRVAC motors and drives are designed for use with high voltages. These components are not designed to work at low voltages (12V, 32V, 48V, 70V).

STP-DRV Series
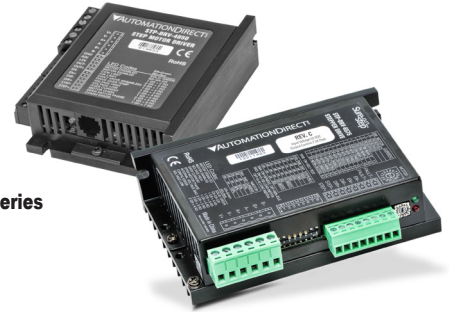
STP-MTRD Series
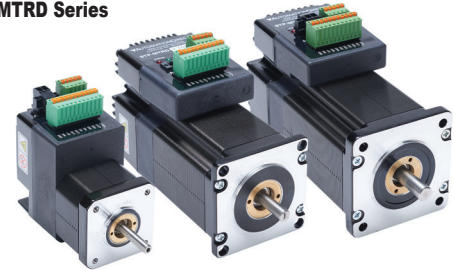
What you need	STP-DRV-4035	STP-DRV-4845	STP-DRV-4850	STP-DRV-6575	STP-DRV-80100	STP-MTRD-17x(E)	STP-MTRD-23x(E)	STP-MTRD-17xR(E)	STP-MTRD-23xR(E)	STP-MTRD-24xRV(E)
12V Speed-Torque Curve (from Step 1)	–	–	–	–	–	✓	✓	✓	✓	✓
32V Speed-Torque Curve (from Step 1)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
48V Speed-Torque Curve (from Step 1)	–	✓	✓	✓	✓	–	✓	–	✓	✓
70V Speed-Torque Curve (from Step 1)	–	–	–	–	✓	–	✓	–	✓	✓
More than 3.5A/motor phase	–	✓	✓	✓	✓	–	–	–	–	–
More than 5A/motor phsae ("H" motors)	–	–	–	✓	✓	–	–	–	–	–
Supply voltage	12–32	24–48	24–48	24–65	24–80	12–48	12–70	12–48	12–70	12–70
Digital Input Voltage	5V (12V*, 24V*)	5–24V	5V (12V*, 24V*)	5–24V	5V (12V*, 24V*)	5–24V	5–24V	5–24V	5–24V	5–24V
Internal Indexing (Drive can move from point A to point B with a serial communication command)	–	–	✓	–	✓	–	–	✓	✓	✓
High-speed pulse input	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Analog Velocity input	–	–	✓	–	✓	–	–	✓	✓	✓
Position Verification (internal encoder)	–	–	–	–	–	–	–	E models only	E models only	E models only
External encoder	–	–	–	–	–	E models only	E models only	–	–	–
RS-232 communication (ASCII)	–	–	✓	–	✓	–	–	–	–	–
RS-485 communication (ASCII)	–	–	–	–	–	–	–	✓	✓	✓
Variable I/O (I/O can be either a digital input or digital output)	–	–	–	–	–	–	–	–	–	✓

* External dropping resistor required for 12V and 24V I/O use. See Product Data Sheet for wiring details and resistor values.

Sure**step**®

Choose your SureStep System

3a.

### Using RMS Step Motor Phase Current to Select an Appropriate Stepper Drive Rated in Peak Phase Current

$$(Drive\ Amps)_{peak} = 1.2 \times (Motor\ Amps)_{RMS}$$

Generic stepper drives usually have output current specified in peak phase current while stepper motors will have their phase current specified in RMS phase current. This can cause sub-optimal drive to motor pairing unless this is understood. There is no need to understand this difference if you are selecting a system that uses the SureStep drives that are tuned for specific SureStep motors. These drives will have a rotary switch setting (STP-DRV-6575 and STP-DRVAC-24025) or a motor selection in the SureMotion Pro software (STP-DRV-4850 and STP-DRV-80100). These drives when properly paired with a SureStep motor will output 1.2 times the motor rated phase current.

When choosing a drive that only has current selections instead of motor specific selections you will want to select a peak current that is 1.2 times the motor's listed RMS current. The true peak drive current value would be 1.4 times the RMS motor value but this amount of current will cause a lot of motor heating and the torque at higher speeds will actually suffer with due to higher back electro-magnetic force caused by the inductive field of the coils changing polarity quickly.

Example of a SureStep matched stepper system

To use an STP-MTR-23055 motor with a STP-DRV-6575 drive, the drive's rotary switch should be positioned to selection 9 (STP-MTR-23055x). The STP-MTR-23055 has a phase current of 2.8 A (RMS), so the drive will actually output 1.2 x 2.8 A (RMS) = 3.36 A (peak). You do not need to calculate peak or RMS current with a pre-configured SureStep motor and drive system.
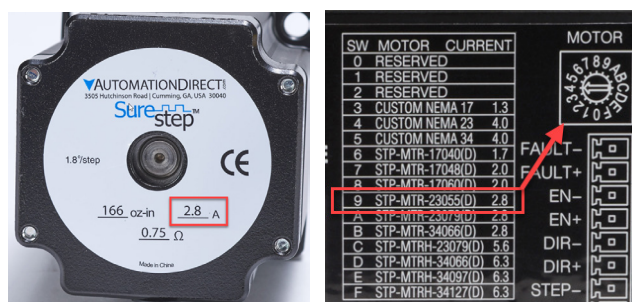

Matched stepper system

Example of an adjustable current stepper drive

To use an STP-MTR-23055 motor with a STP-DRV-4845 drive, you should calculate the correct phase current setting for the drive. The motor phase current is 2.8 A (RMS).

- If you do not understand peak vs RMS current, you would select phase current position #8, the 2.8 A selection on the drive (blue box). This setting will work (and the motor will run very cool) but will provide slightly less than the motor's rated torque.
- If a true peak current value is selected (1.4 x 2.8 A = 3.92 A) then the rotary switch selection would be set to the C position (red box). This will cause excessive motor heating and a lack of performance at higher speeds.
- The optimal phase current selection for stepper motors is 1.2 times the motor RMS phase current (1.2 x 2.8 A (RMS) = 3.36 A (peak)). This will be the rotary switch selection A (green box)
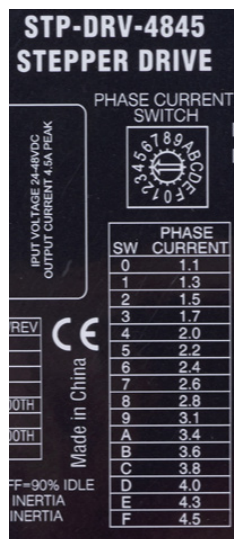
	STP-DRV-4845 Motor Selection Tal (A/Phase)(Peak of Sine A)		
Rotary Switch Position	SW1 & SW2 @100%	SW1 & SW2 @90%	SW1 & @80
0	1.1	1.0	0.9
1	1.3	1.2	1.0
2	1.5	1.4	1.2
3	1.7	1.5	1.4
4	2.0	1.8	1.6
5	2.2	2.0	1.8
6	2.4	2.2	1.9
7	2.6	2.3	2.1
8	2.8	2.5	2.2
9	3.1	2.8	2.5
A	3.4	3.1	2.7
B	3.6	3.2	2.9
C	3.8	3.4	3.0
D	4.0	3.6	3.2
E	4.3	3.9	3.4
F	4.5	4.1	3.6

Matching an adjustable stepper drive
with any step motor

Surestep®

Choose your SureStep System

4. Choose a power supply

Since all low voltage SureStep (non-integrated) 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. If using an integrated motor/drive, then the power supply is dictated by the specifications of the integrated product. If using an STP-MTRAC-23xxx or -34xxx drive, no DC power supply is needed since the drive is powered directly from 115 to 230 VAC. Choose a power supply that matches the desired speed-

torque curve and stays within the voltage limit of the selected drive. Each SureStep linear power supply has incoming AC and outgoing DC fusing. The linear supplies have an electronic overload protected 5V supply for all your logic needs. Stepper applications without large fluctuations in load, without aggressive deceleration, and without regeneration (where the load pushes the motor) can often use a switching power supply instead.

Permissible Drive/Power Supply Combinations

DC Powered Drive	Linear Power Supply				Switching Power Supply		
	STP-PWR-3204	STP-PWR-4805	STP-PWR-4810	STP-PWR-7005	PSB12-xxxS	PSB24-xxxS	PSB48-xxxS
STP-DRV-4830 12-48 VDC input (53V max)	√	√	√	–	√	√	√
STP-DRV-4845 24-48 VDC input (60V max)	√	√	√	–	–	√	√
STP-DRV-4850 24-48 VDC input (53V max)	√	√	√	–	–	√	√
STP-DRV-6575 24-65 VDC input (85V max)	√	√	√	–	–	√	√
STP-DRV-80100 24-80 VDC input (88V max)	√	√	√	√	–	√	√
STP-MTRD-17 series 12-48 VDC input (55V max)	√	√	√	–	√	√	√
STP-MTRD-23, -24 series 12-70 VDC input (75V max)	√	√	√	√	√	√	√
Supply current calculation	*For systems that use multiple steppers and only one power supply, the power supply current must be at least the sum of 2/3rds of the combined motor currents:* $$I(ps) \geq 2/3 \; x \; (I\_motor1 + I\_motor2 + I\_motor\,3 + \ldots)$$						

Linear Power Supply

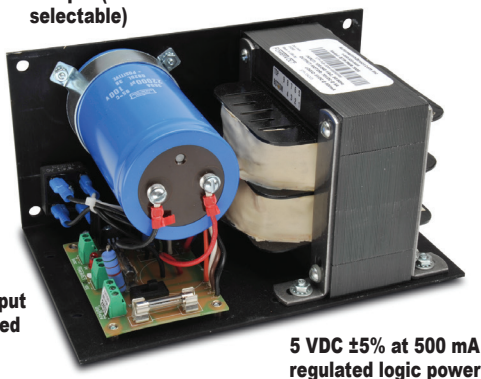120 or 240 VAC, 50/60 Hz power input (switch selectable)

Screw terminal AC input and DC output connections

32V, 48V and 70V linear supplies

Power ON LEDs

unregulated linear supplies perfect for stepper systems

Input and output fusing included

5 VDC ±5% at 500 mA regulated logic power

Switching Power Supply

85–264 VAC (DC input range 120–375 VDC)

Rugged plastic or aluminum housings with integral 35mm DIN rail mounting adapters

Adjustable output voltage
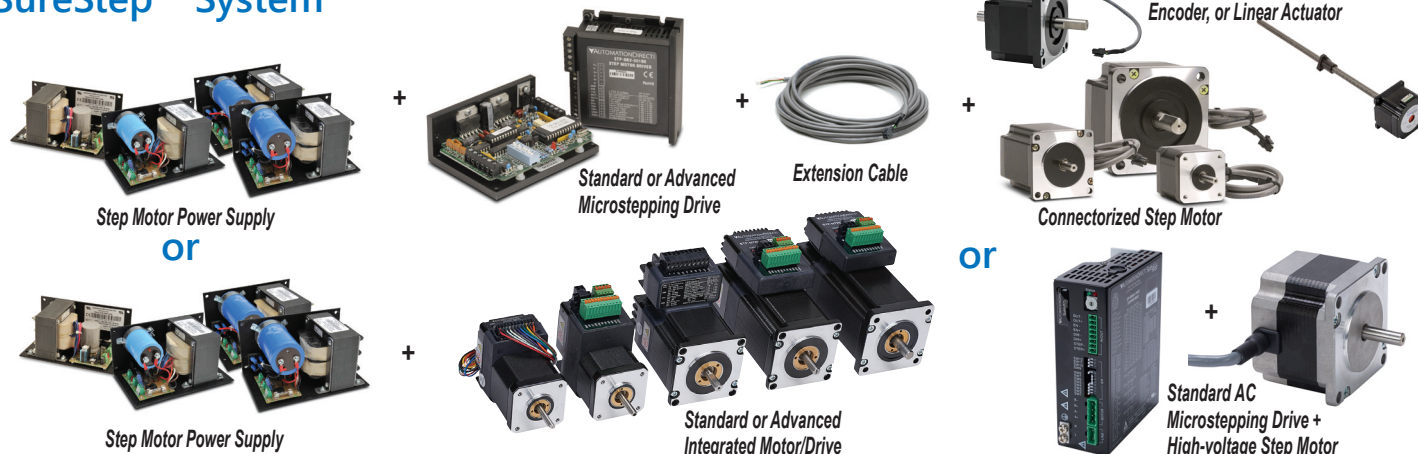
Output voltage status LED

DC Output Overload and Short-Circuit Protected

Note: For detailed information on the switching power supplies, please see: https://cdn.automationdirect.com/static/specs/rhinopsbc1d2.pdf

Stepping System Components

SureStep® System

Step Motor Power Supply

or

Step Motor Power Supply

+

Standard or Advanced Microstepping Drive

+

Extension Cable

+

Single-shaft, Dual-shaft, Encoder, or Linear Actuator

Connectorized Step Motor

+

Standard or Advanced Integrated Motor/Drive

or

Standard AC Microstepping Drive + High-voltage Step Motor

SureStep stepping family includes:

- Linear step motor power supplies
- DIP-switch configurable microstepping drives
- Software-configurable advanced microstepping drives
- Motor extension cables
- NEMA 14, 17, 23, 24, 34, and 42 frame size step motors in single shaft, dual-shaft, IP65, high bus voltage, or encoder mounted configurations
- NEMA 17, 23, and 24 frame size integrated motor/drives
- NEMA 17 and 23 linear actuators (6", 9", and 12" lengths)
- Variety of step motor accessories including encoders, control cables, and connector kits
- SureStep PC adapter, USB to RS-485
- SureMotion Pro software for advanced drive and integrated motor/drive systems

Motor features

- Low voltage, high torque, 2-phase, bipolar, 1.8° per step, 4-lead
- High voltage, high torque, 2-phase, bipolar, 1.8° per step, 8-lead
- Available in single-shaft and dual-shaft models
- Connectorized pigtails or integrated 10' cable (STP-MTRAC only)
- Optional encoder feedback (STP-MTR-xxxxE)
- IP65 versions available (STP-MTR-xxxxW)
- High bus voltage versions available (STP-MTRAC-xxxx)
- Linear actuators have lead screws for motor shafts (STP-LExx-xxxxxx)
- Linear actuators ADJ series available with encoder-ready rear shaft and machined journals on screw ends for easy bearing mounting
- Wide variety of NEMA 14 , 17, 23, and 34 motors

Power supply features

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

NOTE: If a switching power supply is desired, we recommend the PSB12-xxxS, PSB24-xxxS, or PSB48-xxxS series.

Standard stepper drive features

(STP-DRV-4035, -4830, -4845, -6575, STP-MTRD-x, STP-DRVAC-24025)

- Low cost, digital step motor driver in compact package
- Operates from Step and Direction signals, or Step CW and Step CCW (jumper selectable).
- Fault output and Enable input
- Optically isolated I/O
- Digital filters prevent position error from electrical noise on command signals; jumper selectable: 150 kHz or 2MHz
- Rotary or DIP switch easily selects from many popular motors
- Electronic damping and anti-resonance
- Automatic idle current reduction to reduce heat when motor is not moving; switch selectable: 50% or 90% of running current
- Switch-selectable step resolution: 200–25,600 steps per revolution depending on drive
- Switch-selectable microstep emulation provides smoother, more reliable motion in full- and half-step modes
- Automatic self test (switch selectable)
- Optional external encoder feedback (integrated models)
- Operates from a 24–65 VDC or 12–40 VDC power supply, depending upon model. STP-DRVAC drive operates off AC voltage.
- Running current from 0.35–7.5A

Advanced stepper drive features

(STP-DRV-4850, STP-DRV-80100, STP-MTRD-xR, & STP-MTRD-xRE)

- 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, and serial communication inputs
- Serial communications allow point-to-point positioning
- AB quadrature/encoder following (integrated models)
- Optional internal encoder feedback (integrated models)
- RS-485 communications (integrated models)
- Four 5 to 24 volt digital "Variable I/O" points (NEMA 24 integrated models)
- Controllable via streaming SCL commands

Motion Control

For the latest prices, please check AutomationDirect.com.

Stepping System Components

SureStep Power Supply / DC Input Drive Compatibility

Drive(1)(2)	Recommended Linear Power Supply(1)(2)(5)			
Model #	STP-PWR-3204	STP-PWR-4805	STP-PWR-4810	STP-PWR-7005(3)
STP-DRV-4035	√	No	No	No
STP-DRV-4830	√	√	√	No
STP-DRV-4845	√	√	√	No
STP-DRV-4850	√	√	√	No
STP-DRV-6575	√	√	√	No
STP-DRV-80100	√	√	√	√
STP-MTRD-17(4)	√	√	√	No
STP-MTRD-23(4)	√	√	√	√
STP-MTRD-24(4)	√	√	√	√

1) Do NOT use a power supply that exceeds the drive's input voltage range.
   If using a 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.
3) An unloaded STP-PWR-7005 can float above the allowable input voltages of some drives if it is fed with a high AC input voltage (greater than 120VAC).
4) Integrated motor/drives are included here because they include a drive as well as a motor.
5) STP-DRVAC-x drives are AC powered and cannot be powered by DC power supplies.

SureStep Power Supply / DC Input Drive Compatibility

Drive(1)(2)	Recommended Switching Power Supply(1)(2)(4)		
Model #	PSB12-xxxS	PSB24-xxxS	PSB48-xxxS
STP-DRV-4035	√	√	No
STP-DRV-4830	√	√	√
STP-DRV-4845	No	√	√
STP-DRV-4850	No	√	√
STP-DRV-6575	No	√	√
STP-DRV-80100	No	√	√
STP-MTRD-17(3)	√	√	√
STP-MTRD-23(3)	√	√	√
STP-MTRD-24(3)	√	√	√

1) Do NOT use a power supply that exceeds the drive's input voltage range.
2) For best performance, use the lowest voltage power supply that supplies the required speed and torque.
3) Integrated motor/drives are included here because they include a drive as well as a motor.
4) STP-DRVAC-x drives are AC powered and cannot be powered by DC power supplies.

SureStep AC Motor/Drive Compatibility

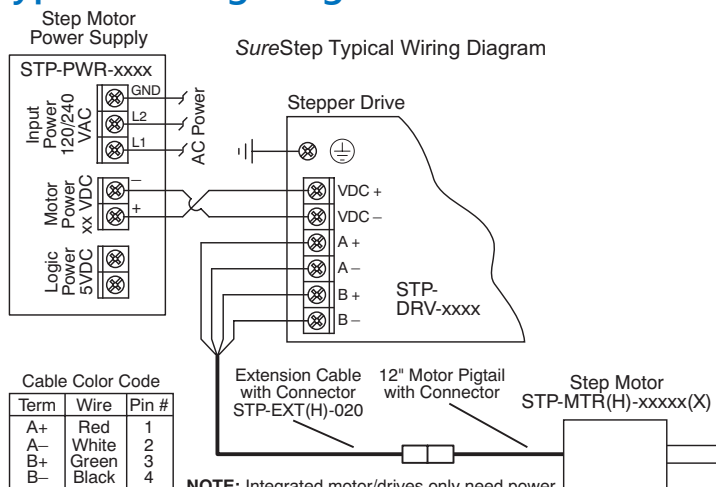| Model #	STP-DRVAC-24025	
	Series Wired Motor	Parallel Wired Motor
STP-MTRAC-23044(x)	√	No
STP-MTRAC-23055(x)	√	No
STP-MTRAC-23078(x)	√	No
STP-MTRAC-34075(x)	√	No
STP-MTRAC-34115(x)	√	No
STP-MTRAC-34156(x)	√	No

NOTE: STP-MTRAC-34156(x) motors have a 5/8" front shaft.

SureStep DC Input Drive / Motor Compatibility(3)

Motor(1)			Recommended Drive(1)					
Model # (1)	Rated Amps(2)	Extension Cable	STP-DRV-4035(1)	STP-DRV-4830	STP-DRV-4845	STP-DRV-4850(1)	STP-DRV-6575(1)	STP-DRV-80100(1)
STP-MTRL-14026(x)	0.35	STP-EXTL-0xx	√	√	–	√	–	–
STP-MTRL-14034(x)	0.8		√	√	√	√	–	–
STP-MTR-17040(x)	1.7	STP-EXT-0xx	√	√	√	√	√	√
STP-MTR-17048(x)	2.0		√	√	√	√	√	√
STP-MTR-17060(x)	2.0		√	√	√	√	√	√
STP-MTR-23055(x)	2.8		√	√	√	√	√	√
STP-MTR-23079(x)	2.8		√	√	√	√	√	√
STP-MTR-34066(x)	2.8		√	√	√	√	√	√
STP-MTRAC-42100(x)	4.2	STP-EXT420xx	–	–	√	√	√	√
STP-MTRAC-42151(x)	6		–	–			√	√
STP-MTRAC-42202(x)	6		–	–			√	√
STP-MTRH-23079(x)	5.6	STP-EXTH-0xx	–				√	√
STP-MTRH-34066(x)	6.3						√	√
STP-MTRH-34097(x)	6.3						√	√
STP-MTRH-34127(x)	6.3						√	√
STP-MTRACH-42100(x)	6	STP-EXTH420xx					√	√
STP-MTRACH-42151(x)	8						–	√
STP-MTRACH-42202(x)	8						–	√

1) The combinations above will perform according to the published speed/torque curves. Using a motor with a current rating higher than the drive's output rating will proportionally limit the motor torque.
2) Listed NEMA42 motor amperages are for Bipolar Series wiring. See the NEMA42 motor specs for amperages with other wiring types.
3) Table not applicable to integrated motor/drives as drives and motors are already paired.

Typical Wiring Diagram

SureStep Typical Wiring Diagram

Step Motor Power Supply — STP-PWR-xxxx
Input Power 120/240 VAC — GND, L2, L1 — AC Power
Motor Power xx VDC — –, +
Logic Power 5VDC

Stepper Drive — STP-DRV-xxxx
VDC +, VDC –, A +, A –, B +, B –

Cable Color Code

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

Extension Cable with Connector STP-EXT(H)-020
12" Motor Pigtail with Connector
Step Motor STP-MTR(H)-xxxxx(X)

NOTE: Integrated motor/drives only need power since the drive and motor are one unit. MTRAC motors do not need an extension cable, they have 10' leads coming from the motor.

NOTE: STP-MTRAC-23xxx/34xxx motors and STP-DRVAC drives are designed to work with AC input power to the drive. They are not designed to work with DC input power.

Sure step®

Stepping System Drives

SureStep Series – Microstepping Drives Features Comparison

Drive Model	Standard Microstepping Drives						Advanced Microstepping Drives		
	STP-DRVAC-24025	STP-DRV-4830	STP-DRV-4845	STP-DRV-6575	STP-MTRD-x	STP-DRV-4035	STP-DRV-4850	STP-DRV-80100	STP-MTRD-xR
Price	$236.00	$97.00	$98.00	$110.00	See Integrated Motor/Drives section	Retired	$286.00	$338.00	See Integrated Motor/ Drives section
Drive Type	Microstepping drive with pulse input				Integrated stepper motor/ drive	Micro-stepping drive with pulse input	Advanced microstepping drive with pulse or analog input, serial communication;includes programming/communication cable STP-232RJ11-CBL		Advanced integrated stepper motor/drive with internal encoder
	enclosed				enclosed	open-frame	enclosed		enclosed
Output Current	0.6–2.5 A/ phase	0.35–3.0 A/phase	0.8–4.5 A/ phase	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: 120/240 VAC range: 90–240 VAC	nominal: 12–48 VDC range: 10–53 VDC	nominal: 24–48 VDC range: 20–60 VDC	nominal: 24–75 VDC range: 20–85 VDC	nominal: 12-48 VDC (NEMA 17) 12-70 VDC (NEMA 23) range: 10-55 VDC (NEMA 17) 11-74 VDC (NEMA 23)	nominal: 12–32 VDC range: 12–42 VDC	nominal: 24–48 VDC range: 18– 53 VDC	nominal: 24–80 VDC range: 18–88 VDC	nominal: 12-48 VDC (NEMA 17) 12-70 VDC (NEMA 23, 24) range: 10-55 VDC (NEMA 17) 11-74 VDC (NEMA 23) 10-75 VDC (NEMA 24)
Configuration Method	rotary dial, dip switches, jumpers				dip switches		SureMotion Pro software (SM-PRO: free download)		
Amplifier Type	MOSFET, dual H-bridge, 4-quadrant				Dual H-bridge, 4 quadrant	MOSFET, dual H-bridge, bipolar chopper	MOSFET, dual H-bridge, 4-quadrant		Dual H-bridge, 4 quadrant
Current Control	4-state PWM @ 20 kHz	4-state PWM @ 16 kHz	4-state PWM @ 20 kHz		4-state PWM @ 16 kHz	4-state PWM @ 20 kHz			
Microstep Resolution	dipswitch selectable						software selectable		
	200 to 25,600 steps/rev		200 to 20,000 steps/rev		200 to 25,600 steps/rev	400 to 10,000 steps/rev	200 to 51200 steps/rev		
Modes of Operation — Step & Dir	YES	YES	YES	YES	YES	YES	YES	YES	YES
CW/CCW	YES	YES	YES	YES	YES	n/a	YES	YES	YES
A/B Quad	n/a	n/a	n/a	n/a	n/a	n/a	YES	YES	YES
Oscillator	n/a	n/a	n/a	n/a	n/a	n/a	YES	YES	YES
Serial Indexing	n/a	n/a	n/a	n/a	n/a	n/a	YES	YES	YES
Digital Input Signals — Step/Pulse	step & direction, CW/CCW step				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 enable	motor disable	motor enable, alarm reset, speed select (oscillator mode)		
Analog Input	n/a	n/a	n/a	n/a	n/a	n/a	speed control		signal range, offset, dead band, and filtering
Output Signal	fault	n/a	fault	fault	fault	n/a	fault, motion, tach		brake, fault, motion, tach
Communication Interface	n/a	n/a	n/a	n/a	n/a	n/a	YES (programming/communication cable included)		
Non-volatile Memory Storage	n/a	n/a	n/a	n/a	n/a	n/a	YES		
Idle Current Reduction	YES								
Self Test	YES								
Additional Features	Step pulse noise filter, accepts AC power input	Step pulse noise filter	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 range 0.25 to 1.5 rps) Waveform (command signal) smoothing		

Refer to Specifications Tables for detailed specifications.

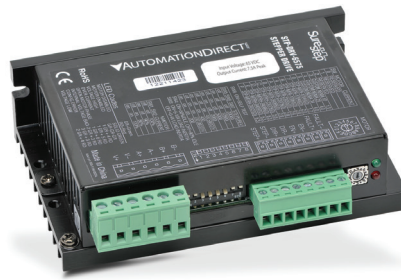# Stepping System Drives

SureStep® Standard Microstepping Drives

<table>
<tr><th colspan="3">SureStep Series Specifications – Standard Microstepping Drives</th></tr>
<tr><td>Microstepping Drive</td><td>STP-DRV-4035</td><td>STP-DRV-4830</td></tr>
<tr><td>Drive Type</td><td>Microstepping drive with pulse input</td><td>Microstepping drive with pulse input</td></tr>
<tr><td>Drawing</td><td>PDF</td><td>PDF</td></tr>
<tr><td>Output Current</td><td>Selectable from 0.4 to 3.5 A/phase (maximum output power is 140W)</td><td>Selectable from 0.35 to 3.0 A/phase (peak of sine)</td></tr>
<tr><td>Input Voltage
(external p/s required)</td><td>Nominal: 12–32 VDC
Range: 12–42 VDC (including ripple voltage)</td><td>Nominal: 12–48 VDC
Range: 10–53 VDC</td></tr>
<tr><td>Configuration Method</td><td>DIP switches</td><td>DIP switches</td></tr>
<tr><td>Amplifier Type</td><td>MOSFET, dual H-bridge, bipolar chopper</td><td>MOSFET, dual H-bridge, 4-quadrant</td></tr>
<tr><td>Current Control</td><td>4-state PWM @ 20 kHz</td><td>4-state PWM @ 16 kHz</td></tr>
<tr><td>Protection</td><td>n/a</td><td>n/a</td></tr>
<tr><td>Recommended Input Fusing</td><td>Fuse: 4A fast-acting; ADC # AGC4; Holder: ADC # DN-F6L110</td><td>Fuse: 3A fast-acting; ADC #AGC3; Holder: ADC # DN-F6L110</td></tr>
<tr><td rowspan="5">Input Signals</td><td>Input Circuit

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.</td><td>5 –24 VDC nominal (range: 4–30 VDC); (5mA @ 4V; 15 mA @ 30V); Optically isolated, differential</td></tr>
<tr><td>Step/Pulse
Motor steps on falling edge of pulse and minimum pulse width is 0.5 μs (1MHz)</td><td>Minimum pulse width = 1μs. Maximum pulse frequency = 150kHz or 500kHz (user selectable).</td></tr>
<tr><td>Direction
Needs to change at least 2 microseconds before a step pulse is sent</td><td>FU   NCTIONS: step & direction, CW/CCW step</td></tr>
<tr><td>Enable
Logic 1 will disable current to the motor
(current is enabled with no hook-up or logic 0)</td><td>FUNCTION: disable motor when closed</td></tr>
<tr><td>Analog
n/a</td><td>n/a</td></tr>
<tr><td colspan="2">Output Signal</td><td>n/a</td></tr>
</table>

Output Signal		n/a	n/a

<table>
<tr><td rowspan="8">Features</td><td>Current Reduction</td><td>n/a</td><td>n/a</td></tr>
<tr><td>Idle Current Reduction</td><td>0% or 50% reduction
(Idle current setting is active if motor is at rest for 1 second or more)</td><td>90% or 50% of running current.
(Holding torque is reduced by the same %.)</td></tr>
<tr><td>Microstep Resolution</td><td>400 (200x2), 1,000 (200x5), 2,000 (200x10), or 10,000 (200x50) steps/rev</td><td>200, 400, 800, 1000, 1600, 2000, 3200, 4000, 5000, 6000, 6400, 8000, 10000, 12800, 20000, 25600</td></tr>
<tr><td>Phase Current Setting</td><td>0.4 to 3.5 A/phase with 32 selectable levels</td><td>(peak)(0.35–3.0)
(0.25–2.3) RMS</td></tr>
<tr><td>Self Test</td><td>Uses half-step to rotate 1/2 revolution in each direction at 100 steps/second.</td><td>Automatically rotates the motor back and forth two turns in each direction in order to confirm that the motor is operational.</td></tr>
<tr><td>Step Pulse Noise Filter</td><td>n/a</td><td>Select 150kHz or 500kHz</td></tr>
<tr><td>Load Inertia</td><td>n/a</td><td>n/a</td></tr>
<tr><td colspan="1"></td><td></td><td></td></tr>
<tr><td colspan="2">Connectors</td><td>Screw terminal blocks with AWG 18 maximum wire size</td><td>DEGSON 15EDGK-5.08-02P-14-00AH 2-pin power connector
DEGSON 15EDGK-3.1.04P-14-00A(H) 4-pin motor connector
DEGSON 15EDGK-3.5-06P-14-00A(H) 6-pin I/O connector
ADC part STP-CON-5 contains replacement connectors</td></tr>
</table>

		STP-DRV-4035	STP-DRV-4830
Maximum Humidity		90% non-condensing	90% non-condensing
Storage/Ambient Temperature		-20 to 80 °C [-4 to 176 °F]	0 to 40 °C [32 to 104 °F] (mount to suitable heat sink)
Operating Temperature		0 to 55 °C [32 to 131 °F] recommended; 70 °C [158 °F] maximum	0 to 85 °C [32 to 185 °F] (interior of electronics section)
Drive Cooling Method		Natural convection (mount drive to metal surface to dissipate heat)	Natural convection (mount drive to metal surface)
Mounting		(4) #4 screws to mount on wide side; (2) #4 screws to mount on narrow side	(2) #6 screws to mount to metal surface
Weight		9.3 oz. [264 g]	3.0 oz [85.9 g]
Agency Approvals		CE	CE

SureStep®

Stepping System Drives

SureStep® Standard Microstepping Drives, continued

SureStep Series Specifications – Standard Microstepping Drives		
Microstepping Drive	**STP-DRV-4845**	**STP-DRV-6575**
Drive Type	Microstepping drive with pulse input	
Drawing	PDF	PDF
Output Current	Selectable from 0.8–4.5 A/phase (peak of sine)	Selectable from 1.0–7.5 A/phase (peak of sine)
Input Voltage (external p/s required)	Nominal: 24–48 VDC Range: 20–60 VDC	Nominal: 24–65 VDC Range: 20–85 VDC
Configuration Method	Rotary dial, DIP switches, jumpers	
Amplifier Type	MOSFET, dual H-bridge, 4-quadrant	
Current Control	4-state PWM @ 20 kHz	
Protection	n/a	
Recommended Input Fusing	Fuse: 4A fast-acting; ADC #AGC4; Holder: ADC # DN-F6L110	Fuse: 7A fast-acting; ADC #AGC7; Holder: ADC # DN-F6L110
Input Signals	**Input Circuit**	5 –24 VDC nominal (range: 4–30 VDC); (5mA @ 4V; 15 mA @ 30V); Optically isolated, differential	
	Step/Pulse	Minimum pulse width = 1µs. Maximum pulse frequency = 150kHz or 2MHz (user selectable).	
	Direction	FUNCTIONS: step & direction, CW/CCW step	
	Enable	FUNCTION: disable motor when closed	
	Analog	n/a	
Output Signal		30 VDC / 80 mA max, optically isolated photodarlington, sinking or sourcing. Function = closes on drive fault.	
Features	**Current Reduction**	Reduce power consumption and heat generation by limiting motor running current to 100%, 90%, 80%, or 70% of maximum. Current should be increased to 100% if microstepping. (Torque is reduced/increased by the same %.)	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 %.)
	Idle Current Reduction	90% or 50% of running current. (Holding torque is reduced by the same %.)	
	Microstep Resolution	200, 200 smooth, 400, 400 smooth, 2000, 5000, 12800, 20000	
	Phase Current Setting	(peak)(1.1–4.5) x 70%–100% DIP switch selectable (0.79–3.2) RMS	(1.3–6.3) x 80%–120% DIP switch selectable
	Self Test	Automatically rotates the motor back and forth two turns in each direction in order to confirm that the motor is operational.	
	Step Pulse Noise Filter	Select 150kHz or 2MHz	
	Load Inertia	Set motor and load inertia range to 0–4x or 5–10x.	
Connectors		Removable screw terminal blocks. Motor & Power Supply: 30–12 AWG; Signals: 30–14 AWG ADC part STP-CON-1 contains replacement connectors	
Maximum Humidity	90% non-condensing	
Storage/Ambient Temperature	0 to 50 °C [32 to 122 °F] (mount to suitable heat sink)	
Operating Temperature	0 to 85 °C [32 to 185 °F] (interior of electronics section)	
Drive Cooling Method	Natural convection (mount drive to metal surface)	
Mounting	(2) #6 screws to mount to metal surface	
Weight	10.8 oz [306g]	
Agency Approvals	CE, $_C$UR$_{US}$	

SureStep®

Stepping System Drives

SureStep® Advanced Microstepping Drives

SureStep 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)	
Drawing	PDF	PDF
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	SureMotion 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	
Direction	FUNCTIONS: step & direction, CW/CCW step, A/B quadrature, run/stop & direction, jog CW/CCW, CW/CCW limits	
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	

Stepping System Drives

SureStep® High Bus Voltage Microstepping Drives

SureStep Series Specifications – Standard Microstepping Drives		
Microstepping Drive		*STP-DRVAC-24025*
Price		$236.00
Drawing		PDF
Drive Type		Microstepping drive with pulse input
Output Current		Selectable from 0.6–2.5 A/phase (peak of sine)
Input Voltage		90–240 VAC
Configuration Method		Rotary dial, DIP switches, jumpers
Amplifier Type		MOSFET, dual H-bridge, 4-quadrant
Current Control		4-state PWM @ 20 kHz
Protection		Over temp, over voltage, under voltage, over current, excess regen, open circuit
Recommended Input Fusing		Fuse: 4A fast-acting; ADC #AGC4; Holder: ADC # DN-F6L110
Input Signals	**Input Circuit**	5–24 VDC nominal (range: 4–28 VDC); optically isolated, differential.
	Step/Pulse	Minimum pulse width = 1µs. Maximum pulse frequency = 150kHz or 2MHz (user selectable). FUNCTIONS: step & direction, CW/CCW step
	Direction	
	Enable	FUNCTION: disable motor when closed
	Analog	n/a
Output Signal		30 VDC / 100 mA max, optically isolated photodarlington, sinking or sourcing. Function = closes on drive fault.
Features	**Current Reduction**	n/a
	Idle Current Reduction	90% or 50% of running current. (Holding torque is reduced by the same %.)
	Microstep Resolution	200, 400, 800, 1000, 1600, 2000, 3200, 4000, 5000, 6000, 6400, 8000, 10000, 12800, 20000, 25600
	Phase Current Setting	0.6–2.5 Amps RMS
	Self Test	Automatically rotates the motor back and forth two turns in each direction in order to confirm that the motor is operational.
	Step Pulse Noise Filter	Select 150kHz or 2MHz
	Load Inertia	Set motor and load inertia range to 0–4x or 5–10x.
Connectors		DEGSON 2EDGK-7.62-02P-14-00A(H) 2-pin power connector DEGSON 2EDGK-5.08-04P-14-00A(H) 4-pin motor connector DEGSON 15EDGK-3.81-08P-14-00A(H) 8-pin I/O connector ADC part STP-CON-6 contains replacement connectors
Maximum Humidity		90% non-condensing
Storage/Ambient Temperature		0 to 40 °C [32 to 104 °F]
Operating Temperature		0 to 85 °C [32 to 185 °F] (interior of electronics section)
Drive Cooling Method		Natural convection (mount drive to metal surface)
Mounting		(2) M4 screws to mount to metal surface
Weight		1 lb 15 oz [0.88 kg]
Agency Approvals		CE, $_C$UR$_{US}$

Motion Control tMNC-16

Stepping System Drives

SureStep® Microstepping Drives Dimensions

Dimensions = in [mm]

STP-DRV-4830

2.40 [60.9]
1.50 [38.0]
0.91 [23.2]
0.18 [4.5]
Ä0.18 [Ä4.5]
1.77 [45.0]
2.18 [55.4]
1.12 [28.4]

STP-DRV-4845 & STP-DRV-6575

4.66 [118.4]
0.13 [3.2]
4.40 [111.8]
4X Ø0.14 [Ø3.6]
2.98 [75.6]
0.89 [22.7]
1.04 [26.5]
0.22 [5.6]
0.41 [10.5]
4.42 [112.3]
2 X R0.09 [R2.2]
0.35 [8.9]
1.30 [33.0]

STP-DRV-4850 & STP-DRV-80100

0.61 [15.5]
SureStep Microstepping Drive -
1.98 [50.3]
3.0 [76.2]
3.39 [86.1]
1.125 [28.6]
3.65 [92.7]
6X slot 0.16 [4.1] wide, full R
0.663 [16.8]

STP-DRVAC-24025

Ø0.18 [Ø4.5]
0.18 [4.5]
0.41 [10.5]
0.24 [6.0]
0.18 [4.5]
5.15 [130.7]
4.32 [109.8]
1.87 [47.5]
5.56 [141.2]

SureStep®
step

Stepping System Drives

SureStep® Microstepping Drives Dimensions

Dimensions = in [mm]

STP-DRV-4035

1.50 [38.1]

2x Ø0.125 Ø[3.2]

3.70 [94.0]

0.25 [6.4]

0.15 [3.8]

0.875 [22.2]

0.125 [3.2]

2.50 [63.5]

4x Ø0.125 Ø[3.2]

3.75 [95.3]

4.00 [101.6]

3.00 [76.2]

0.25 [6.4]

Motion Control   tMNC-18

Stepping System Motors

Sure̲step®

SureStep® Stepping Motors

SureStep Series Part Numbers – Bipolar Stepping Motors*					
Bipolar Stepping Motors	**Price**	**Shaft Type**	**Torque Level**	**Encoder Mounting**	**Drawing**
STP-MTRL-14026	$29.00	single	low	not available	PDF
STP-MTRL-14026D	$32.50	dual		optional	PDF
STP-MTRL-14026E**	$112.00	dual		pre-installed	PDF
STP-MTRL-14034	$28.00	single		not available	PDF
STP-MTRL-14034D	$41.00	dual		optional	PDF
STP-MTRL-14034E**	$117.00	dual		pre-installed	PDF
STP-MTR-17040	$23.00	single	high	not available	PDF
STP-MTR-17040D	$31.00	dual		optional	PDF
STP-MTR-17040E**	$110.00	dual		pre-installed	PDF
STP-MTR-17040W***	$162.00	single		not available	PDF
STP-MTR-17048	$30.00	single		not available	PDF
STP-MTR-17048D	$36.50	dual		optional	PDF
STP-MTR-17048E**	$116.00	dual		pre-installed	PDF
STP-MTR-17048W***	$168.00	single		not available	PDF
STP-MTR-17060	$54.00	single		not available	PDF
STP-MTR-17060D	$55.00	dual		optional	PDF
STP-MTR-17060E**	$133.00	dual		pre-installed	PDF
STP-MTR-17060W ***	$221.00	single		not available	PDF
STP-MTR-23055	$43.50	single		not available	PDF
STP-MTR-23055D	$49.50	dual		optional	PDF
STP-MTR-23055E**	$137.00	dual		pre-installed	PDF
STP-MTR-23055W ***	$199.00	single		not available	PDF
STP-MTR-23079	$56.00	single		not available	PDF
STP-MTR-23079D	$72.00	dual		optional	PDF
STP-MTR-23079E**	$151.00	dual		pre-installed	PDF
STP-MTR-23079W ***	$218.00	single		not available	PDF
STP-MTR-34066	$132.00	single		not available	PDF
STP-MTR-34066D	$164.00	dual		optional	PDF
STP-MTR-34066W ***	$261.00	single		not available	PDF
STP-MTRH-23079	$63.00	single	higher	not available	PDF
STP-MTRH-23079D	$85.00	dual		optional	PDF
STP-MTRH-23079E **	$158.00	dual		pre-installed	PDF
STP-MTRH-23079W ***	$315.00	single		not available	PDF
STP-MTRH-34066	$161.00	single		not available	PDF
STP-MTRH-34066D	$175.00	dual		optional	PDF
STP-MTRH-34066W ***	$360.00	single		not available	PDF
STP-MTRH-34097	$184.00	single		not available	PDF
STP-MTRH-34097D	$217.00	dual		optional	PDF
STP-MTRH-34097W ***	$406.00	single		not available	PDF
STP-MTRH-34127	$197.00	single		not available	PDF
STP-MTRH-34127D	$217.00	dual		optional	PDF
STP-MTRH-34127W ***	$444.00	single		not available	PDF

STP-MTR-xxxxx (single-shaft)

STP-MTR-xxxxxE (encoder mount)
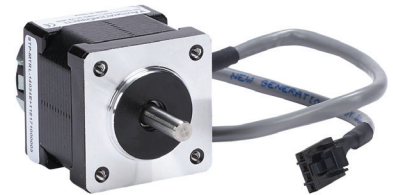
STP-MTR-xxxxxD (dual-shaft)
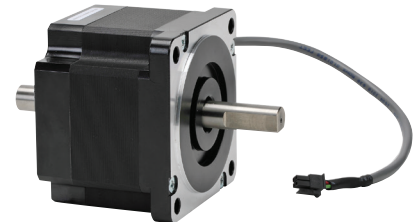
STP-MTR-xxxxxW (IP65)

Surestep®

Stepping System Motors

SureStep® Stepping Motors

SureStep Series Part Numbers – Bipolar Stepping Motors, continued					
Bipolar Stepping Motors	**Price**	**Shaft Type**	**Torque Level**	**Encoder Mounting**	**Drawing**
Motors listing continued from previous page					
STP-MTRAC-23044	$140.00	single	High voltage High torque	not available	PDF
STP-MTRAC-23044D	$165.00	dual		optional	PDF
STP-MTRAC-23055	$170.00	single		not available	PDF
STP-MTRAC-23055D	$195.00	dual		optional	PDF
STP-MTRAC-23078	$182.00	single		not available	PDF
STP-MTRAC-23078D	$229.00	dual		optional	PDF
STP-MTRAC-34075	$267.00	single		not available	PDF
STP-MTRAC-34075D	$268.00	dual		optional	PDF
STP-MTRAC-34115	$276.00	single		not available	PDF
STP-MTRAC-34115D	$277.00	dual		optional	PDF
STP-MTRAC-34156	$295.00	single*		not available	PDF
STP-MTRAC-34156D	$296.00	dual*		optional	PDF
STP-MTRAC-42100	$289.00	single	High voltage Higher torque	not available	PDF
STP-MTRAC-42100D	$312.00	dual		optional**	PDF
STP-MTRAC-42151	$472.00	single		not available	PDF
STP-MTRAC-42151D	$495.00	dual		optional**	PDF
STP-MTRAC-42202	$582.00	single		not available	PDF
STP-MTRAC-42202D	$599.00	dual		optional**	PDF
STP-MTRACH-42100	$289.00	single		not available	PDF
STP-MTRACH-42100D	$312.00	dual		optional**	PDF
STP-MTRACH-42151	$472.00	single		not available	PDF
STP-MTRACH-42151D	$495.00	dual		optional**	PDF
STP-MTRACH-42202	$587.00	single		not available	PDF
STP-MTRACH-42202D	$607.00	dual		optional**	PDF

NOTE: STP-MTRAC-34156(x) motors have a 5/8" front shaft.
** NOTE: NEMA 42 "D" motors require an STP-MTRA-42ENC adapter plate for AMT13/AMT33 encoder mounting.

STP-MTRAC-xxxxx (single-shaft)

STP-MTRAC-xxxxxD (dual-shaft)
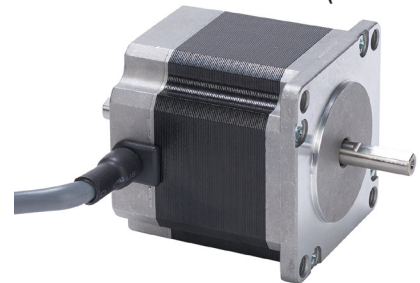
STP-MTRACH-42xxxD (dual-shaft)

SureStep® Stepping Motors Mounting Accessories

Mounting Accessories – for NEMA 17 and NEMA 42 SureStep Stepping Motors				
Part Number	**Price**	**Description**	**Drawing Links**	**Use With**
STP-MTRA-RB-85	$9.25	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.	n/a	SureStep NEMA 17 motors
STP-MTRA-42ENC	$12.00	SureStep encoder mounting plate, metal body. For use with SureStep NEMA 42 stepper motors with dual shafts. Encoder mounting screws and mounting plate screws included. Mounting holes for CUI Devices AMT132/AMT332 encoders and US Digital E6 encoders.	PDF	SureStep NEMA 42 motors

STP-MTRA-42ENC

Motion Control

Stepping System Motors

![SureStep logo]

SureStep® Stepping Motors

SureStep Series Specifications – Connectorized Bipolar Stepping Motors													
Bipolar Stepping Motors		Low Voltage Low Torque		Low Voltage High Torque						Low Voltage Higher Torque			
		STP-MTRL-14026(x)	STP-MTRL-14034(x)	STP-MTR-17040(x)	STP-MTR-17048(x)	STP-MTR-17060(x)	STP-MTR-23055(x)	STP-MTR-23079(x)	STP-MTR-34066(x)	STP-MTRH-23079(x)	STP-MTRH-34066(x)	STP-MTRH-34097(x)	STP-MTRH-34127(x)
NEMA Frame Size		14	14	17	17	17	23	23	34	23	34	34	34
Maximum Holding Torque*	*(lb·in)*	0.5	1.25	3.81	5.19	7.19	10.37	17.25	27.12	17.87	27.12	50.00	80.50
	(oz·in)	8	20	61	83	115	166	276	434	286	434	800	1288
	(N·m)	0.06	0.14	0.43	0.59	0.81	1.17	1.95	3.06	2.02	3.06	5.65	9.10
Rotor Inertia	*(oz·in2)*	0.06	0.08	0.28	0.37	0.56	1.46	2.60	7.66	2.60	7.66	14.80	21.90
	(kg·cm2)	0.0003	0.00035	0.05	0.07	0.10	0.27	0.48	1.40	0.48	1.40	2.71	4.01
Rated Current (A/phase)		0.35	0.8	1.7	2.0	2.0	2.8	2.8	2.8	5.6	6.3	6.3	6.3
Resistance (Ω/phase)		8.5	7.66	1.6	1.4	2.0	0.75	1.1	1.11	0.4	0.25	0.3	0.49
Inductance (mH/phase)		5.77	6.92	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		0.003 in [0.076 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 80°C [176°F])											
Operating Humidity Range		55% to 85% non-condensing											
Product Material		steel motor case; stainless steel shaft(s)											
Environmental Rating		IP40 (IP65 for "W" motors)											
Weight (lb [kg]) (E models)		0.25 [0.11] (0.3 [0.1])	0.35 [0.15] (0.4 [0.2])	0.6 [0.3] (0.7 [0.3])	0.7 [0.3] (0.8 [0.4])	0.9 [0.4] (0.9 [0.4])	1.5 [0.7] (1.5 [0.7])	2.2 [1.0] (2.4 [1.1])	3.9 [1.7]	2.4 [1.1] (2.4 [1.1])	3.9 [1.7]	5.9 [2.7]	8.4 [3.8]
Agency Approvals		CE											
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-EXTL-0xx	STP-EXT-0xx STP-EXTW-0xx (for "W" motors)							STP-EXTH-0xx STP-EXTHW-0xx (for "W" motors)			

* 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.

Stepping System Motors

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SureStep® Stepping Motors

SureStep Series Specifications – High Voltage Bipolar Stepping Motors							
Bipolar Stepping Motors			**High Voltage High Torque**				
			STP-MTRAC-23044(x)	STP-MTRAC-23055(x)	STP-MTRAC-23078(x)	STP-MTRAC-34075(x)	STP-MTRAC-34115(x)	STP-MTRAC-34156(x)**
NEMA Frame Size			23	23	23	34	34	34**
Maximum Holding Torque*	**(lb·in)**		4.69	9.31	14.19	51.31	69.48	115.06
	(oz·in)		75	149	227	821	1110	1841
	(N·m)		0.53	1.05	1.6	5.8	7.84	13
Rotor Inertia	**(oz·in2)**		0.66	1.64	2.62	7.38	14.74	24.06
	(g·cm2)		120	300	480	1350	2700	4400
Rated Current (A/phase)	**Series**		0.71	0.71	0.71	2.15	2.05	2.55
	Parallel		1.41	1.41	1.41	4.3	4.1	5.1
Resistance (Ω/ phase)	**Series**		12.4	14.4	18	4	4.8	4.8
	Parallel		3.1	3.6	4.5	1.0	1.2	1.375
Inductance (mH/phase)	**Series**		30.4	51.2	60.8	32	43.2	44.8
	Parallel		7.6	12.8	15.2	8.0	10.8	11.2
Insulation Class			B					
Steps per Revolution			200					
Basic Step Angle			1.8°					
Shaft Runout (in)			0.002 in 0.05 mm]					
Max Shaft Radial Play @ 1lb load			0.02 in [0.51 mm]			0.025 in [0.635 mm]		0.02 in [0.51 mm]
Max End Play @ 2.2-lb Axial load			0.08 in [2.03 mm]			0.075 in [1.91 mm]		0.08 in [2.03 mm]
Connectors			8 leads, 24AWG			8 leads, 22AWG		
Temperature Rise			80°C [176°F] max					
Storage Temperature Range			-40°C to 70°C [-40°F to 158°F]					
Operating Temperature Range			-20°C to 50°C [-4°F to 122°F]					
Operating Humidity Range			5% to 95% non-condensing					
Product Material			Steel motor case; stainless steel shaft(s)					
Environmental Rating			IP40					
Weight (lb [kg])			1.03 [0.47]	1.54 [0.7]	2.2 [1.0]	4.2 [1.9]	8.4 [3.8]	11.46 [5.2]
Agency Approvals			None			$_C$UR$_{US}$		

* For dual-shaft motors (STP-MTRAC-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.
** **STP-MTRAC-34156**(x) motors have a 5/8" front shaft

Stepping System Motors

SureStep® Stepping Motors

SureStep Series Specifications – Connectorized Stepping Motors							
Stepping Motors		Higher voltage High torque					
		STP-MTRAC-42100(x)	STP-MTRAC-42151(x)	STP-MTRAC-42202(x)	STP-MTRACH-42100(x)	STP-MTRACH-42151(x)	STP-MTRACH-42202(x)
NEMA Frame Size		42	42	42	42	42	42
Optional Encoder[1]		Y	Y	Y	Y	Y	Y
Max Holding Torque (N·m)	Unipolar Series	9.7	19.0	26.0	9.7	17.5	26.0
	Bipolar Series	12.2	22.0	31.0	12.3	22.0	32.0
	Bipolar Parallel	12.2	22.0	31.0	12.3	22.0	32.0
Rotor Inertia (g·cm2)		5500	10900	16200	5500	10900	16200
Rated RMS Current (A/phase)	Unipolar Series	6	9.4	9	8.5	11.3	11.5
	Bipolar Series	4.2	6	6	6	8	8
	Bipolar Parallel	8.4	12	12	12	16	16
Resistance (Ω/phase)	Unipolar Series	0.6	0.34	0.46	0.32	0.215	0.29
	Bipolar Series	1.19	0.68	0.91	0.64	0.43	0.58
	Bipolar Parallel	0.3	0.17	0.23	0.159	0.108	0.144
Inductance (mH/phase)	Unipolar Series	5	3.6	5.5	2.5	1.9	3.2
	Bipolar Series	19.8	14.5	22	10.1	7.6	13
	Bipolar Parallel	5	3.6	5.5	2.5	1.9	3.2
Insulation Class		B					
Steps per Revolution		200					
Basic Step Angle		1.8°					
Shaft Runout		0.05 mm					
Max Shaft Radial Play @ 1lb load		1.1 in					
Connectors		8 leads, 18AWG					
Temperature Rise		80°C max					
Storage Temp.		-30°C to 70°C [-22°F to 158°F]					
Operating Temperature		-20°C to 40°C [-4°F to 104°F]					
Operating Humidity		5% to 95% non-condensing					
Product Material		Steel motor case, stainless steel shaft(s)					
Environmental Rating		IP40					
Weight (lb [kg])		10.6 [4.8]	17.6 [8]	25.6 [11.6]	10.6 [4.8]	17.6 [8]	25.6 [11.6]
Agency Approval		$_\text{c}$UR$_\text{US}$					

1 - Dual-shaft versions only. For US Digital E6 or CUI Devices AMT13/AMT33 encoder mounting, the STP-MTRA-42ENC encoder adapter plate is required.

Surestep®

Stepping System Motors

SureStep® Motor Running Torque vs. Speed Charts

STP-MTRL-14xxx(x) NEMA 14 Step Motors

STP-MTRL-14026(x) Torque vs Speed (1.8° step motor; 1/2 stepping, RMS phase current)
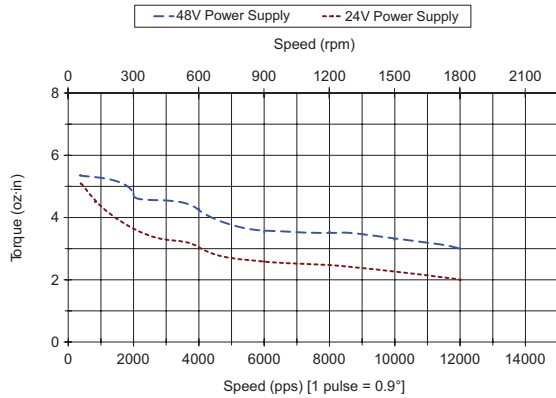
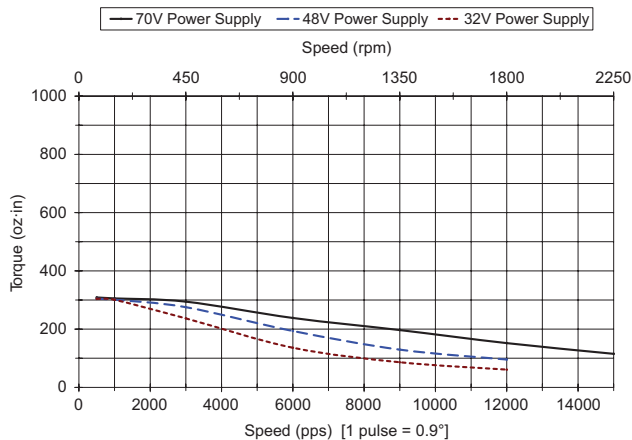**STP-MTRL-14034(x)** Torque vs Speed (1.8° step motor; 1/2 stepping, RMS phase current)
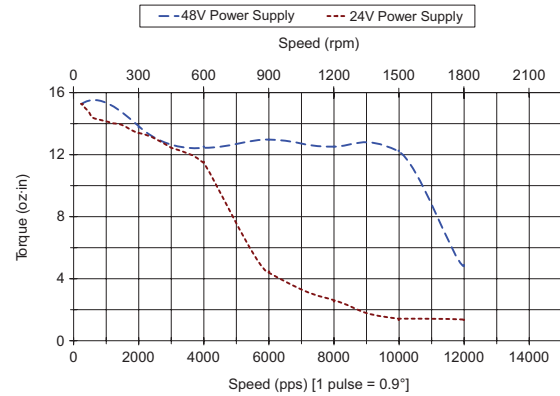
STP-MTR-17xxx(x) NEMA 17 Step Motors

Note: "W" series motors have 5% less running torque than other models

STP-MTR-17040(x) Torque vs Speed (1.8° step motor; 1/2 stepping)
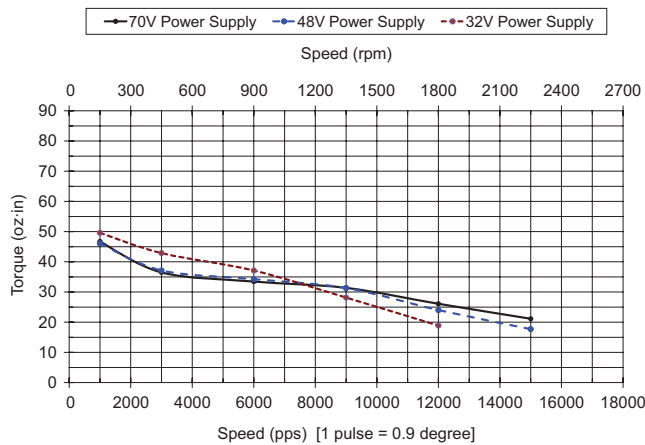
STP-MTR-17060(x) Torque vs Speed (1.8° step motor; 1/2 stepping)
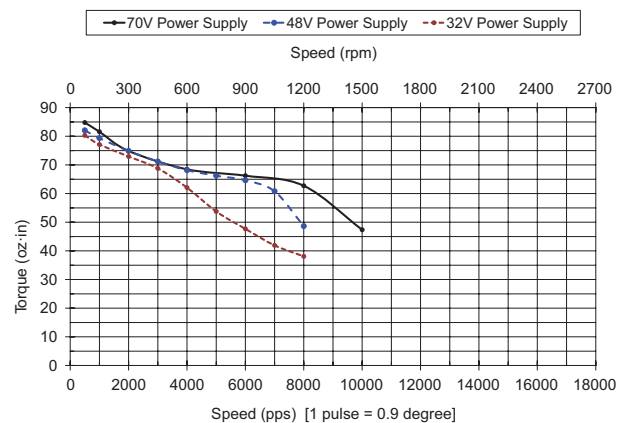
STP-MTR-17048(x) Torque vs Speed (1.8° step motor; 1/2 stepping)
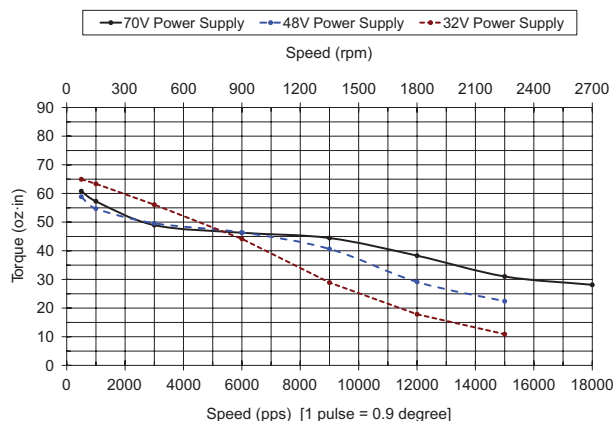
Note: Motor torque vs speed charts for STP-MTRD series integrated motor/drives can be found in the integrated motor/drives section of the full catalog
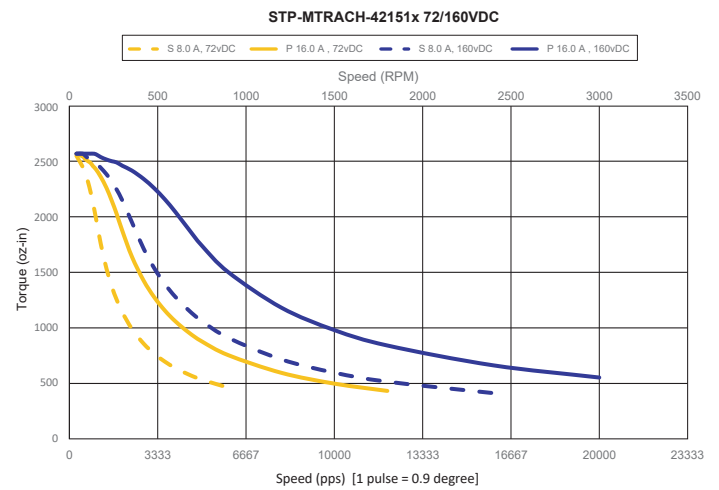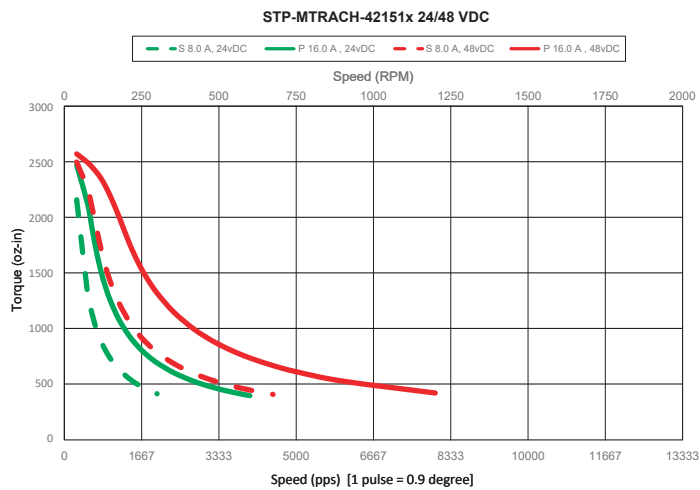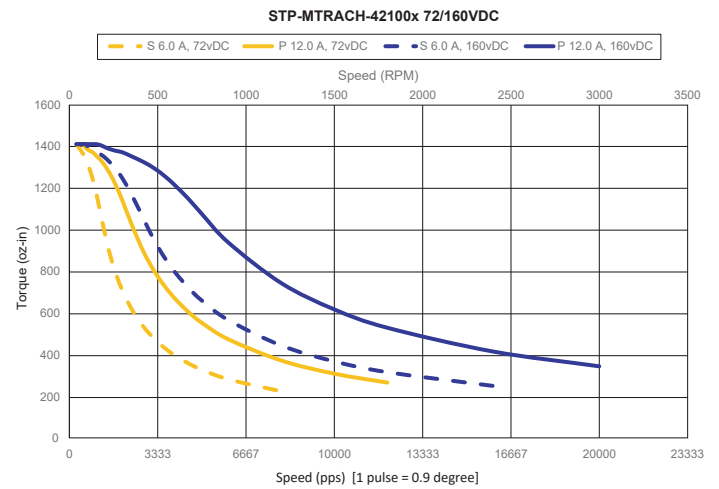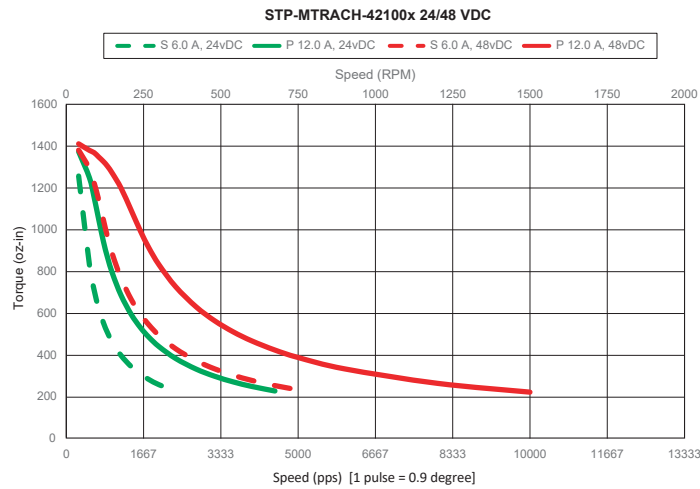
Stepping System Motors

SureStep® Motor Torque vs. Speed Charts (continued)

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

Note: "W" series motors have 5% less running torque than other models

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

— 70V Power Supply – – 48V Power Supply - - - 32V Power Supply
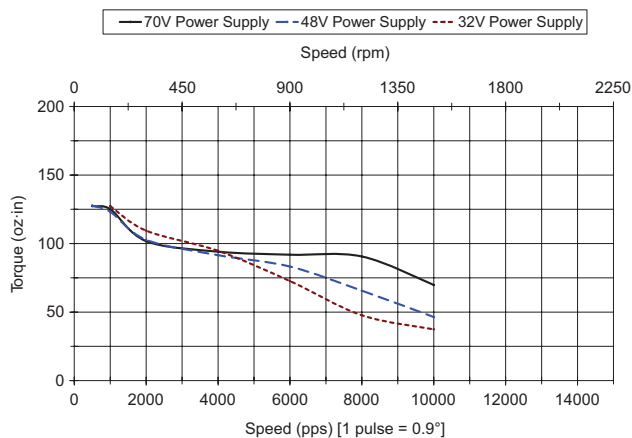
STP-MTR*H*-23079(x) Torque vs Speed (1.8° step motor; 1/2 stepping)

— 70V Power Supply – – 48V Power Supply - - - 32V Power Supply
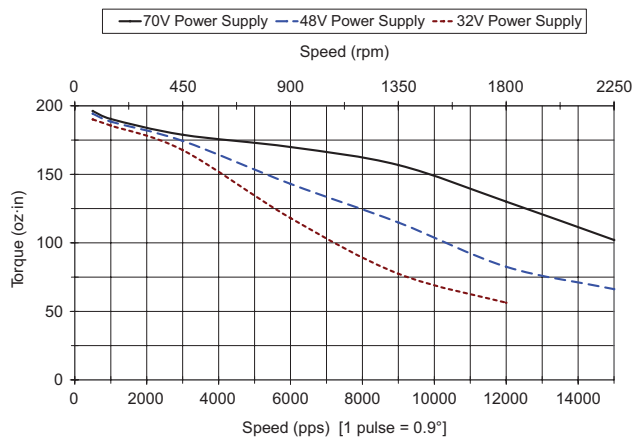
STP-MTR-23079(x) Torque vs Speed (1.8° step motor; 1/2 stepping)

— 70V Power Supply – – 48V Power Supply - - - 32V Power Supply
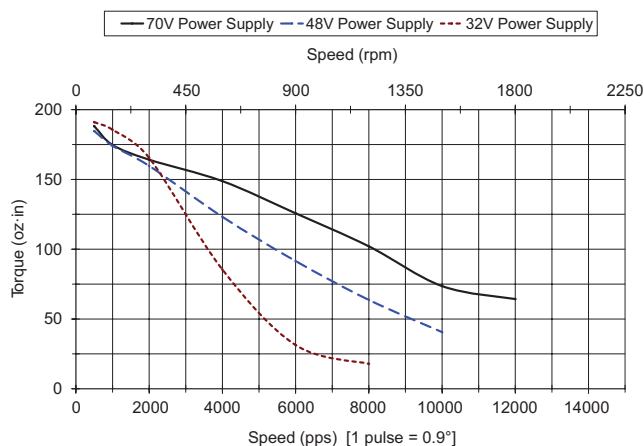
STP-MTRAC-23xxxx Torque vs Speed @ 340VDC bus
(1.8° step motor; 1/2 stepping)

— STP-MTRAC-23044 — STP-MTRAC-23055 — STP-MTRAC-23078
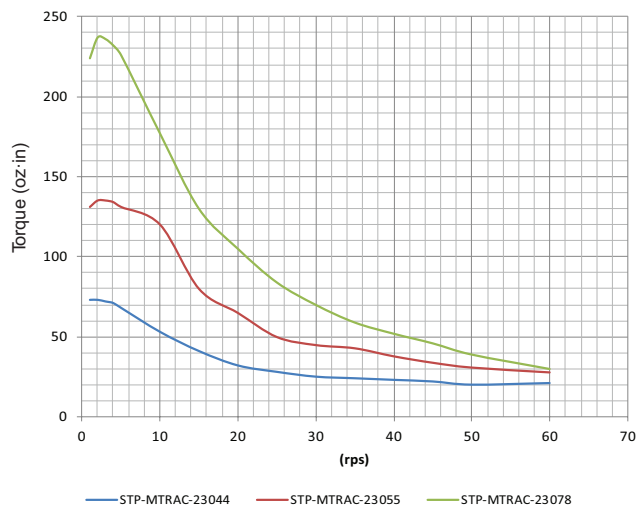
SureStep®

Stepping System Motors

SureStep® Motor Torque vs. Speed Charts (continued)

STP-MTR(H)-34xxx(x) NEMA 34 Step Motors
Note: "W" series motors have 5% less running torque than other models

STP-MTR-34066(x) Torque vs Speed (1.8° step motor; 1/2 stepping)

— 70V Power Supply — — 48V Power Supply - - - 32V Power Supply
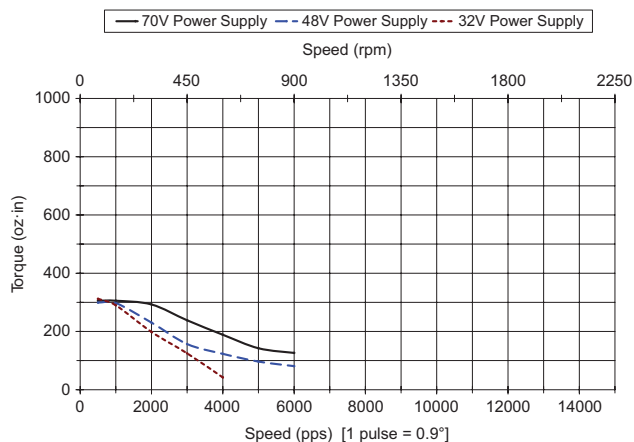
STP-MTR*H***-34066(x)** Torque vs Speed (1.8° motor; 1/2 stepping)

— 70V Power Supply — — 48V Power Supply - - - 32V Power Supply

STP-MTR*H***-34097(x)** Torque vs Speed (1.8° step motor; 1/2 stepping)

— 70V Power Supply — — 48V Power Supply - - - 32V Power Supply
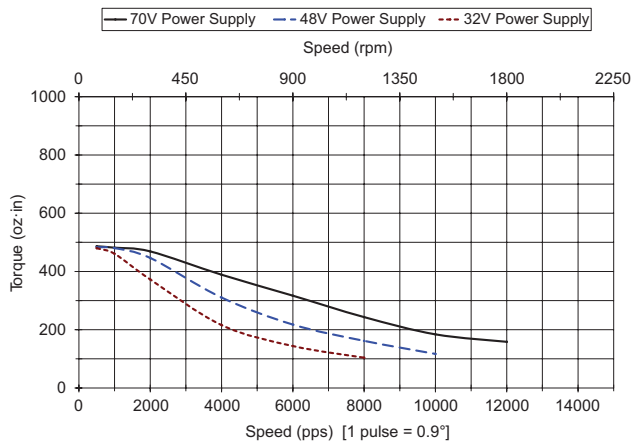
STP-MTR*H***-34127(x)** Torque vs Speed (1.8° step motor; 1/2 stepping)

— 70V Power Supply — — 48V Power Supply - - - 32V Power Supply
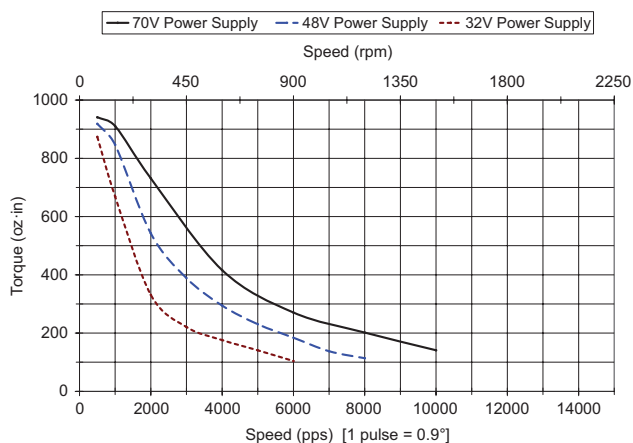
STP-MTRAC-34xxxx Torque vs Speed @ 340VDC bus
(1.8° step motor; 1/2 stepping)

— STP-MTRAC-34075 — STP-MTRAC-34115 — STP-MTRAC-34156

Stepping System Motors

SureStep® Motor Torque vs. Speed Charts (continued)

STP-MTRAC(H)-42xxx(x) NEMA 42 Step Motors

For all NEMA 42 charts: "S" = Series Bipolar Wiring
"P" = Parallel Bipolar Wiring

STP-MTRAC-42100x 24/48 VDC

- - - S 4.2 A, 24vDC ——— P 8.4 A, 24vDC - - - S 4.2 A, 48vDC ——— P 8.4 A, 48vDC

STP-MTRAC-42100x 72/160VDC

- - - S 4.2 A, 72vDC ——— P 8.4 A, 72vDC - - - S 4.2 A, 160vDC ——— P 8.4 A, 160vDC

STP-MTRAC-42151x 24/48 VDC

- - - S 6.0 A, 24vDC ——— P 12.0 A, 24vDC - - - S 6.0 A, 48vDC ——— P 12.0 A, 48vDC

STP-MTRAC-42151x 72/160VDC

- - - S 6.0 A, 72vDC ——— P 12.0 A, 72vDC - - - S 6.0 A, 160vDC ——— P 12.0 A, 160vDC

STP-MTRAC-42202x 24/48 VDC

- - - S 6.0 A, 24vDC ——— P 12.0 A, 24vDC - - - S 6.0 A, 48vDC ——— P 12.0 A, 48vDC

STP-MTRAC-42202x 72/160VDC

- - - S 6.0 A, 72vDC ——— P 12.0 A, 72vDC - - - S 6.0 A, 160vDC ——— P 12.0 A, 160vDC

Stepping System Motors

SureStep® Motor Torque vs. Speed Charts (continued)

STP-MTRAC(H)-42xxx(x) NEMA 42 Step Motors

**For all NEMA 42 charts: "S" = Series Bipolar Wiring
"P" = Parallel Bipolar Wiring**

STP-MTRACH-42100x 24/48 VDC

- - - S 6.0 A, 24vDC —— P 12.0 A, 24vDC - - - S 6.0 A, 48vDC —— P 12.0 A, 48vDC

STP-MTRACH-42100x 72/160VDC

- - - S 6.0 A, 72vDC —— P 12.0 A, 72vDC - - - S 6.0 A, 160vDC —— P 12.0 A, 160vDC

STP-MTRACH-42151x 24/48 VDC

- - - S 8.0 A, 24vDC —— P 16.0 A, 24vDC - - - S 8.0 A, 48vDC —— P 16.0 A, 48vDC

STP-MTRACH-42151x 72/160VDC

- - - S 8.0 A, 72vDC —— P 16.0 A, 72vDC - - - S 8.0 A, 160vDC —— P 16.0 A, 160vDC

STP-MTRACH-42202x 24/48 VDC

- - - S 8.0 A, 24vDC —— P 16.0 A, 24vDC - - - S 8.0 A, 48vDC —— P 16.0 A, 48vDC

STP-MTRACH-42202x 72/160VDC

- - - S 8.0 A, 72vDC —— P 16.0 A, 72vDC - - - S 8.0 A, 160vDC —— P 16.0 A, 160vDC

Stepping System Motors

Surestep®

SureStep® Motor Dimensions and Cabling

STP-MTR(x)-14,17,23xxx(X) Motors

UNSHIELDED CABLE:
4 CONDUCTORS

CONNECTOR

For STP-MTR-17060(x)

PIN # 1	EXTL MOTORS

PIN #	COLOR	PHASE
1	RED	A+
2	YELLOW	A−
3	GREEN	B+
4	BLACK	B−

CONNECTOR:
VIEW FROM WIRE ENTRANCE

PIN #	EXT & EXTH MOTORS

PIN #	COLOR	PHASE
1	RED	A+
2	WHITE	A−
3	GREEN	B+
4	BLACK	B−

CONNECTOR:
VIEW FROM WIRE ENTRANCE

D** K**
NEMA # 14,17: ROUND SHAFT
NEMA # 23 (front shaft): ONE FLAT

Note: Drawings and dimensions for STP-MTRD series integrated motor/drives can be found in the integrated motor/drives section of the manual

** Dimension H2 applies only to dual-shaft (D) and encoder (E) motors.
Dimension D is the same for both front and rear shafts of dual-shaft and encoder motors.
Dimensions J & K do NOT apply to rear shafts of dual-shaft and encoder motors
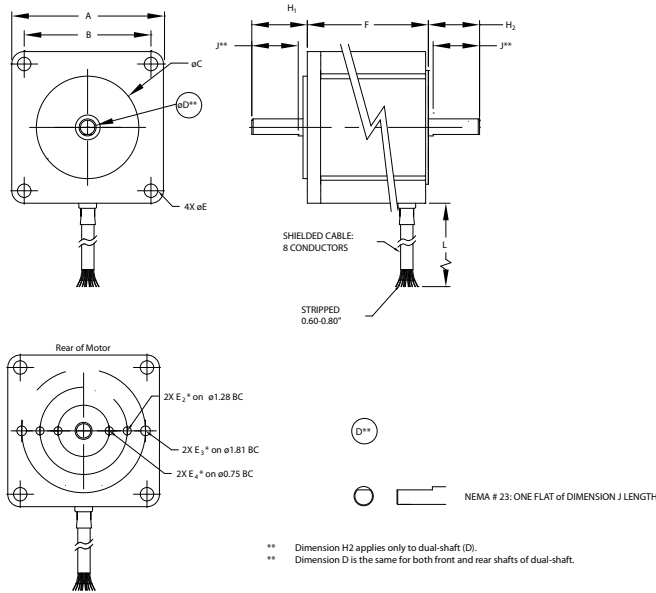(all rear shafts are round style).

STP-MTR-xxxxxW Motors

18AWG SHIELDED CABLE:
BELDEN #9418

CONNECTOR:
BULGIN #PXP4011/06P/6065
SOCKET: SA3347

PIN OUT CONNECTION		
PIN #	COLOR	PHASE
1	RED	A+
2	WHITE	A−
3	GREEN	B+
4	BLACK	B−
5	GROUND	GROUND
6	N/A	N/A

VIEW FROM PIN INSERT

D** K**
NEMA # 14,17: ROUND SHAFT
NEMA # 23 : ONE FLAT
NEMA # 34 : TWO FLATS 90° APART

SureStep Series Dimensions & Cabling – NEMA 14, 17, and 23 Connectorized Bipolar Stepping Motors

Dimensions* (in [mm]*)	Low Torque Motors		High Torque Motors					Higher Torque Motors
	STP-MTRL-14026(x)	STP-MTRL-14034(x)	STP-MTR-17040(x)	STP-MTR-17048(x)	STP-MTR-17060(x)	STP-MTR-23055(x)	STP-MTR-23079(x)	STP-MTRH-23079(x)
A	1.39 [35.3]	1.39 [35.3]	1.67 [42.3]			2.25 [57.2]		2.25 [57.2]
B	1.02 [25.9]	1.02 [25.9]	1.22 [31.0]			1.86 [47.2]		1.86 [47.2]
C	Ø 0.87 [22.1]					Ø 1.50 [38.1]		Ø 1.50 [38.1]
D**	Ø 0.20 [5.0]					Ø 0.25 [6.4]		Ø 0.25 [6.4]
E	4-40 thread 0.15 [3.8] min depth		M3 x 0.5 thread 0.15 [3.8] min depth			Ø 0.20 [5.1] through		Ø 0.20 [5.1] through
E2	M2.5 x 0.45 thread	M2.5 x 0.45 thread	M2.5 x 0.45 thread		M2 x 0.4 thread	4-40		4-40
F**	1.02 [25.9]	1.34 [34.0]	1.58 [40.1]	1.89 [48.0]	2.34 [59.5]	2.22 [56.4]	3.10 [78.7]	3.10 [78.7]
F2**	n/a		1.90 [48.3]	2.24 [56.9]	2.67 [67.8]	2.33 [59.1]	3.19 [81.0]	3.19 [81.0]
G1	0.375	0.375	0.375	0.375	0.411	0.906	0.906	0.906
G2	0.75	0.75	0.75	0.75	n/a	1.812	1.812	1.812
H1	0.60 [15.2]	0.60 [15.2]	0.94 [24.0]			0.81 [20.6]		0.81 [20.6]
H2**	0.51 [13.0]							
H3***	0.40							
J**	n/a					0.59 [15.0]		
K**	n/a					0.23 [5.8]		
L	12 [305]							
Conductor	(4) #26 AWG		(4) #20 AWG, (5) #18 AWG (for W motors)					(4) #18 AWG, (5) #18 AWG (for W motors)
Connector	TE # 103653-3		Molex # 43025-0400, PXP4010/06S/6065 (for W motors)					Molex # 39-01-3042, PXP4010/06S/6065 (for W motors)
Pin	TE # 1-104505-3 (LOOSE)		Molex # 43030-0007, Socket: SA3347 (for W motors)					Molex # 39-00-0039, Socket: SA3347 (for W motors)

* mm dimensions are for reference purposes only.
** Dimension H2 applies only to dual-shaft (D) and encoder (E) motors.
  Dimension D (shaft diameter) is the same for both front and rear shafts of dual-shaft (D) and encoder (E) motors.
  Dimensions J & K do NOT apply to rear shafts of dual-shaft (D) and encoder (E) motors (all rear shafts are round style).
  Dimension F2 applies to IP65 (W) motors only.
*** Dimension H3 applies only to "E" models with the encoder pre-mounted.

Stepping System Motors

SureStep® Motor Dimensions and Cabling

STP-MTR(x)-34xxx(X) Motors

EXTL MOTORS

PIN #	COLOR	PHASE
1	RED	A+
2	YELLOW	A-
3	GREEN	B+
4	BLACK	B-

EXT & EXTH MOTORS

PIN #	COLOR	PHASE
1	RED	A+
2	WHITE	A-
3	GREEN	B+
4	BLACK	B-

NEMA # 34 (front shaft): TWO FLATS 90° APART
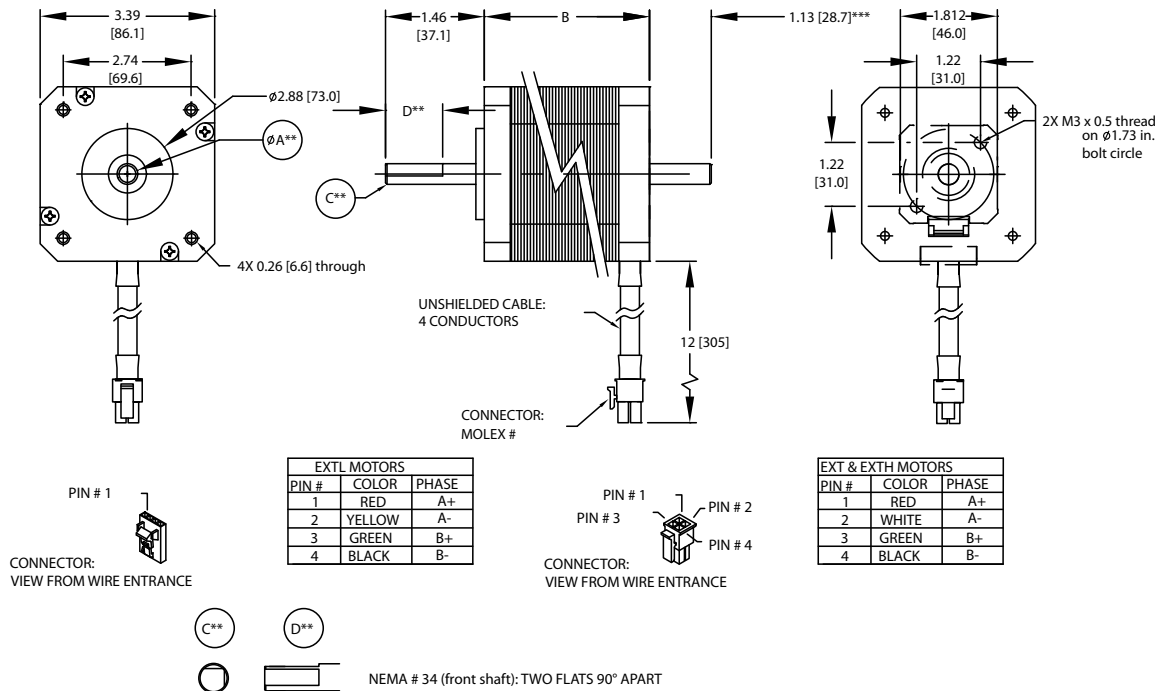
** Dimension A is the same for both front and rear shafts of dual-shaft motors.
** Dimensions C & D do NOT apply to rear shafts of dual-shaft motors (all rear shafts are round style).
*** Dimension applies only to dual-shaft (D) motors.

SureStep Series Dimensions & Cabling – NEMA 34 Connectorized Bipolar Stepping Motors				
Dimensions (in [mm]*)	*High Torque Motors*	*Higher Torque Motors*		
	STP-MTR-34066(x)	*STP-MTRH-34066(x)*	*STP-MTRH-34097(x)*	*STP-MTRH-34127(x)*
A**	Ø 0.50 [12.7]			
B	2.64 [67.1]	2.64 [67.1]	3.82 [97.0]	5.00 [127.0]
C**	0.98 [25.0]			
D**	0.45 [11.4]			
Conductor	(4) #20 AWG, (5) #18 AWG (for W motors)	(4) #18 AWG, (5) #18 AWG (for W motors)		
Connector	Molex # 43025-0400, PXP4010/06S/6065 (for W motors)	Molex # 39-01-3042, PXP4010/06S/6065 (for W motors)		
Pin	Molex # 43030-0007, Socket: SA3347 (for W motors)	Molex # 39-00-0039, Socket: SA3347 (for W motors)		

* mm dimensions are for reference purposes only.
** Dimension A (shaft diameter) is the same for both front and rear shafts of dual-shaft (D series) motors. Dimensions C & D do NOT apply to rear shafts of dual-shaft (D series) motors (all rear shafts are round style).
*** This dimension only applies to dual-shaft (D series) motors.

Stepping System Motors

SureStep® Motor Dimensions and Cabling

STP-MTRAC-23xxx Motors

STP-MTRAC-34xxx Motors

** Dimension H2 applies only to dual-shaft (D) motors.
** Dimensions J & K do NOT apply to rear shafts of dual-shaft motors (all rear shafts are round style).

** Dimension H2 applies only to dual-shaft (D).
** Dimension D is the same for both front and rear shafts of dual-shaft.

STP-MTRAC-230xx(x), 34156(x) Motor Wiring
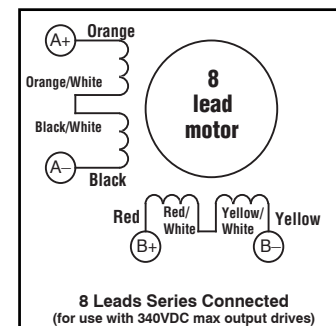
STP-MTRAC-34075(x), 34115(x) Motor Wiring

SureStep Series Dimensions & Cabling – High Voltage Bipolar Stepping Motors						
Dimensions* (in [mm]*)	**High Voltage High Torque**					
	STP-MTRAC-23044(x)	STP-MTRAC-23055(x)	STP-MTRAC-23078(x)	STP-MTRAC-34075(x)	STP-MTRAC-34115(x)	STP-MTRAC-34156(x)
A	2.25 [57.15]	2.25 [57.15]	2.25 [57.15]	3.39 [86.1]	3.39 [86.1]	3.39 [86.1]
B	1.86 [47.24]	1.86 [47.24]	1.86 [47.24]	2.74 [69.6]	2.74 [69.6]	2.74 [69.6]
C	1.50 [38.1]	1.50 [38.1]	1.50 [38.1]	2.87 [72.9]	2.87 [72.9]	2.87 [72.9]
D**	0.25 [6.35]	0.25 [6.35]	0.25 [6.35]	0.5 [12.7]	0.5 [12.7]	0.625 [15.9]
E	0.2 [5.08]	0.2 [5.08]	0.2 [5.08]	0.22 [5.59]	0.26 [6.6]	0.22 [5.59]
E2***	2-56 thru	2-56 thru	2-56 thru	2-56 UNC Tap 0.2 Deep	2-56 UNC Tap 0.2 Deep	2-56 UNC Tap 0.2 Deep
E3***	4-40 UNC x 0.2 Deep	4-40 UNC x 0.2 Deep	4-40 UNC x 0.2 Deep	4-40 UNC Tap 0.2 Deep	4-40 UNC Tap 0.2 Deep	4-40 UNC Tap 0.2 Deep
E4***	2-56 UNC Tap 0.2 Deep	2-56 UNC Tap 0.2 Deep	2-56 UNC Tap 0.2 Deep	–	–	–
F	1.71 [43.43]	2.16 [54.86]	3.05 [77.47]	2.95 [74.93]	4.52 [114.81]	6.14 [155.96]
H1	0.81 [20.57]	0.81 [20.57]	0.81 [20.57]	1.25 [31.75]	1.25 [31.75]	1.25 [31.75]
H2***	0.63 [16.0]	0.63 [16.0]	0.63 [16.0]	1.12 [28.45]	1.12 [28.45]	1.12 [28.45]
J	0.60 [15.24]	0.60 [15.24]	0.60 [15.24]	0.87 [22.1]	0.87 [22.1]	0.87 [22.1]
L	120 [3048]	120 [3048]	120 [3048]	120 [3048]	120 [3048]	120 [3048]

* mm dimensions are for reference purposes only.
** Dimension D (shaft diameter) is the same for both front and rear shafts of NEMA 23 dual-shaft motors. See diagrams for NEMA 34.
*** Dimension applies only to dual-shaft (D) motors.

Stepping System Motors

Sure*step*®

STP-MTRAC-42xxx Motors

Housing: MOLEX 39-01-2100
Terminal: MOLEX 39-00-0038

SHIELDED CABLE:
8 CONDUCTORS

Rear Shaft Ø0.50

4X E₂ * on Ø3.00 BC

NEMA # 42 (front shaft): KEYED, Key Dimensions 0.188 X 0.188 X 1.377

▪ Dimension D applies only to the front shaft.
** Dimension H2 applies only to dual-shaft (D) motors.
*** Dimensions J & Key do NOT apply to rear shafts of dual-shaft motors   (all rear shafts are round style).

Uni-polar
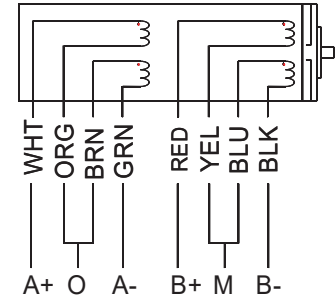
Bi-polar series
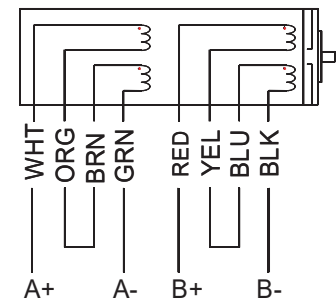
Bi-polar parallel
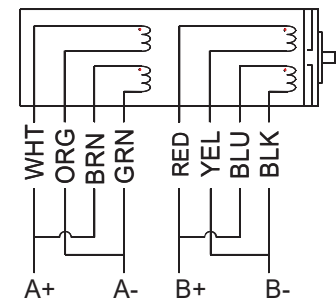
SureStep Series Dimensions & Cabling – Higher Voltage Bipolar Stepping Motors											
Dimensions* (in [mm]*)	Higher Voltage High Torque										
	STP-MTRAC-42100	STP-MTRACH-42100	STP-MTRAC-42151	STP-MTRACH-42151	STP-MTRAC-42202	STP-MTRACH-42202	STP-MTRAC-42100D	STP-MTRACH-42100D	STP-MTRAC-42151D	STP-MTRACH-42151D	STP-MTRAC-42202D	STP-MTRACH-42202D
A	4.33 [110]		4.33 [110]		4.33 [110]		4.33 [110]		4.33 [110]		4.33 [110]	
B	3.50 [88.9]		3.50 [88.9]		3.50 [88.9]		3.50 [88.9]		3.50 [88.9]		3.50 [88.9]	
C	2.19 [55.6]		2.19 [55.6]		2.19 [55.6]		2.19 [55.6]		2.19 [55.6]		2.19 [55.6]	
D**	0.75 [19.05]		0.75 [19.05]		0.75 [19.05]		0.75 [19.05]		0.75 [19.05]		0.75 [19.05]	
E	0.327 [8.31]		0.327 [8.31]		0.327 [8.31]		0.327 [8.31]		0.327 [8.31]		0.327 [8.31]	
E2	n/a		n/a		n/a		4-40 UNC Tap 0.2 Deep		4-40 UNC Tap 0.2 Deep		4-40 UNC Tap 0.2 Deep	
F	3.88		5.94		7.91		3.88***		5.94***		7.91***	
H1	2.19 [55.6]		2.19 [55.6]		2.19 [55.6]		2.19 [55.6]		2.19 [55.6]		2.19 [55.6]	
H2	n/a		n/a		n/a		1.12 [28.4]		1.12 [28.4]		1.12 [28.4]	
J**	1.37 [34.8]		1.37 [34.8]		1.37 [34.8]		1.37 [34.8]		1.37 [34.8]		1.37 [34.8]	
L	12 [305]											

* mm dimensions are for reference purposes only.
** Dimension D (shaft diameter), J, and Key do not apply to rear shafts of dual-shaft motors.
*** For encoder mounting the required **STP-MTRA-42ENC** bracket will add 0.13 inches [3.2 mm] to the length of the motor.

SureStep

Linear Actuators

SureStep® Linear Actuators

SureStep Linear Actuators consist of Surestep NEMA 17 or NEMA 23 stepper motors that incorporate a stainless steel lead screw as the rotor. This translates the motor's torque into linear thrust. No maintenance, non-lubricated PTFE-infused polymer lead screw nuts allow for a long life. Triangular nuts come standard on the actuators. Replacement triangular nuts and spare round nuts are available. The motors in these actuators are from the same family of motors as the other SureStep stepper motors. The linear actuators come in 6, 9, and 12 inch lengths. A 1-ft motor power cable ships with the actuator and plugs into the motor's integrated connectors. Longer motor power cables are available in 6, 10, and 20 foot lengths.

Linear actuators ending in "ANN" are the most cost effective. Actuators ending in "ADJ" have a journal machined at the end of the screw to accept a bearing for mounting. There is also a groove cut into the journal for a retaining clip. See the SureStep User Manual for more details and bearing/clip specifications. The "ADJ" actuators also feature a rear motor shaft and encoder mounting holes pre-drilled and tapped. See our line of CUI stepper motor encoders for a complete line of available encoders that can mount onto the linear actuators.

ADJ series journal end

SureStep Series Part Numbers – Linear Actuators											
Linear Actuator	Price	Screw End Machining	NEMA Frame Size	Lead Screw Length	Lead Screw Material	Lead (in/rev or mm/rev)	Linear Travel (per 1.8° rotation)		Nominal Thrust (lbs)	Motor Weight (lbs)	Drawing
							in/step	mm/step			
STP-LE17-2A06ANN	$127.00	None	17	6"	Stainless Steel	0.25"	0.00125	0.03175	45	0.7	PDF
STP-LE17-2C06ANN	$129.00					3mm	0.00059	0.015	73	0.7	PDF
STP-LE17-2D06ANN	$131.00					1.25 mm	0.00025	0.00625	87	0.8	PDF
STP-LE17-3A06ANN	$137.00					0.25"	0.00125	0.03175	69	0.9	PDF
STP-LE17-3B06ANN	$145.00					0.5"	0.0025	0.0635	38	0.9	PDF
STP-LE17-3E06ANN	$142.00					8mm	0.0016	0.04	55	1.0	PDF
STP-LE17-2A06ADJ	$141.00	Journal and groove				0.25"	0.00125	0.03175	45	0.7	PDF
STP-LE17-2C06ADJ	$145.00					3mm	0.00059	0.015	73	0.7	PDF
STP-LE17-2D06ADJ	$146.00					1.25 mm	0.00025	0.00625	87	0.8	PDF
STP-LE17-3A06ADJ	$160.00					0.25"	0.00125	0.03175	69	0.9	PDF
STP-LE17-3B06ADJ	$161.00					0.5"	0.0025	0.0635	38	0.9	PDF
STP-LE17-3E06ADJ	$159.00					8mm	0.0016	0.04	55	1.0	PDF
STP-LE23-1F06ANN	$172.00	None	23			10.5 mm	0.0021	0.0525	63	1.4	PDF
STP-LE23-1H06ANN	$188.00					6mm	0.0012	0.03	87	1.4	PDF
STP-LE23-1G06ANN	$189.00					2mm	0.0004	0.01	137	1.4	PDF
STP-LE23-3K06ANN	$248.00					1"	0.005	0.127	62	2.7	PDF
STP-LE23-3H06ANN	$232.00					6mm	0.0012	0.03	193	2.7	PDF
STP-LE23-1F06ADJ	$199.00	Journal and groove				10.5 mm	0.0021	0.0525	63	1.4	PDF
STP-LE23-1H06ADJ	$217.00					6mm	0.0012	0.03	87	1.4	PDF
STP-LE23-1G06ADJ	$218.00					2mm	0.0004	0.01	137	1.4	PDF
STP-LE23-3K06ADJ	$263.00					1"	0.005	0.127	62	2.7	PDF
STP-LE23-3H06ADJ	$250.00					6mm	0.0012	0.03	193	2.7	PDF

Motors listing continued on next page

STP-LE17-3B06ADJ

STP-LE17-2A06ANN

Linear Actuators

SureStep® Linear Actuators

STP-LE23-1G09ADJ

SureStep Series Part Numbers – Linear Actuators (Cont'd)										
Linear Actuators	Price	Screw End Machining	NEMA Frame Size	Lead Screw Length	Lead Screw Material	Lead (in/rev or mm/rev)	Linear Travel (per 1.8° rot.)		Nominal Thrust (lbs)	Motor Weight (lbs)	Drawing
							in/step	mm/step			
STP-LE17-2A09ANN	$135.00	None	17	9"	Stainless Steel	0.25"	0.00125	0.03175	45	0.8	PDF
STP-LE17-2C09ANN	$131.00					3mm	0.00059	0.015	73	0.8	PDF
STP-LE17-2D09ANN	$133.00					1.25 mm	0.00025	0.00625	87	0.9	PDF
STP-LE17-3A09ANN	$148.00					0.25"	0.00125	0.03175	69	1.1	PDF
STP-LE17-3B09ANN	$148.00					0.5"	0.0025	0.0635	38	1.1	PDF
STP-LE17-3E09ANN	$146.00					8mm	0.0016	0.04	55	1.2	PDF
STP-LE17-2A09ADJ	$152.00	Journal and groove				0.25"	0.00125	0.03175	45	0.8	PDF
STP-LE17-2C09ADJ	$146.00					3mm	0.00059	0.015	73	0.8	PDF
STP-LE17-2D09ADJ	$151.00					1.25 mm	0.00025	0.00625	87	0.9	PDF
STP-LE17-3A09ADJ	$163.00					0.25"	0.00125	0.03175	69	1.1	PDF
STP-LE17-3B09ADJ	$163.00					0.5"	0.0025	0.0635	38	1.1	PDF
STP-LE17-3E09ADJ	$162.00					8mm	0.0016	0.04	55	1.2	PDF
STP-LE23-1F09ANN	$190.00	None	23			10.5 mm	0.0021	0.0525	63	1.6	PDF
STP-LE23-1H09ANN	$205.00					6mm	0.0012	0.03	87	1.7	PDF
STP-LE23-1G09ANN	$208.00					2mm	0.0004	0.01	137	1.7	PDF
STP-LE23-3K09ANN	$259.00					1"	0.005	0.127	62	3.0	PDF
STP-LE23-3H09ANN	$239.00					6mm	0.0012	0.03	193	3.0	PDF
STP-LE23-1F09ADJ	$205.00	Journal and groove				10.5 mm	0.0021	0.0525	63	1.6	PDF
STP-LE23-1H09ADJ	$223.00					6mm	0.0012	0.03	87	1.7	PDF
STP-LE23-1G09ADJ	$225.00					2mm	0.0004	0.01	137	1.7	PDF
STP-LE23-3K09ADJ	$262.00					1"	0.005	0.127	62	3.0	PDF
STP-LE23-3H09ADJ	$256.00					6mm	0.0012	0.03	193	3.0	PDF
STP-LE17-2A12ANN	$131.00	None	17	12"		0.25"	0.00125	0.03175	45	0.9	PDF
STP-LE17-2C12ANN	$133.00					3mm	0.00059	0.015	73	0.9	PDF
STP-LE17-2D12ANN	$136.00					1.25 mm	0.00025	0.00625	87	1.0	PDF
STP-LE17-3A12ANN	$149.00					0.25"	0.00125	0.03175	69	1.3	PDF
STP-LE17-3B12ANN	$153.00					0.5"	0.0025	0.0635	38	1.3	PDF
STP-LE17-3E12ANN	$151.00					8mm	0.0016	0.04	55	1.4	PDF
STP-LE17-2A12ADJ	$152.00	Journal and groove				0.25"	0.00125	0.03175	45	0.9	PDF
STP-LE17-2C12ADJ	$150.00					3mm	0.00059	0.015	73	0.9	PDF
STP-LE17-2D12ADJ	$153.00					1.25 mm	0.00025	0.00625	87	1.0	PDF
STP-LE17-3A12ADJ	$167.00					0.25"	0.00125	0.03175	69	1.3	PDF
STP-LE17-3B12ADJ	$167.00					0.5"	0.0025	0.0635	38	1.3	PDF
STP-LE17-3E12ADJ	$165.00					8mm	0.0016	0.04	55	1.4	PDF
STP-LE23-1F12ANN	$194.00	None	23			10.5 mm	0.0021	0.0525	63	1.8	PDF
STP-LE23-1H12ANN	$212.00					6mm	0.0012	0.03	87	2.0	PDF
STP-LE23-1G12ANN	$217.00					2mm	0.0004	0.01	137	2.0	PDF
STP-LE23-3K12ANN	$269.00					1"	0.005	0.127	62	3.3	PDF
STP-LE23-3H12ANN	$246.00					6mm	0.0012	0.03	193	3.3	PDF
STP-LE23-1F12ADJ	$211.00	Journal and groove				10.5 mm	0.0021	0.0525	63	1.8	PDF
STP-LE23-1H12ADJ	$227.00					6mm	0.0012	0.03	87	2.0	PDF
STP-LE23-1G12ADJ	$230.00					2mm	0.0004	0.01	137	2.0	PDF
STP-LE23-3K12ADJ	$266.00					1"	0.005	0.127	62	3.3	PDF
STP-LE23-3H12ADJ	$261.00					6mm	0.0012	0.03	193	3.3	PDF

Motion Control

Linear Actuators

Sure┌┴┐step ®

SureStep® Linear Actuators Specifications

SureStep Series Specifications – NEMA 17 Linear Actuators						
Linear Actuator Motors	STP-LE17-2Axxyyy	STP-LE17-2Cxxyyy	STP-LE17-2Dxxyyy	STP-LE17-3Axxyyy	STP-LE17-3Bxxyyy	STP-LE17-3Exxyyy
NEMA Frame Size	17					
Phases	2					
Rated Current	2A					
Phase Resistance	1.04 Ω ± 10% (@20°C)			1.25 Ω ± 15% (@20°C)		
Phase Inductance	2.5 mH ± 20% (1kHz 1V rms)			2.8 mH ± 20% (1kHz 1V rms)		
Rotor Inertia	57 g·cm2			82 g·cm2		
Rotational Shaft Holding Torque	0.46 N·m (65.14 oz-in)			0.63 N·m (89.21 oz-in)		
No. of Motor Stacks	2			3		
Motor Length	39.8 mm			48.3 mm		
Lead Screw Material	SUS303Cu (cold-finished stainless steel)					
Nut Material	TECAFORM AD AF (PTFE-infused polymer)					
Lead	0.25"/rev	3 mm/rev	1.25 mm/rev	0.25"/rev	0.5"/rev	8mm/rev
Linear Travel/Step (per 1.8° rotation)	0.00125 in/step	0.015 mm/step	0.00625 mm/step	0.00125 in/step	0.0025 in/step	0.04 mm/step
Linear Speed (@150rpm)1	0.625 in/sec	7.5 mm/sec	3.125 mm/sec	0.625 in/sec	1.25 in/sec	20 mm/sec
Thrust (@150rpm)	45lbs	73lbs	87lbs	69lbs	38lbs	55lbs
Load Limit (lbs)2	75	75	80	75	75	80
Radial Deflection (Max)3	6" lead screw: 0.015" 9" lead screw: 0.0225" 12" lead screw 0.03"					
Ambient Operating Temperature	-20-50°C					
Insulation Class	B (130°C)					
Screw Diameter	0.25"	6.5 mm	8mm	0.25"	0.25"	8mm
Agency Approvals	CE					

1 To determine your linear speed as it relates to RPM use the following formula: Linear Speed = RPM x (Lead/60 sec)
2 The load limit indicates max load before the nut begins to have its lifespan negatively impacted, not what the linear actuator can move.
3 Calculated deflection is the deflection value measured at the end of the lead screw.
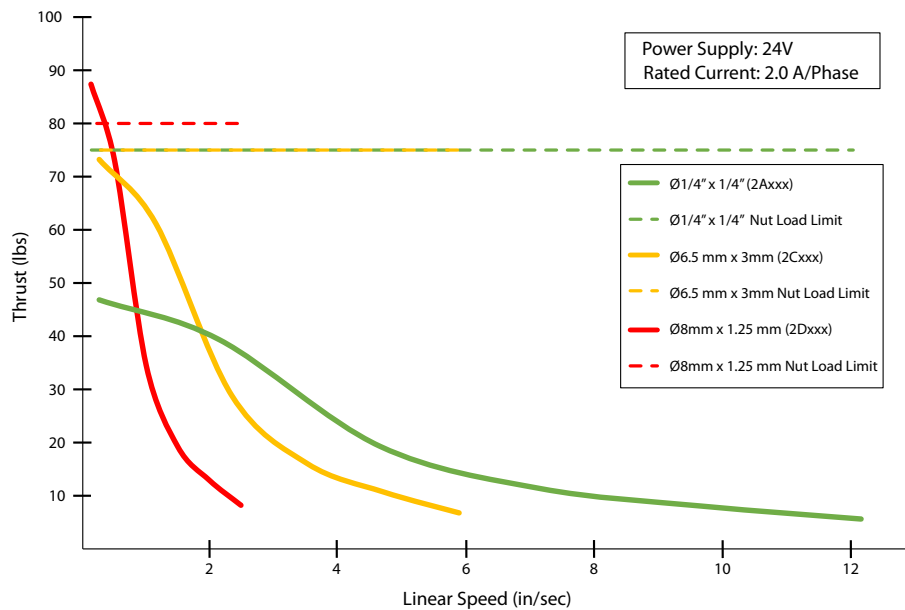**Note:** For dual-shaft motors (STP-LExx-xxxxADJ series) the sum of the front and rear torque loads, radial loads, and thrust loads must not exceed the applicable torque, radial and thrust load ratings of the motor.
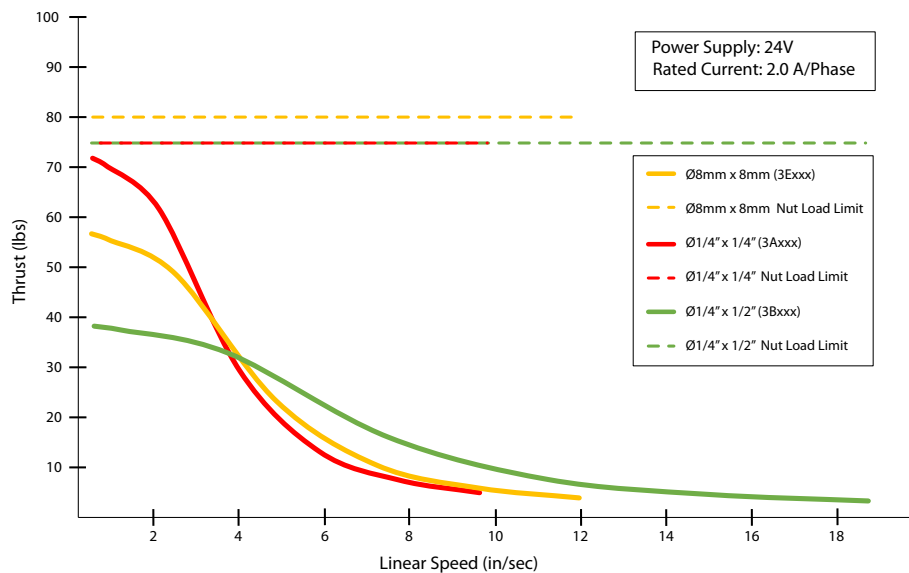
Linear Actuators

SureStep® Linear Actuators Specifications

SureStep Series Specifications – NEMA 23 Linear Actuators					
Linear Actuator Motors	STP-LE23-1Fxxyyy	STP-LE23-1Hxxyyy	STP-LE23-1Gxxyyy	STP-LE23-3Kxxyyy	STP-LE23-3Hxxyyy
NEMA Frame Size	23				
Phases	2				
Rated Current	2.1 A			3A	
Phase Resistance	1.6 Ω ± 10% (@20°C)			1.1 Ω ± 10% (@20°C)	
Phase Inductance	3.9 mH ± 20% (1kHz 1V rms)			5.0 mH ± 20% (1kHz 1V rms)	
Rotor Inertia	180 g·cm2			460 g·cm2	
Rotational Shaft Holding Torque	0.9 N·m (127.45 oz-in)			2.3 N·m (325.70 oz-in)	
No. of Motor Stacks	1			3	
Motor Length	45mm			79mm	
Lead Screw Material	SUS303Cu (cold-finished stainless steel)				
Nut Material	TECAFORM AD AF (PTFE-infused polymer)				
Lead	10.5 mm/rev	6mm/rev	2mm/rev	1"/rev	6mm/rev
Linear Travel/Step (per 1.8° rotation)	0.0525 mm/step	0.03 mm/step	0.01 mm/step	0.005 in/step	0.03 mm/step
Linear Speed (@150rpm)1	26.25 mm/sec	15 mm/sec	5 mm/sec	2.5 in/sec	15 mm/sec
Thrust (@150rpm)	63lbs	87lbs	137 lbs	62 lbs	193 lbs
Load Limit (lbs)2	100	175	175	175	175
Radial Deflection (Max)3	6" lead screw: 0.015" 9" lead screw: 0.0225" 12" lead screw 0.03"				
Ambient Operating Temperature	-20-50°C				
Insulation Class	B (130°C)				
Screw Diameter	10mm	12mm	12mm	0.5"	12mm
Agency Approvals	CE				

1 To determine your linear speed as it relates to RPM use the following formula: Linear Speed = RPM x (Lead/60 sec)
2 The load limit indicates max load before the nut begins to have its lifespan negatively impacted, not what the linear actuator can move.
3 Calculated deflection is the deflection value measured at the end of the lead screw.
Note: For dual-shaft motors (STP-LExx-xxxxADJ series) 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.

Linear Actuators

SureStep® Linear Actuator Thrust vs. Speed Charts

The charts below detail the thrust output by the motor depending on the linear speed of the motor. The highest thrust is acheivable at the lowest speeds. Note that for some motors, the output thrust (solid lines) can exceed the load tolerance (horizontal dashed lines) of the nut on the shaft. *Allow sufficient time to accelerate the load and size the step motor with a 100% thrust safety factor (i.e.: design the system using a maximum of 50% of the motor's thrust).*

STP-LE17-2xxxx NEMA 17 Step Motor Linear Actuators (Double-stack motors)

Power Supply: 24V
Rated Current: 2.0 A/Phase

— Ø1/4" x 1/4" (2Axxx)
--- Ø1/4" x 1/4" Nut Load Limit
— Ø6.5 mm x 3mm (2Cxxx)
--- Ø6.5 mm x 3mm Nut Load Limit
— Ø8mm x 1.25 mm (2Dxxx)
--- Ø8mm x 1.25 mm Nut Load Limit

STP-LE17-3xxxx NEMA 17 Step Motor Linear Actuators (Triple-stack motors)

Power Supply: 24V
Rated Current: 2.0 A/Phase

— Ø8mm x 8mm (3Exxx)
--- Ø8mm x 8mm Nut Load Limit
— Ø1/4" x 1/4" (3Axxx)
--- Ø1/4" x 1/4" Nut Load Limit
— Ø1/4" x 1/2" (3Bxxx)
--- Ø1/4" x 1/2" Nut Load Limit

Linear Actuators

SureStep® Linear Actuator Thrust vs. Speed Charts, continued

STP-LE23-1xxxx NEMA 23 Step Motor Linear Actuators (Single-stack motors)

Legend:
- Ø10mm x 10.5 mm (1Fxxx)
- Ø10mm x 10.5 mm Nut Load Limit
- Ø12mm x 6mm (1Hxxx)
- Ø12mm x 6mm Nut Load Limit
- Ø12mm x 2mm (1Gxxx)
- Ø12mm x 2mm Nut Load Limit

Power Supply: 24V
Rated Current: 2.1 A/Phase

Axes: Thrust (lbs) vs. Linear Speed (in/sec)
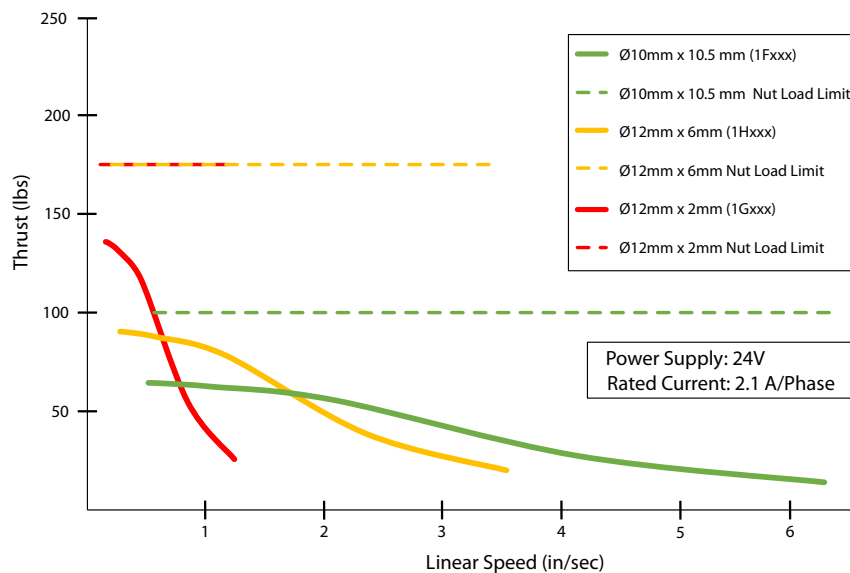
STP-LE23-3xxxx NEMA 23 Step Motor Linear Actuators (Triple-stack motors)

Power Supply: 24V
Rated Current: 3.0 A/Phase

Legend:
- Ø1/2" x 1" (3Kxxx)
- Ø1/2" x 1" Nut Load Limit
- Ø12mm x 6mm (3Hxxx)
- Ø12mm x 6mm Nut Load Limit

Axes: Thrust (lbs) vs. Linear Speed (in/sec)
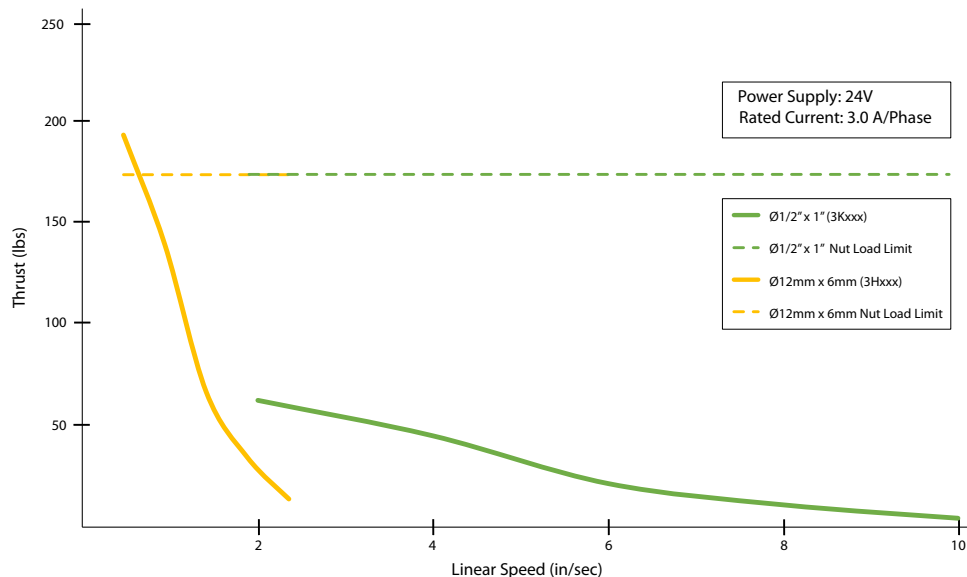
Sure**step** ®

SureStep® Linear Actuator Dimensions and Cabling

STP-LE17-xxxxANN Motors

Ø 19.1
[0.75]
BC
3X
Ø 3.5
[0.14]

S1

Ø 22.0
[0.87]

Ø 25.4
[1.00]

4X M3 x 0.5 thread
4.5mm DEPTH

□ 31.0
[1.22]

□ 42.2
[1.66]

L3
L1
L2

7.7
[0.30]

2X M2.5
2.5mm
DEPTH

19.1
0.75

2.0
[0.08]

See the cables section on page tMNC-43 for connector pin-out and wire color information.
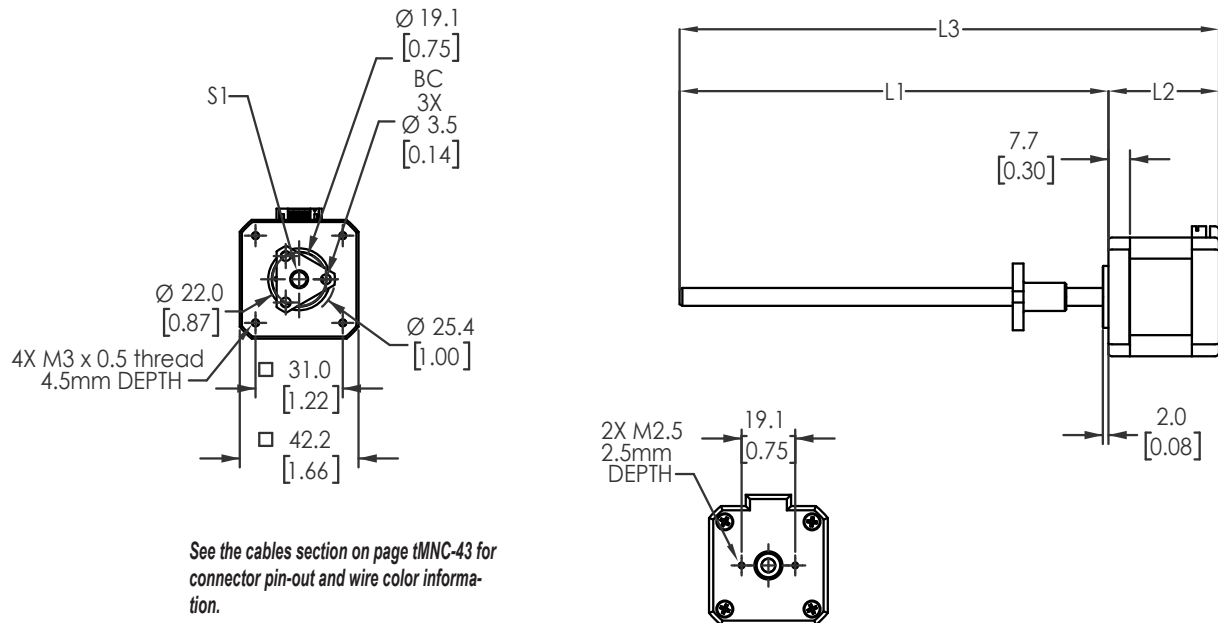
STP-LE17-xxxxANN Dimensions (mm [inch])				
Part #	**L1**	**L2**	**L3**	**S1**
STP-LE17-2A06ANN	152.4 [6.00]	39.3 [1.55]	191.7 [7.55]	6.4 [0.25] 0.25" Lead
STP-LE17-2A09ANN	228.6 [9.00]	39.3 [1.55]	267.9 [10.55]	6.4 [0.25] 0.25" Lead
STP-LE17-2A12ANN	304.8 [12.00]	39.3 [1.55]	344.1 [13.55]	6.4 [0.25] 0.25" Lead
STP-LE17-2C06ANN	152.4 [6.00]	39.3 [1.55]	191.7 [7.55]	6.5 [0.47] 3.0 mm Lead
STP-LE17-2C09ANN	228.6 [9.00]	39.3 [1.55]	267.9 [10.55]	6.5 [0.47] 3.0 mm Lead
STP-LE17-2C12ANN	304.8 [12.00]	39.3 [1.55]	344.1 [13.55]	6.5 [0.47] 3.0 mm Lead
STP-LE17-2D06ANN	152.4 [6.00]	39.3 [1.55]	191.7 [7.55]	8.0 [0.31] 1.25 mm Lead
STP-LE17-2D09ANN	228.6 [9.00]	39.3 [1.55]	267.9 [10.55]	8.0 [0.31] 1.25 mm Lead
STP-LE17-2D12ANN	304.8 [12.00]	39.3 [1.55]	344.1 [13.55]	8.0 [0.31] 1.25 mm Lead
STP-LE17-3A06ANN	152.4 [6.00]	47.8 [1.88]	200.2 [7.88]	6.4 [0.25] 0.25" Lead
STP-LE17-3A09ANN	228.6 [9.00]	47.8 [1.88]	276.4 [10.88]	6.4 [0.25] 0.25" Lead
STP-LE17-3A12ANN	304.8 [12.00]	47.8 [1.88]	352.6 [13.88]	6.4 [0.25] 0.25" Lead
STP-LE17-3B06ANN	152.4 [6.00]	47.8 [1.88]	200.2 [7.88]	6.4 [0.25] 0.5" Lead
STP-LE17-3B09ANN	228.6 [9.00]	47.8 [1.88]	276.4 [10.88]	6.4 [0.25] 0.5" Lead
STP-LE17-3B12ANN	304.8 [12.00]	47.8 [1.88]	352.6 [13.88]	6.4 [0.25] 0.5" Lead
STP-LE17-3E06ANN	152.4 [6.00]	47.8 [1.88]	200.2 [7.88]	8.0 [0.31] 8.0 mm Lead
STP-LE17-3E09ANN	228.6 [9.00]	47.8 [1.88]	276.4 [10.88]	8.0 [0.31] 8.0 mm Lead
STP-LE17-3E12ANN	304.8 [12.00]	47.8 [1.88]	352.6 [13.88]	8.0 [0.31] 8.0 mm Lead

Surestep®

Linear Actuators

SureStep® Linear Actuator Dimensions and Cabling

STP-LE17-xxxxADJ Motors

S1

Ø 19.1 [0.75] BC

3X Ø 3.5 [0.14]

Ø 22.0 [0.87]

Ø 25.4 [1.00]

4X M3 x 0.5 thread 4.5mm DEPTH

□ 31.0 [1.22]

□ 42.2 [1.66]

L3

L1

L2

9.7 [0.38]

7.7 [0.30]

11.9 [0.47]

Ø 4.9 [0.19]

0.7 [0.03]

6.3 [0.25]

2.0 [0.08]

2X M2.5 2.5mm DEPTH

19.1 [0.75]

REAR SHAFT Ø4.8 [Ø0.19]
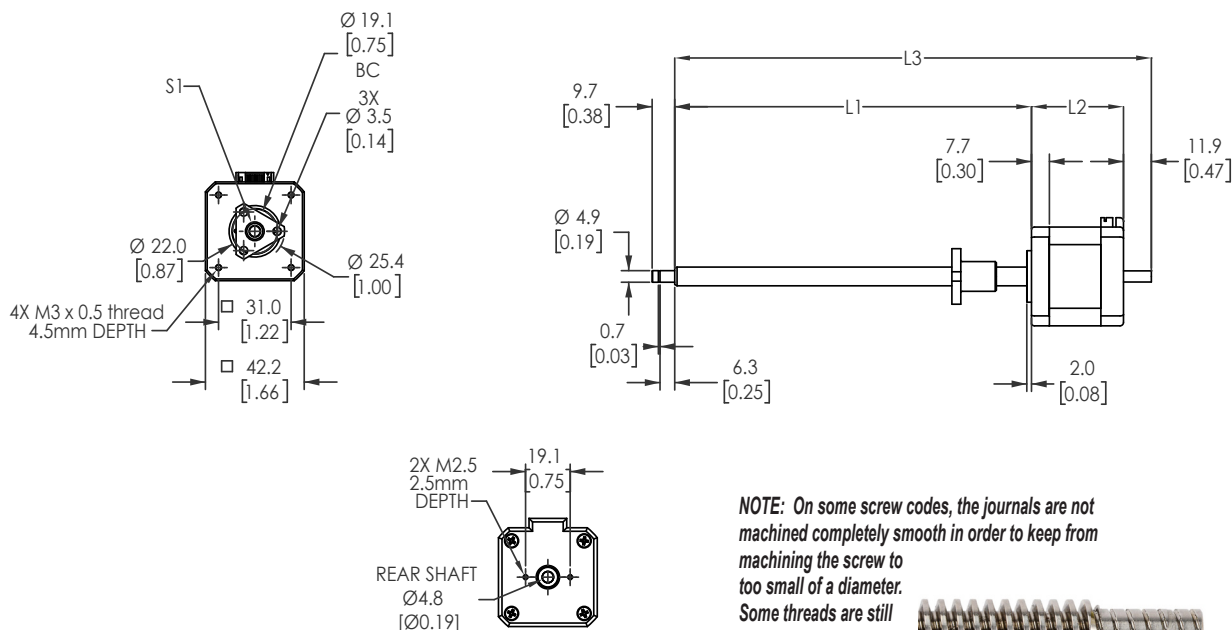
See the encoder compatibility section on page tMNC-44 for a list of compatible encoders.

See the cables section on page tMNC-43 for connector pinout and wire color information.

NOTE: On some screw codes, the journals are not machined completely smooth in order to keep from machining the screw to too small of a diameter. Some threads are still visible. This is intentional and will not affect bearing performance.

STP-LE17-xxxxADJ Dimensions (mm [inch])				
Part #	L1	L2	L3	S1
STP-LE17-2A06ADJ	152.4 [6.00]	39.3 [1.55]	203.6 [8.02]	6.4 [0.25] 0.25" Lead
STP-LE17-2A09ADJ	228.6 [9.00]	39.3 [1.55]	279.8 [11.02]	6.4 [0.25] 0.25" Lead
STP-LE17-2A12ADJ	304.8 [12.00]	39.3 [1.55]	356.0 [14.02]	6.4 [0.25] 0.25" Lead
STP-LE17-2C06ADJ	152.4 [6.00]	39.3 [1.55]	203.6 [8.02]	6.5 [0.47] 3.0 mm Lead
STP-LE17-2C09ADJ	228.6 [9.00]	39.3 [1.55]	279.8 [11.02]	6.5 [0.47] 3.0 mm Lead
STP-LE17-2C12ADJ	304.8 [12.00]	39.3 [1.55]	356.0 [14.02]	6.5 [0.47] 3.0 mm Lead
STP-LE17-2D06ADJ	152.4 [6.00]	39.3 [1.55]	203.6 [8.02]	8.0 [0.31] 1.25 mm Lead
STP-LE17-2D09ADJ	228.6 [9.00]	39.3 [1.55]	279.8 [11.02]	8.0 [0.31] 1.25 mm Lead
STP-LE17-2D12ADJ	304.8 [12.00]	39.3 [1.55]	356.0 [14.02]	8.0 [0.31] 1.25 mm Lead
STP-LE17-3A06ADJ	152.4 [6.00]	47.8 [1.88]	212.1 [8.35]	6.4 [0.25] 0.25" Lead
STP-LE17-3A09ADJ	228.6 [9.00]	47.8 [1.88]	288.3 [11.35]	6.4 [0.25] 0.25" Lead
STP-LE17-3A12ADJ	304.8 [12.00]	47.8 [1.88]	364.5 [15.35]	6.4 [0.25] 0.25" Lead
STP-LE17-3B06ADJ	152.4 [6.00]	47.8 [1.88]	212.1 [8.35]	6.4 [0.25] 0.5" Lead
STP-LE17-3B09ADJ	228.6 [9.00]	47.8 [1.88]	288.3 [11.35]	6.4 [0.25] 0.5" Lead
STP-LE17-3B12ADJ	304.8 [12.00]	47.8 [1.88]	364.5 [15.35]	6.4 [0.25] 0.5" Lead
STP-LE17-3E06ADJ	152.4 [6.00]	47.8 [1.88]	212.1 [8.35]	8.0 [0.31] 8.0 mm Lead
STP-LE17-3E09ADJ	228.6 [9.00]	47.8 [1.88]	288.3 [11.35]	8.0 [0.31] 8.0 mm Lead
STP-LE17-3E12ADJ	304.8 [12.00]	47.8 [1.88]	364.5 [15.35]	8.0 [0.31] 8.0 mm Lead

SureStep® Linear Actuator Dimensions and Cabling

STP-LE23-xxxxANN Motors

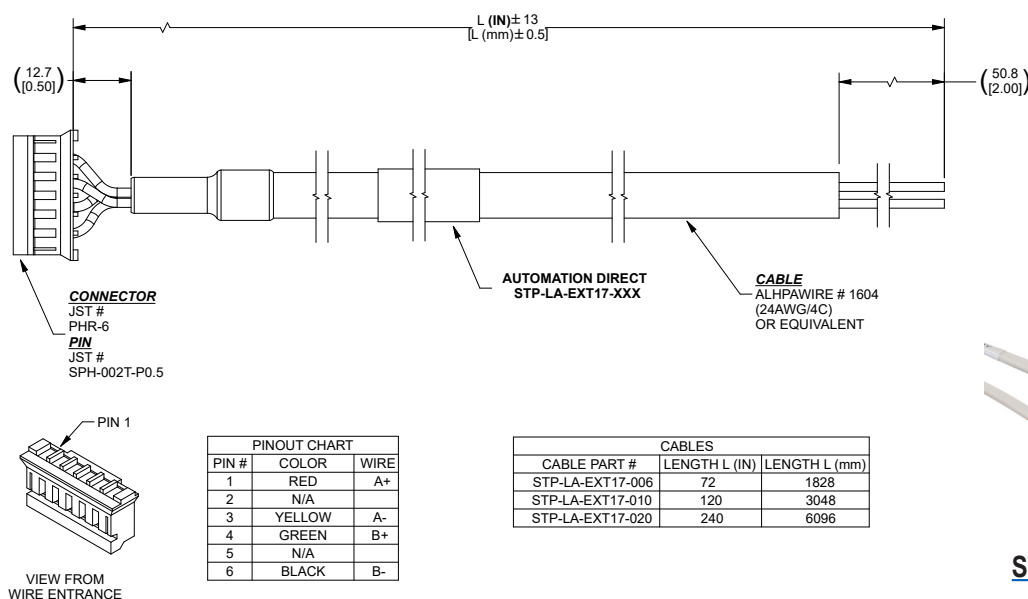See the cables section on page tMNC-43 for connector pin-out and wire color information.
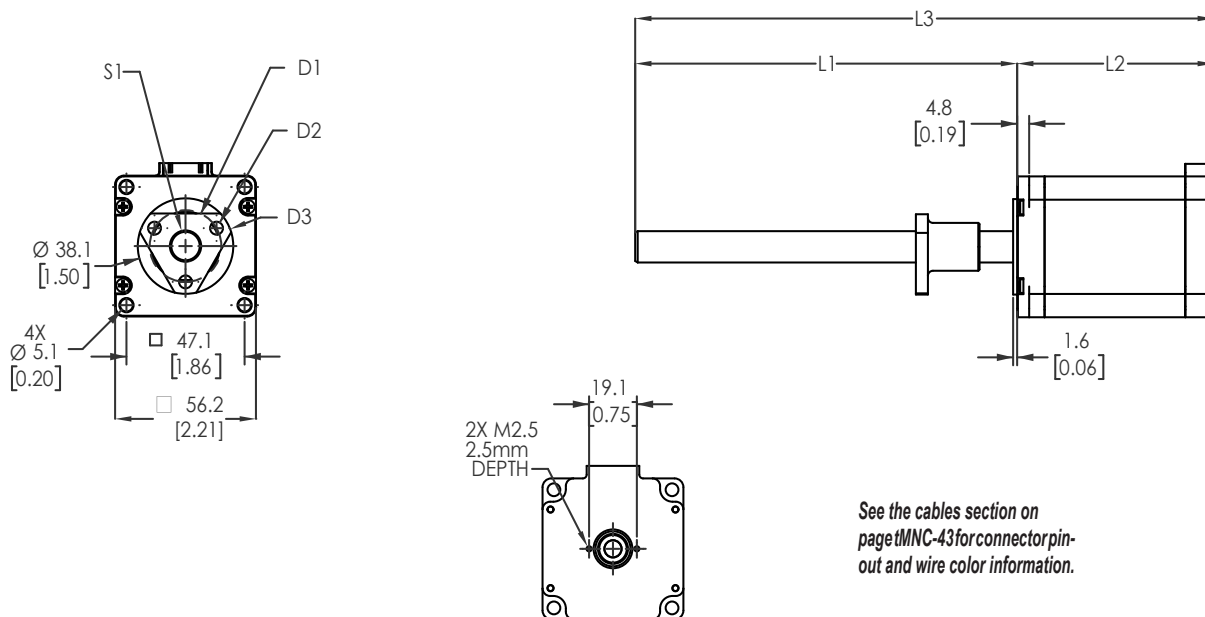
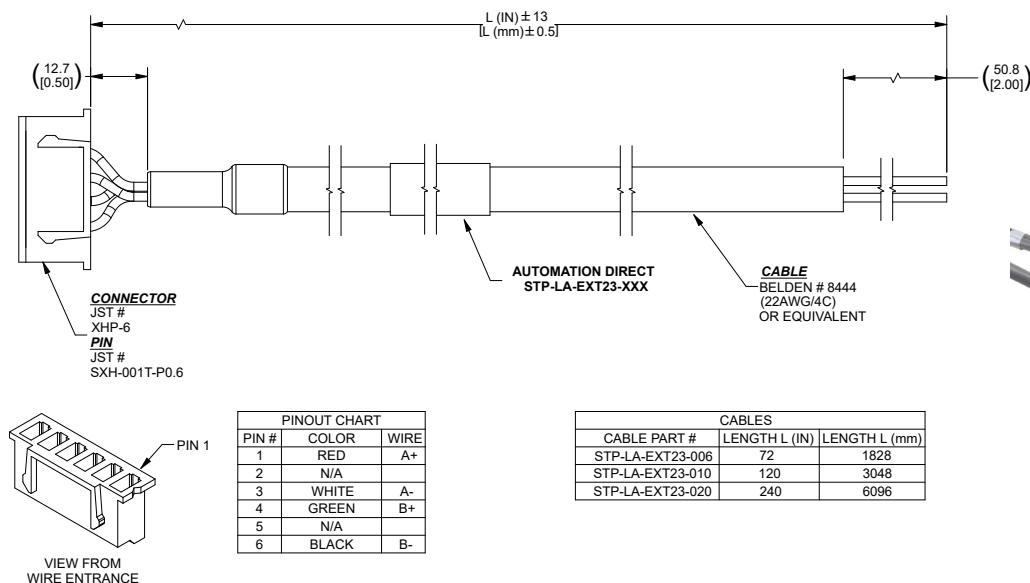| STP-LE23-xxxxANN Dimensions (mm [inch])							
Part #	L1	L2	L3	D1	D2	D3	S1
STP-LE23-1F06ANN	152.4 [6.00]	44.5 [1.75]	196.9 [7.75]	Ø22.2 [0.87] BC	3x Ø3.56 [0.14]	Ø29.5 [1.16]	10.0 [0.39] 10.5 mm Lead
STP-LE23-1F09ANN	228.6 [9.00]	44.5 [1.75]	273.1 [10.75]	Ø22.2 [0.87] BC	3x Ø3.56 [0.14]	Ø29.5 [1.16]	10.0 [0.39] 10.5 mm Lead
STP-LE23-1F12ANN	304.8 [12.00]	44.5 [1.75]	349.3 [13.75]	Ø22.2 [0.87] BC	3x Ø3.56 [0.14]	Ø29.5 [1.16]	10.0 [0.39] 10.5 mm Lead
STP-LE23-1G06ANN	152.4 [6.00]	44.5 [1.75]	196.9 [7.75]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 2.0 mm Lead
STP-LE23-1G09ANN	228.6 [9.00]	44.5 [1.75]	273.1 [10.75]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 2.0 mm Lead
STP-LE23-1G12ANN	304.8 [12.00]	44.5 [1.75]	349.3 [13.75]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 2.0 mm Lead
STP-LE23-1H06ANN	152.4 [6.00]	44.5 [1.75]	196.9 [7.75]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 6.0 mm Lead
STP-LE23-1H09ANN	228.6 [9.00]	44.5 [1.75]	273.1 [10.75]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 6.0 mm Lead
STP-LE23-1H12ANN	304.8 [12.00]	44.5 [1.75]	349.3 [13.75]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 6.0 mm Lead
STP-LE23-3H06ANN	152.4 [6.00]	78.5 [3.09]	230.9 [9.09]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 6.0 mm Lead
STP-LE23-3H09ANN	228.6 [9.00]	78.5 [3.09]	307.1 [12.09]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 6.0 mm Lead
STP-LE23-3H12ANN	304.8 [12.00]	78.5 [3.09]	383.3 [15.09]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 6.0 mm Lead
STP-LE23-3K06ANN	152.4 [6.00]	78.5 [3.09]	230.9 [9.09]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.5 [0.50] 1in Lead
STP-LE23-3K09ANN	228.6 [9.00]	78.5 [3.09]	307.1 [12.09]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.5 [0.50] 1in Lead
STP-LE23-3K12ANN	304.8 [12.00]	78.5 [3.09]	383.3 [15.09]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.5 [0.50] 1in Lead

Sure**step**®

Linear Actuators

SureStep® Linear Actuator Dimensions and Cabling

STP-LE23-xxxxADJ Motors
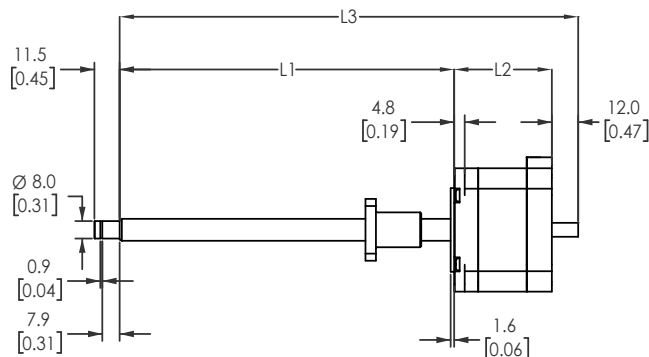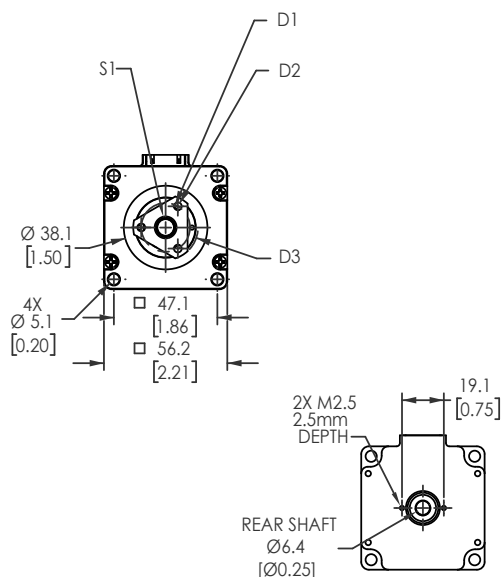
See the cables section on page tMNC-43 for connector pin-out and wire color information.

See the encoder compatibility section on page tMNC-44 for a list of compatible encoders.

Part #	L1	L2	L3	D1	D2	D3	S1
STP-LE23-1F06ADJ	152.4 [6.00]	44.5 [1.75]	208.9 [8.22]	Ø22.2 [0.87] BC	3x Ø3.56 [0.14]	Ø29.5 [1.16]	10.0 [0.39] 10.5 mm Lead
STP-LE23-1F09ADJ	228.6 [9.00]	44.5 [1.75]	285.1 [11.22]	Ø22.2 [0.87] BC	3x Ø3.56 [0.14]	Ø29.5 [1.16]	10.0 [0.39] 10.5 mm Lead
STP-LE23-1F12ADJ	304.8 [12.00]	44.5 [1.75]	361.3 [14.22]	Ø22.2 [0.87] BC	3x Ø3.56 [0.14]	Ø29.5 [1.16]	10.0 [0.39] 10.5 mm Lead
STP-LE23-1G06ADJ	152.4 [6.00]	44.5 [1.75]	208.9 [8.22]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 2.0 mm Lead
STP-LE23-1G09ADJ	228.6 [9.00]	44.5 [1.75]	285.1 [11.22]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 2.0 mm Lead
STP-LE23-1G12ADJ	304.8 [12.00]	44.5 [1.75]	361.3 [14.22]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 2.0 mm Lead
STP-LE23-1H06ADJ	152.4 [6.00]	44.5 [1.75]	208.9 [8.22]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 6.0 mm Lead
STP-LE23-1H09ADJ	228.6 [9.00]	44.5 [1.75]	285.1 [11.22]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 6.0 mm Lead
STP-LE23-1H12ADJ	304.8 [12.00]	44.5 [1.75]	361.3 [14.22]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 6.0 mm Lead
STP-LE23-3H06ADJ	152.4 [6.00]	78.5 [3.09]	242.9 [9.06]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 6.0 mm Lead
STP-LE23-3H09ADJ	228.6 [9.00]	78.5 [3.09]	319.1 [12.56]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 6.0 mm Lead
STP-LE23-3H12ADJ	304.8 [12.00]	78.5 [3.09]	395.3 [15.56]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.0 [0.47] 6.0 mm Lead
STP-LE23-3K06ADJ	152.4 [6.00]	78.5 [3.09]	242.9 [9.06]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.5 [0.50] 1in Lead
STP-LE23-3K09ADJ	228.6 [9.00]	78.5 [3.09]	319.1 [12.56]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.5 [0.50] 1in Lead
STP-LE23-3K12ADJ	304.8 [12.00]	78.5 [3.09]	395.3 [15.56]	Ø28.58 [1.13] BC	3x Ø5.2 [0.20]	Ø38.1 [1.50]	12.5 [0.50] 1in Lead

Table title: **STP-LE23-xxxxADJ Dimensions (mm [inch])**

SureStep® Linear Actuators Cables

Cables for SureStep Series Linear Actuators			
Part Number	*Price*	*Description*	*Drawing*
STP-LA-EXT17-006	$26.00	SureStep extension cable, 6-pin (4-wire) connector to pigtail, 6ft cable length. For use with SureStep NEMA 17 STP-LE series linear actuators.	PDF
STP-LA-EXT17-010	$33.50	SureStep extension cable, 6-pin (4-wire) connector to pigtail, 10ft cable length. For use with SureStep NEMA 17 STP-LE series linear actuators.	PDF
STP-LA-EXT17-020	$55.00	SureStep extension cable, 6-pin (4-wire) connector to pigtail, 20ft cable length. For use with SureStep NEMA 17 STP-LE series linear actuators.	PDF
STP-LA-EXT23-006	$29.50	SureStep extension cable, 6-pin (4-wire) connector to pigtail, 6ft cable length. For use with SureStep NEMA 23 STP-LE series linear actuators.	PDF
STP-LA-EXT23-010	$39.00	SureStep extension cable, 6-pin (4-wire) connector to pigtail, 10ft cable length. For use with SureStep NEMA 23 STP-LE series linear actuators.	PDF
STP-LA-EXT23-020	$60.00	SureStep extension cable, 6-pin (4-wire) connector to pigtail, 20ft cable length. For use with SureStep NEMA 23 STP-LE series linear actuators.	PDF

STP-LA-EXT17-0xx Dimensions (mm [in])

L (IN)± 13
[L (mm)± 0.5]

12.7 [0.50]

50.8 [2.00]

CONNECTOR
JST #
PHR-6
PIN
JST #
SPH-002T-P0.5

AUTOMATION DIRECT
STP-LA-EXT17-XXX

CABLE
ALHPAWIRE # 1604
(24AWG/4C)
OR EQUIVALENT

PIN 1

PINOUT CHART		
PIN #	COLOR	WIRE
1	RED	A+
2	N/A	
3	YELLOW	A-
4	GREEN	B+
5	N/A	
6	BLACK	B-

VIEW FROM
WIRE ENTRANCE

CABLES		
CABLE PART #	LENGTH L (IN)	LENGTH L (mm)
STP-LA-EXT17-006	72	1828
STP-LA-EXT17-010	120	3048
STP-LA-EXT17-020	240	6096

STP-LA-EXT17-006

STP-LA-EXT23-0xx Dimensions (mm [in])

L (IN) ± 13
[L (mm)± 0.5]

12.7 [0.50]

50.8 [2.00]

CONNECTOR
JST #
XHP-6
PIN
JST #
SXH-001T-P0.6

AUTOMATION DIRECT
STP-LA-EXT23-XXX

CABLE
BELDEN # 8444
(22AWG/4C)
OR EQUIVALENT

PIN 1

PINOUT CHART		
PIN #	COLOR	WIRE
1	RED	A+
2	N/A	
3	WHITE	A-
4	GREEN	B+
5	N/A	
6	BLACK	B-

VIEW FROM
WIRE ENTRANCE

CABLES		
CABLE PART #	LENGTH L (IN)	LENGTH L (mm)
STP-LA-EXT23-006	72	1828
STP-LA-EXT23-010	120	3048
STP-LA-EXT23-020	240	6096

STP-LA-EXT23-006

Sure-step®

SureStep® Linear Actuators Accessories

Replacement Parts for SureStep Series Linear Actuators

Part Number	Price	Description	Drawing
STP-LA-NTFA	$25.00	SureStep lead screw flange nut, replacement, triangular, 0.25 in/rev, 0.25 inch lead screw diameter. For use with SureStep STP-LE series screw code A linear actuators.	PDF
STP-LA-NTFB	$25.00	SureStep lead screw flange nut, replacement, triangular, 0.5 in/rev, 0.25 inch lead screw diameter. For use with SureStep STP-LE series screw code B linear actuators.	PDF
STP-LA-NTFC	$25.00	SureStep lead screw flange nut, replacement, triangular, 3mm/rev, 6.5 mm lead screw diameter. For use with SureStep STP-LE series screw code C linear actuators.	PDF
STP-LA-NTFD	$24.00	SureStep lead screw flange nut, replacement, triangular, 1.25 mm/rev, 8mm lead screw diameter. For use with SureStep STP-LE series screw code D linear actuators.	PDF
STP-LA-NTFE	$28.00	SureStep lead screw flange nut, replacement, triangular, 8mm/rev, 8mm lead screw diameter. For use with SureStep STP-LE series screw code E linear actuators.	PDF
STP-LA-NTFF	$40.00	SureStep lead screw flange nut, replacement, triangular, 10.5 mm/rev, 10mm lead screw diameter. For use with SureStep STP-LE series screw code F linear actuators.	PDF
STP-LA-NTFG	$42.50	SureStep lead screw flange nut, replacement, triangular, 2mm/rev, 12mm lead screw diameter. For use with SureStep STP-LE series screw code G linear actuators.	PDF
STP-LA-NTFH	$42.50	SureStep lead screw flange nut, replacement, triangular, 6mm/rev, 12mm lead screw diameter. For use with SureStep STP-LE series screw code H linear actuators.	PDF
STP-LA-NTFK	$44.00	SureStep lead screw flange nut, replacement, triangular, 1in/rev, 0.5 inch lead screw diameter. For use with SureStep STP-LE series screw code K linear actuators.	PDF
STP-LA-NRFA	$24.00	SureStep lead screw flange nut, round, 0.25 in/rev, 0.25 inch lead screw diameter. For use with SureStep STP-LE series screw code A linear actuators.	PDF
STP-LA-NRFB	$24.00	SureStep lead screw flange nut, round, 0.5 in/rev, 0.25 in lead screw diameter. For use with SureStep STP-LE series screw code B linear actuators.	PDF
STP-LA-NRFC	$24.00	SureStep lead screw flange nut, round, 3mm/rev, 6.5 mm lead screw diameter. For use with SureStep STP-LE series screw code C linear actuators.	PDF
STP-LA-NRFD	$24.00	SureStep lead screw flange nut, round, 1.25 mm/rev, 8mm lead screw diameter. For use with SureStep STP-LE series screw code D linear actuators.	PDF
STP-LA-NRFE	$25.00	SureStep lead screw flange nut, round, 8mm/rev, 8mm lead screw diameter. For use with SureStep STP-LE series screw code E linear actuators.	PDF
STP-LA-NRFF	$27.50	SureStep lead screw flange nut, round, 10.5 mm/rev, 10mm lead screw diameter. For use with SureStep STP-LE series screw code F linear actuators.	PDF
STP-LA-NRFG	$42.50	SureStep lead screw flange nut, round, 2mm/rev, 12mm lead screw diameter. For use with SureStep STP-LE series screw code G linear actuators.	PDF
STP-LA-NRFH	$42.50	SureStep lead screw flange nut, round, 6mm/rev, 12mm lead screw diameter. For use with SureStep STP-LE series screw code H linear actuators.	PDF
STP-LA-NRFK	$42.50	SureStep lead screw flange nut, round, 1in/rev, 0.5 inch lead screw diameter. For use with SureStep STP-LE series screw code K linear actuators.	PDF

All STP-LA series nuts are formed from TECAFORM AD AF (a PTFE-infused polymer) and require no lubrication. Using any sort of lubricant is not recommended as it will eventually dry out and contaminate the screw.

SureStep Linear Actuators have a "Screw Code" built into the part number. Each screw has a specific diameter and lead (pitch). The "Y" variable in the Linear Actuator part numbers below represents the Screw Code:

STP-LE17-x**Y**xxxxx

STP-LE23-x**Y**xxxxx

To find a compatible nut, match the actuator's Screw Code to the nut screw code ("Y" below):

STP-LA-xxx**Y**

Example: An STP-LA-NTFB nut will fit onto an STP-LE17-3B06ADJ actuator.

STP-LA-NTFA

STP-LA-NRFK

NEMA 17 Linear Actuator Compatible Encoders

NEMA 17 Compatible Encoders	
CUI Devices Configurable Encoders	SureStep Encoders
AMT102-V (config. ppr, Push-pull)	STP-MTRA-ENC1 (1000ppr, Line Driver)
AMT103-V (config. ppr, Push-pull)	STP-MTRA-ENC3 (400ppr, Line Driver)
AMT112S-V (config. ppr, Push-pull)	STP-MTRA-ENC2 (1000ppr, Push-pull)
AMT112Q-V (config. ppr, Line Driver)	STP-MTRA-ENC4 (400ppr, Push-pull)
AMT312D-V (config. ppr, Line Driver)	STP-MTRA-ENC9 (config. ppr, Line Driver)
AMT312S-V (config. ppr, Push-pull)	STP-MTRA-ENC10 (config. ppr, Push-pull)

NEMA 23 Linear Actuator Compatible Encoders

| NEMA 23 Compatible Encoders	
CUI Devices Configurable Encoders	SureStep Encoders
AMT102-V (config. ppr, Push-pull)	STP-MTRA-ENC5 (1000ppr, Line Driver)
AMT103-V (config. ppr, Push-pull)	STP-MTRA-ENC7 (400ppr, Line Driver)
AMT112S-V (config. ppr, Push-pull)	STP-MTRA-ENC6 (1000ppr, Push-pull)
AMT112Q-V (config. ppr, Line Driver)	STP-MTRA-ENC8 (400ppr, Push-pull)
AMT312D-V (config. ppr, Line Driver)	STP-MTRA-ENC9 (config. ppr, Line Driver)
AMT312S-V (config. ppr, Push-pull)	STP-MTRA-ENC10 (config. ppr, Push-pull)

Stepping System Power Supplies

SureStep® logo

SureStep® Power Supplies

SureStep Series Specifications – Stepping System Power Supplies				
Power Supply	*STP-PWR-3204*	*STP-PWR-4805*	*STP-PWR-4810*	*STP-PWR-7005*
Drawing	PDF	PDF	PDF	PDF
Price	$150.00	$183.00	$237.00	$233.00
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)			
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
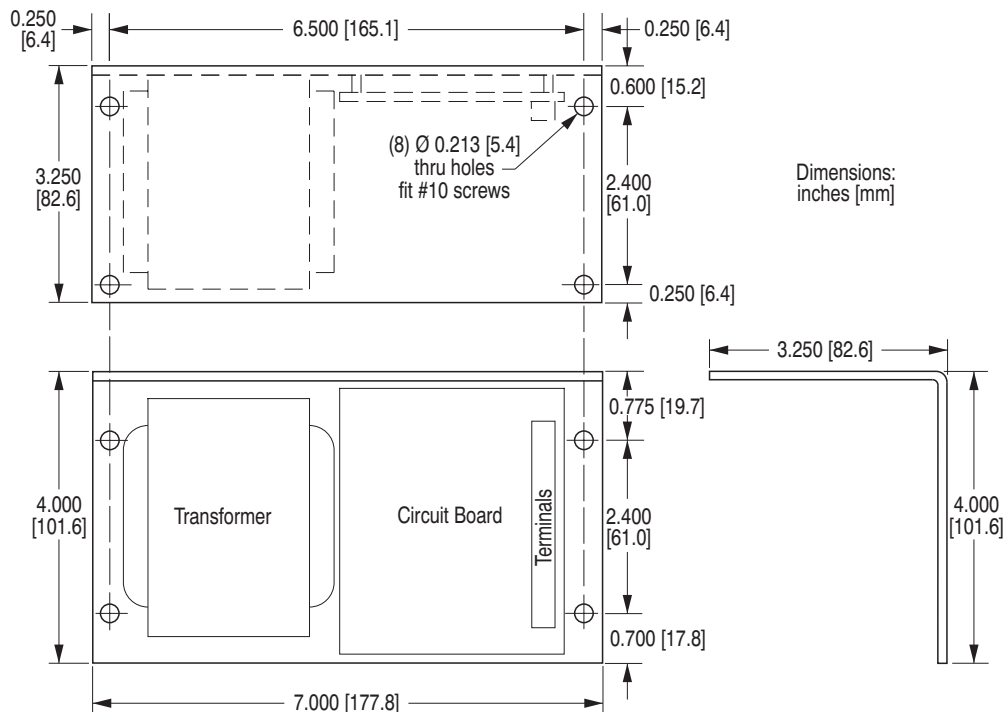
Stepping System Power Supplies

SureStep® Power Supply Dimensions (continued)

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

STP-PWR-4805 only

Transformer

Circuit Board

Terminals

Ø L
thru holes
(8) STP-PWR-4805
(7) STP-PWR-4810
(7) STP-PWR-7005

Dimensions for:
STP-PWR-4805
STP-PWR-4810
STP-PWR-7005
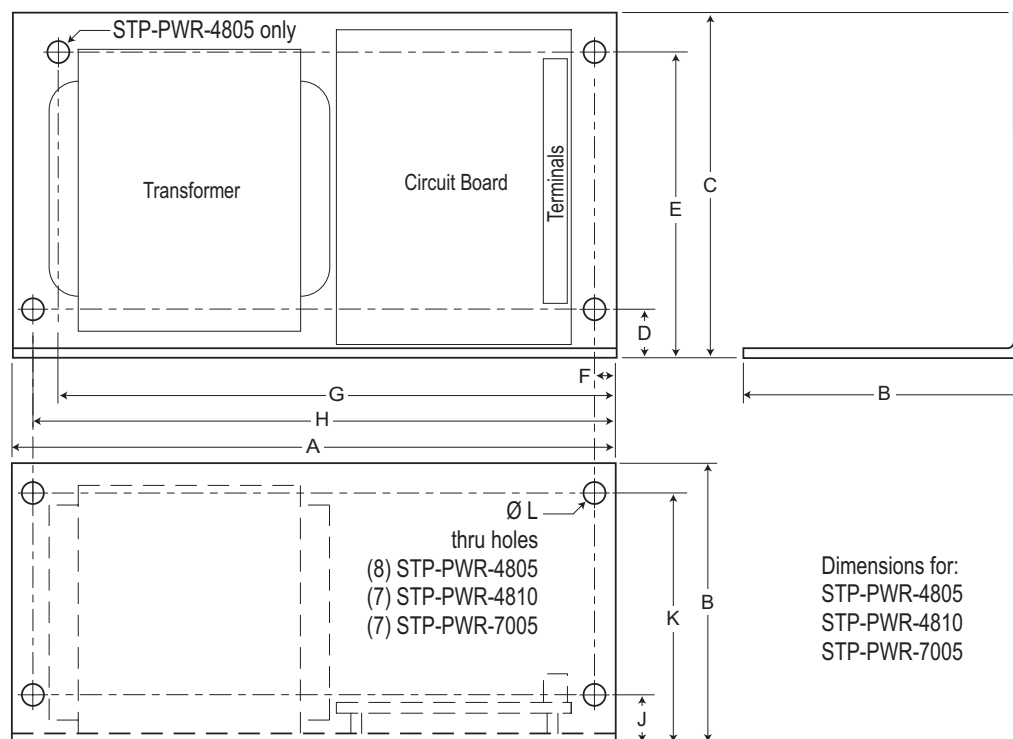
SureStep Series Dimensions – 48V & 70V Power Supplies											
Power Supply Part Number	Dimensions* (in [mm]*)										Mtg Screw
	A	B	C	D	E	F	G	H	J	K	L	
STP-PWR-4805	8.10 [205.7]	3.88 [98.6]	5.00 [127.0]	0.87 [22.1]	4.67 [118.6]	0.25 [6.4]	7.15 [181.6]	7.75 [196.9]	0.50 [12.7]	3.53 [89.7]	0.200 [5.1]	#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® Integrated Motors System

Integrated Microstepping Motors and Drives

General integrated motor/drive features

- DC power supply required (12-48 VDC or 12-70 VDC)
- Pulse/Direction or CW Pulse/CCW Pulse
- Digital input filtering
- "E" models include an encoder
- Three optically isolated digital inputs, 5 to 24 volts
- Step input signal smoothing (microstep emulation), performs high resolution stepping by synthesizing coarse steps into fine microsteps
- Dynamic smoothing, software-configurable filtering for use in removing spectral components from command sequence, reduces jerk, limiting excitation of system resonance
- Anti-resonance (electronic damping): raises the system-damping ratio to eliminate midrange instability and allow stable operation throughout the speed range of the motor
- Idle current reduction range of 0-90% of running current after a delay selectable in milliseconds (Standard models = 50/90%, DIP switch selectable)
- Configurable hardware digital noise filter, software noise filter
- Non-volatile storage, configurations are saved in FLASH memory on-board the DSP
- Dynamic current control, software configurable for running current, accel current, idle current, to make motion smoother and the motor run cooler
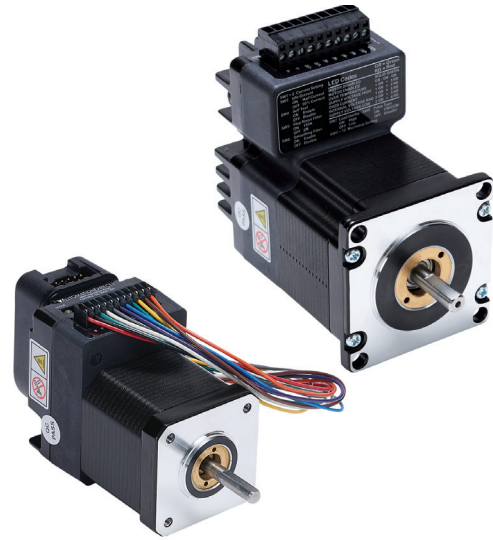
Standard NEMA 17 and 23 motor/drives

Standard integrated motor/drive features

(STP-MTRD-x)

- "E" models have an externally wireable encoder which can provide feedback to an external controller
- Configurable via DIP switches
- Available torque from 68 to 210 oz-in

Advanced integrated motor/drive features

(STP-MTRD-xR)

- Step and Direction, CW/CCW, and AB Quadrature/Encoder following
- Velocity (Oscillator) and position mode
- Control via streaming SCL commands
- RS-485 ASCII (2- or 4-wire) communications
- On "E" models, the internal encoder provides improved position and speed control
- Four "Variable I/O" points, 5 to 24 volts (NEMA 24 models)
- Analog input for speed and position, 0 to 5 VDC
- Configurable via SureMotion Pro software
- Available torque from 54 to 340 oz-in
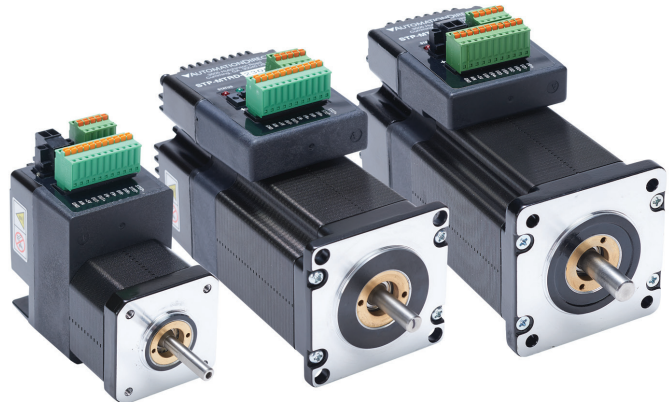
Advanced NEMA 17, 23, and 24 motor/drives

SureStep Series Part Numbers Standard Integrated Motor/Drives			
Integrated Motor/Drive	NEMA Size	Price	Drawing
STP-MTRD-17038	17	$170.00	PDF
STP-MTRD-17038E	17	$260.00	PDF
STP-MTRD-23042	23	$205.00	PDF
STP-MTRD-23042E	23	$350.00	PDF
STP-MTRD-23065	23	$247.00	PDF
STP-MTRD-23065E	23	$369.00	PDF

Note: Standard Integrated motor/drives with an "E" have an external encoder that can be wired to an external controller.

SureStep Series Part Numbers Advanced Integrated Motor/Drives			
Integrated Motor/Drive	NEMA Size	Price	Drawing
STP-MTRD-17030R	17	$305.00	PDF
STP-MTRD-17030RE	17	$490.00	PDF
STP-MTRD-17038R	17	$310.00	PDF
STP-MTRD-17038RE	17	$483.00	PDF
STP-MTRD-23042R	23	$346.00	PDF
STP-MTRD-23042RE	23	$494.00	PDF
STP-MTRD-23065R	23	$347.00	PDF
STP-MTRD-23065RE	23	$507.00	PDF
STP-MTRD-24075RV	24	$449.00	PDF
STP-MTRD-24075RVE	24	$525.00	PDF

Note: Advanced Integrated motor/drives with an "E" have an internal encoder used for stall prevention (cannot be wired to an external PLC or controller).
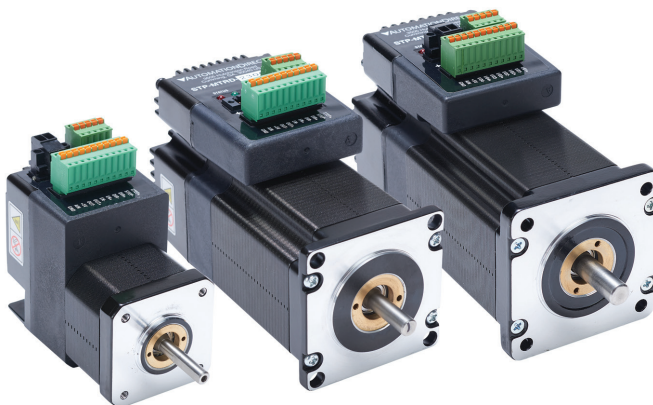
SureStep®

Integrated Microstepping Motors and Drives

SureStep® Standard Integrated Motor/Drives Specifications

SureStep Integrated Series Specifications – Standard			
Microstepping Drive/Motor	STP-MTRD-17038 STP-MTRD-17038E	STP-MTRD-23042 STP-MTRD-23042E	STP-MTRD-23065 STP-MTRD-23065E
Input Voltage (external p/s required)	12-48 VDC	12-70 VDC	12-70 VDC
Configuration Method	DIP switches		
Current Controller	Digital MOSFET, PWM @ 16kHz		
Encoder Feedback	"E" models only. External encoder must be wired to external feedback device.		
Encoder Specs ("E" models only)	1000 ppr, Line Driver, Supply Voltage (Typ: 5V, Max: 5.5 V, Min: 4.5 V). Detailed specs, other encoder options, and PLC compatibility are listed in Appendix A of the SureStep user manual.		
Motor/Drive Protection	Short circuit, over-voltage, under-voltage, over-temp		
Input Signals — Step/Pulse	5-24 VDC nominal (range 4-30VDC); (5mA @ 4V; 15 mA @ 30V); Optically isolated. Minimum pulse width = 3µs (at 2 MHz), 0.25µs (at 150kHZ), Maximum pulse frequency = 150kHz or 2MHz (switch selectable), Function = Step Input, Limit CW		
Input Signals — Direction	5-24 VDC nominal (range 4-30VDC); (5mA @ 4V; 15 mA @ 30V); Optically isolated. Minimum pulse width = 3µs (at 2 MHz), 0.25µs (at 150kHZ), Maximum pulse frequency = 150kHz or 2MHz (switch selectable), Function = Direction Input, Limit CCW		
Input Signals — Enable	5-24 VDC nominal (range 4-30VDC); (5mA @ 4V; 15 mA @ 30V); Optically isolated. Minimum pulse width = 3µs (at 2 MHz), 0.25µs (at 150kHZ), Maximum pulse frequency = 150kHz or 2MHz (switch selectable), Function = Enable Input		
Output Signal	30 VDC / 100mA max, photodarlington, voltage drop = 1.2V max at 100mA Function = Alarm Output		
Jumper Selectable Functions — Step Pulse Type	Step and Direction: Step signal = step/pulse; Direction signal = direction. Step CW & CCW: Step signal = CW step; Direction signal = CCW step.		
Jumper Selectable Functions — Step Pulse Noise Filter	Selectable 150 kHz or 2MHz		
Features — Current Reduction	This is the percentage of full current that the motor will use when the shaft is rotating. 100%, 90%, 70%, and 50% current selections.		
Features — Idle Current Reduction	Reduce power consumption and heat generation by limiting motor idle current to 90% or 50% of running current. (Holding torque is reduced by the same %.)		
Features — Microstep Resolution	200-25000 (dip switch selectable)		
Features — Self Test	Automatically rotate the motor back and forth 2 1/2 turns in each direction in order to confirm that the motor is operational.		
Features — Load Inertia	Anti-resonance and damping feature improves motor performance. Set motor and load inertia range to 0–4x or 5–10x.		
Connectors — Control	Housing: Tyco 4-643498-1 Cover: Tyco 1-643075-1	Connector part number: Weidmuller 1610200000, included in STP-CON-3	
Connectors — Encoder	Two 5 pin inserts (Molex# 14-60-0058), one housing Molex# 15-04-5104		
Drive Cooling Method	Natural convection (mount to suitable heat sink)		
Status LEDs	One red/green		
Mounting	Four M3 screws	Four #6 screws	

Integrated Microstepping Motors and Drives

SureStep® Standard Integrated Motor/Drives Specifications

| SureStep Integrated Series Specifications – Standard				
Integrated Stepping Motor/Drives		STP-MTRD-17038 STP-MTRD-17038E	STP-MTRD-23042 STP-MTRD-23042E	STP-MTRD-23065 STP-MTRD-23065E
NEMA Frame Size		NEMA 17	NEMA 23	NEMA 23
Maximum Holding Torque	(lb·in)	4.25	7.8125	13.125
	(oz·in)	68	125	210
	(N·m)	0.480189	0.8827	1.482936
Rotor Inertia	(oz·in2)	0.448	1.420	2.515
	(kg·cm2)	0.082	0.260	0.460
Insulation Class		Class B (130°C)		
Basic Step Angle		1.8 degrees		
Shaft Runout (in)		0.03	0.05	
Max Shaft Radial Play @ 1lb load		0.02		
Perpendicularity (mm)		0.08		
Concentricity (mm)		0.05		
* Maximum Radial Load (lb [kg])		6.7	13.9	
* Maximum Thrust Load (lb [kg])		34	63	
Storage Temperature Range		0-40°C (32-104°F)		
Operating Temperature Range		0-85°C		
Operating Humidity Range		90% max, non-condensing		
Product Material		Aluminum, steel, plastic, FR4, etc		
Environmental Rating		IP40		
Weight (oz [g])		14.7 [417]	30 [850]	42 [1200]
Agency Approvals		CE		
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 and to prevent loosening due to vibration.		

Integrated Microstepping Motors and Drives

SureStep® Advanced Integrated Motor/Drives

SureStep Integrated Series Specifications – Advanced				
Integrated Motor/Drive	*STP-MTRD-17030R* *STP-MTRD-17030RE* *STP-MTRD-17030RE*	*STP-MTRD-17038R* *STP-MTRD-17038RE* *STP-MTRD-17038RE*	*STP-MTRD-23042R* *STP-MTRD-23042RE*	*STP-MTRD-23065R* *STP-MTRD-23065RE*
Input Voltage (external p/s required)	12-48 VDC		12-70 VDC	
Configuration Method	SureMotion Pro software (SM-PRO: free download)			
Supply Output	+4.8 - 5 volts @ 50mA maximum			
Current Controller	Dual H-Bridge, 4 Quadrant, 4 state PWM @ 16kHz		Dual H-Bridge, 4 Quadrant, 4 state PWM @ 20kHz	
Encoder Feedback	"E" models only. Encoder is internal and provides position verification and stall prevention control by default.			
Motor/Drive Protection	Short circuit, over-voltage, under-voltage, over-temp			
Input Signals / **Step/Pulse**	5-24 VDC nominal. Optically isolated. Minimum pulse width = 250ns (at 3 MHz). Maximum pulse frequency = 3MHz, max current draw = 12mA Function = Step Input, Jog CW, Limit CW, Start/Stop, General Purpose			
Input Signals / **Direction**	5-24 VDC nominal. Optically isolated. Minimum pulse width = 250ns (at 3 MHz). Maximum pulse frequency = 3MHz, max current draw = 12mA Function = Direction Input, Jog CCW, Limit CCW, General Purpose			
Input Signals / **Enable**	5-24 VDC nominal. Optically isolated. Minimum pulse width = 250ns (at 3 MHz). Maximum pulse frequency = 3MHz, max current draw = 12mA Function = Enable Input, Reset Input, Change Speed, General Purpose			
Input Signals / **Analog**	0-5 VDC nominal (AIN referenced to GND). Input impedance: 30K ohms minimum, resolution = 12 bits Function = analog control modes and general purpose analog usage; programmable for signal range, offset, dead band, and filtering			
Output Signal	30VDC, 40mA maximum. Optically isolated, open collector. Maximum pulse frequency 10kHz. Functions = Brake Output, Alarm Output, Motion Output, Tach Output, General Purpose			
Communication Interface	RS-485 ASCII			
Non-volatile Memory Storage	Configurations are saved in FLASH memory on-board the DSP			
Features / **Current Reduction**	Selectable in SureMotion Pro software			
Features / **Idle Current Reduction**	Reduction range of 0–90% of running current after delay selectable in ms			
Features / **Microstep Resolution**	Software selectable from 200 to 51200 steps/rev in increments of 2 steps/rev			
Features / **Modes of Operation**	Pulse (step) & direction, CW/CCW, A/B quadrature, velocity (oscillator), SCL streaming commands			
Features / **Self Test**	Checks internal and external power supply voltages. Diagnoses open motor phases and motor resistance changes > 40%			
Connectors / **DC Power**	2-position screw terminal: Weidmuller 1615780000			
Connectors / **I/O**	11-position spring cage: Phoenix 1881419			
Connectors / **Comm**	5-position spring cage: Phoenix 1881354			
Drive Cooling Method	Natural convection (mount to suitable heat sink)			
Status LEDs	1 red, 1 green			
Mounting	Four M3 screws		Four #6 screws	

SureStep®
step

Integrated Microstepping Motors and Drives

SureStep® Advanced Integrated Motor/Drives

SureStep Integrated Series Specifications – Advanced Variable I/O		
Integrated Motor/Drive		STP-MTRD-24075RV / STP-MTRD-24075RVE
Input Voltage (external p/s required)		12-70 VDC
Configuration Method		SureMotion Pro software (SM-PRO: free download)
Supply Output		+4.8 - 5 volts @ 50mA maximum
Current Controller		Dual H-Bridge, 4 Quadrant, 4 state PWM @ 20kHz
Encoder Feedback		"E" models only. Encoder is internal and provides position verification and stall prevention control by default.
Motor/Drive Protection		Short circuit, over-voltage, under-voltage, over-temp
Variable I/O	**I/O 1 (Step/Pulse)**	INPUT: 5-24 VDC nominal. Optically isolated. Minimum pulse width = 250ns (at 3MHz). Maximum pulse frequency = 3MHz, max current draw = 12mA, Function = Step Input, Jog CW, Enable Input, Start/Stop, General Purpose OUTPUT: 30VDC, 40mA maximum. Optically isolated, open collector. Maximum pulse frequency 10kHz. Functions = Brake Output, Fault Output, Motion Output, Tach Output, General Purpose
	I/O 2 (Direction)	INPUT: 5-24 VDC nominal. Optically isolated. Minimum pulse width = 250ns (at 3MHz). Maximum pulse frequency = 3MHz, max current draw = 12mA, Function = Direction Input, Jog CCW, Alarm Reset Input, General Purpose OUTPUT: 30VDC, 40mA maximum. Optically isolated, open collector. Maximum pulse frequency 10kHz. Functions = Brake Output, Fault Output, Motion Output, Tach Output, General Purpose
	I/O 3	INPUT: 5-24 VDC nominal. Optically isolated. Minimum pulse width = 250ns (at 3MHz). Maximum pulse frequency = 3MHz, max current draw = 12mA, Function = Limit CW Input, Enable Input, Change Speed Input, General Purpose OUTPUT: 30VDC, 40mA maximum. Optically isolated, open collector. Maximum pulse frequency 10kHz. Functions = Brake Output, Fault Output, Motion Output, Tach Output, General Purpose
	I/O 4	INPUT: 5-24 VDC nominal. Optically isolated. Minimum pulse width = 250ns (at 3 MHz). Maximum pulse frequency = 3MHz, max current draw = 12mA, Function = Limit CCW Input, Alarm Reset Input, General Purpose OUTPUT: 30VDC, 40mA maximum. Optically isolated, open collector. Maximum pulse frequency 10kHz. Functions = Brake Output, Fault Output, Motion Output, Tach Output, General Purpose
Analog		0-5 VDC nominal (AIN referenced to GND). Input impedance: 30K ohms minimum, resolution = 12 bits, Function = analog control modes and general purpose analog usage; programmable for signal range, offset, dead band, and filtering
Communication Interface		RS-485 ASCII (2- or 4-wire)
Non-volatile Memory Storage		Configurations are saved in FLASH memory on-board the DSP
Features	**Current Reduction**	Selectable in SureMotion Pro software
	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	Pulse (step) & direction, CW/CCW, A/B quadrature, velocity (oscillator), SCL streaming commands
	Self Test	Checks internal and external power supply voltages. Diagnoses open motor phases and motor resistance changes > 40%
Connectors	**DC Power**	2-position screw terminal: Weidmuller 1615780000
	I/O	11-position spring cage: Phoenix 1881419
	Comm	5-position spring cage: Phoenix 1881354
Drive Cooling Method		Natural convection (mount to suitable heat sink)
Status LEDs		1 red, 1 green
Mounting		Four #6 screws

Surestep®

Integrated Microstepping Motors and Drives

SureStep® Advanced Integrated Motor/Drives

SureStep Integrated Series Specifications – Advanced					
Integrated Motor/Drive	*STP-MTRD-17030R* *STP-MTRD-17030RE*	*STP-MTRD-17038R* *STP-MTRD-17038RE*	*STP-MTRD-23042R* *STP-MTRD-23042RE*	*STP-MTRD-23065R* *STP-MTRD-23065RE*	*STP-MTRD-24075RV* *STP-MTRD-24075RVE*
NEMA Frame Size	NEMA 17	NEMA 17	NEMA 23	NEMA 23	NEMA 24
* Maximum Holding Torque *(lb·in)*	3.375	4.25	7.8125	13.125	21.25
(oz·in)	54	68	125	210	340
(N·m)	0.381326	0.480189	0.8827	1.482936	2.400944
Rotor Inertia *(oz·in2)*	0.310	0.448	1.420	2.515	4.900
(kg·cm2)	0.057	0.082	0.260	0.460	0.897
Insulation Class	Class B (130°C)				
Basic Step Angle	1.8 degrees				
Shaft Runout (in)	0.03		0.05		
Max Shaft Radial Play @ 1lb load	0.02				
Perpendicularity (mm)	0.08				
Concentricity (mm)	0.05				
* Maximum Radial Load (lb [kg])	6.7		13.9		
* Maximum Thrust Load (lb [kg])	34		63		
Storage Temperature Range	0-40°C (32-104°F)				
Operating Temperature Range	0-85°C				0-70°C
Operating Humidity Range	90% max, non-condensing				
Product Material	Aluminum, steel, plastic, FR4, etc.				
Environmental Rating	IP40				
Weight (oz [g])	12.7 [360]	15.6 [441]	30 [850]	42 [1191]	56 [1580]
Agency Approvals	CE*				
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 and to prevent loosening due to vibration.				

* For NEMA 24 motors, an EMI filter (RES10F03) is needed on the power supply for CE compliance.

Integrated Microstepping Motors and Drives

SureStep® Integrated Motor/Drives Motor Torque vs. Speed

STP-MTRD-17030 Torque vs Speed (1.8° step motor; 1/2 stepping)

— 12V Power Supply – – 24V Power Supply ···· 48V Power Supply
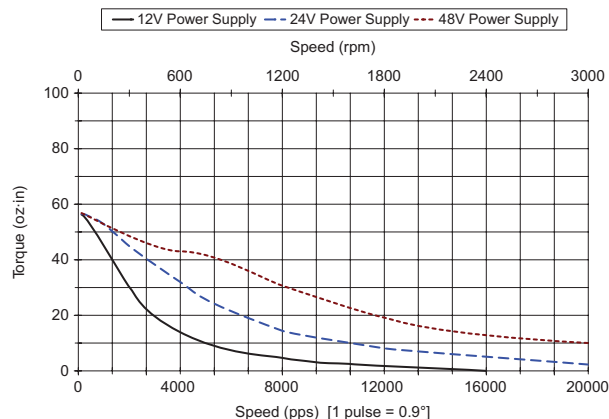
STP-MTRD-17038 Torque vs Speed (1.8° step motor; 1/2 stepping)

— 12V Power Supply – – 24V Power Supply ···· 48V Power Supply
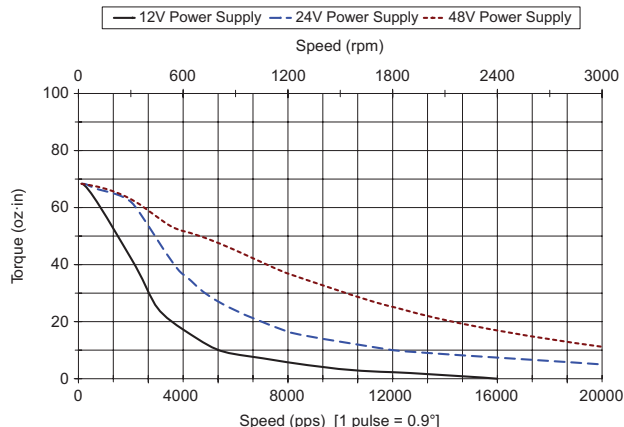
STP-MTRD-23042 Torque vs Speed (1.8° step motor; 1/2 stepping)

— 12V Power Supply – – 24V Power Supply ···· 48V Power Supply –·– 70V Power Supply
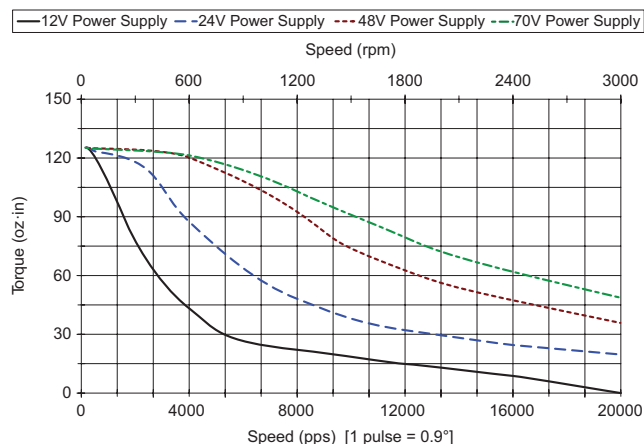
STP-MTRD-23065 Torque vs Speed (1.8° step motor; 1/2 stepping)

— 12V Power Supply – – 24V Power Supply ···· 48V Power Supply –·– 70V Power Supply
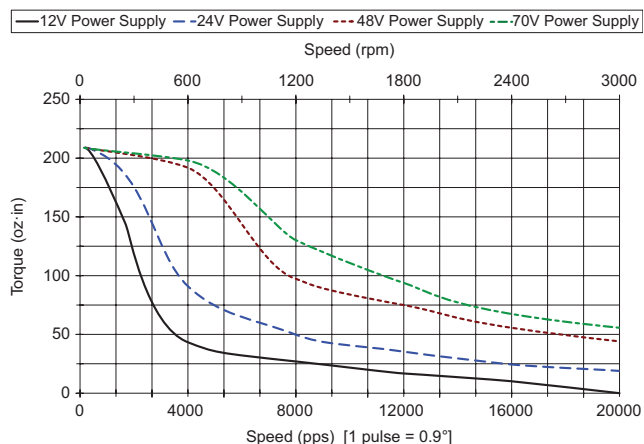
STP-MTRD-24075 Torque vs Speed (1.8° step motor; 1/2 stepping)
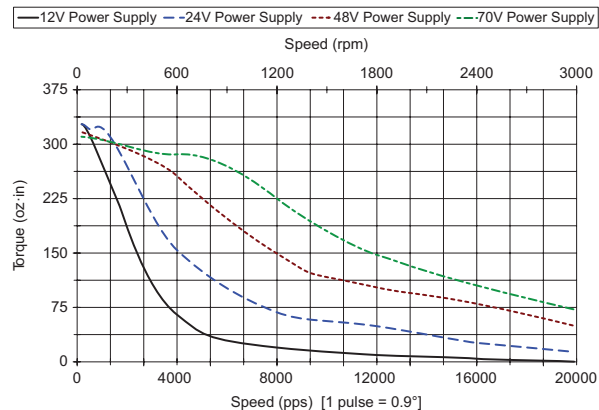
— 12V Power Supply – – 24V Power Supply ···· 48V Power Supply –·– 70V Power Supply

Integrated Microstepping Motors and Drives

SureStep® Standard Integrated Motor/Drives Dimensions

Dimensions = in [mm]
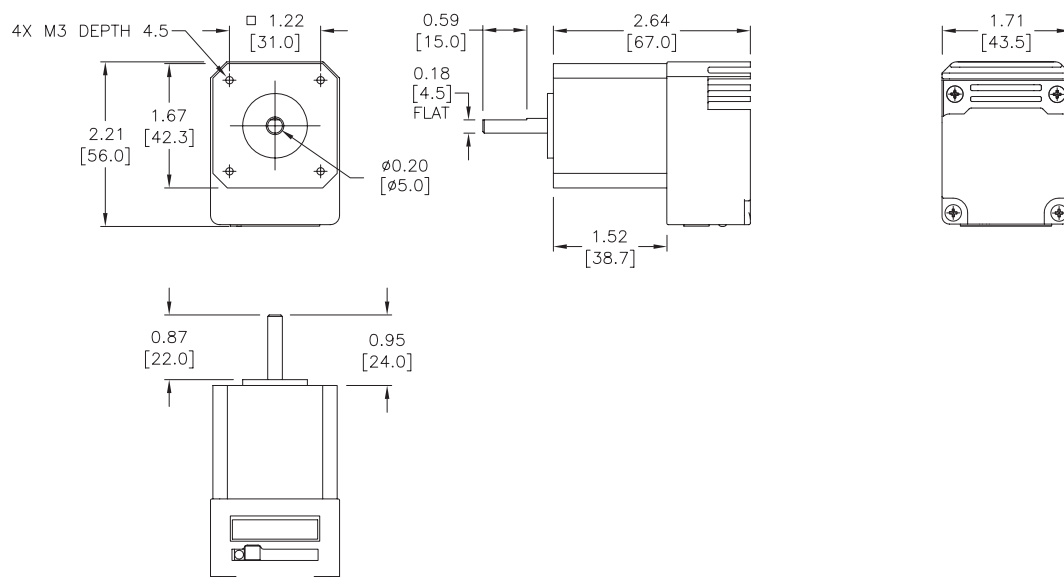
STP-MTRD-17038

STP-MTRD-17038E

Integrated Microstepping Motors and Drives

SureStep® Standard Integrated Motor/Drives Dimensions, continued

Dimensions = in [mm]

STP-MTRD-23042

4X ⌀0.20 [⌀5.0]
□ 1.86 [47.2]
2.21 [56.2]
3.35 [85.2]
⌀0.25 [⌀6.4]
0.59 [15.0]
0.23 [5.8] FLAT
3.35 [85.0]
1.65 [42.0]
1.69 [43.0]
2.22 [56.4]
0.72 [18.4]
0.79 [20.0]

STP-MTRD-23042E

4X ⌀0.20 [⌀5.0]
□ 1.86 [47.2]
2.21 [56.2]
3.35 [85.2]
⌀0.25 [⌀6.4]
0.59 [15.0]
0.23 [5.8] FLAT
4.00 [101.6]
1.65 [42.0]
1.69 [43.0]
2.22 [56.4]
0.72 [18.4]
0.79 [20.0]

Sure**step**®

Integrated Microstepping Motors and Drives

SureStep® Standard Integrated Motor/Drives Dimensions, continued

Dimensions = in [mm]

STP-MTRD-23065

4X ⌀0.20 [⌀5.0]
□ 1.86 [47.2]
0.59 [15.0]
2.21 [56.2]
3.35 [85.1]
⌀0.25 [⌀6.4]
4.21 [107.0]
2.22 [56.4]
2.52 [64.0]
1.69 [43.0]
0.72 [18.4]
0.79 [20.0]

STP-MTRD-23065E

4X ⌀0.20 [⌀5.0]
□ 1.86 [47.2]
0.59 [15.0]
2.21 [56.2]
3.35 [85.1]
⌀0.25 [⌀6.4]
4.87 [123.6]
2.22 [56.4]
2.52 [64.0]
1.69 [43.0]
0.72 [18.4]
0.79 [20.0]

Motion Control   tMNC-56

Integrated Microstepping Motors and Drives

SureStep® Advanced Integrated Motor/Drives Dimensions

Dimensions = in [mm]

STP-MTRD-17030R / STP-MTRD-17030RE

4X M3 DEPTH 4.5
□ 1.22 [31.0]
1.67 [42.3]
2.20 [55.9]
2.65 [67.4]
Ø0.20 [Ø5.0]
0.59 [15.0]
0.18 [4.5] FLAT
2.86 [72.5]
1.19 [30.1]
1.71 [43.5]
0.87 [22.0]
0.95 [24.0]

NOTE: Encoder is internal only - not available externally

STP-MTRD-17038R / STP-MTRD-17038RE

□ 1.22 [31.0]
1.66 [42.1]
2.20 [55.9]
2.65 [67.2]
Ø0.20 [Ø5.0]
0.59 [15.0]
0.18 [4.5] FLAT
3.19 [81.1]
1.52 [38.7]
1.71 [43.5]
0.87 [22.0]
0.95 [24.0]

NOTE: Encoder is internal only - not available externally

Sure step ®

Integrated Microstepping Motors and Drives

SureStep® Advanced Integrated Motor/Drives Dimensions, continued

Dimensions = in [mm]

STP-MTRD-23042R / STP-MTRD-23042RE

4X ∅0.20 [∅5.0]
□ 1.86 [47.2]
2.22 [56.4]
2.96 [75.1]
3.58 [90.9]
∅0.25 [∅6.4]

0.59 [15.0]
0.23 [5.9] FLAT
3.64 [92.4]
2.48 [63.1]

2.22 [56.4]
2.06 [52.4]

0.72 [18.4]
0.79 [20.0]

NOTE: Encoder is internal only - not available externally

STP-MTRD-23065R / STP-MTRD-23065RE

4X ∅0.20 [∅5.0]
□ 1.86 [47.2]
2.22 [56.4]
2.96 [75.1]
3.58 [90.9]
∅0.25 [∅6.4]

0.59 [15.0]
0.23 [5.9] FLAT
4.51 [114.4]
2.00 [50.8]

2.22 [56.4]
2.06 [52.4]

0.72 [18.4]
0.79 [20.0]

NOTE: Encoder is internal only - not available externally

Integrated Microstepping Motors and Drives

SureStep® Advanced Integrated Motor/Drives Dimensions, continued

Dimensions = in [mm]

STP-MTRD-24075RV / STP-MTRD-24075RVE
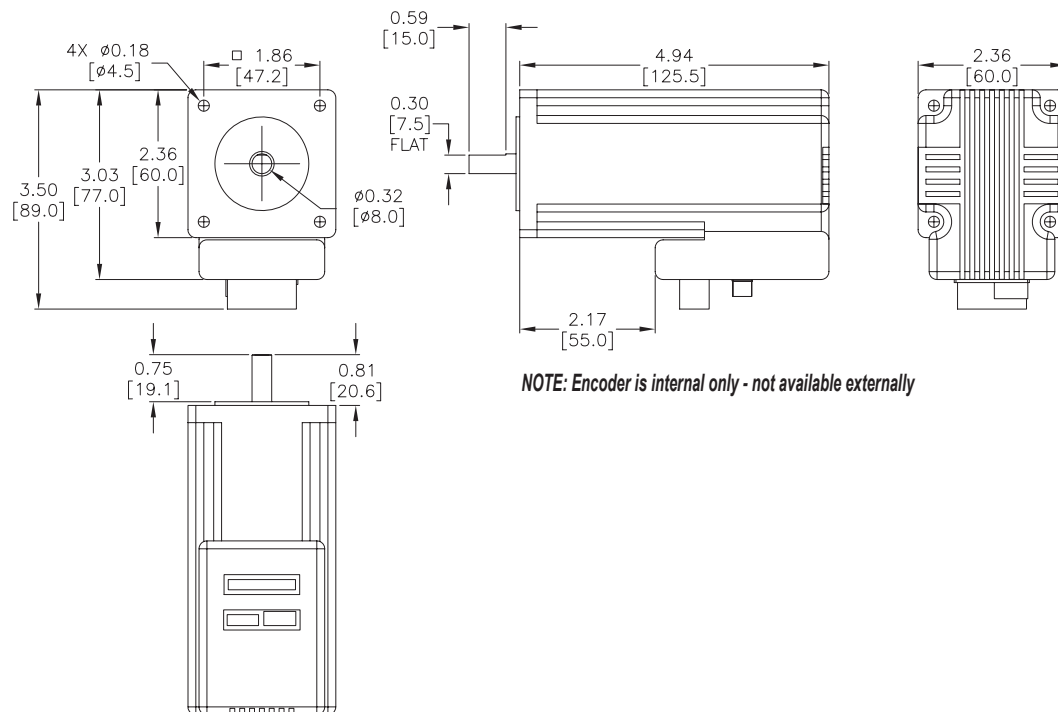
NOTE: Encoder is internal only - not available externally

Stepping System Accessories

SureStep® Microstepping Drives Accessories

Braking Accessories

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. In general, the more torque the motor is capable of producing then the more energy it can push back into the drive.

When using a regulated/switching power supply, this can trip the overvoltage protection of the power supply or drive, and cause it to shut down.

To solve this problem, AutomationDirect offers a regeneration clamp as an optional accessory. The regen clamp has a built-in 50W braking resistor. The STP-DRVA-RC-050A does not have the ability to use an external resistor.

Regeneration Clamp STP-DRVA-RC-050A

Regeneration Clamp Features

STP-DRVA-RC-050A

- Built-in 50W power resistor for more continuous current handling
- Mounted on a heat sink
- Voltage range: 24–80 VDC; no user adjustments required
- Power: 50W continuous; 800W peak
- 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.

- Three drive connections, 7A max per channel, 15A total output current
- Removable terminal blocks (replacement kit STP-CON-4)
- Uses 18-20 AWG wire for connections

SureStep Damper

A step motor inertia damper can smooth out steps in a typical step motor resulting in a quieter and smoother motion when rotating between steps. Reducing the resonance and possible micro oscillations when moving from step to step is the main purpose of a "hockey puck" style damper, but it can also be used as a hand wheel to directly rotate the position of the rotor when power is removed from the motor. The damper is a properly sized machined piece of aluminum encased in plastic. It is sized and weighted for general damping of the respective frame size motor.

Damper

Sure Step Series Specifications – Microstepping Drives Optional Accessories				
Part Number	*Price*	*Description*	*Drawing*	
STP-DRVA-RC-050A*	$91.00	Regen Clamp: 50W, for DC input stepper and servo drives, enclosed	PDF	
STP-MTRA-17DMP	$16.50	SureStep damper, metal body. For use with NEMA 17 stepper motors with 5mm shafts. Mounting set screw included.	PDF	
STP-MTRA-23DMP	$37.50	SureStep damper, metal body. For use with NEMA 23 stepper motors with 1/4 inch shafts. Mounting set screw included.	PDF	

* Do not use the regeneration clamp in an atmosphere containing corrosive gases.

Stepping System Accessories

SureStep® Microstepping Drives Accessories

Dimensions = in [mm]

STP-DRVA-RC-050A
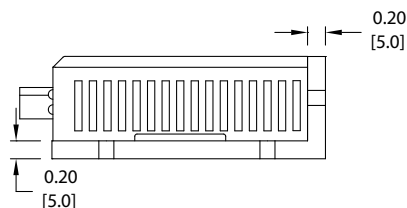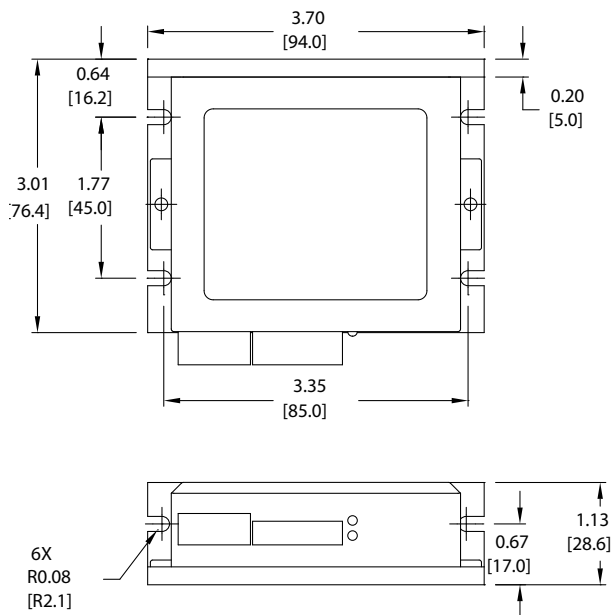
Stepping System Accessories

SureStep® Microstepping Drives Accessories

USB to RS-485 Adapter

The STP-USB485-4W is a USB to RS-232/RS-485 converter that can be used in 2-wire or 4-wire serial networks. Serial communication can be wired up via the 9-pin D-sub connector or through the 6-screw terminals.

The STP-USB485-4W can be set for several different configurations. These modes are set up by the 4 DIP switches on the outside of the case (RS-232/RS-485, full/half duplex) and by the 7 jumpers located inside the case (termination/bias resistors).

SureStep Advanced Drives communicate via RS-232 (for control and for configuration via SureMotion Pro).

The Advanced Integrated motor/drives use RS-485. While the Advanced Integrated motor/drives can be wired for either 2- or 4-wire networks, 4-wire is require for use with SureMotion Pro due to the Firmware Download utility and the Status Monitor Screen.

Depending on the host controller's RS-485 implementation, either 2- or 4-wire RS-485 can be used for control. All RS-485 PLCs that have 2-wire capability (Productivity, BRX, Click, DirectLogic, etc.) can control the Advanced Integrated steppers.

SureStep PC Adapter - STP-USB485-4W	
Price	$132.00
Drawing	PDF
Communications	2-wire RS-232 2- or 4-wire RS-485
Configure With	Internal jumpers and external DIP switches
Compatible Cables	STP-232RJ11-CBL STP-485DB9-CBL-2 USB

Dimensions = in [mm]
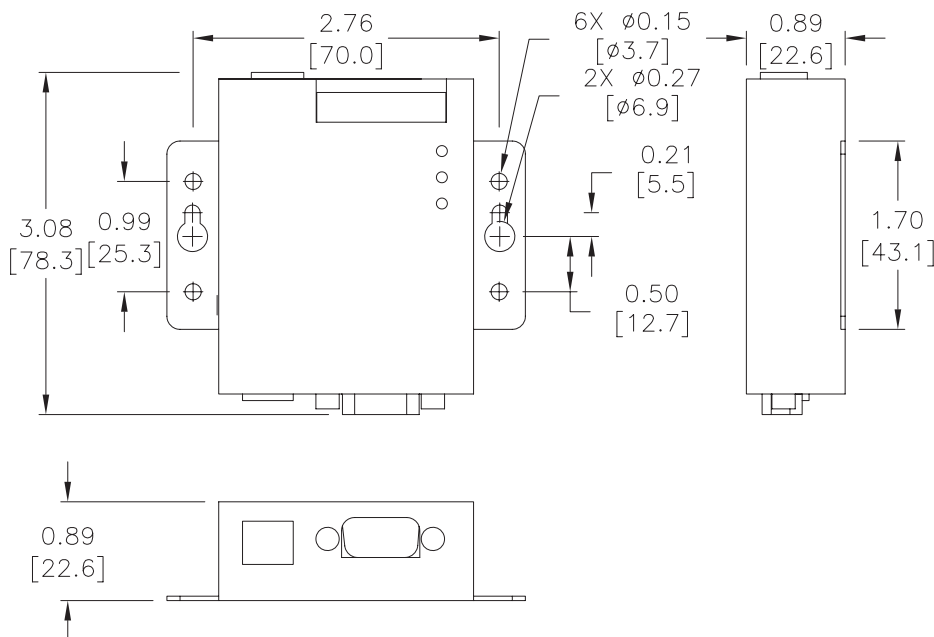
Stepping System Accessories

SureStep® Stepping System Encoders

Replacement Encoders

The STP-MTRA-ENC1 is a replacement for the encoder that comes standard with the STP-MTRD-17038E, STP-MTRD-23042E, and STP-MTRD-23065E integrated motor/drives. Note that the encoder included with (E) model advanced integrated motor/drives is internal and cannot be replaced.

The AMT112Q-V is a replacement for the encoder that comes standard with the STP-MTR(x)-xxxxE stand alone step motors.

Installation tool and mounting hardware is included with all replacement encoders. For more information and details on how to wire the replacement encoders, please see the SureStep User Manual.

Optional Encoders

Optional encoders can be purchased separately for standard integrated motor/drives and standalone dual-shaft motors in all NEMA 14, 17, and 23 sizes, and also for STP-MTRAC-34xxxD motors (currently not available for STP-MTRx-34xxxD motors). All (D) model (dual-shaft) step motors come with pre-drilled holes in the rear end cap for easy encoder mounting. Pre-installed encoders on standalone dual-shaft motors and standard integrated motor/drives can be retrofitted with an appropriate optional encoder if desired. Please see the chart on the following page for encoder compatibility.

Features:
- Fixed resolutions include 400ppr or 1000ppr
- Configurable models have up to 4096ppr (default = 400ppr)
- Choose line driver or push-pull (totem) output signals

STP-MTRA-ENC2

AMT112Q-V

STP-MTRA-ENC11

Sure Step Series Specifications – Encoders			
Part Number	**Price**	**Description**	**Drawing**
STP-MTRA-ENC1	$91.00	SureStep incremental (quadrature) modular encoder, 5VDC, line driver (differential) output, 1000 ppr. For use with SureStep stepper motors with 5mm rear shaft. Installation tool and mounting hardware included.	PDF
STP-MTRA-ENC2	$79.00	SureStep incremental (quadrature) modular encoder, 5VDC, Push-pull (totem) output, 1000 ppr. For use with SureStep stepper motors with 5mm rear shaft. Installation tool and mounting hardware included.	PDF
STP-MTRA-ENC3	$89.00	SureStep incremental (quadrature) modular encoder, 5VDC, line driver (differential) output, 400 ppr. For use with SureStep stepper motors with 5mm rear shaft. Installation tool and mounting hardware included.	PDF
STP-MTRA-ENC4	$76.00	SureStep incremental (quadrature) modular encoder, 5VDC, Push-pull (totem) output, 400 ppr. For use with SureStep stepper motors with 5mm rear shaft. Installation tool and mounting hardware included.	PDF
STP-MTRA-ENC5	$91.00	SureStep incremental (quadrature) modular encoder, 5VDC, line driver (differential) output, 1000 ppr. For use with SureStep stepper motors with 1/4 inch rear shaft. Installation tool and mounting hardware included.	PDF
STP-MTRA-ENC6	$79.00	SureStep incremental (quadrature) modular encoder, 5VDC, Push-pull (totem) output, 1000 ppr. For use with SureStep stepper motors with 1/4 inch rear shaft. Installation tool and mounting hardware included.	PDF
STP-MTRA-ENC7	$89.00	SureStep incremental (quadrature) modular encoder, 5VDC, line driver (differential) output, 400 ppr. For use with SureStep stepper motors with 1/4 inch rear shaft. Installation tool and mounting hardware included.	PDF
STP-MTRA-ENC8	$76.00	SureStep incremental (quadrature) modular encoder, 5VDC, Push-pull (totem) output, 400 ppr. For use with SureStep stepper motors with 1/4 inch rear shaft. Installation tool and mounting hardware included.	PDF
STP-MTRA-ENC11	$105.00	SureStep incremental (quadrature) modular encoder, 5 VDC, line driver (differential) output, 1000 ppr. For use with SureStep stepper motors with 3/8in rear shaft. Installation hardware included. Requires STP-CBL-EAxx cable.	PDF
STP-MTRA-ENC12	$92.00	SureStep incremental (quadrature) modular encoder, 5 VDC, push-pull (totem) output, 1000 ppr. For use with SureStep stepper motors with 3/8in rear shaft. Installation hardware included. Requires STP-CBL-EDxx cable.	PDF
STP-MTRA-ENC13	$103.00	SureStep incremental (quadrature) modular encoder, 5 VDC, line driver (differential) output, 400 ppr. For use with SureStep stepper motors with 3/8in rear shaft. Installation hardware included. Requires STP-CBL-EAxx cable.	PDF
STP-MTRA-ENC14	$90.00	SureStep incremental (quadrature) modular encoder, 5 VDC, push-pull (totem) output, 400 ppr. For use with SureStep stepper motors with 3/8in rear shaft. Installation hardware included. Requires STP-CBL-EDxx cable.	PDF

Stepping System Accessories

SureStep® Stepping System Encoders

Sure Step Series Encoder Compatibility						
Part Number	*PPR*	*Bore Diameter*	*Output Type*	*Encoder Cable*	*PLC Compatibility*	*Motor Compatibility*
STP-MTRA-ENC1	1000	5mm	Line Driver	STP-CBL-EAxx	P2-HSI, P3-HSI, BRX*, CLICK C0-1xDxE-D*	STP-MTRx-14xxxD STP-MTRx-14xxxE STP-MTRx-17xxxD STP-MTRx-17xxxE Standard STP-MTRD-xxxxxE
STP-MTRA-ENC2			Push-pull (totem)	STP-CBL-EDxx	BRX*, CLICK C0-1xDxE-D*	
STP-MTRA-ENC3	400		Line Driver	STP-CBL-EAxx	P2-HSI, P3-HSI, BRX*, CLICK C0-1xDxE-D*	
STP-MTRA-ENC4			Push-pull (totem)	STP-CBL-EDxx	BRX*, CLICK C0-1xDxE-D*	
STP-MTRA-ENC5	1000	0.25 inch	Line Driver	STP-CBL-EAxx	P2-HSI, P3-HSI, BRX*, CLICK C0-1xDxE-D*	STP-MTRx-23xxxD STP-MTRx-23xxxE STP-MTRAC-23xxxD
STP-MTRA-ENC6			Push-pull (totem)	STP-CBL-EDxx	BRX*, CLICK C0-1xDxE-D*	
STP-MTRA-ENC7	400		Line Driver	STP-CBL-EAxx	P2-HSI, P3-HSI, BRX*, CLICK C0-1xDxE-D*	
STP-MTRA-ENC8			Push-pull (totem)	STP-CBL-EDxx	BRX*, CLICK C0-1xDxE-D*	
STP-MTRA-ENC11	1000	0.375 inch	Line Driver	STP-CBL-EAxx	P2-HSI, P3-HSI, BRX*, CLICK C0-1xDxE-D*	STP-MTRAC-34xxxD
STP-MTRA-ENC12			Push-pull (totem)	STP-CBL-EDxx	BRX*, CLICK C0-1xDxE-D*	
STP-MTRA-ENC13	400		Line Driver	STP-CBL-EAxx	P2-HSI, P3-HSI, BRX*, CLICK C0-1xDxE-D*	
STP-MTRA-ENC14			Push-pull (totem)	STP-CBL-EDxx	BRX*, CLICK C0-1xDxE-D*	

* Requires FC-ISO-C

Stepping System Accessories

SureStep® Stepping System Encoders

Dimensions = in [mm]

STP-MTRA-ENC1, 3, 5, 7

0.025 INCH SQUARE PINS
MATES TO CON—FC10

PIN 1

0.653
[16.6]

* CABLE CONNECTION

2X ⌀0.13
[⌀3.2]

⌀D

3X ⌀0.08
[⌀2.0]
SPACED EVENLY
ON ⌀0.823 [20.9] BC

0.75
[19.1]

1.22
[31.1]

1.43
[36.2]

2.04
[51.8]
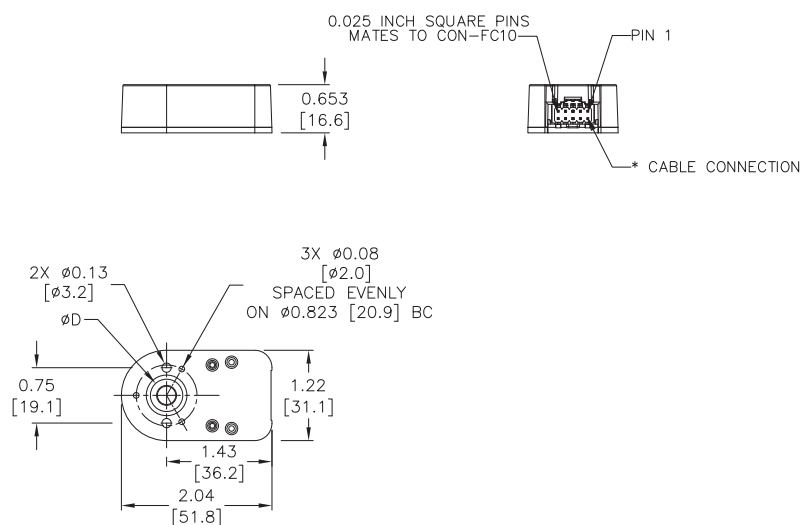
Bolt Hole Circles for Mounting	
Encoder	*Holes*
ENC1, ENC2, ENC3, ENC4, ENC5, ENC6, ENC7, ENC8	2 holes @ 19.05mm (.75") 3 holes @ 20.9mm (.823")

STP-MTRA-ENC2, 4, 6, 8
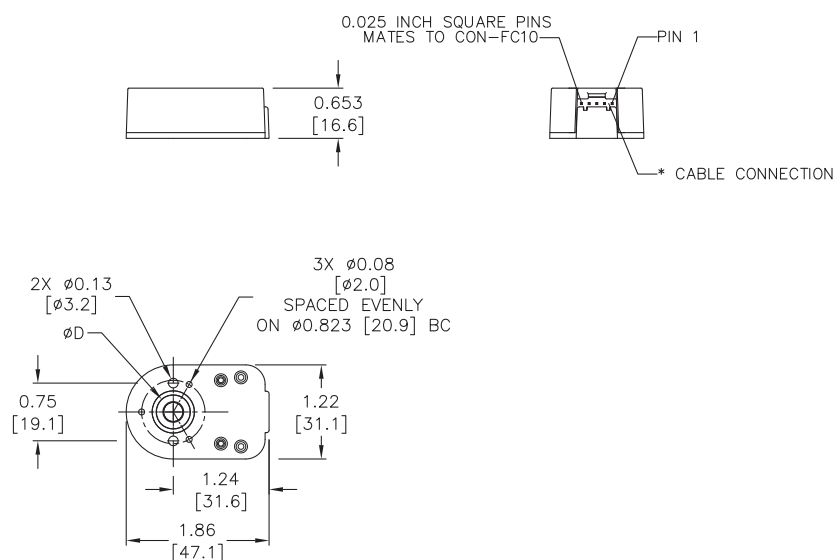
0.025 INCH SQUARE PINS
MATES TO CON—FC10

PIN 1

0.653
[16.6]

* CABLE CONNECTION

2X ⌀0.13
[⌀3.2]

⌀D

3X ⌀0.08
[⌀2.0]
SPACED EVENLY
ON ⌀0.823 [20.9] BC

0.75
[19.1]

1.22
[31.1]

1.24
[31.6]

1.86
[47.1]

SureStep®

Stepping System Accessories

SureStep® Stepping System Encoders

Dimensions = in [mm]

STP-MTRA-ENC11, 13

0.653
[16.6]

PIN 1

* CABLE CONNECTION TYPE

2X ⌀0.13
[⌀3.2]

⌀0.44
[⌀11.1] THRU
13.92 [0.548]
DEPTH 1.14 [0.045]

3X ⌀0.08
[⌀2.0]
SPACED EVENLY
ON ⌀0.823 [20.9] BC

0.75
[19.1]

1.22
[31.1]

1.81
[46.0]

⌀0.375
[⌀9.5]

1.43
[36.2]

2.04
[51.8]
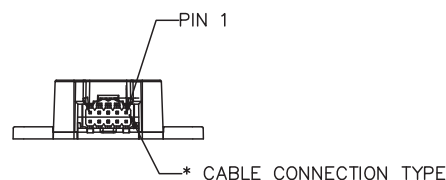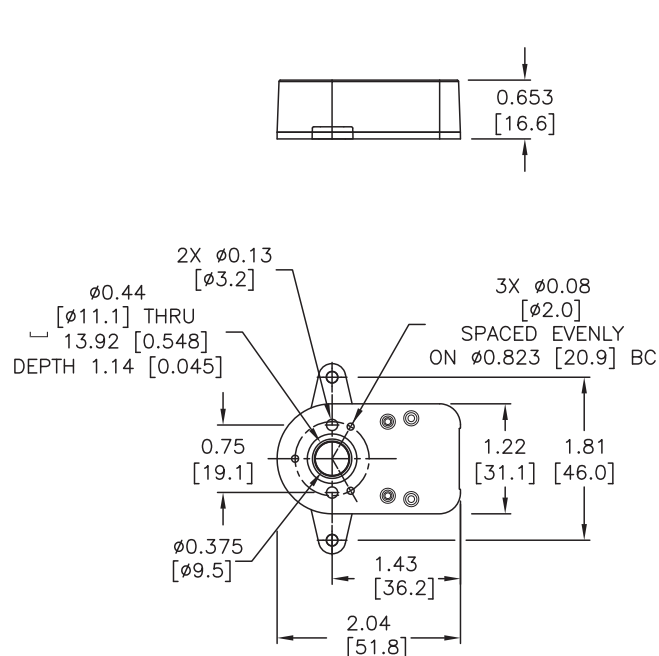
Bolt Hole Circles for Mounting	
Encoder	*Holes*
ENC11, ENC12, ENC13, ENC14	2 holes @ 19.05mm (.75") 3 holes @ 20.9mm (.823") 2 holes @ 46.02mm (1.812")

STP-MTRA-ENC12, 14

0.653
[16.6]

PIN 1

* CABLE CONNECTION TYPE

2X ⌀0.13
[⌀3.2]

⌀0.44
[⌀11.1] THRU
13.92 [0.548]
DEPTH 1.14 [0.045]

3X ⌀0.08
[⌀2.0]
SPACED EVENLY
ON ⌀0.823 [20.9] BC

0.75
[19.1]

1.22
[30.9]

1.81
[46.0]

⌀0.375
[⌀9.5]

1.19
[30.3]
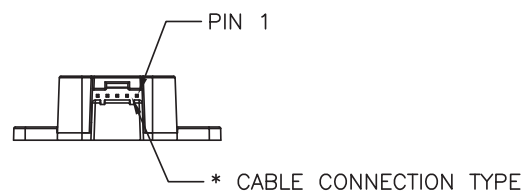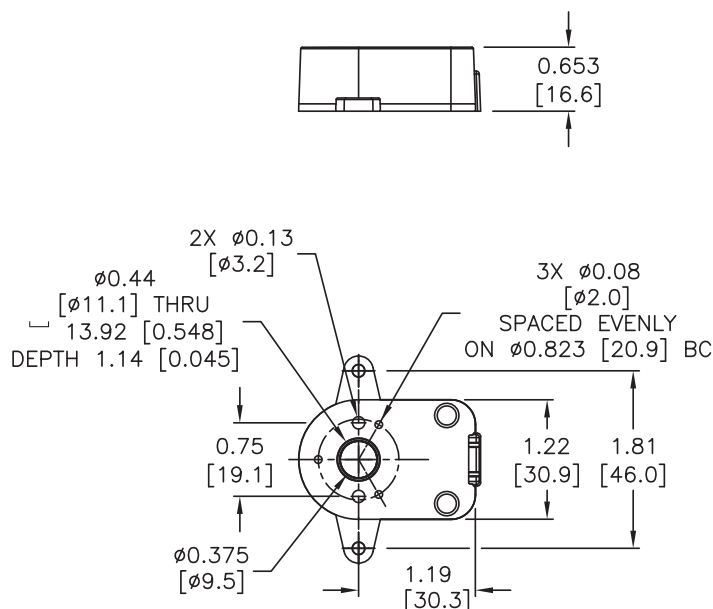
CUDEVICES

Stepping System Accessories

AMT Series Stepping System Encoders

CUI Devices' AMT series encoders are award-winning technologically advanced capacitive encoders with a variety of uses. Small, configurable, robust, and inexpensive, AMT encoders have won Product of the Year from Electronic's Weekly and from Electronic Products magazines.

AMT series encoders are typically mounted to the back of a stepper motor, but they can be used in many other applications. Instead of manufacturing many different encoders with different resolutions, CUI Devices offers the AMT series encoders with configurable pulses per revolution (PPR). The PPR can be set for most models using the free AMT Viewpoint software (available at https://www.automationdirect.com/support/software-downloads?itemcode=AMT%20ViewPoint). The AMT10 family of encoders are configured using DIP switches.

Encoder Model Overview

AMT series encoders include six distinct model lines (families) designed to meet specific needs.

CUI Devices AMT Series Encoders

- AMT10 – DIP switch configurable incremental quadrature encoders. Good for NEMA 14, NEMA 17, and NEMA 23/24 size motors.
- AMT11 – SW configurable resolution incremental quadrature encoders. Good for NEMA 14, NEMA 17, and NEMA 23/24 size motors (motor shaft sizes 2mm, 3mm, 1/8", 4mm, 3/16", 5mm, 6mm, 1/4", 8mm).
- AMT13 – Similar to AMT11, but these are larger sized and good for NEMA 34 and NEMA 42 motors (motor shaft sizes 9mm, 3/8", 10mm, 11mm, 12mm, 1/2", 13mm, 14mm, 5/8").
- AMT31 – A modified version of AMT11 with additional Hall-effect sensor outputs for commutation. This is needed for motors that don't have Hall-effect sensors mounted inside the motor. Typically "commutation encoders" are used with brushless DC (BLDC) motors and drives. Good for NEMA 14, NEMA 17, and NEMA 23/24 size motors.
- AMT33 – Same encoder + commutation features as the AMT31 family, but larger size for use with NEMA 34 and NEMA 42 motors.

Capacitive Encoders

A capacitive encoder is comprised of three main components: a rotor, a stationary transmitter, and a stationary receiver. The rotor contains a sinusoidal pattern and, as it rotates, the high frequency reference signal of the transmitter is modulated in a predictable way. The encoder detects the changes in capacitance-reactance on the receiver board and translates them, using a demodulation algorithm, into increments of rotary motion.

Advantages of Capacitive Encoders

Derived from the same principles used in digital calipers, capacitive encoders have an excellent track record. The AMT series has proven to be both highly reliable and accurate. A capacitive encoder is more rugged than an optical encoder, tolerating a range of environmental contaminants such as dust, dirt, and oil. Capacitive encoders also hold-up much better to vibration and temperature extremes. Further, with no LED, it has a longer lifetime, a smaller footprint, and lower current consumption (6 to 18 mA) than an optical encoder. Immune to magnetic interference and electrical noise, it is as rugged as a magnetic encoder, but delivers greater accuracy and higher resolution.

Given their digital nature, capacitive encoders also offer increased flexibility, allowing users to change the encoder's resolution while a typical optical or magnetic encoder must be swapped out each time a different resolution is needed.

AMT x x x x - V

Installation Kit
Models with -V include an installation kit

Output
S = Single-ended signals
Q = Line Driver (differential) encoder signals
D = Line Driver encoder + Line Driver commutation signals
F = Absolute encoder: 14-bit single-turn encoder
H = Absolute encoder: 14-bit multi-turn encoder

Connector Orientation
2 = radial
3 = axial

Encoder Series
10 = DIP switch configurable incremental
11 = SW configurable incremental
13 = NEMA 34/42 SW configurable incremental
31 = SW configurable incremental with commutation signals
33 = NEMA 34/42 SW configurable incremental with commutation signals

AMT series name

The programmable resolutions available in capacitive encoders are not only useful for system optimization, particularly when designing the PID control loop, but can reduce inventory holding, as one model can be used across multiple applications. Capacitive technology also allows the ability to digitally set the index pulse and alignment of the encoder for BLDC commutation, while its built-in diagnostic capabilities provide designers access to valuable system data for quick troubleshooting in the field.

![CUI DEVICES]

Stepping System Accessories

AMT Series Stepping System Encoders

Replacement Encoders

The AMT112Q-V is a replacement for the encoder that comes pre-mounted on the STP-MTR(x)-xxxxE step motors. Step motor part numbers that end in "E" have encoders pre-mounted on the rear shaft. Models that end in "D" are the same motors, without the pre-mounted encoders. If you would like a different encoder then should purchase the "D" model motor and the encoder separately.

Installation tools and mounting hardware are included with all CUI Devices brand AMT series replacement encoders. For more information and details on how to wire the replacement encoders, please see the SureStep User Manual.

PPR

CUI Devices defines PPR, pulses per revolution, as the number of high pulses per channel per revolution. CPR, the number of counts that a controller could determine from a quadrature encoder (both channels have a rising and a falling edge), is 4 x PPR.

For more information regarding PPR, CPR, or LPR (Lines Per Revolution) view https://www.cuidevices.com/blog/what-is-encoder-ppr-cpr-and-lpr.

Optional Encoders

Optional encoders can be purchased separately for standard integrated motor/drives and standalone dual-shaft motors in all NEMA 14, 17, 23, 34, and 42 motors. All "D" model (dual-shaft) step motors come with pre-drilled holes in the rear end cap for easy modular encoder mounting. Pre-installed encoders on standalone dual-shaft motors and standard integrated motor/drives can be retrofitted with an appropriate optional encoder if desired. Please see the chart on the following page for encoder compatibility.

AMT102-V
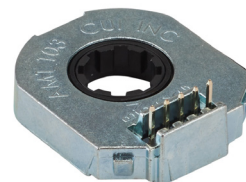
AMT103-V

	AMT Series Encoders		
Part Number	**listprice**	**Description**	**Drawing**
AMT102-V	$25.00	CUI Devices incremental (quadrature) modular encoder, 5 VDC, radial, push-pull (totem) output, DIP switch configurable up to 2048 ppr. For use with NEMA 14, 17, and 23 dual shaft motors.	PDF
AMT103-V	$25.00	CUI Devices incremental (quadrature) modular encoder, 5 VDC, axial, push-pull (totem) output, DIP switch configurable up to 2048 ppr. For use with NEMA 14, 17, and 23 dual shaft motors.	PDF
AMT112S-V	$41.50	CUI Devices incremental (quadrature) modular encoder, 5 VDC, radial, push-pull (totem) output, configurable up to 4096 ppr. For use with NEMA 14, 17, and 23 dual shaft motors.	PDF
AMT112Q-V	$46.50	CUI Devices incremental (quadrature) modular encoder, 5 VDC, radial, line driver (differential) output, configurable up to 4096 ppr. For use with NEMA 14, 17, and 23 dual shaft motors.	PDF
AMT312D-V	$54.00	CUI Devices incremental (quadrature)/commutation modular encoder, 5 VDC, radial, line driver (differential) encoder output, configurable up to 4096 ppr, line driver (differential) commutation output. For use with NEMA 14, 17, and 23 dual shaft motors.	PDF
AMT312S-V	$44.00	CUI Devices incremental (quadrature)/commutation modular encoder, 5 VDC, radial, push-pull (totem) encoder output, configurable up to 4096 ppr, push-pull (totem) commutation output. For use with NEMA 14, 17, and 23 dual shaft motors.	PDF

See Accessories section for configuration and signal cables.
CUI Devices Datasheets provide detailed encoder specifications. These datasheets can be found on each encoder's web page at www.automationdirect.com.

AMT112S-V

AMT312D-V

CUIDEVICES

Stepping System Accessories

AMT Series Stepping System Encoders

AMT Series Encoders, continued			
Part Number	Price	Description	Drawing
AMT132S-V	$44.00	CUI Devices incremental (quadrature) modular encoder, 5 VDC, radial, push-pull (totem) output, configurable up to 4096 ppr. For use with NEMA 34 and 42 dual shaft motors.	PDF
AMT132Q-V	$47.00	CUI Devices incremental (quadrature) modular encoder, 5 VDC, radial, line driver (differential) output, configurable up to 4096 ppr. For use with NEMA 34 and 42 dual shaft motors.	PDF
AMT332S-V	$48.50	CUI Devices incremental (quadrature)/commutation modular encoder, 5 VDC, radial, push-pull (totem) encoder output, configurable up to 4096 ppr, push-pull (totem) commutation output. For use with NEMA 34 and 42 dual shaft motors.	PDF
AMT332D-V	$52.00	CUI Devices incremental (quadrature)/commutation modular encoder, 5 VDC, radial, line driver (differential) encoder output, configurable up to 4096 ppr, line driver (differential) commutation output. For use with NEMA 34 and 42 dual shaft motors.	PDF

See Accessories section for configuration and signal cables.
CUI Devices Datasheets provide detailed encoder specifications. These datasheets can be found on each encoder's web page at www.automationdirect.com.

AMT132S-V
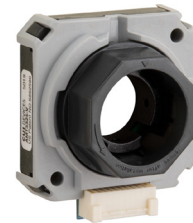
AMT332S-V

AMT Series Encoder Accessories		
Part Number	Price	Description
CUI-KIT-1	$6.50	CUI Devices encoder accessory kit, replacement. For use with CUI Devices AMT102 encoders. Includes (1) AMT102 base, (1) AMT102 wide base, and (1) AMT10 sleeve kit (9 sleeves sized from 2-8mm).
CUI-KIT-2	$6.50	CUI Devices encoder accessory kit, replacement. For use with CUI Devices AMT103 encoders. Includes (1) AMT standard base, (1) AMT standard wide base, and (1) AMT10 sleeve kit (9 sleeves sized from 2-8mm).
CUI-KIT-3	$6.50	CUI Devices encoder accessory kit, replacement. For use with CUI Devices AMT11, AMT21, and AMT31 encoders. Includes (1) AMT standard base, (1) AMT standard wide base, and (1) AMT standard sleeve kit (9 sleeves sized from 2-8mm).
CUI-KIT-4	$6.50	CUI Devices encoder sleeve kit, replacement. For use with CUI Devices AMT13 and AMT33 encoders. Includes (8) sleeves sized from 9-14mm.
STP-MTRA-SCRWKT-1	$5.50	SureStep encoder mounting screw kit, for use with all stepper encoders.

CUI-KIT-1

CUI-KIT-2

CUI-KIT-3

CUI-KIT-4

STP-MTRA-SCRWKT-1

![CUI DEVICES logo]

Stepping System Accessories

AMT Series Stepping System Encoders

AMT Series Encoder Compatibility

Part Number	Max PPR	Bore Diameter	Output Type	PLC Compatibility	Encoder Cable	Configuration Cable	Motor Compatibility
AMT102-V	2048	2mm, 3mm, 1/8", 4mm, 3/16", 5mm, 6mm, 1/4", 8mm	push-pull (totem) (radial connector)	BRX[1], CLICK C0-1xDxE-D2	CUI-3131-x CUI-3132-1FT	n/a	NEMA 14, 17, 23 dual-shaft
AMT103-V[2]	2048		push-pull (totem) (axial connector)		CUI-435-x CUI-3934-6FT	n/a	
AMT112S-V	4096		push-pull (totem)		AMT-17C-1-x	AMT-PGRM-17C	
AMT112Q-V	4096		line driver (differential)	P2-HSI, P3-HSI, BRX[1], CLICK C0-1xDxE-D2	AMT-17C-1-x	AMT-PGRM-17C	
AMT312D-V	4096		line driver (differential) encoder+commutation	P2-HSI, P3-HSI, BRX[1], CLICK C0-1xDxE-D2	AMT-17C-1-x	AMT-PGRM-17C	
AMT312S-V	4096		push-pull (totem) encoder+commutation	BRX[1], CLICK C0-1xDxE-D2	AMT-17C-1-x		
AMT132S-V	4096	9mm, 3/8", 10mm, 11mm, 12mm, 1/2", 13mm, 14mm, 5/8"	push-pull (totem)		AMT-18C-3-x	AMT-PGRM-18C	NEMA 34 and 42[3] dual-shaft (Does not fit STP-MTRAC-34 motors)
AMT132Q-V	4096		line driver (differential)	P2-HSI, P3-HSI, BRX[1], CLICK C0-1xDxE-D2	AMT-18C-3-x		
AMT332S-V	4096		push-pull (totem) encoder+commutation	BRX[1], CLICK C0-1xDxE-D2	AMT-18C-3-x		
AMT332D-V	4096		line driver (differential) encoder+commutation	P2-HSI, P3-HSI, BRX[1], CLICK C0-1xDxE-D2	AMT-18C-3-x		

Note: For specific AutomationDirect PLC and step motor model compatibility, please see Appendix A in the SureStep User Manual.
1 - Requires FC-ISO-C (see wiring diagrams for DIP switch settings).
2 - For AMT103-V to maintain NEMA23 compatibility, CUI-KIT-2 must be purchased to use the standard wide base for mounting.
3 - For STP-MTRAC(H)-42 series motors, encoder mounting kit STP-MTRA-42ENC is required.

AMT Series Encoder Signal Cables

Part Number	Price	Description	Drawing
CUI-3132-1FT	$5.00	CUI Devices encoder cable, 5-pin connector to pigtail, 1ft cable length. For use with CUI Devices AMT102 encoders.	PDF
CUI-3131-6FT	$10.50	CUI Devices encoder cable, 5-pin connector to pigtail, shielded, twisted pair, 6ft cable length. For use with CUI Devices AMT102 encoders.	PDF
CUI-3131-10FT	$30.00	CUI Devices encoder cable, 5-pin connector to pigtail, shielded, twisted pair, 10ft cable length. For use with CUI Devices AMT102 encoders.	PDF
CUI-3131-20FT	$49.00	CUI Devices encoder cable, 5-pin connector to pigtail, shielded, twisted pair, 20ft cable length. For use with CUI Devices AMT102 encoders.	PDF
CUI-435-1FT	$5.50	CUI Devices encoder cable, 5-pin connector to pigtail, 1ft cable length. For use with CUI Devices AMT103 encoders.	PDF
CUI-3934-6FT	$26.50	CUI Devices encoder cable, 5-pin connector to pigtail, shielded, twisted pair, 6ft cable length. For use with CUI Devices AMT103 encoders.	PDF
CUI-435-10FT	$22.00	CUI Devices encoder cable, 5-pin connector to pigtail, 10ft cable length. For use with CUI Devices AMT103 encoders.	PDF
CUI-435-20FT	$30.00	CUI Devices encoder cable, 5-pin connector to pigtail, 20ft cable length. For use with CUI Devices AMT103 encoders.	PDF
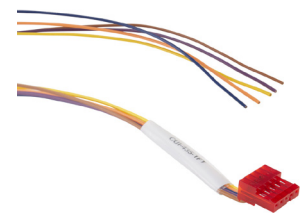
CUI-435-1FT
CUI-435-10FT
CUI-435-20FT

CUI-3131-6FT
CUI-3131-10FT
CUI-3131-20FT

CUI-3132-1FT

CUI-3934-6FT

CUDEVICES

Stepping System Accessories

AMT Series Stepping System Encoders

AMT Series Encoder Signal Cables

Part Number	Price	Description	Drawing
AMT-17C-1-036	$40.00	CUI Devices encoder cable, 17-pin connector to pigtail, shielded, twisted pair, 3ft cable length. For use with CUI Devices AMT112 and AMT312 encoders.	PDF
AMT-17C-1-072	$81.00	CUI Devices encoder cable, 17-pin connector to pigtail, shielded, twisted pair, 6ft cable length. For use with CUI Devices AMT112 and AMT312 encoders.	PDF
AMT-17C-1-120	$121.00	CUI Devices encoder cable, 17-pin connector to pigtail, shielded, twisted pair, 10ft cable length. For use with CUI Devices AMT112 and AMT312 encoders.	PDF
AMT-18C-3-036	$27.50	CUI Devices encoder cable, 18-pin connector to pigtail, shielded, twisted pair, 3ft cable length. For use with AMT13 and AMT33 encoders.	PDF
AMT-18C-3-072	$67.00	CUI Devices encoder cable, 18-pin connector to pigtail, shielded, twisted pair, 6ft cable length. For use with AMT13 and AMT33 encoders.	PDF
AMT-18C-3-120	$105.00	CUI Devices encoder cable, 18-pin connector to pigtail, shielded, twisted pair, 10ft cable length. For use with AMT13 and AMT33 encoders.	PDF
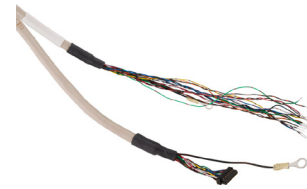
AMT-17C-1-036
AMT-17C-1-072
AMT-17C-1-120
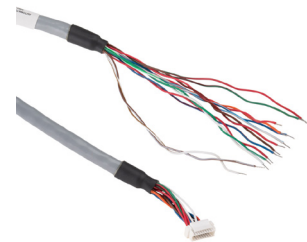
AMT-18C-3-036
AMT-18C-3-072
AMT-18C-3-120

AMT Series Encoders Programming Cables

Part Number	Price	Description
AMT-PGRM-17C	$27.00	CUI Devices programming cable, miniB-USB to 17-pin connector, 1ft cable length. For use with CUI Devices AMT112 and AMT312 encoders.
AMT-PGRM-18C	$24.50	CUI Devices programming cable, miniB-USB to 18-pin connector, 1ft cable length. For use with CUI Devices AMT13 and AMT33 encoders.

AMT-PGRM-17C

AMT-PGRM-18C

CUDEVICES

Stepping System Accessories

AMT Series Stepping System Encoders

Line Driver Encoder Wiring Colors				
Encoder	AMT112Q-V AMT312D-V		AMT132Q-V AMT332D-V	
Pin Function	Pin #	STP-CLB-EBx AMT-17C-1-xxx Wire Color	Pin #	AMT-18C-3-xxx Wire Color
+5V	6	RED/BLK	6	RED/GRN
GND	4	BLK/RED	4	GRN/RED
A	10	WHT/BLK	8	BRN/WHT
Ā	11	BLK/WHT	9	WHT/BRN
B	8	GRN/BLK	10	GRN/WHT
B̄	9	BLK/GRN	11	WHT/GRN
Z	12	BLU/BLK	12	BLU/WHT
Z̄	13	BLK/BLU	13	WHT/BLU

Single Ended (Push-pull/Totem) Encoder Wiring Colors									
Encoder	AMT112S-V AMT312S-V		AMT132S-V AMT332S-V		AMT102-V			AMT103-V	
Pin Function	Pin #	STP-CLB-EBx AMT-17C-1-xxx Wire Color	Pin #	AMT-18C-3-xxx Wire Color	Pin #	CUI-3131-xxx Wire Color	CUI-3132-1FT Wire Color	Pin #	CUI-435-xxx Wire Color	CUI-3934-6FT Wire Color
+5V	6	RED/BLK	6	RED/GRN	5V	RED	ORG	5V	ORG	RED
GND	4	BLK/RED	4	GRN/RED	G	BLACK	BRN	G	BRN	BLACK
A+	10	WHT/BLK	8	BRN/WHT	A	WHT	BLU	A	BLU	WHT
B+	8	GRN/BLK	10	GRN/WHT	B	BRN	YEL	B	YEL	BRN
Z+	12	BLU/BLK	12	BLU/WHT	X	GRN	PUR	X	PUR	GRN

Single Ended (Push-pull/Totem) Commutation Wiring Colors				
Encoder	AMT312S-V		AMT332S-V	
Pin Function	Pin #	AMT-17C-1-xxx Wire Color	Pin #	AMT-18C-3-xxx Wire Color
+5V	6	RED/BLK	6	RED/GRN
GND	4	BLK/RED	4	GRN/RED
U+	3	BRN/BLK	3	BRN/RED
W+	5	ORG/BLK	5	ORG/RED
V+	7	RED/WHT	7	BLU/RED

Stepping System Accessories

AMT Series Encoders – PLC Connectivity

Line Driver Encoder to Line Driver PLC Input

Line Driver (Differential) Encoder

PLC/Controller
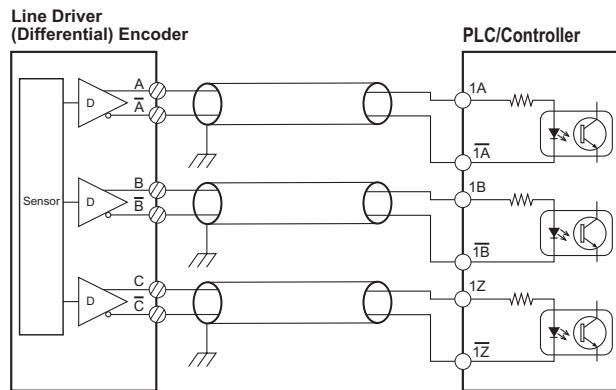
Single Ended (Push-pull/Totem) Encoder to Sourcing PLC

Single Ended (Totem) Encoder

PLC/Controller

5VDC
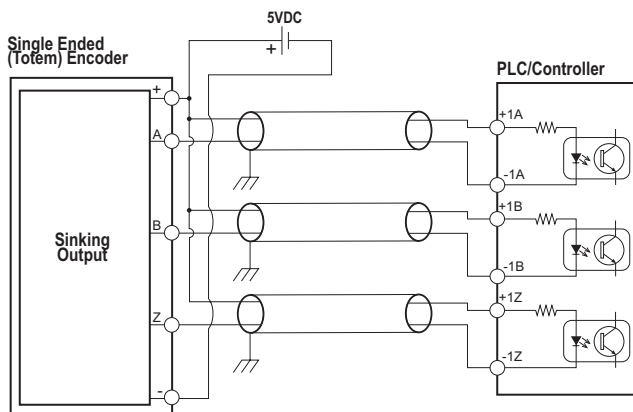
Single Ended (Push-pull/Totem) Encoder to Sinking PLC

Single Ended (Totem) Encoder

PLC/Controller

5VDC
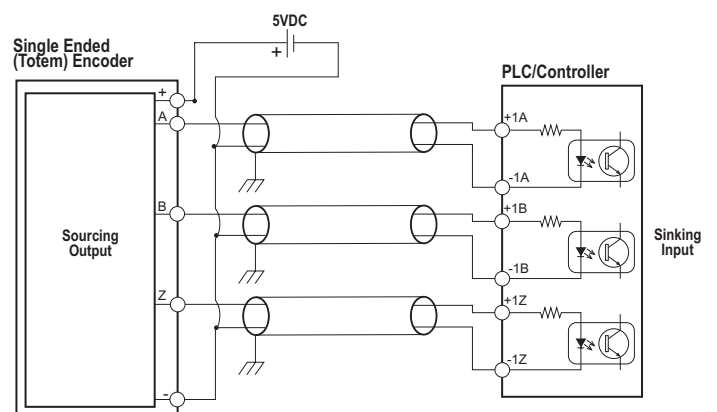
Stepping System Accessories

SureStep® Microstepping Drives Accessories

SureMotion Pro Drive Configuration Software - for Advanced Stepper Drives and Advanced Integrated Motor/Drives

Free Download
SureMotion Pro configuration software is available as a free download from our website for SureStep advanced components (STP-DRV-4850, -80100, & STP-MTRD-xxxxxR).

- Completely replaces SureStep Pro. Required for integrated motor/drives.
- Used for easy configuration and setup of the drive, including drive, motion control mode, I/O, motor.
- Open, Save, Upload, Download configuration files to Advanced Drives and Drive/Motors.
- Status Monitor screen aids in troubleshooting alarms and faults.
- Self Test Mode verifies motor wiring and functionality.
- SCL Terminal window allows testing/verification of SCL (serial ASCII) commands before PLC programming begins.
- Help files include technical data, application information, advanced setup, serial command instructions.
- Runs on 32-bit/64-bit Windows operating systems.

SureStep Drive Configuration Software - for Advanced Stepper Drives		
Part Number	**Price**	**Description**
SM-PRO	$10.50	SureMotion Pro Windows configuration software, USB drive or free download. For use with SureStep stepper drives with serial port. Requires PC serial port, USB-RS232 or STP-USB485-4W serial adapters.

* Available for purchase on USB or can be downloaded for free from the AutomationDirect Web site (www.AutomationDirect.com).

Stepping System Cables

SureStep® Cables

SureStep Series – Stepping System Cables						
Cable	Price	Purpose	Length	Use With	Cable End Connectors	Drawing
STP-EXT-006	$16.00	motor to drive extension	6 ft	STP-MTR-xxxxx(x)	pigtail / Molex 43020-0401 connector	PDF
STP-EXT-010	$18.00		10 ft			PDF
STP-EXT-020	$25.00		20 ft			PDF
STP-EXTH-006	$31.00		6 ft	STP-MTRH-xxxxx(x)	pigtail / Molex 39-01-2041 connector	PDF
STP-EXTH-010	$36.00		10 ft			PDF
STP-EXTH-020	$45.50		20 ft			PDF
STP-EXTHW-006	$62.00		6 ft	STP-MTRHW-xxxxx(x)	Bulgin # PXP4011/06P/6065	PDF
STP-EXTHW-010	$78.00		10 ft			PDF
STP-EXTHW-020	$113.00		20 ft			PDF
STP-EXTL-006	$13.00		6 ft	STP-MTRL-xxxxx(x)	pigtail / Molex 105308-22004 connector	PDF
STP-EXTL-010	$16.50		10 ft			PDF
STP-EXTL-020	$21.00		20 ft			PDF
STP-EXTW-006	$61.00		6 ft	STP-MTRW-xxxxx(x)	Bulgin # PXP4011/06P/6065	PDF
STP-EXTW-010	$76.00		10 ft			PDF
STP-EXTW-020	$107.00		20 ft			PDF
STP-EXT42-006	$28.50	motor to drive extension	6 ft	STP-MTRAC-42xxxx	10-pin / pigtail	PDF
STP-EXT42-010	$34.00		10 ft			PDF
STP-EXT42-020	$50.00		20 ft			PDF
STP-EXT42H-006	$28.50		6 ft	STP-MTRACH-42xxxxx		PDF
STP-EXT42H-010	$34.00		10 ft			PDF
STP-EXT42H-020	$50.00		20 ft			PDF
STP-232RJ11-CBL*	$19.00	programming/ communication	10 ft	STP-DRV-4850, STP-DRV-80100	DB9 female / RJ11(6P4C)	PDF
STP-232HD15-CBL-2**	$19.00	communication	6.6 ft	STP-DRV-4850, STP-DRV-80100 DL06, D2-250-1, D2-260	HD 15-pin male / RJ12 6-pin plug	n/a
STP-232RJ12-CBL-2**	$12.00	communication	6.6 ft	STP-DRV-4850, STP-DRV-80100 DL05, CLICK	RJ11 (6P4C) plug / RJ12 6-pin plug	n/a
STP-CBL-CA6	$42.00	control cable	6 ft	STP-MTRD-17038 STP-MTRD-17038E	11-pin / pigtail	PDF
STP-CBL-CA10	$60.00	control cable	10 ft		11-pin / pigtail	PDF
STP-CBL-CA20	$108.00	control cable	20 ft		11-pin / pigtail	PDF
STP-CBL-EA6	$39.00	encoder cable	6 ft	STP-MTRD-xxxxxE STP-MTRA-ENC1, STP-MTRA-ENC3 STP-MTRA-ENC5, STP-MTRA-ENC7 STP-MTRA-ENC11, STP-MTRA-ENC13 (for line driver encoders)	10-pin / pigtail	PDF
STP-CBL-EA10	$40.00	encoder cable	10 ft		10-pin / pigtail	PDF
STP-CBL-EA20	$69.00	encoder cable	20 ft		10-pin / pigtail	PDF
STP-CBL-EB3	$67.00	encoder cable	3 ft	AMT112Q-V AMT112S-V (for both line driver and push-pull (totem) encoders)	17-pin / pigtail	PDF
STP-CBL-EB6	$94.00	encoder cable	6 ft		17-pin / pigtail	PDF
STP-CBL-EB10	$131.00	encoder cable	10 ft		17-pin / pigtail	PDF
STP-CBL-EB20	$221.00	encoder cable	20 ft		17-pin / pigtail	PDF
STP-CBL-ED6	$42.00	encoder cable	6 ft	STP-MTRA-ENC2, STP-MTRA-ENC4 STP-MTRA-ENC6, STP-MTRA-ENC8 STP-MTRA-ENC12, STP-MTRA-ENC14 (for push-pull (totem) encoders)	5-pin / pigtail	PDF
STP-CBL-ED10	$57.00	encoder cable	10 ft		5-pin / pigtail	PDF
STP-CBL-ED20	$68.00	encoder cable	20 ft		5-pin / pigtail	PDF
STP-CON-1	$37.00	replacement connector kit	n/a	STP-DRV-4845 & -6575	-	n/a
STP-CON-2	$37.00	replacement connector kit	n/a	STP-DRV-4850 & 80100	-	n/a

*Programming/communication cable STP-232RJ11-CBL is 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.

SureStep® Logo

SureStep® Cables, *continued*

SureStep Series – Stepping System Cables						
Cable	Price	Purpose	Length	Use With	Cable End Connectors	Drawing
STP-CON-3	$62.00	replacement connector kit	n/a	STP-MTRD-xxxxxR	-	n/a
STP-CON-4	$35.00	replacement connector kit	n/a	STP-DRVA-RC-050A	-	n/a
STP-CON-5	$35.00	replacement connector kit	n/a	STP-DRV-4830	-	PDF
STP-CON-6	$38.00	replacement connector kit	n/a	STP-DRVAC-24025	-	n/a
STP-485DB9-CBL-2	$64.00	4-wire programming cable	6.5 ft	STP-MTRD-xxxxxR	DB9 / Phoenix 5-conductor plug	PDF

STP-EXT(x)-0xx Extension Cable Wiring Diagram

EXT & EXTH CABLES

PIN#	COLOR
1	RED
2	WHITE
3	GREEN
4	BLACK

EXTL CABLES

PIN#	COLOR
1	RED
2	WHITE
3	GREEN
4	BLACK

PIN #4
PIN #2
PIN #3
PIN #1

PIN #1
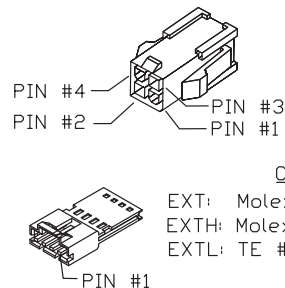
CONNECTORS:
EXT: Molex #43020-0401
EXTH: Molex #39-01-2041
EXTL: TE #103653-3

1.0" ref   L   2.00" / 1.00"

HEAT SHRINK

UNSHIELDED CABLE:
(4) 20 AWG cond
(4) 18 AWG cond
(4) 24 AWG cond
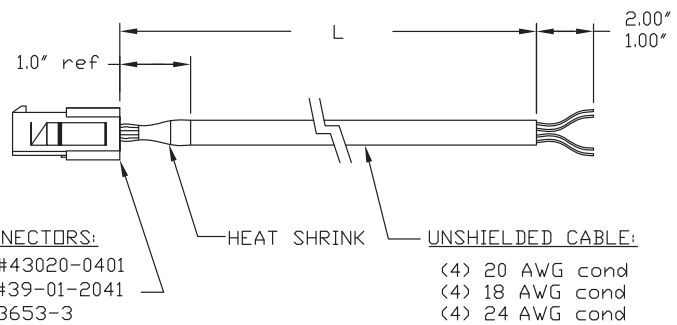
STP-EXTW-0xx and STP-EXTHW-0xx Extension Cable Wiring Diagram

1.8 [46.35]
0.50 [12.70]
Ø0.77 [Ø19.60]

L ±0.50 [L ±12.70]
1.00±0.25 [25.40±6.35]

LABEL:

STP-EXTW-0XX
or
STP-EXTHW-0XX

18AWG SHIELDED CABLE:
BELDEN # 9418
(OR EQUIVALENT)

PIN # 1
PIN # 5
PIN # 2
PIN # 6
PIN # 3
PIN # 4

PIN OUT CONNECTION		
PIN #	COLOR	PHASE
1	RED	A+
2	WHITE	A-
3	GREEN	B+
4	BLACK	B-
5	GROUND	GROUND
6	N/A	N/A

VIEW FROM PIN CONNECTION
Connector: Bulgin # PXP4011/06P/6065
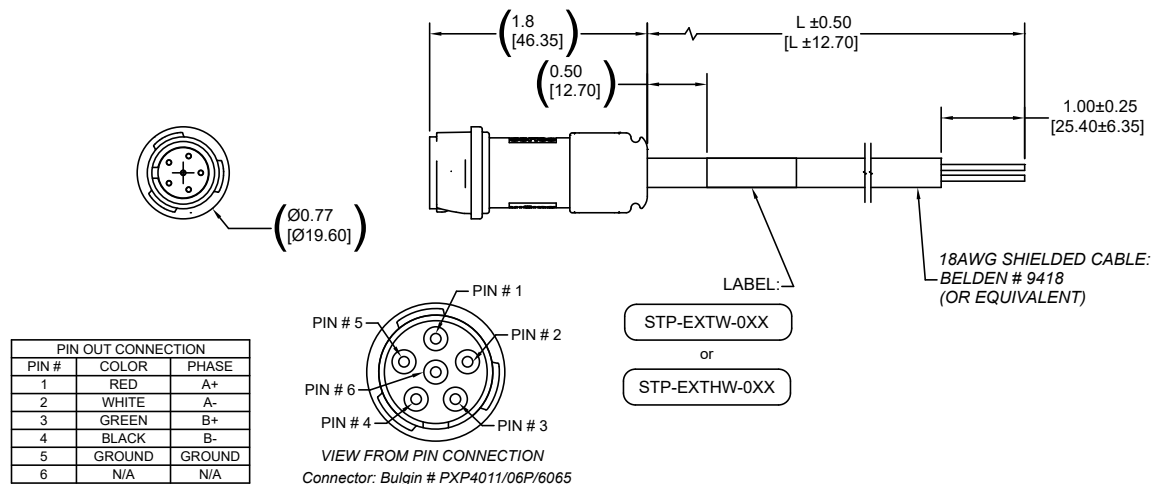
SureStep®

Stepping System Cables

SureStep® Cables, continued

STP-232RJ11-CBL Programming Cable Wiring Diagram

3050±50 mm [10 ft]

P1

P2

9   5
6   1

PIN1
PIN6

INNER MOLDED # YCEDC-C073
OUTER MOLDED # YCEDC-C074

CORE OVER MOLDED # YC-CORE0038   RJ11 6P4C

STP-232RJ11-CBL
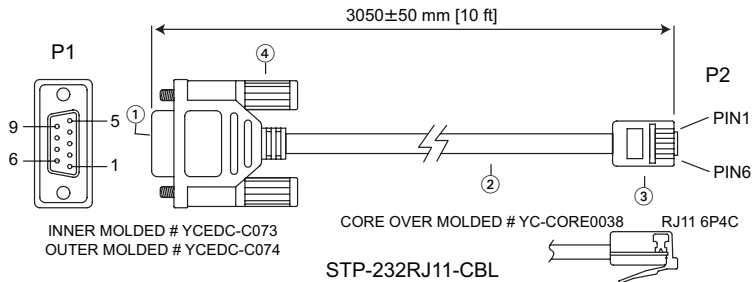
WIRE CONNECTION

(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

STP-485DB9-CBL-2 4-wire Programming Cable Wiring Diagram

CONNECTION CHART				
DB-9 CONN PIN	DB9 SIGNAL	WIRE COLOR	PHOENIX PIN	PHOENIX SIGNAL
2	TX+	RED	5	RX+
1	TX−	ORANGE	4	RX−
3	RX+	BLACK	3	TX+
4	RX−	BROWN	2	TX−
5	GND	YELLOW	1	GND
METAL HOUSING	SHIELD	SHIELD	N/C	N/C

2000+50

SEE CONNECTION TABLE

SHELL KIT: AMP# 5-748677-1 OR APPROVED EQUIVALENT
PLUG: AMP# 1757820-1 OR APPROVED EQUIVALENT
CONTACTS: 9X − AMP 205090-1

AUTOMATION DIRECT
STP-485DB9-CBL-2

CONNECTOR ENLARGED
TO SHOW PINOUTS

PIN 1

9   5
6   1

DB-9 PIN NUMBERS
VIEWED FROM END

CONNECTOR: PHOENIX CONTACT 1881354

Stepping System Cables

SureStep® Cables, continued

STP-CBL-CAxx Control Cable Wiring Diagram

C 1		
PIN NO:	SIGNAL	WIRE COLOR
1	STEP+	ORANGE
2	STEP−	BROWN
3	DIR+	YELLOW
4	DIR−	GREEN
5	EN+	BLUE
6	EN−	TAN
7	OUT+	GRAY
8	OUT−	WHITE
9	N.C.	PINK
10	V−	BLACK
11	V+	RED
12	N/C	PURPLE − CUT

Note: For Rev A of this cable, STEP+ is Grey/Pink and EN- is Red/Blue

(1.9±0.19IN)
50±5MM

L*
* Refer to STP-CBL-CAxx part number for cable length information

10±2

25   50

A

C 1

SHRINK TUBING 2 PLCS

AUTOMATIONDIRECT STP−CBL−CAXX

A

PIN

AWG22 WIRES STRIPPED 5MM, TINNED

HOUSING TYCO 4−643498−1
COVER TYCO 1−643075−1

STP-CBL-EAxx Encoder Cable Wiring Diagram

LENGTH 2

MOLEX 15−04−5104 CONNECTOR
MOLEX 50−57−9305 / 16−02−0069 CRIMPS

LEADS (SEE COLORS/CONNECTION TABLE)

POS 1

2
10   9

0.75±.125

3±.12

STRIP AND TIN 0.4±.12

SHRINK TUBE 0.5±.12

STP−CBL−EAXX

HEAT SHRINK

1.5±.25

0.5±.125

5±0.5

REFER TO TABULATION CHART,
2 SHRINK WRAP LABEL TO READ:
STP−CBL−EAXX

CONN	CONNECTION TABLE		
PIN	LEAD COLOR	SIGNAL	
2	GREEN/WHITE	GROUND	TWISTED PAIR
7	GREEN	POWER+	
3	ORANGE/WHITE	Z−	TWISTED PAIR
4	ORANGE	Z+	
5	BLUE/WHITE	A−	TWISTED PAIR
6	BLUE	A+	
9	BROWN/WHITE	B−	TWISTED PAIR
10	BROWN	B+	
1	N/C	N/A	NO CONNECTION
8	N/C	N/A	

WIRE: 24AWG, CABLE: UL2464.

STP-CBL-EBxx Encoder Cable Wiring Diagram

NOTE:
1. Case_GND is connected internally to GND (BLACK/RED)
2. Ground connected internally to cable shielding-customer ref. only
3. Tolerance: ± 0.2" [5] unless otherwise specified
4. All meterials must be ROHS compliant

TABLE INFORMATION	
CABLE NUMBER	CABLE LENGTH L
STP-CBL-EB3	3 Feet
STP-CBL-EB6	6 Feet
STP-CBL-EB10	10 Feet
STP-CBL-EB20	20 Feet

L ±0.5

1.50 ±0.05 [38.100 ±1.270]

6.0 [152.400]

0.25±0.05 [6.350±1.270]

2

A

3

1

round dual shielding jacket

Leads Stripped and Tinned

Case_GND
Note 1

#8 Insulated Terminal Ring or Equivalent

A

3.0 [76.20]

0.5 [13]

heat shrink tube with glue 2X (1 [25])

Special Label
PANDUIT # LJSL5-Y3-2.5
AUTOMATION DIRECT
STP-CBL-EBxx

Ground

3.0 [76.20]

Note 2

#8 Insulated Terminal Ring or Equivalent

Connector Pinout			
		Color	
#	Function	Primary	Stripe
4	GND	Black	Red
6	+5V	Red	Black
8	B+	Green	Black
9	B-	Black	Green
10	A+	White	Black
11	A-	Black	White
12	Z+	Blue	Black
13	Z-	Black	Blue

17 15 13 11 9 7 5 3 1

16 14 12 10 8 6 4 2

SECTION A-A
SCALE 3:1
(Back of Connector Housing)

PARTS LIST			
#	PART	DESCRIPTION	QTY
1	CABLE	3M # 3600B/14	1
2	CONNECTOR	JAE # FI-W175	1
3	CRIMP PINS	JAE #FI-C3-A1-15000	8

Stepping System Cables

SureStep® Cables, continued

STP-CBL-EDxx Encoder Cable Wiring Diagram

STP—EDxx CABLES

PIN#	Function	Color
1	Ground	Black
2	Index	Green
3	A Channel	White
4	+5VDC Power	Red
5	B Channel	Brown

TABLE INFORMATION	
CABLE NUMBER	CABLE LENGTH L
STP-CBL-ED6	6 Feet
STP-CBL-ED10	10 Feet
STP-CBL-ED20	20 Feet

SPECIAL LABEL:
PANDUIT# LJSL5-Y3-2.5

STP-CBL-EDxx
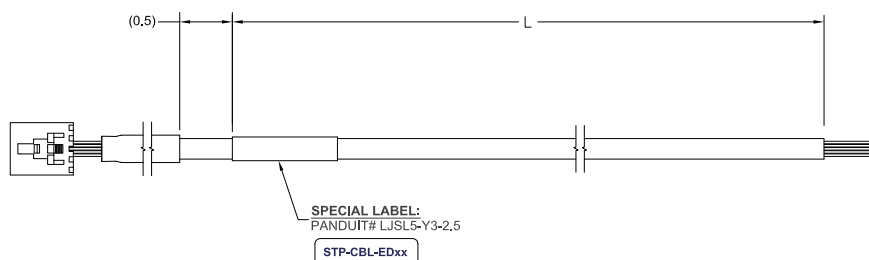
STP-EXT42(H)-xxx Cable Wiring Diagram

HEAT SHRINK

LABEL   UL2517 18AWG 8C   HEAT SHRINK

26±2   75±3
80±3
L
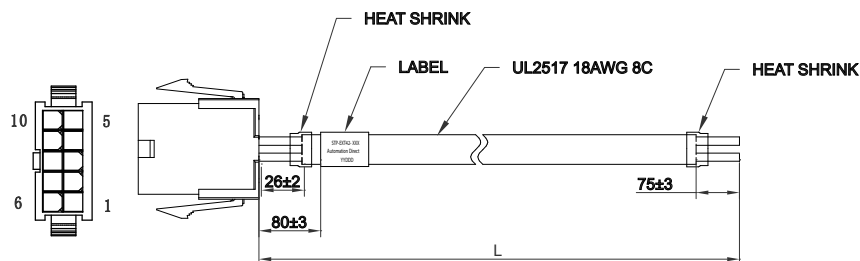
Pin	Wire Description
1	A - White
2	$\overline{A}$ - Orange
3	C - Green
4	$\overline{C}$ - Brown
5	B - Red
6	$\overline{B}$ - Yellow
7	D - Black
8	$\overline{D}$ - Blue
9	GND - Drain wire

Bi-polar series

WHT ORG BRN GRN   RED YEL BLU BLK
A+   A-   B+   B-

Bi-polar parallel

WHT ORG BRN GRN   RED YEL BLU BLK
A+   A-   B+   B-

WHT A
ORG $\overline{A}$
BRN $\overline{C}$
GRN C

B $\overline{B}$ $\overline{D}$ D
RED YEL BLU BLK
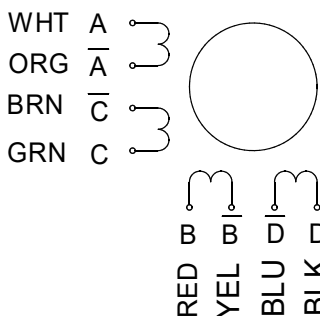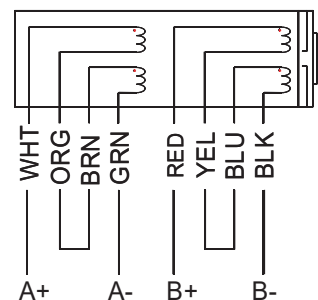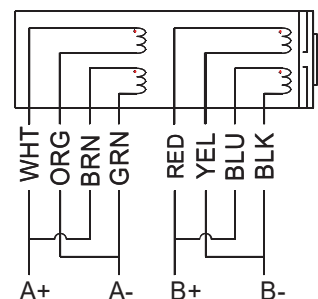
Stepping Systems with PLCs

Controller Compatibility

High Speed Pulse Motion Control with AutomationDirect PLCs* and SureStep® Stepping Systems			
PLC Series	*Starting at $213.00*	*Starting at $329.00*	*Starting at $391.00*
	BX-DM1x-10	*BX-DM1x-18*	*BX-DM1x-36*
Maximum Number of Axes	2	3	3
Output Signal Type	Sink/Source		
Maximum Pulse Rate (pulses/sec)	250,000		
Position Control	Trapezoidal Profiles (linear and S-curve ramps)		
Velocity Control	Dynamic Velocity (controlled accel/decel)		

High Speed Pulse 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 $365.00		CPUs starting at $735.00	
	P2000		P3000	
I/O Modules Pulse Outputs	P2-HSO		P3-HSO	
Maximum Number of Axes	2 per module, 22 per PLC rack, 44 per PLC system			
Output Signal Type	Line Driver	Sink/Source	Line Driver	Sink/Source
Maximum Pulse Rate (pulses/sec)	1,000,000	500,000	1,000,000	500,000
Position Control	Trapezoidal Profiles (linear and S-curve ramps)			
Velocity Control	Dynamic Velocity (controlled accel/decel)			
Maximum Number of Modules	11 per PLC rack, 22 per PLC system			

High Speed Pulse Motion Control with AutomationDirect PLCs* and SureStep® Stepping Systems			
PLC Series	*Starting at Retired*	*Starting at $252.00*	*Starting at $476.00*
	DL105	*DL05*	*DL06*
Built-In PLC Pulse Outputs	1 axis pulse output included with the PLC base unit		
Maximum Number of Axes	1 axis control**	1-2 axis control***	1-5 axis control***
Maximum Pulse Rate (pulses/sec)	7,000		10,000
Position Control	Trapezoidal Profiles (linear only)		
Velocity Control	Velocity Levels (no ramps available when changing velocity)		
I/O Modules Pulse Outputs		H0-CTRIO2 (1 axis per module)	
Maximum Pulse Rate (pulses/sec)		65,000	
Position Control	Not Applicable for DL105	Trapezoidal Profiles (linear & S-curve ramps)	
Velocity Control		Dynamic Velocity (controlled accel/decel)	
Maximum Number of Modules		1	4

* Any PLC capable of RS-232 ASCII communication can write serial commands to the STP-DRV-4850, -80100 Drives. Any PLC capable of RS-485 ASCII communication can write serial commands to the Advanced Integrated drives. Most AutomationDirect PLCs will communicate using either RS-232 or RS-485 communications, however we recommend using either Click, Productivity, or BRX (DoMore) as they are modern PLCs. DirectLogic will also work but is older technology.
** When using DC output models only. *** When using either DC output model or H0-CTRIO option module.

Stepping Systems with PLCs

Controller Compatibility (continued)

High Speed Pulse 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 Retired		CPUs starting at $437.00	
	DL205		Do-more	
I/O Modules Pulse Outputs	D2-CTRINT (1 axis per module)	H2-CTRIO2 (2 axes)	T1H-CTRIO (2 axes per module)	H2-CTRIO2 (2 axes)
Maximum Pulse Rate (pulses/ sec)	5,000	65,000	25,000	250,000
Position Control	Trapezoidal Profiles (linear and S-curve ramps)			
Velocity Control	Dynamic Velocity (controlled accel/decel)			
Maximum Number of Modules	1	1-8		

* Any PLC capable of RS-232 ASCII communication can write serial commands to the STP-DRV-4850, -80100 Drives. Any PLC capable of RS-485 ASCII communication can write serial commands to the Advanced Integrated drives. Most AutomationDirect PLCs will communicate using either RS-232 or RS-485 communications, however we recommend using either Click, Productivity, or BRX (DoMore) as they are modern PLCs. DirectLogic will also work but is older technology.

** using D2-CITRANT or Hx-CTRIO modules.

Stepping Drives

![Leadshine]

Leadshine 2-phase Digital Stepper Drives

Leadshine has been an industry leading motion control supplier since 1997, and is one of the largest stepper drive manufacturers in the world. Leadshine steppers offer high quality products (Leadshine factories are ISO9001 certified) at very affordable prices. Leadshine steppers are simple, easy to use, long-lasting, and reliable.

AutomationDirect sells a wide range of linear and switching power supplies, stepper motors, cables, and PLCs with hi-speed outputs that are compatible with Leadshine stepper drives.

Features

- 2-phase digital stepper drives
- Anti-resonance for optimal torque, extra smooth motion, low motor heating and noise
- Motor auto-config on power up
- All drives support step and direction control, some models support CW/CCW as well
- Micro-stepping for smooth motor movement
- DIP switch configurable
- Wide range of input voltages supported (12-110 VDC, 18-80 VAC)

- Pulse input frequency up to 200kHz
- Soft-start with no "jump" when powered on
- Automatic idle-current reduction
- Protections for over-voltage and over-current
- NEMA 11, 14, 17, 23, 24, 34 and 42 frame size step motors supported

Leadshine Series – Drives Features Comparison1								
Drive Model	**DM322E**	**DM542E**	**DM556E**	**DM860E**	**DMA860E**	**DM805-AI**	**EM542S**	**EM556S**
Price	$32.50	$45.50	$50.00	$67.00	$87.00	$129.00	$59.00	$72.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Drive Type	2-phase digital stepper drive							
Supply Voltage	12–30 VDC (24 VDC typical)	20–50 VDC (24–48 VDC typical)		24–74 VDC (48–68 VDC typical)	24–110 VDC (48–90 VDC typical) or 18–80 VAC (36–70 VAC typical)	20–80 VDC (30–60 VDC typical)	20–50 VDC (24–48 VDC typical)	
Pulse Input Type	Single-ended2	Differential, Single-ended				Single-ended2	Differential, Single-ended	
Step Input Modes	Step & Direction			Step & Direction, CW & CCW		Step & Direction, Analog input	Step & Direction, CW & CCW	
Digital Input Voltage	5V (add a 1K resistor to accept +12V input, or a 2K resistor to accept +24V input)						DIP switch selectable for 5V or 24V	
PPR Range	400–12800	400–25600		400–51200		200-12800	200–25600	
Motor Output Current Range	0.3–2.2 A peak (0.2–1.6 RMS)	1.0–4.2 A peak (0.7–3.0 RMS)	1.8–5.6 A peak (1.3–4.0 RMS)	2.4–7.2 A peak (1.7–5.1 RMS)		2.6–7.0 A peak (0.3–5.0 RMS)	0.5-4.2A peak (0.4-2.9 RMS)	0.5-5.6A peak (0.4-3.9 RMS)
Digital Output	No						+24VDC (Brake and Fault Detection)	
Self-test Capable	No	No	No	No	No	Yes	Yes	Yes
Special Features	Soft-start, motor auto-config				Accepts a DC or an AC power supply, soft-start, motor auto-config	Built-in pulse generator, command source	Auto-tuning, soft-start, fault and brake outputs, shaft lock	

1 - Refer to Specifications Tables for detailed specifications.
2 - See the User Manual or Quick Start Guide for instructions on wiring Single-Ended drives to a Differential (Line Driver) controller.

Leadshine

Stepping Drives

DM542E

DMA860E

DM542E, DM556E, DM860E, DMA860E

The DM542E and DM556E drives are capable of pulse and direction operation, with auto-motor config on power up.

The DM860E and DMA860E drives possess the same capabilities but can also do CW and CCW pulse operation. The main difference between these models are output current range to the motor and supply voltage.

Leadshine DM542E, DM556E, DM860E, DMA860E Specifications				
Drive Model	*DM542E*	*DM556E*	*DM860E*	*DMA860E*
Output Current	1.0–4.2 A peak (0.7–3.0 RMS)	1.8–5.6 A peak (1.3–4.0 RMS)	2.4–7.2 A peak (1.7–5.1 RMS)	2.4–7.2 A peak (1.7–5.1 RMS)
Input Voltage	20–50 VDC (24–48 VDC typical)		24–74 VDC (48–68 VDC typical)	24–110 VDC (48–90 VDC typical) or 18–80 VAC (36–70 VAC typical)
Logic Signal Current	7–16 mA (10mA typical)			
Pulse Input Frequency	0–200 kHz			
Minimal Pulse Width	2.5 μs			
Minimal Direction Setup	5.0 μs			
Isolation Resistance	500mΩ			
Connector P1 Functions — PUL+ / PUL-	Pulse signal: 5V signal, differential input. High input is 4-5V, Low input is 0-0.5 V. Minimum pulse width = 2.5 μs. Add a 1kΩ resistor for +12V signals, 2kΩ for +24V signals.			
DIR+ / DIR-	Direction signal: 5V signal, differential input. High input is 4-5V, Low input is 0-0.5 V. Minimum pulse width = 2.5 μs. Add a 1kΩ resistor for +12V signals, 2kΩ for +24V signals. Direction Function: requires 5μs setup time. CW/CCW Function (DM860E and DMA860E only): see DIP switch SW14.			
ENA+ / ENA-	Enable signal: 5V signal, differential input. High input is 4-5V, Low input is 0-0.5 V. Minimum pulse width = 2.5 μs. Add a 1kΩ resistor for +12V signals, 2kΩ for +24V signals. Enable Function: Close (pull low) to disable the drive.			
Replacement Connectors	Power = DN-6PLUG, I/O = DN-4PLUG, Enable = DN-2PLUG			
Cooling	Natural cooling or forced cooling			
Ambient Temperature	0°C to 65°C (32°F to 149°F)			
Humidity	40–90% relative humidity			
Operating Temperature	0°C to 50°C (32°F to 122°F)			
Vibration	10–50 Hz / 0.15 mm			
Storage Temperature	-20°C to 65°C (-4°F to 149°F)			
Self Test	No			
Weight	227g (8 oz)	300g (10.6 oz)	510g (1.13 lbs)	510g (1.13 lbs)

![Leadshine logo]

Stepping Drives

Leadshine Drive Dimensions

Dimensions = in [mm]

DM542E
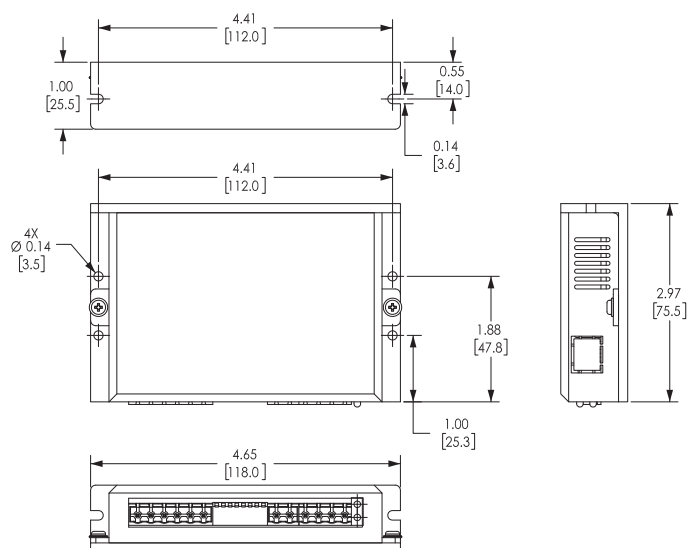
DM556E
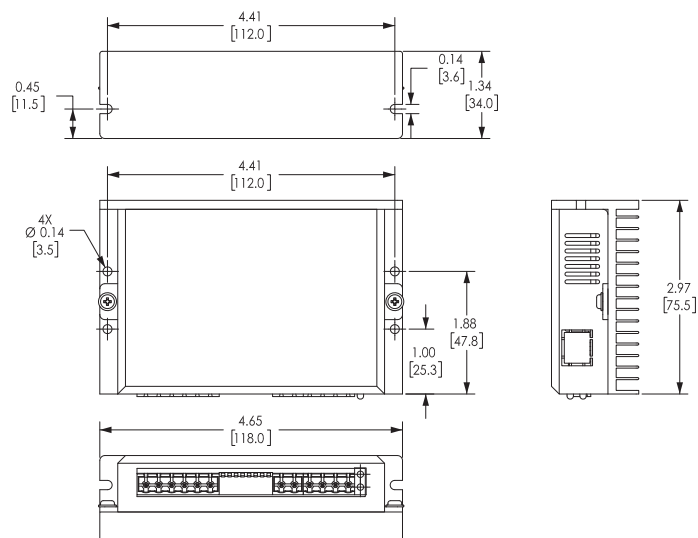
DM860E
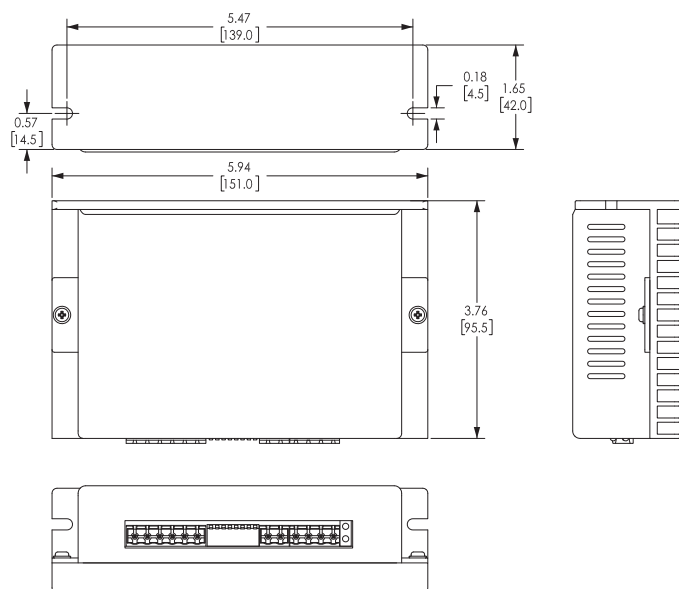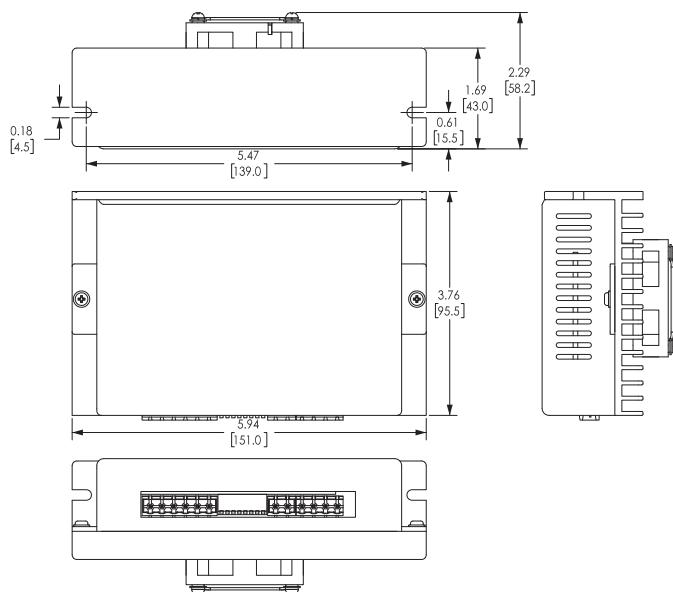
DMA860E

Leadshine Drive Wiring

DM542E, DM556E, DM860E, DMA860E
Connection to Open Collector Signal
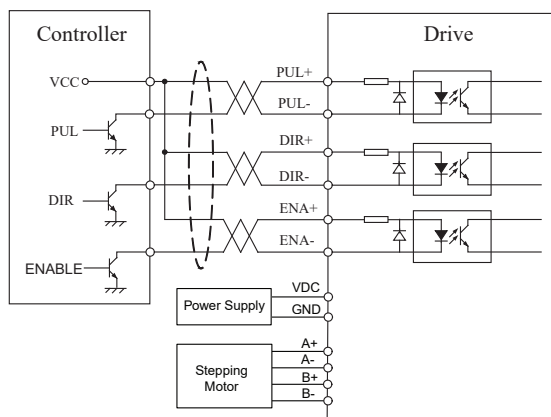
DM542E, DM556E, DM860E,
DMA860E Connection to PNP Signal
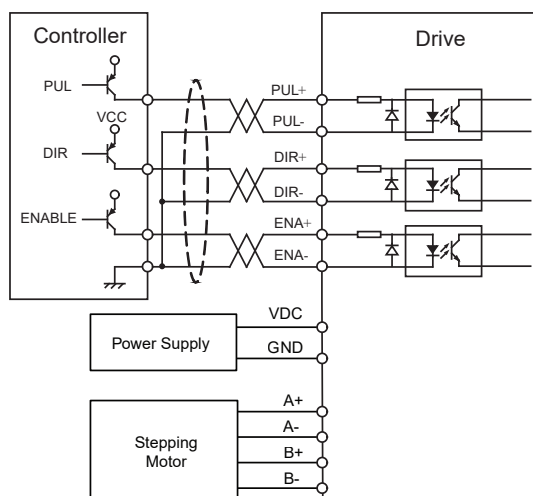
DM542E, DM556E, DM860E, DMA860E
Connection to Differential Signal
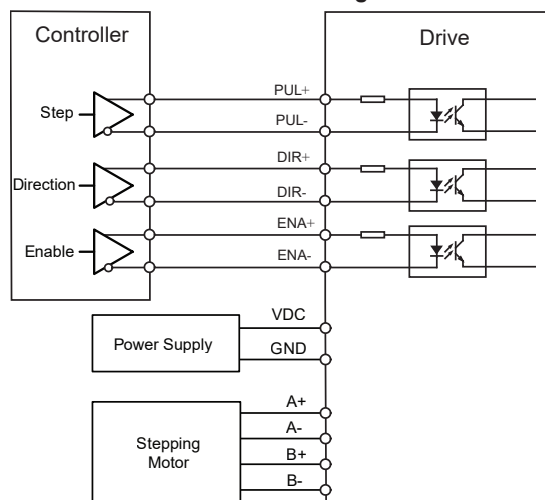
Leadshine

Stepping Drives

DM332E

The DM322E is a compact drive capable of pulse and direction operation, with motor auto-configuration on power up.

DM322E

Leadshine DM322E Specifications		
Drive Model	*DM322E*	
Output Current	0.3–2.2 A peak (0.2–1.6 RMS)	
Input Voltage	12–30 VDC (24 VDC typical)	
Logic Signal Current	7–16 mA (10mA typical)	
Pulse Input Frequency	0–70 kHz	
Minimal Pulse Width	7.5 µs	
Minimal Direction Setup	7.5 µs	
Isolation Resistance	100mΩ	
Connector P1 Functions	**PUL**	Pulse signal: 5V signal, single-ended input. High input is 4-5V, Low input is 0-0.5 V. Minimum pulse width = 2.5 µs. Add a 1k⎕ resistor for +12V signals, 2k⎕ for +24V signals.
	DIR	DIR signal: 5V signal, single-ended input. High input is 4-5V, Low input is 0-0.5 V. Minimum pulse width = 2.5 µs. Add a 1k⎕ resistor for +12V signals, 2k⎕ for +24V signals. Direction Function: requires 5µs setup time. CW/CCW Function: see DIP switch SW14.
	OPTO	This input is the voltage supply for the Pulse, Direction, and Enable opto-couplers. Connect 5VDC (or +12V, +24V with appropriate resistors on Pulse, Direction, and Enable inputs).
	ENA	Enable signal: 5V signal, single-ended input. High input is 4-5V, Low input is 0-0.5 V. Minimum pulse width = 2.5 µs. Add a 1k⎕ resistor for +12V signals, 2k⎕ for +24V signals. Enable Function: Close (pull low) to disable the drive.
Replacement Connectors	Power = 6-pin from STP-CON-4; I/O = 4-pin from STP-CON-5	
Cooling	Natural cooling or forced cooling	
Ambient Temperature	0°C to 65°C (32°F to 149°F)	
Humidity	40–90% relative humidity	
Operating Temperature	0°C to 50°C (32°F to 122°F)	
Vibration	10–50 Hz / 0.15 mm	
Storage Temperature	-20°C to 65°C (-4°F to 149°F)	
Self Test	No	
Weight	90g (3.5 oz)	

Leadshine

Stepping Drives

DM322E Dimensions and Wiring

Dimensions = in [mm]

3.07 [78.0]

0.50 [12.8]

0.16 [4.0]

2.19 [55.5]

1.08 [27.5]

0.16 [4.0]

0.85 [21.5]

3.39 [86.0]

DM322E Connection to Open Collector Signal

R=0 if VCC=5V
R=1K(Power>0.125W) if VCC=12V
R=2K(Power>0.125W) if VCC=24V
R must be connected to control signal terminal

Controller

VCC

PUL

DIR

ENABLE

DM322E Driver

OPTO   270Ω
PUL
270Ω
DIR
270Ω
ENA

Power Supply   VDC
GND

Stepping Motor   A+
A-
B+
B-

DM322E Connection to Differential Control Signal

R=0 if VCC=5V
R=1K(Power>0.125W) if VCC=12V
R=2K(Power>0.125W) if VCC=24V
R must be connected to control signal terminal

Controller

VCC
PUL+
PUL-
DIR+
DIR-
ENA+
ENA-

DM322E Driver

OPTO   270Ω
PUL
270Ω
DIR
270Ω
ENA

Power Supply   VDC
GND

Stepping Motor   A+
A-
B+
B-

Note: Although the controller has a pair of differential outputs (+,-), the + output is not used in this configuration with the DM322E.

Leadshine

Stepping Drives

DM805-AI

The DM805-AI is capable of pulse and direction as well as analog input and speed control, with motor auto-configuration on power up and motor self-test capability. Comes with built in potentiometers for adjusting accel and decel rates and can be controlled via an external potentiometer.
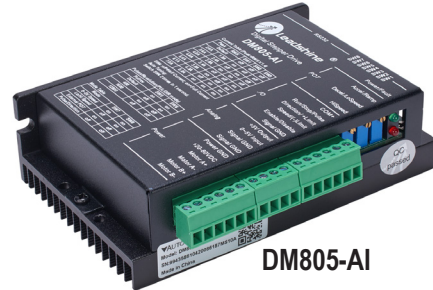
DM805-AI

Leadshine DM805-AI Specifications	
Drive Model	*DM805-AI*
Output Current	2.6–7.0 A peak (0.3–5.0 RMS)
Input Voltage	20–80 VDC (60VDC typical)
Logic Signal Current	7–16 mA (10mA typical)
Pulse Input Frequency	0–200 kHz
Minimal Pulse Width	2.5 µs
Minimal Direction Setup	5.0 µs
Isolation Resistance	500mΩ
Pin Functions *Run/Stop or Pulse*	Pulse signal: 5V signal, single-ended input. High input is 4-5V, Low input is 0-0.5 V. Minimum pulse width = 2.5 µs. Add a 1k resistor for +12V signals, 2k for +24V signals. Run/Stop Function: Close (pull low) to enable the motor.
Direction or +Limit	DIR signal: 5V signal, single-ended input. High input is 4-5V, Low input is 0-0.5 V. Minimum pulse width = 2.5 µs. Add a 1k resistor for +12V signals, 2k for +24V signals. Direction Function: requires 5µs setup time. (+)Limit Function: Close (pull low) to stop motor movement in the positive direction.
Speed or (-)Limit	Speed: 5V signal, single-ended input. High input is 4-5V, Low input is 0-0.5 V. Minimum pulse width = 2.5 µs. Add a 1k resistor for +12V signals, 2k for +24V signals. Speed Function (Low Speed/High Speed Mode): Close (pull low) to select Lo Speed pot setpoint. Open (float high) to enable Hi Speed pot setpoint. (-)Limit Function: Close (pull low) to stop motor movement in the negative direction.
Enable/Disable	Enable signal: 5V signal, single-ended input. High input is 4-5V, Low input is 0-0.5 V. Minimum pulse width = 2.5 µs. Add a 1k resistor for +12V signals, 2k for +24V signals. Enable Function: Close (pull low) to disable the drive.
Replacement Connectors	Power = 6-pin from STP-CON-4; I/O = 6-pin from STP-CON-4; Analog = 4-pin from STP-CON-4
Cooling	Natural cooling or forced cooling
Ambient Temperature	0°C to 50°C (32°F to 122°F)
Humidity	40–90% relative humidity
Operating Temperature	70°C (158°F) max
Vibration	4.9 m/s2 max
Storage Temperature	-20°C to 65°C (-4°F to 149°F)
Self Test	Yes
Configuration Cable	1.4.4-0609505-B3
Weight	264g (9.3 oz)

Leadshine Series Drive Cables		
Optional Configuration Cable	*Compatible With*	*Price*
1.4.4-0609505-B3	DM805-AI	$6.50

1.4.4-0609505-B3

Note: Configuration cable only required if using optional configuration software. Software configuration not necessary unless DIP switch settings and auto-tuning aren't sufficient for your application. Requires an RS232 port on your PC, or a USB to RS232 converter, like USB-RS232.

Note: ProTuner for DM805-AI is not officially supported by the manufacturer for Operating Systems newer than Windows 7. Some Win10 and Win11 PCs will still run the software, but there is no guarantee from the manufacturer. See a potential solution for newer OS compatibility in our Community Forum:
https://community.automationdirect.com/s/question/0D5Dp00000WPRm8KAH/fix-for-dm805ai-protune

Leadshine

Stepping Drives

DM805-AI Dimensions

Dimensions = in [mm]
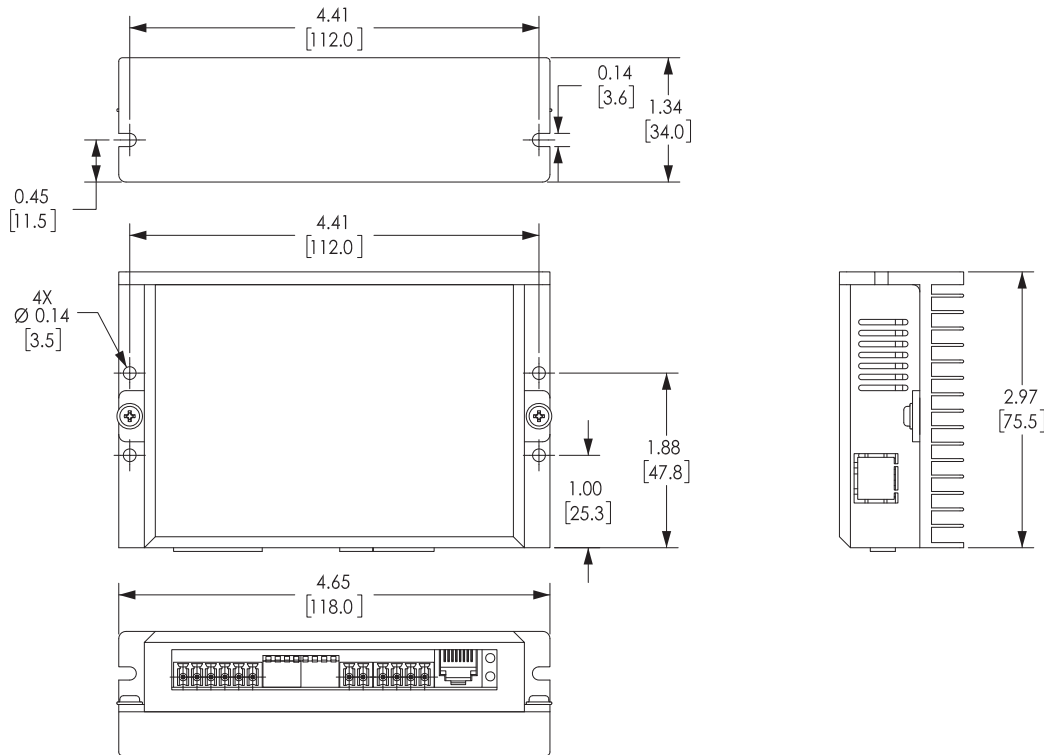
DM805-AI Wiring

The DM805-AI has four different operation modes that can be selected through DIP SW7 and SW8, and can also be wired to a differential controller.

DM805-AI Wiring for Analog Speed Mode
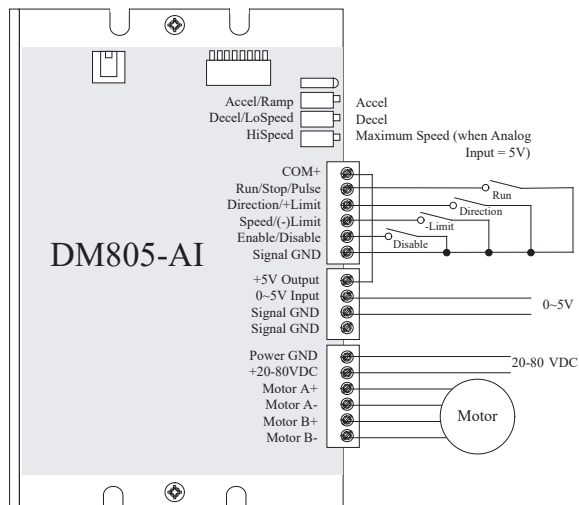
DM805-AI Wiring for External Pot Mode

Leadshine
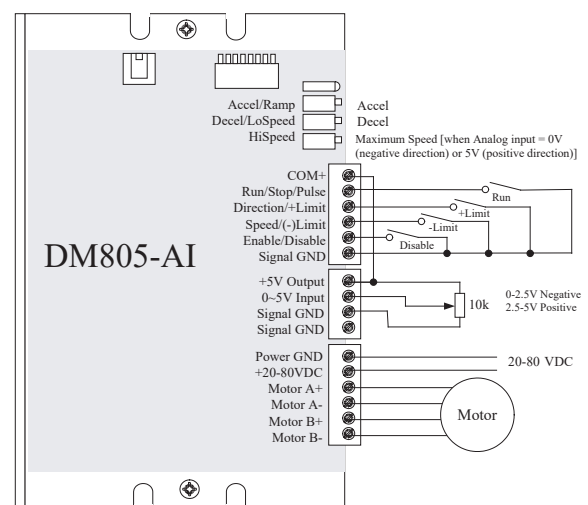
Stepping Drives

DM805-AI Wiring for Low/High Speed Mode
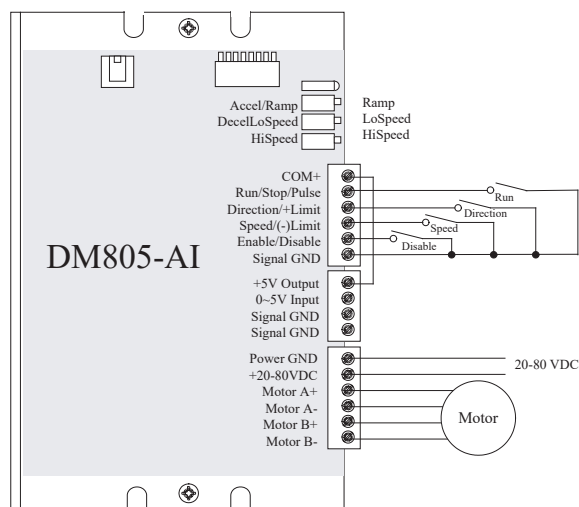
DM805-AI Wiring for Pulse/Direction Mode
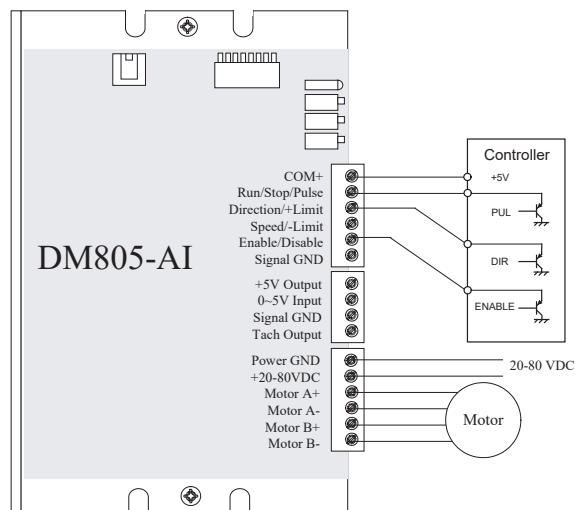
DM805-AI Wiring for Differential Control Signal

R=0 if VCC=5V
R=1K(Power>0.125W) if VCC=12V
R=2K(Power>0.125W) if VCC=24V
R must be connected to control signal terminal

Note: Although the controller has a pair of differential outputs (+,-), the + output is not used in this configuration

Leadshine
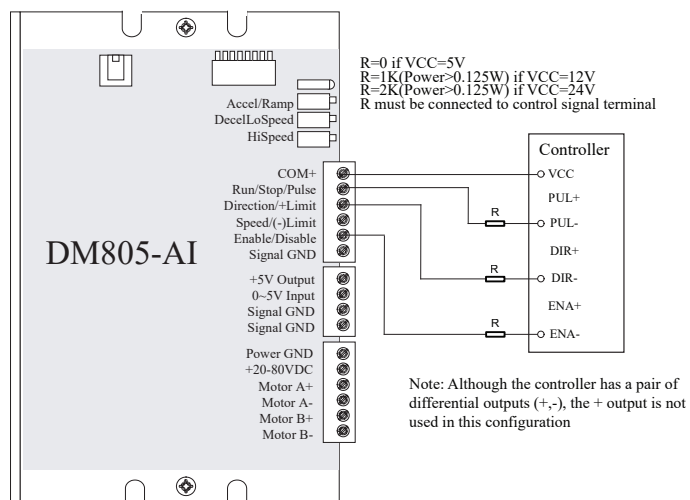
Stepping Drives

EM542S, EM556S

The EM542S and EM556S are digital stepper drives capable of pulse and direction as well as CW and CCW operation, with motor auto-configuration on power up and self-test capability. EM542S and EM556S have a built-in current-limiting resistor (on a switch) to allow either 5V or 24V input pulses. They also include a fault and a brake output, and a shaft lock feature. The brake output can be used with an external holding brake to hold the motor in place if power fails or the drive is disabled - you lose power, the brake engages. The shaft lock is set via DIP switch and will lock the motor into position using phase current, but only works when the drive has power.

EM542S

Leadshine EM542S, EM556S Specifications		
Drive Model	**EM542S**	**EM556S**
Output Current[1]	0.5-4.2A peak (0.4-2.9 RMS)	0.5-5.6A peak (0.4-3.9 RMS)
Input Voltage	20–50 VDC (24–48 VDC typical)	
Logic Signal Current	7–16 mA (10mA typical)	
Pulse Input Frequency	0–200 kHz	
Minimal Pulse Width	2.5 µs	
Minimal Direction Setup	5.0 µs	
Isolation Resistance	500mΩ	
Connector P1 Functions	PUL+	Pulse signal: 5V or 24V signal (Switch S3 determines voltage), differential input. High input is 4-5V or 22-24V, Low input is 0-0.5 V. Minimum pulse width = 2.5 µs. Switch S3 factory default = 24V position. WARNING! If switch S3 is in the 5V position and 24V is applied, the drive will be damaged.
	PUL-	
	DIR+	DIR signal: 5V or 24V signal (Switch S3 determines voltage), differential input. High input is 4-5V or 22-24V, Low input is 0-0.5 V. Minimum pulse width = 2.5 µs. Direction Function: requires 5µs setup time. CW/CCW Function: see DIP switch SW14. WARNING! If switch S3 is in the 5V position and 24V is applied, the drive will be damaged.
	DIR-	
	ENA+	Enable signal: 5V or 24V signal (Switch S3 determines voltage), differential input. High input is 4-5V or 22-24V, Low input is 0-0.5 V. Minimum pulse width = 2.5 µs. Enable Function: Close (pull low) to disable the drive. WARNING! If switch S3 is in the 5V position and 24V is applied, the drive will be damaged.
	ENA-	
Fault and Brake Output Connector	ALM	Optional output connection. Maximum of 30V/100mA output, sinking or sourcing.
	BR	
	COM-	
Replacement Connectors	Incoming Power = DN-2PLUG; Motor Power = DN-4PLUG; I/O = 6-pin from STP-CON-4	
Cooling	Natural cooling or forced cooling	
Ambient Temperature	0°C to 65°C (32°F to 149°F)	
Humidity	40–90% relative humidity	
Operating Temperature	0°C to 50°C (32°F to 122°F)	
Vibration	10–50 Hz / 0.15 mm	
Storage Temperature	-20°C to 65°C (-4°F to 149°F)	
Self Test	Yes	
Configuration Cable	1.4.4-0409505-B3	
Weight	250g (8.8 oz)	250g (8.8 oz)
1 - Output current ranges are for software settings which allow for a wider current range than DIP switches.		

Leadshine Series Drive Cables		
Optional Configuration Cable	**Compatible With**	**Price**
1.4.4-0409505-B3	EM542S, EM556S	$6.50

Note: Configuration cable only required if using optional configuration software. Software configuration not necessary unless DIP switch settings and auto-tuning aren't sufficient for your application. Requires an RS232 port on your PC, or a USB to RS232 converter, like USB-RS232.

1.4.4-0409505-B3

EM542S, EM556S Dimensions

Dimensions = in [mm]

EM542S

EM556S

Leadshine
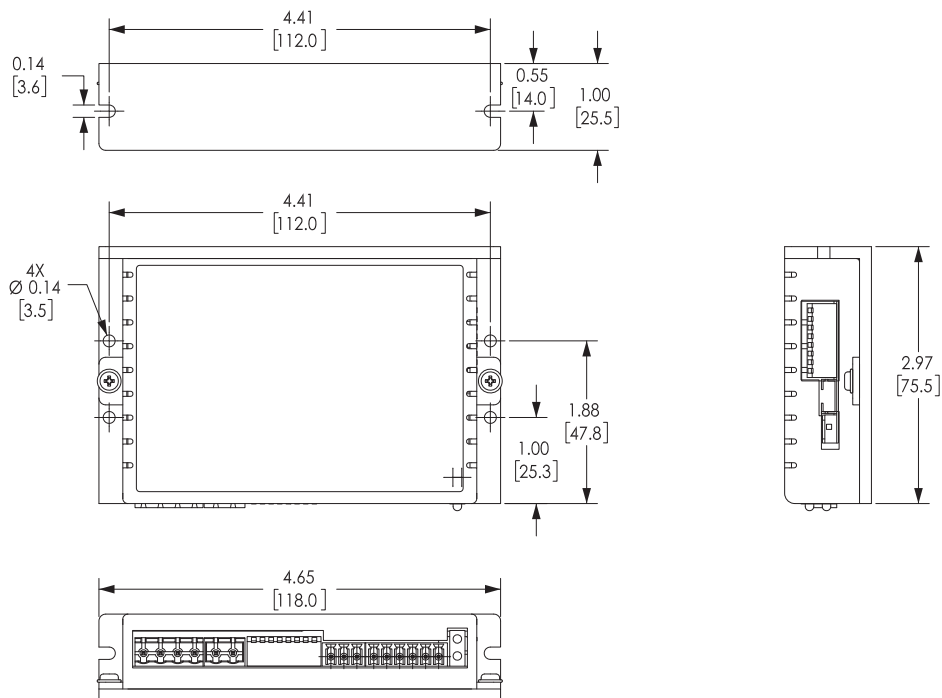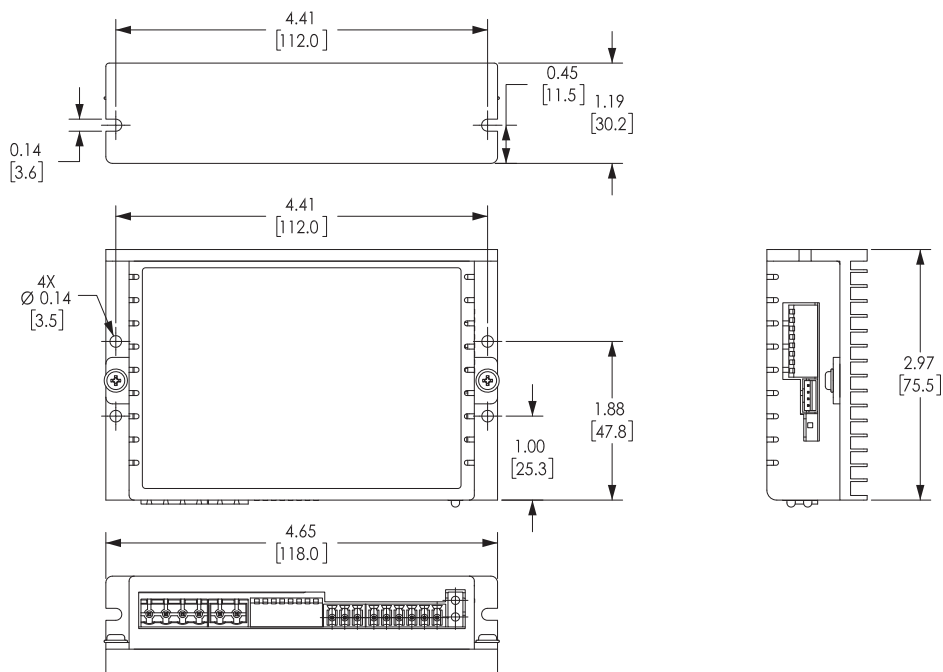
Stepping Drives

EM542S, EM556S Wiring

Note: These drives can accept Vcc of 24V or 5V. Set switch S3 before applying power.

EM542S, EM556S Connection to Open-Collector Signal
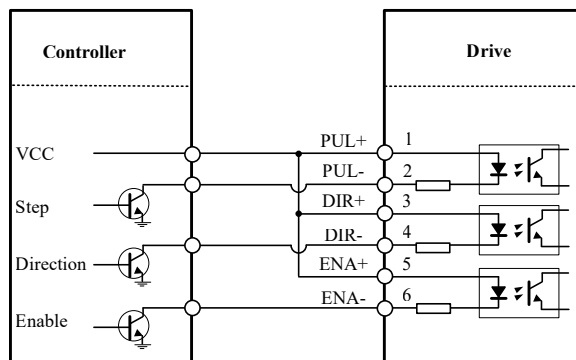
EM542S, EM556S Connection to PNP Signal
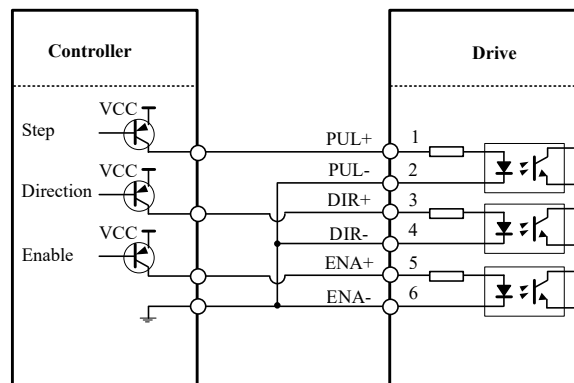
EM542S, EM556S Connection to Differential Signal; Typical Connection with Brake and Fault Outputs

24-48 VDC recommended, leaving room for voltage fluctuation and back EMF of the motor
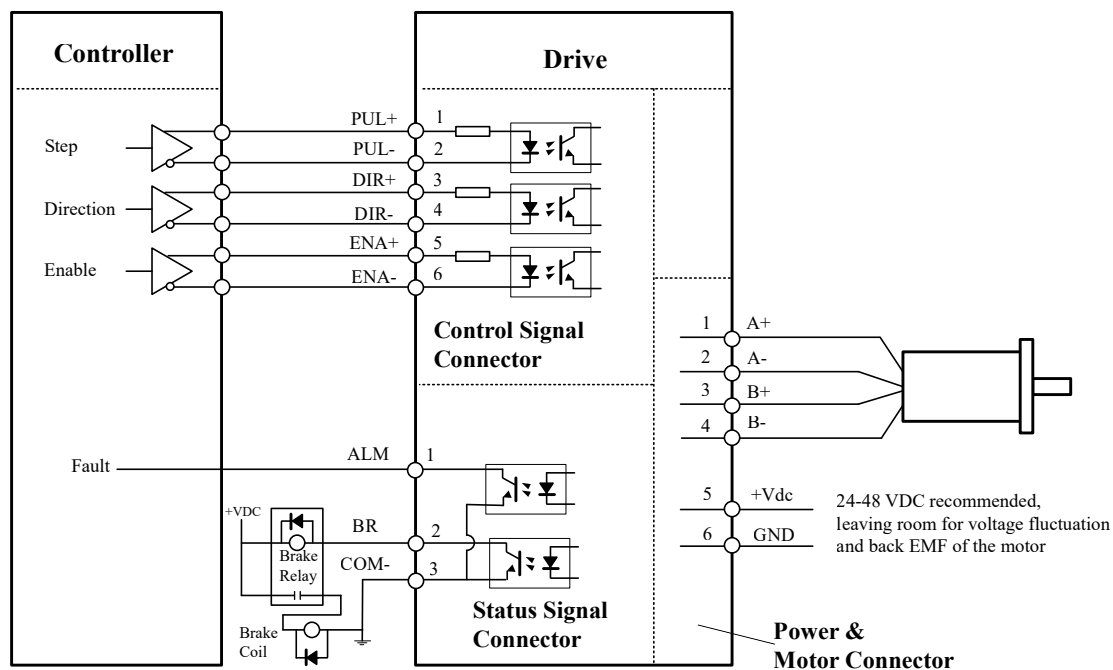
Linear Motion Slides and Components to Create up to 3 Axes of Motion

SureMotion linear slide actuators easily mate to SureStep motors, SureServo motors and other NEMA motors. Everything you need to mount your SureStep motor is included!

SureMotion linear actuators provide high performance linear motion. Available in lead screw or ball screw controlled versions. Coupling and hardware to mount small NEMA frame and SureServo motors are available as well as hardware to attach units together to create motion in 2 or 3 axes of movement.
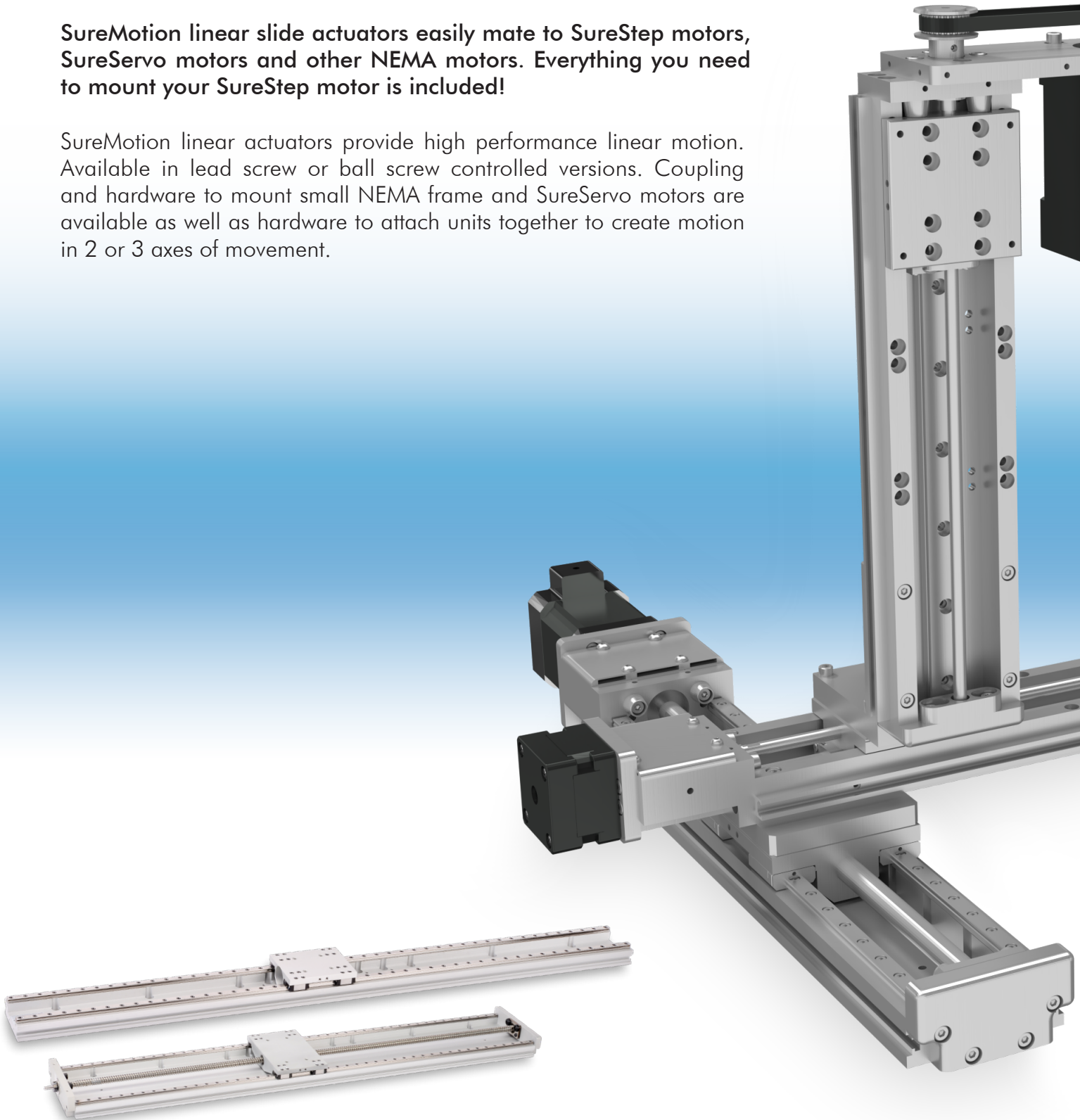
Sure motion

LAHP units can be attached to each other to provide up toa 3 axes of motion and from 52mm to 910mm of travel.
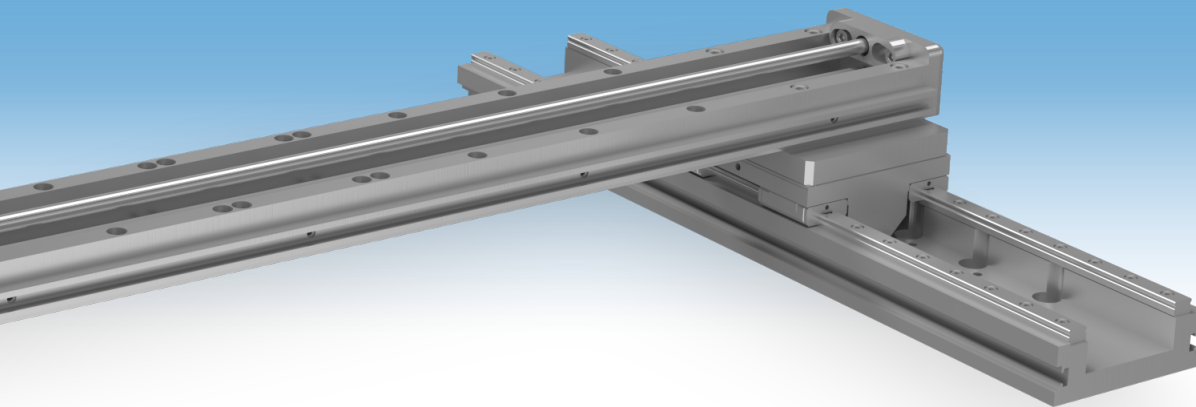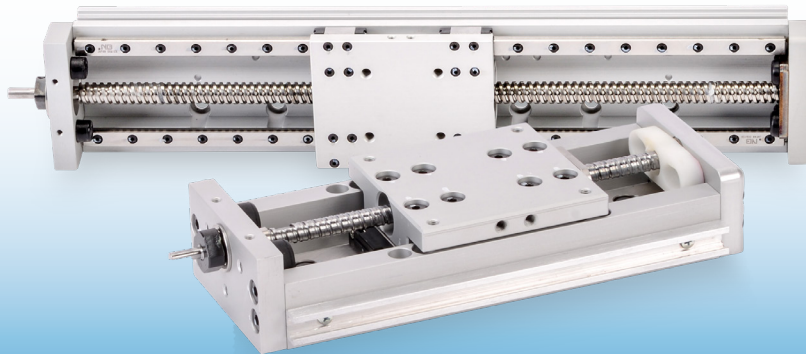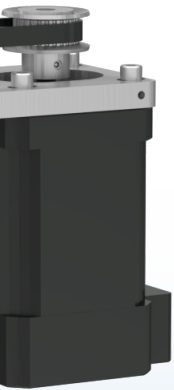
18 models, with travels from 6 to 36 inches

Ready to mount NEMA 17, 23 or 34 motors
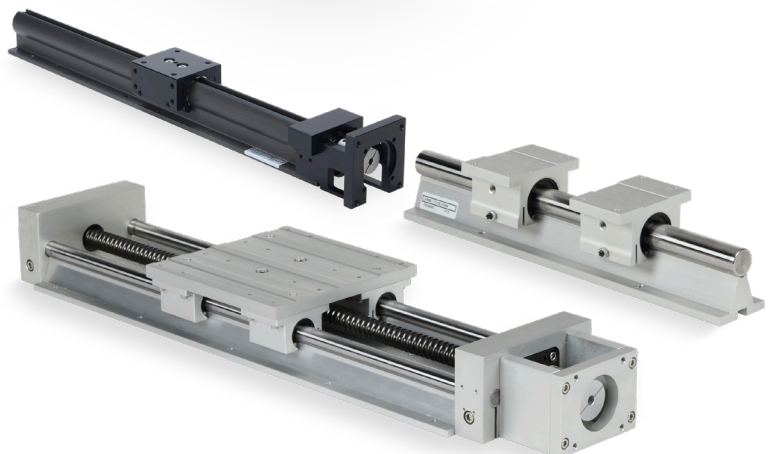
igus XYZ Gantries Overview

Features:

- Maintenance and Lubrication free
- Base/Rail material: 6061-T6 Aluminum with hard anodize finish
- Carriage Block Bushing Material: Drylin® iglide®-J
- Drive Type: Belt Drive or Lead Screw
- Adjustable Carriage Block Clearance

- Stackable and easy to assemble
- T-slots enable limit switches to be positioned anywhere
- Up to 1,000 mm Stroke
- Motor mounts for SureServo servo motors and SureStep stepper motors
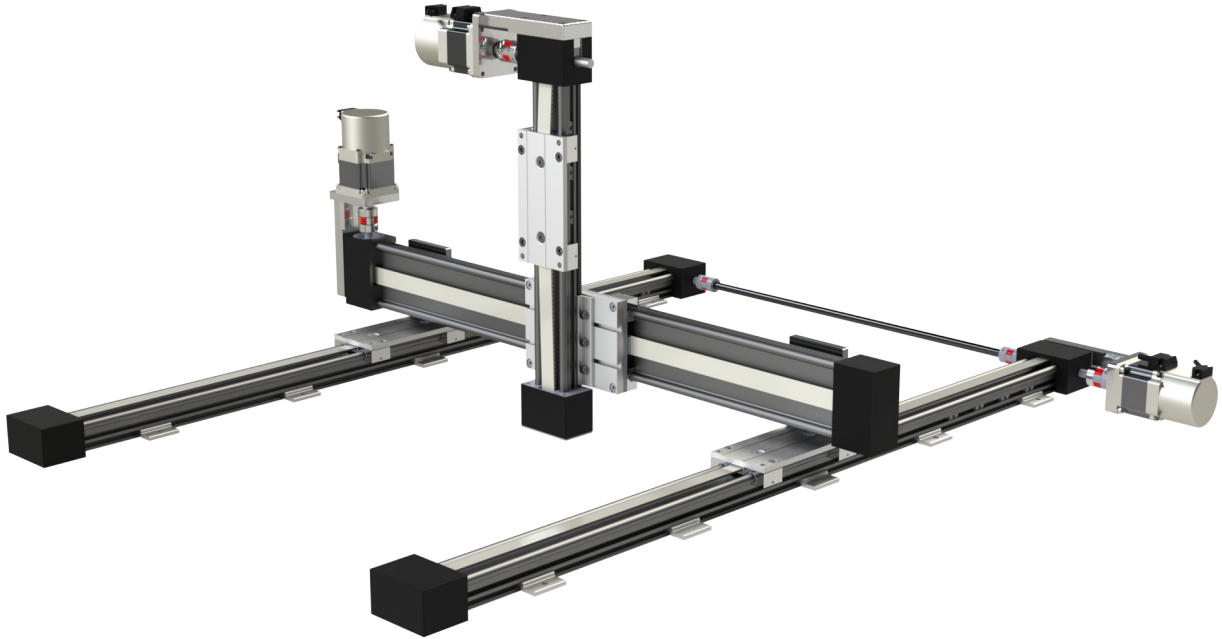
Configurations

igus linear actuators can be mounted in any orientation. However, overhead provides the best protection against contamination.
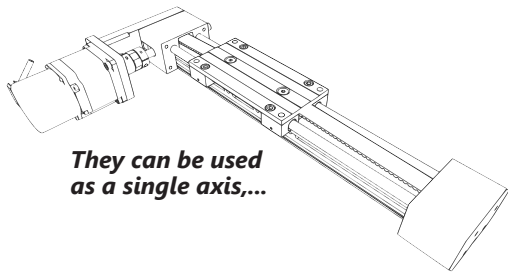
They can be used as a single axis,...
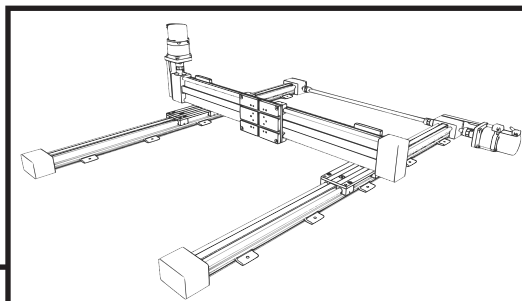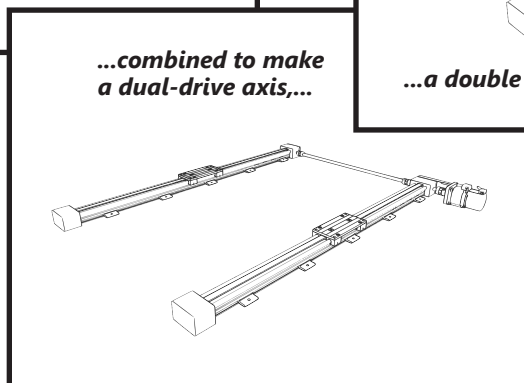
...combined to make a dual-drive axis,...

...a double axis,...
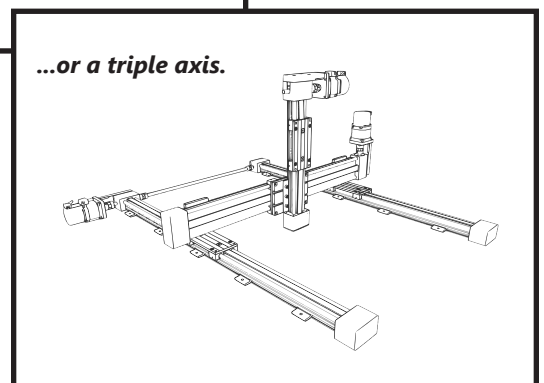
...or a triple axis.

igus XYZ Gantries Overview

Rail Sizes

igus linear actuators are available in 2 rail sizes: W1040 and W1080.

W1040 Twin Rail   W1080 Twin Rail

T-Slots for attaching accessories

Mounting slots for variable mounting locations
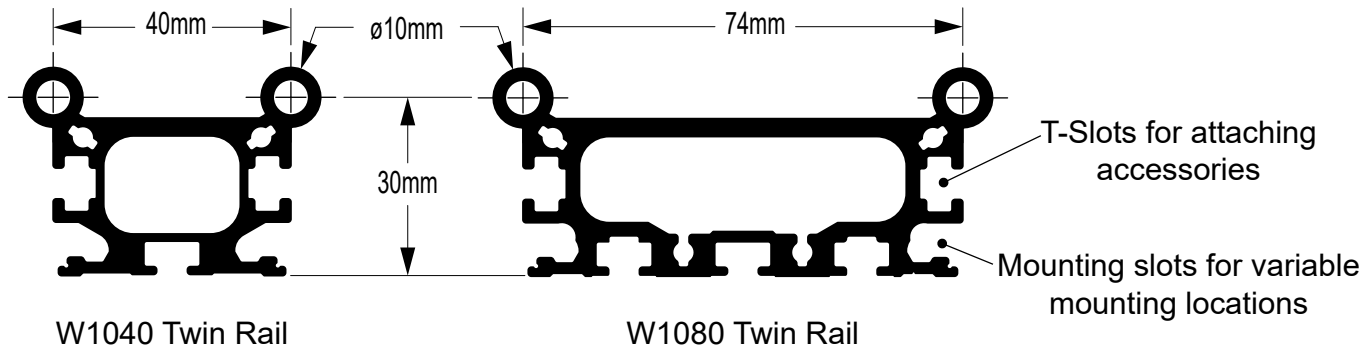
Drive Types

igus linear actuators are available in 2 drive types: ZLW (Belt Driven) and SAW (Lead Screw Driven).

**ZLW1040S-2
(Belt Driven)**
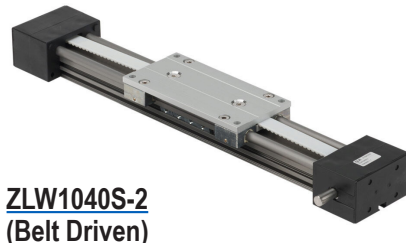
ZLW1040 & ZLW1080
- Belt Drive
- Max Linear Speed: 1.5 m/s [4.92 ft/s]
- Max Stroke: 1000mm
- Available Accessories
  - Servo Motor Brackets
  - Stepper Motor Brackets
  - XY Plate
  - YZ Plate
  - Dual X connecting Drive Shaft
  - Sensor Bracket
  - Replacement Carriage Block Liners

**SAW1040-2-B
(Lead Screw Driven)**
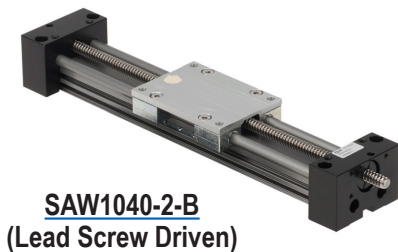
SAW1040 & SAW1080
- Lead Screw Drive
- Max Linear Speed: 0.15 m/s [0.49 ft/s]
- Max Stroke: 750mm
- Available Accessories
  - Servo Motor Brackets
  - Stepper Motor Brackets
  - XY Plate
  - YZ Plate
  - Sensor Bracket
  - Replacement Carriage Block Liners
  - Replacement Lead Nut

igus®

igus XYZ Gantries

ZLW Series (Belt Driven)

- Rail Material: 6061-T6 Aluminum, with Hard Anodize coating
- Carriage Block Bearing Material: iglide® J
- Belt Material: Polyurethane with steel cords, AT5 x 16mm wide
- ZLW1040 has Dual Input shafts, Ø10 mm
- ZLW1080 has Single Input shaft, Ø10 mm
- Adjustable clearance carriage blocks
- 8 T-slot nuts pre-installed, M5-0.8
- Mounting Clamps included
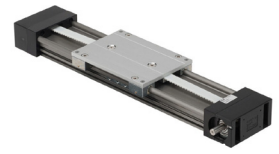
ZLW1040S-2 **ZLW1080S-2**

ZLW Series Linear Actuators (Belt Driven)											
Part Number	Price	Stroke (mm)	Mass (kg)	Backlash (in [mm])	Efficiency	Pitch (in/rev [mm/rev])	Max Linear Speed (ft/sec [m/sec])	Linear Position Accuracy (in [mm])	Linear Position Repeatability (in [mm])	Idle Torque (Nm)	Drawing Links
ZLW1040S-10	$500.00	1,000	1.8	0.008 [0.2]	83%	2.76 [70]	4.92 [1.5]	0.008 [0.2]	0.008 [0.2]	0.3	PDF
ZLW1040S-2	$422.00	200	1.54								PDF
ZLW1040S-3	$450.00	300	1.68								PDF
ZLW1040S-4	$476.00	400	1.82								PDF
ZLW1040S-5	$450.00	500	1.96								PDF
ZLW1040S-6	$465.00	600	2.24								PDF
ZLW1040S-8	$480.00	800	2.52								PDF
ZLW1080S-10	$665.00	1,000	1.05	0.008 [0.2]	85%	2.76 [70]	4.92 [1.5]	0.008 [0.2]	0.008 [0.2]	0.25	PDF
ZLW1080S-2	$620.00	200	2.01								PDF
ZLW1080S-3	$630.00	300	2.22								PDF
ZLW1080S-4	$635.00	400	2.43								PDF
ZLW1080S-5	$640.00	500	2.64								PDF
ZLW1080S-6	$650.00	600	3.06								PDF
ZLW1080S-8	$660.00	800	3.48								PDF

ZLW Series Linear Actuators (Belt Driven) Load Ratings		
Part Number	ZLW1040S-xx	ZLW1080S-xx
Dynamic Load Rating, C (lbf [N])	112.41 [500]	
Static Load Rating, C_O (lbf [N])	1079.14 [4800]	
Reverse Static Load Rating, $-C_O$ (lbf [N])	224.82 [1000]	
Lateral Load Rating, L_T (lbf [N])	1079.14 [4800]	
Axial Load Rating, L_A (lbf [N])	16.86 [75]	
Pitch Moment Rating, M_P (lb·ft [N·m])	213.86 [290]	
Yaw Moment Rating, M_Y (lb·ft [N·m])	125.37 [170]	213.86 [290]
Roll Moment Rating, M_R (lb·ft [N·m])	70.8 [96]	131.27 [178]

Note: The end blocks should not be used as a mechanical stop.
A buffer distance of 1 motor shaft revolution is recommended.
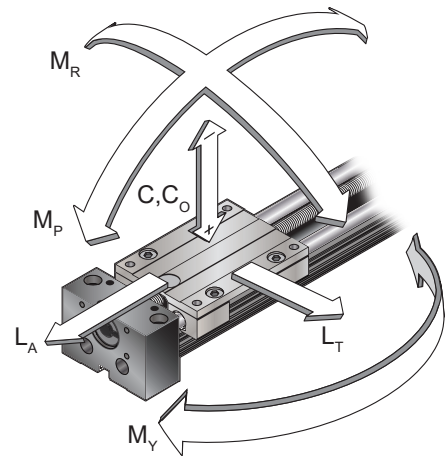
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SAW Series (Lead Screw Driven)

- Rail Material: 6061-T6 Aluminum, with Hard Anodize coating
- Carriage Block Bearing Material: iglide® J
- Lead Screw Material: 300 series Stainless Steel
- Lead Nut Material: iglide® J
- Adjustable clearance carriage blocks
- 8 T-slot nuts pre-installed, M5-0.8
- Mounting Clamps included
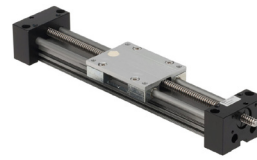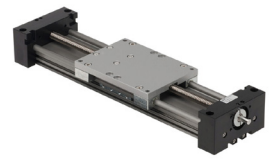
SAW1040-2-B   **SAW1080-2-A**

SAW Series Linear Actuators (Lead Screw Driven)

Part Number	Price	Stroke (mm)	Mass (kg)	Backlash (in [mm])	Efficiency	Pitch (in/rev [mm/rev])	Max Linear Speed (ft/sec [m/sec])	Linear Position Accuracy (in [mm])	Linear Position Repeatability (in [mm])	Idle Torque (Nm)	Drawing Links
SAW1040-05-B	$355.00	50	1.1	0.004 [0.1]	67%	0.98 [25]	1.15 [0.35]	0.004 [0.1]	0.004 [0.1]	0.2	PDF
SAW1040-1.5-B	$370.00	150	1.2				1.31 [0.4]				PDF
SAW1040-1-B	$360.00	100	1.15								PDF
SAW1040-2-B	$375.00	200	1.3				0.49 [0.15]				PDF
SAW1040-3-B	$385.00	300	2.9								PDF
SAW1080-1.5-A	$638.00	150	3.1	0.004 [0.1]	67%	0.98 [25]	0.49 [0.15]	0.004 [0.1]	0.004 [0.1]	0.3	PDF
SAW1080-1-A	$630.00	100	3								PDF
SAW1080-2-A	$637.00	200	3.3								PDF
SAW1080-3-A	$651.00	300	3.5								PDF
SAW1080-4-A	$675.00	400	3.7								PDF
SAW1080-5-A	$700.00	500	3.9								PDF
SAW1080-6-A	$725.00	600	4.1								PDF
SAW1080-7.5-A	$750.00	750	4.5								PDF

SAW Series Linear Actuators (Lead Screw Driven) Load Ratings

Part Number	SAW1080-xx	SAW1040-xx
Dynamic Load Rating, C (lbf [N])	168.62 [750]	
Static Load Rating, C_O (lbf [N])	1079.14 [4800]	
Reverse Static Load Rating, $-C_O$ (lbf [N])	224.82 [1000]	
Lateral Load Rating, L_T (lbf [N])	1079.14 [4800]	
Axial Load Rating, L_A (lbf [N])	44.96 [200]	56.21 [250]
Pitch Moment Rating, M_P (lb·ft [N·m])	213.86 [290]	125.37 [170]
Yaw Moment Rating, M_Y (lb·ft [N·m])	213.86 [290]	125.37 [170]
Roll Moment Rating, M_R (lb·ft [N·m])	131.27 [178]	70.8 [96]

Note: The end blocks should not be used as a mechanical stop.
A buffer distance of 1 motor shaft revolution is recommended.
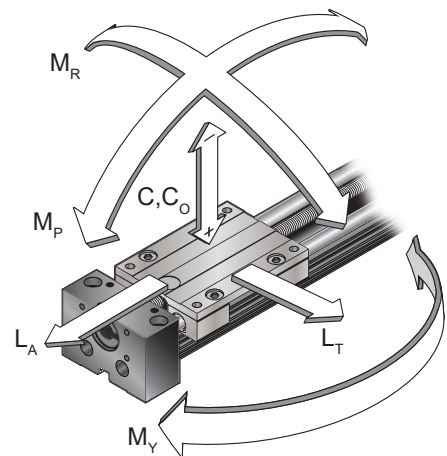
![igus®]

igus XYZ Gantries

Motor Brackets

- Material: Aluminum
- Open frame for ease of assembly
- Available sizes for Stepper and Server motors

igus ZLW Motor Brackets					
Part Number	Price	Fits Motor	Recommended ADC Coupling Parts*		Drawing Links
			1040	1080	
STP17-ZLW	$145.00	NEMA 17 stepper motors (Click here for applicable Stepper Motors)	SJCA-30C-5 SJCA-30C-10 SJC-30-RD-SLEEVE		PDF
STP23-ZLW	$145.00	NEMA 23 stepper motors (Click here for applicable Stepper Motors)	SJCA-30C-6.35 SJCA-30C-10 SJC-30-RD-SLEEVE		PDF
SVL201-ZLW	$175.00	SVL-201 SVL-201B SV2L-201B SV2L-201N	SJCA-30C-8 SJCA-30C-10 SJC-30-RD-SLEEVE		PDF
SVL202-ZLW	$250.00	SVL-202 SVL-202B SV2L-202B SV2L-202N	SJCA-30C-14 SJCA-30C-10 SJC-30-RD-SLEEVE		PDF

Includes Mounting Hardware.
*Drive coupling parts sold separately. 2 coupling jaws and 1 spider required for complete coupling subassembly.

SVL201-ZLW

igus SAW Motor Brackets					
Part Number	Price	Fits Motor	Recommended ADC Coupling Parts*		Drawing Links
			1040	1080	
STP17-SAW	$115.00	NEMA 17 stepper motors (Click here for applicable Stepper Motors)	SJCA-30C-5 SJCA-30C-10 SJC-30-RD-SLEEVE	SJCA-30C-5 SJCA-30C-8 SJC-30-RD-SLEEVE	PDF
STP23-SAW	$115.00	NEMA 23 stepper motors (Click here for applicable Stepper Motors)	SJCA-30C-6.35 SJCA-30C-10 SJC-30-RD-SLEEVE	SJCA-30C-6.35 SJCA-30C-8 SJC-30-RD-SLEEVE	PDF
SVL201-SAW	$140.00	SVL-201 SVL-201B SV2L-201B SV2L-201N	SJCA-30C-8 SJCA-30C-10 SJC-30-RD-SLEEVE	SJCA-30C-8 (x2) SJC-30-RD-SLEEVE	PDF
SVL202-SAW	$125.00	SVL-202 SVL-202B SV2L-202B SV2L-202N	SJCA-30C-10 SJCA-30C-14 SJC-30-RD-SLEEVE	SJCA-30C-14 SJCA-30C-8 SJC-30-RD-SLEEVE	PDF

Includes Mounting Hardware.
*Drive coupling parts sold separately. 2 coupling jaws and 1 spider required for complete coupling subassembly.

SVL201-SAW
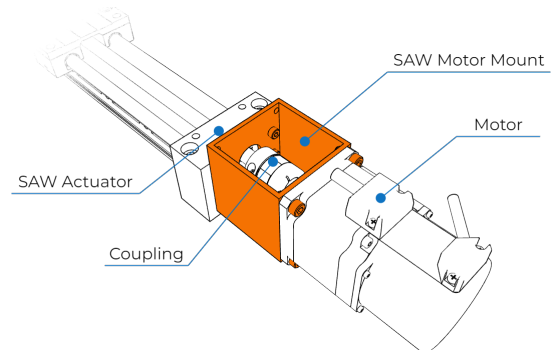
igus XYZ Gantries

igus

Mounting Brackets

- Material: Aluminum
- Mounts directly to Carriage Plate

igus Mounting Brackets					
Part Number	Price	Description	Holds Linear Actuator	Fits Linear Actuator Carriage Plate	Drawing Links
A-SWY108003150	$136.00	Y or Z Adapter Plate (Qty. 2)	ZLW1040 and SAW1040	ZLW1080 and SAW1080 series actuators.	PDF
A-AK-0026	$155.00	Y Mounting Bracket (Qty. 2)	ZLW080 and SAW1080	ZLW1040 and SAW1040 series actuators.	PDF
A-ZSY-104026	$3.50	Mounting Clamp (Qty. 2)*	All ZLW and SAW series actuators.	All ZLW and SAW series actuators.	PDF

Includes Mounting Hardware.
*Mounts to Y or Z Adapter Plate.

A-SWY108003150

A-AK-0026

A-ZSY-104026

Adapter Plate

Carriage

Y-Bracket

Adapter Plate

Mounting Clamp
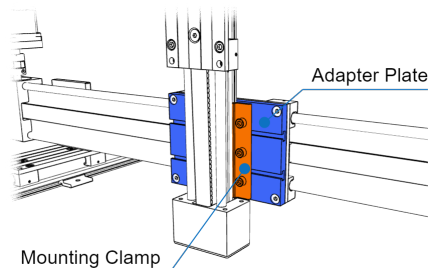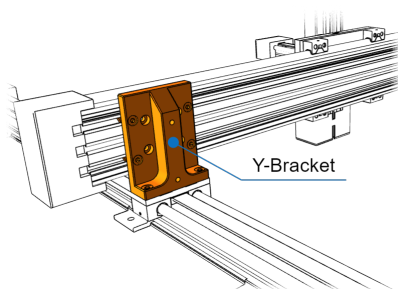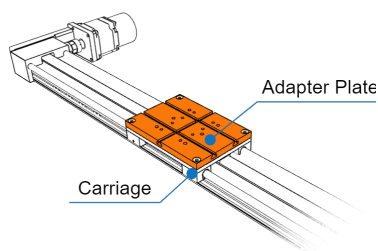
igus XYZ Gantries

Accessories

igus Accessories							
Part Number	*Price*	*Description*	*Material*	*For Use With*	*Qty*	*Photo*	*Drawing Links*
A-AWM-10-1000	$33.00	Drylin R Series Shaft: round connecting, 10mm diameter, 1000mm length	Hard-anodized aluminum	All ZLW series actuators	1		PDF
A-AWM-10-500	$15.00	Drylin R Series Shaft: round connecting, 10mm diameter, 500mm length	Hard-anodized aluminum	All ZLW series actuators	1		PDF
A-KSTM-10	$6.00	Igubal K Series Mounted Spherical Bearing: 10mm inside diameter, pillow block	Ball: Type L280 polymer Housing:	Drylin R series 10mm shafts	1		PDF
A-JUME-01-10	$4.50	Bearing Liner: for ZLW1040 and ZLW1080 series actuators	iglide® J	ZLW1040 and ZLW1080 series actuators	4		N/A
A-NOR-20634	$2.50	M5 Slot Nut: for all ZLW and SAW series actuators	zinc plated steel	All ZLW and SAW series actuators	8		PDF
IGUS-SENSBKT	$25.00	Sensor Bracket: for all ZLW and SAW series actuators	anodized aluminum	All ZLW and SAW series actuators Compatible Sensors: P8-AN-2A, P8-AP-2F, P8-CP-2F	1		PDF
NUT1040-25	$27.00	Lead Nut: for SAW1040 series actuators	iglide® J	SAW1040 series actuators	1		N/A
NUT1080-25	$65.00	Lead Nut: for SAW1080 series actuators	iglide® J	SAW1080 series actuators	1		N/A

Includes Mounting Hardware.

A-KSTM-10 Bearing

A-AWM-10 Shaft

25°

A-KSTM-10 Bearing
and
A-AWM-10-500 or A-AWM-10-1000 Shaft

ADC PN:
P8-xx-2x

Sensor Bracket

IGUS-SENSBKT
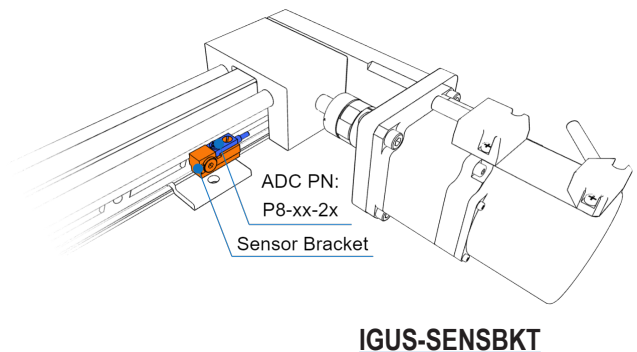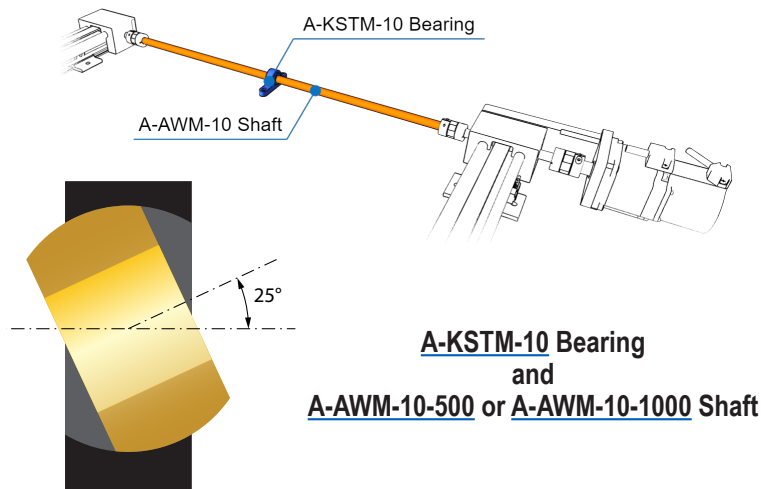
SureMotion® XYZ Gantries

SureMotion® XYZ Gantry Features

The SureMotion® XYZ Gantry offers high-performance linear positioning at an economical price. This system uses recirculating ball linear guides which offer smooth motion and high load capacity. A ball screw version is available for higher speeds and duty cycles.

- Rigid linear bearings
- Lightweight precision aluminum base
- Stackable and easy to assemble
- High-Precision
- Customizable
- Lead or ball screw options

- Wide base available for maximum stiffness
- Up to 910mm stroke
- Anti-backlash leadscrew nut
- Proximity or photoelectric sensor kits available
- Motor mounts available for SureServo® servo motors and SureStep® stepper motors
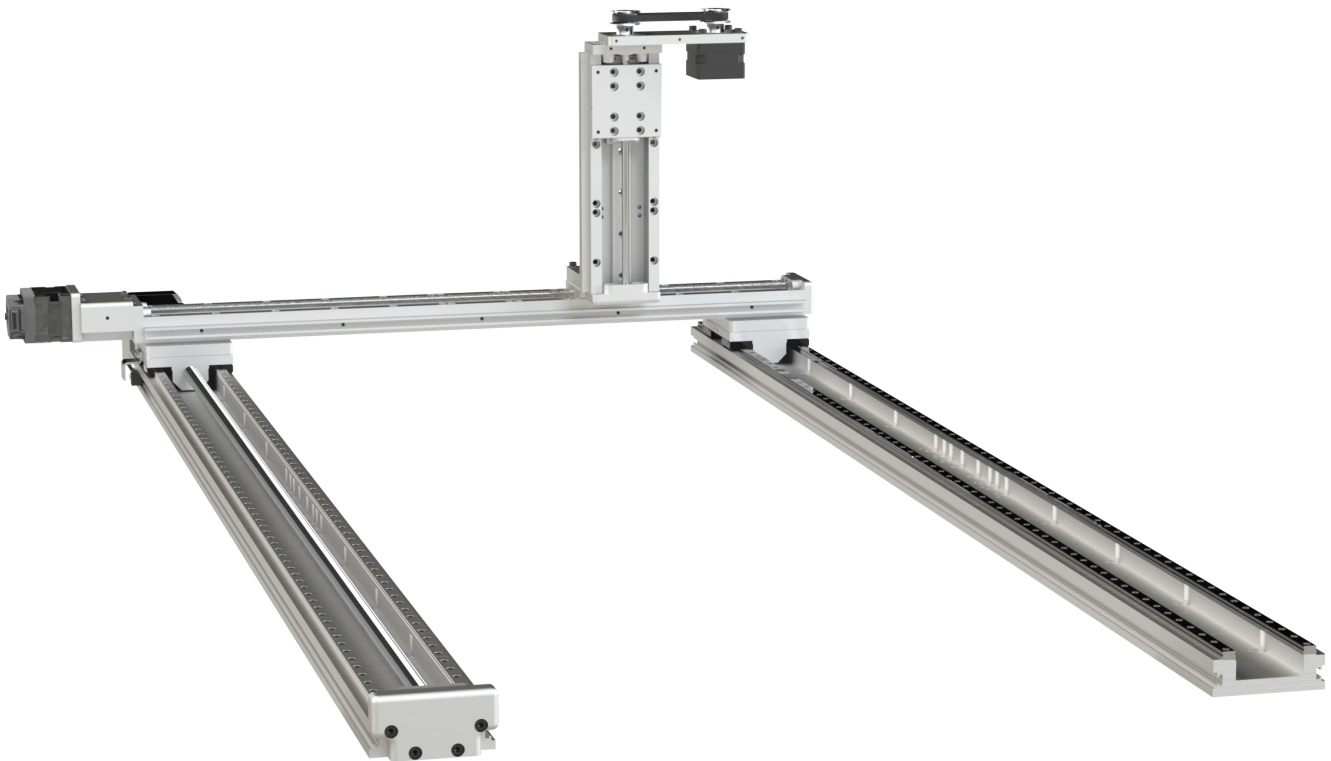
SureMotion® XYZ Gantries

LAHP-25 Series Linear Actuators

Part Number	Price	Stroke	Type	Efficiency	Pitch	Max Linear Speed	Linear Position Accuracy	Linear Position Repeatability	Drawing Links
LAHP-25TM52B3M	$1,302.00	52mm	ball screw	90%	3mm	0.150 m/s	±0.039 mm	±0.05 mm	PDF
LAHP-25TM52LP25	$1,050.00	52mm	lead screw	60%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-25TM102B3M	$1,416.00	102mm	ball screw	90%	3mm	0.150 m/s	±0.0765 mm	±0.05 mm	PDF
LAHP-25TM102LP25	$1,164.00	102mm	lead screw	60%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-25TM152B3M	$1,485.00	152mm	ball screw	90%	3mm	0.150 m/s	±0.114 mm	±0.05 mm	PDF
LAHP-25TM152LP25	$1,235.00	152mm	lead screw	60%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-25TM220B3M	$1,524.00	220mm	ball screw	90%	3mm	0.150 m/s	±0.165 mm	±0.05 mm	PDF
LAHP-25TM220LP25	$1,273.00	220mm	lead screw	60%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-25TM304B3M	$1,622.00	304mm	ball screw	90%	3mm	0.140 m/s	±0.228 mm	±0.05 mm	PDF
LAHP-25TM304LP25	$1,374.00	304mm	lead screw	60%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-25TM404B3M	$1,914.00	404mm	ball screw	90%	3mm	0.085 m/s	±0.303 mm	±0.05 mm	PDF
LAHP-25TM404LP25	$1,665.00	404mm	lead screw	60%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-25TM504B3M	$2,041.00	504mm	ball screw	90%	3mm	0.060 m/s	±0.378 mm	±0.05 mm	PDF
LAHP-25TM504LP25	$1,789.00	504mm	lead screw	60%	0.25in	0.085 m/s		±0.013 mm	PDF

LAHP 25 Series Linear Slides

Part Number	Price	Stroke	Max Linear Speed	Drawing Links
LAHP-25TM52SF	$652.00	52mm		PDF
LAHP-25TM102SF	$756.00	102mm		PDF
LAHP-25TM152SF	$802.00	152mm		PDF
LAHP-25TM220SF	$816.00	220mm	1.5 m/s	PDF
LAHP-25TM304SF	$895.00	304mm		PDF
LAHP-25TM404SF	$1,146.00	404mm		PDF
LAHP-25TM504SF	$1,239.00	504mm		PDF

LAHP 25 Series Linear Actuators Specifications

|		
Max Lateral Load, L_T	480N	108 lbf
Max Axial Load, L_A	350N	78.7 lbf
Roll Moment Rating, M_R	36N·m	26.6 lb·ft
Pitch Moment Rating, M_P	48N·m	35.4 lb·ft
Yaw Moment Rating, M_Y	20N·m	14.6 lb·ft
Static Radial Load Rating, C_O	5060N	1138 lbf
Reverse Static Radial Load Rating, $-C_O$	5060N	1138 lbf
Dynamic Load Rating, C	3420N	769 lbf

Linear Actuator LAHP-25TM52B3M

Linear Slide LAHP-25TM52SF

*Same mechanical design as Linear Actuator, not driven
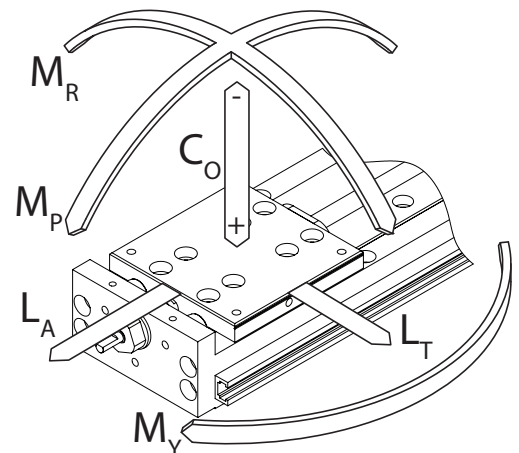
SureMotion® XYZ Gantries

LAHP 33 Series Linear Actuators

Part Number	Price	Stroke	Type	Efficiency	Pitch	Max Linear Speed	Linear Position Accuracy	Linear Position Repeatability	Drawing Links
LAHP-33TM210B10M	$1,607.00	210mm	ball screw	90%	10mm	0.500 m/s	±0.158 mm	±0.05 mm	PDF
LAHP-33TM210LP25	$1,427.00	210mm	lead screw	58%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-33TM310B10M	$1,815.00	310mm	ball screw	90%	10mm	0.500 m/s	±0.233 mm	±0.05 mm	PDF
LAHP-33TM310LP25	$1,634.00	310mm	lead screw	58%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-33TM410B10M	$2,049.00	410mm	ball screw	90%	10mm	0.467 m/s	±0.308 mm	±0.05 mm	PDF
LAHP-33TM410LP25	$1,869.00	410mm	lead screw	58%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-33TM510B10M	$2,297.00	510mm	ball screw	90%	10mm	0.333 m/s	±0.383 mm	±0.05 mm	PDF
LAHP-33TM510LP25	$2,116.00	510mm	lead screw	58%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-33TM610B10M	$2,726.00	610mm	ball screw	90%	10mm	0.250 m/s	±0.458 mm	±0.05 mm	PDF
LAHP-33TM610LP25	$2,547.00	610mm	lead screw	58%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-33TM810B10M	$3,154.00	810mm	ball screw	90%	10mm	0.133 m/s	±0.608 mm	±0.05 mm	PDF
LAHP-33TM810LP25	$2,974.00	810mm	lead screw	58%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-33TM910B10M	$3,403.00	910mm	ball screw	90%	10mm	0.122 m/s	±0.683 mm	±0.05 mm	PDF
LAHP-33TM910LP25	$3,224.00	910mm	lead screw	58%	0.25in	0.077 m/s		±0.013 mm	PDF

LAHP 33 Series Linear Slides

Part Number	Price	Stroke	Max Linear Speed	Drawing Links
LAHP-33TM210SF	$979.00	210mm		PDF
LAHP-33TM310SF	$1,159.00	310mm		PDF
LAHP-33TM410SF	$1,359.00	410mm		PDF
LAHP-33TM510SF	$1,588.00	510mm	1.5 m/s	PDF
LAHP-33TM610SF	$1,987.00	610mm		PDF
LAHP-33TM810SF	$2,366.00	810mm		PDF
LAHP-33TM910SF	$2,567.00	910mm		PDF

LAHP 33 Series Linear Actuators Specifications

Max Lateral Load, L_T	480N	108 lbf
Max Axial Load, L_A	890N	200 lbf
Roll Moment Rating , M_R	109N·m	80.4 lb·ft
Pitch Moment Rating, M_P	133N·m	98.1 lb·ft
Yaw Moment Rating, M_Y	25N·m	18.4 lb·ft
Static Radial Load Rating, C_O	6760N	1520 lbf
Reverse Static Radial Load Rating, $-C_O$	6760N	1520 lbf
Dynamic Load Rating, C	5120N	1151 lbf

Linear Actuator
LAHP-33TM210B10M

Linear Slide*
LAHP-33TM210SF

*Same mechanical design as Linear Actuator, not driven

SureMotion® XYZ Gantries
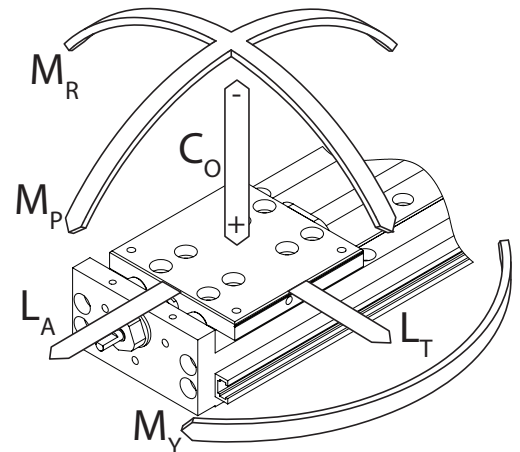
LAHP 33W (Wide) Series Linear Actuators

Part Number	Price	Stroke	Type	Efficiency	Pitch	Max Linear Speed	Linear Position Accuracy	Linear Position Repeatability	Drawing Links
LAHP-33WTM210B10M	$1,843.00	210mm	ball screw	90%	10mm	0.500 m/s	±0.158 mm	±0.05 mm	PDF
LAHP-33WTM210LP25	$1,664.00	210mm	lead screw	58%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-33WTM310B10M	$2,072.00	310mm	ball screw	90%	10mm	0.500 m/s	±0.233 mm	±0.05 mm	PDF
LAHP-33WTM310LP25	$1,893.00	310mm	lead screw	58%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-33WTM410B10M	$2,261.00	410mm	ball screw	90%	10mm	0.467 m/s	±0.308 mm	±0.05 mm	PDF
LAHP-33WTM410LP25	$2,081.00	410mm	lead screw	58%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-33WTM510B10M	$2,795.00	510mm	ball screw	90%	10mm	0.333 m/s	±0.383 mm	±0.05 mm	PDF
LAHP-33WTM510LP25	$2,616.00	510mm	lead screw	58%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-33WTM610B10M	$2,985.00	610mm	ball screw	90%	10mm	0.250 m/s	±0.458 mm	±0.05 mm	PDF
LAHP-33WTM610LP25	$2,805.00	610mm	lead screw	58%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-33WTM810B10M	$3,567.00	810mm	ball screw	90%	10mm	0.133 m/s	±0.608 mm	±0.05 mm	PDF
LAHP-33WTM810LP25	$3,389.00	810mm	lead screw	58%	0.25in	0.085 m/s		±0.013 mm	PDF
LAHP-33WTM910B10M	$3,835.00	910mm	ball screw	90%	10mm	0.122 m/s	±0.683 mm	±0.05 mm	PDF
LAHP-33WTM910LP25	$3,655.00	910mm	lead screw	58%	0.25in	0.077 m/s		±0.013 mm	PDF

LAHP 33W Series Linear Actuators Specifications

Max Lateral Load, L_T	480N	108 lbf
Max Axial Load, L_A	890N	200 lbf
Roll Moment Rating , M_R	218N·m	160.8 lb·ft
Pitch Moment Rating, M_P	133N·m	98.1 lb·ft
Yaw Moment Rating, M_Y	25N·m	18.4 lb·ft
Static Radial Load Rating, C_O	6760N	1520 lbf
Reverse Static Radial Load Rating, $-C_O$	6760N	1520 lbf
Dynamic Load Rating, C	5120N	1151 lbf
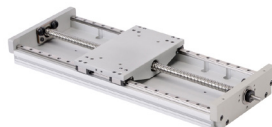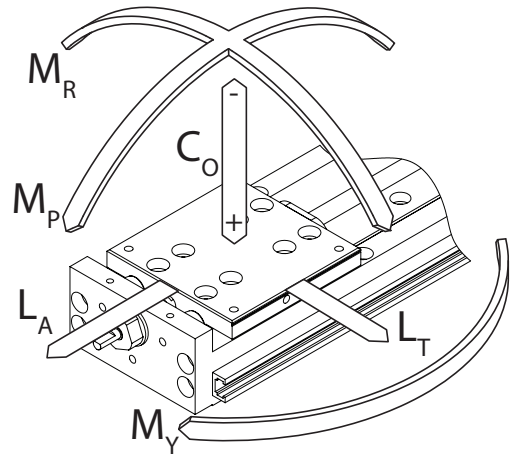
Linear Actuator (Wide)
LAHP-33WTM210B10M
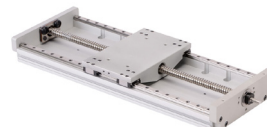
Lead Screw Actuator (Wide)
LAHP-33WTM210LP25

SureMotion® XYZ Gantries

LAHP Series Motor Brackets

Part Number	Price	Bracket Type	Actuator Compatibility	Motor Compatibility	Drawing Links
LAHP-201-25MTRBKT	$286.00	axial	LAHP-25	SureServo® SVL-201 series servomotors	PDF
LAHP-201-33MTRBKT	$287.00	axial	LAHP-33/33W	SureServo® SVL-201 series servomotors	PDF
LAHP-202-33MTRBKT	$339.00	axial	LAHP-33/33W	SureServo® SVL-202 series servomotors	PDF
LAHP-N14-25MTRBKT	$216.00	axial	LAHP-25	SureStep® NEMA 14 stepper motors	PDF
LAHP-N14-25WRPBKT	$233.00	parallel	LAHP-25	SureStep® NEMA 14 stepper motors	PDF
LAHP-N17-25MTRBKT	$218.00	axial	LAHP-25	SureStep® NEMA 17 stepper motors	PDF
LAHP-N17-25WRPBKT	$310.00	parallel	LAHP-25	SureStep® NEMA 17 stepper motors	PDF
LAHP-N17-33MTRBKT	$244.00	axial	LAHP-33/33W	SureStep® NEMA 17 stepper motors	PDF
LAHP-N17-33WRPBKT	$188.00	parallel	LAHP-33/33W	SureStep® NEMA 17 stepper motors	PDF
LAHP-N23-33MTRBKT	$244.00	axial	LAHP-33/33W	SureStep® NEMA 23 stepper motors	PDF
LAHP-N23-33WRPBKT	$248.00	parallel	LAHP-33/33W	SureStep® NEMA 23 stepper motors	PDF
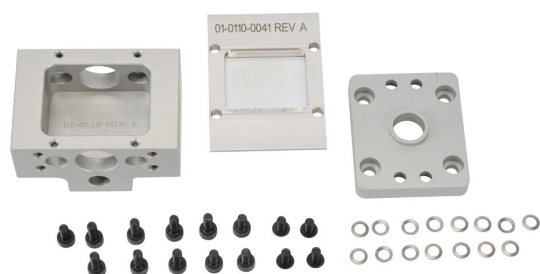
NEMA 14 Axial Motor Bracket*
LAHP-N14-25MTRBKT

***Coupling Sold Separately**

NEMA 14 Parallel Motor Bracket
LAHP-N14-25WRPBKT
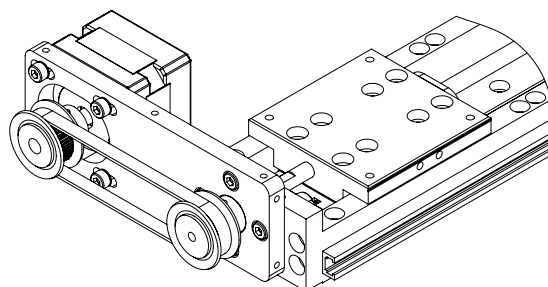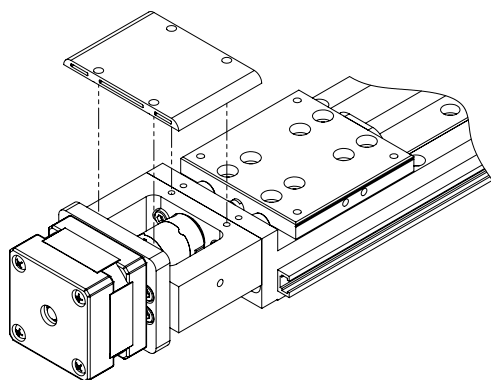
SureMotion® XYZ Gantries

LAHP Series Drive Couplings

Part Number	Price	Actuator Side Bore	Motor Side Bore	Actuator Compatibility	Motor Compatibility	Drawing Links
LAHP-25-CPL-201	$44.50	3mm	8mm	LAHP-25	SureServo® SVL-201	PDF
LAHP-25-CPL-N1417	$62.00	3mm	5mm	LAHP-25	SureStep® NEMA 14/17	PDF
LAHP-33-CPL-201	$89.00	5mm	8mm	LAHP-33/33W	SureServo® SVL-201	PDF
LAHP-33-CPL-202	$66.00	5mm	14mm	LAHP-33/33W	SureServo® SVL-202	PDF
LAHP-33-CPL-N17	$67.00	5mm	5mm	LAHP-33/33W	SureStep® NEMA 17	PDF
LAHP-33CPL-N23	$89.00	5mm	1/4in	LAHP-33/33W	SureStep® NEMA 23	PDF

Stepper Motor Coupling (NEMA 14 & 17)
LAHP-25-CPL-N1417

LAHP Series XY and Z Brackets

Part Number	Price	Bracket Type	Description	Drawing Links
LAHP-XYB-25-33	$108.00	XY bracket	SureMotion® mounting bracket, anodized aluminum, XY bracket. For use with LAHP-25 to LAHP-33 series actuators.	PDF
LAHP-XYB-25-33W	$125.00	XY bracket	SureMotion® mounting bracket, anodized aluminum, XY bracket. For use with LAHP-25 to LAHP-33W series actuators.	PDF
LAHP-XYB-33-33W	$125.00	XY bracket	SureMotion® mounting bracket, anodized aluminum, XY bracket. For use with LAHP-33 to LAHP-33W series actuators.	PDF
LAHP-ZB-25-25	$436.00	Z bracket	SureMotion® mounting bracket, anodized aluminum, Z bracket. For use with LAHP-25 to LAHP-25 series actuators.	PDF
LAHP-ZB-25-33	$436.00	Z bracket	SureMotion® mounting bracket, anodized aluminum, Z bracket. For use with LAHP-25 to LAHP-33 series actuators.	PDF
LAHP-ZB-25-33W	$433.00	Z bracket	SureMotion® mounting bracket, anodized aluminum, Z bracket. For use with LAHP-25 to LAHP-33W series actuators.	PDF
LAHP-ZB-33-33	$491.00	Z bracket	SureMotion® mounting bracket, anodized aluminum, Z bracket. For use with LAHP-33 to LAHP-33 series actuators.	PDF
LAHP-ZB-33-33W	$510.00	Z bracket	SureMotion® mounting bracket, anodized aluminum, Z bracket. For use with LAHP-33 to LAHP-33W series actuators.	PDF

XY Bracket

Z Bracket
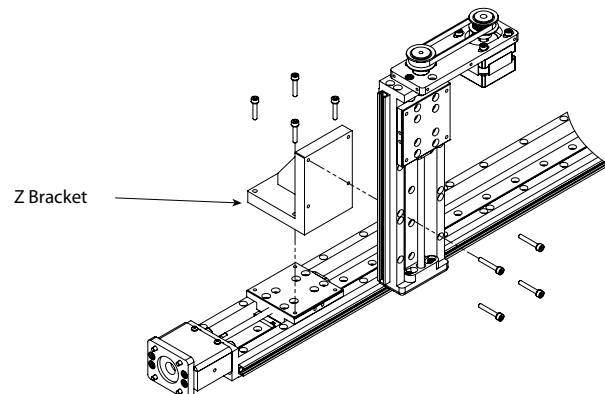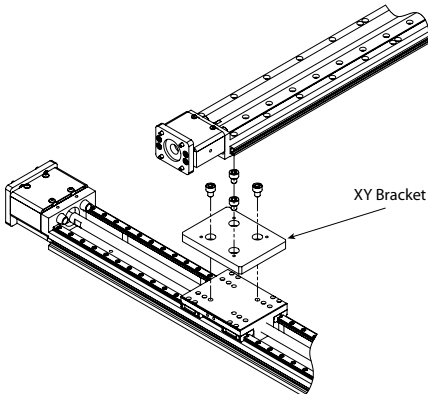
LAHP Series Sensors

Part Number	Price	Sensor Type	Output	Drawing Links
LAHP-SNS-PH-N	$351.00	photoelectric sensor	NPN	PDF
LAHP-SNS-PH-P	$351.00	photoelectric sensor	PNP	PDF
LAHP-SNS-PX-N	$401.00	proximity sensor	NPN	PDF
LAHP-SNS-PX-P	$401.00	proximity sensor	PNP	PDF

NOTE: 3 Sensors included in each kit
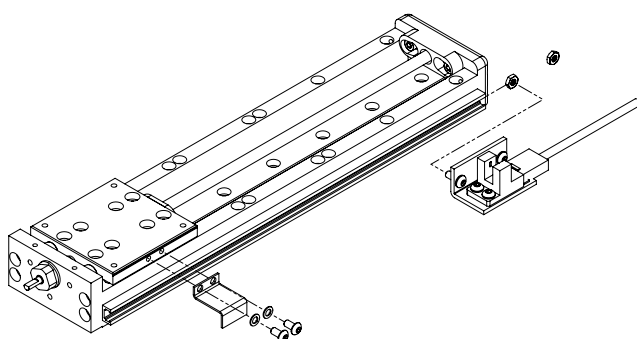
Photoelectric Sensor Kit
LAHP-SNS-PH-N
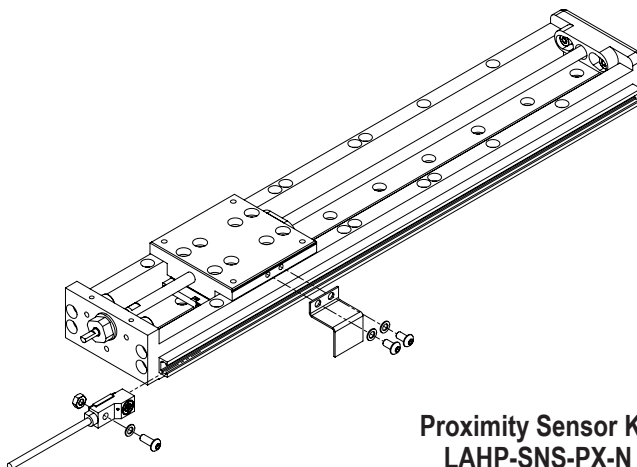
Proximity Sensor Kit
LAHP-SNS-PX-N

LAHP Lead Nut Replacement Kit

Part Number	Price	Description
LAHP-25-NUT-LP25	$150.00	SureMotion® lead nut, replacement, 0.25in pitch. For use with LAHP-25 series actuators.
LAHP-33-NUT-LP25	$167.00	SureMotion® lead nut, replacement, 0.25in pitch. For use with LAHP-33 series actuators.

Linear Motion Products

![SureMotion logo]

Product Overview

Actuator Overview

SureMotion linear motion offers both motor-ready actuator assemblies, and a versatile 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	$$$$
LACP2	Compact Slide	Lead Screw	125	20	6, 12, 24, 36	$$
LAVL2	Value Slide	Lead Screw	110	15	6, 12, 18, 24	$
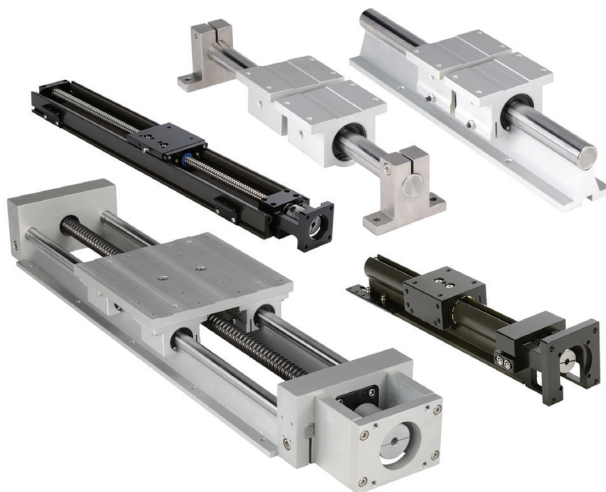
Available Multi-Axis Configurations

X-Y Axis Configurations
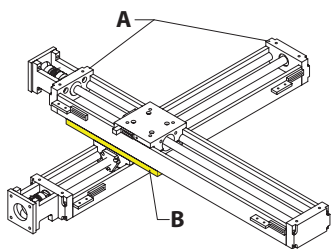
A. (2) LAVL2-60Txxxx
B. (1) LAVLACC-004
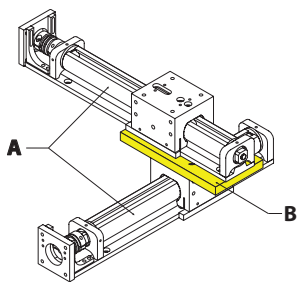
A. (2) LACP2-16Txxxx
B. (1) LACPACC-004
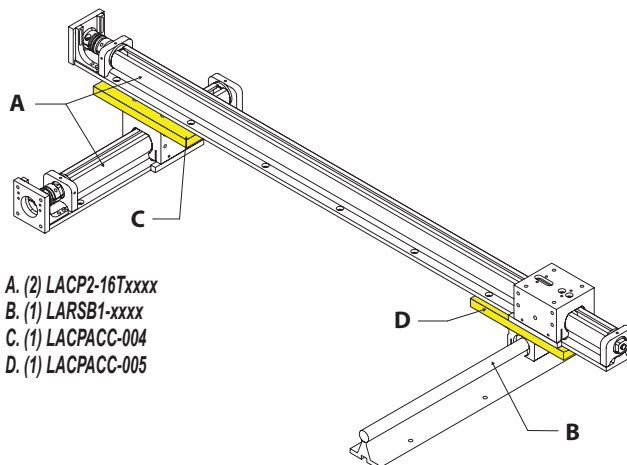
A. (2) LACP2-16Txxxx
B. (1) LARSB1-xxxx
C. (1) LACPACC-004
D. (1) LACPACC-005

X-Z Axis Configuration
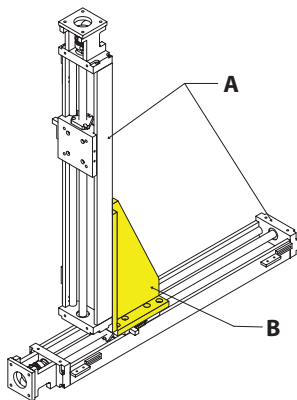
A. (2) LAVL2-60Txxxx
B. (1) LAVLACC-005

X-Y-Z Axis Configuration
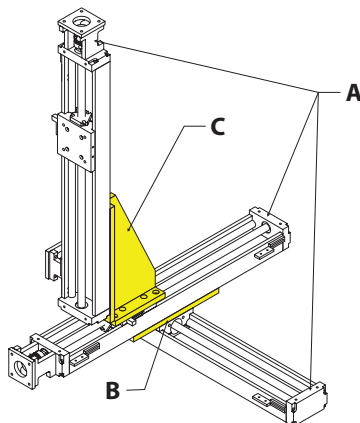
A. (3) LAVL2-60Txxxx
B. (1) LAVLACC-004
C. (1) LAVLACC-005

Linear Motion - U Can Do It
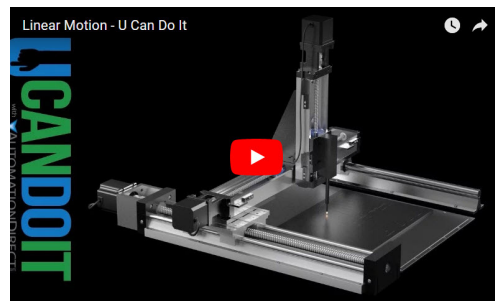
Click on the above video link for a short visual example of how our products can be used.

Sure motion

Linear Motion Products

Twin Round Shaft Slide Actuators
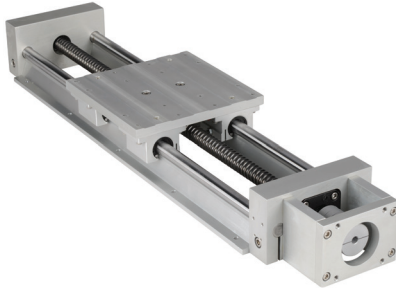
LARSD2-08T12BP2C

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 (in2)	Constant System Inertia (lbm-in2)	Travel	Weight (lb)	Fits Motor
LARSD2-08T12BP2C	$3,157.00	Ball screw	0.2 in	83	0.001	0.11	12in	10.5	NEMA 23
LARSD2-08T24BP2C	$3,409.00					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.
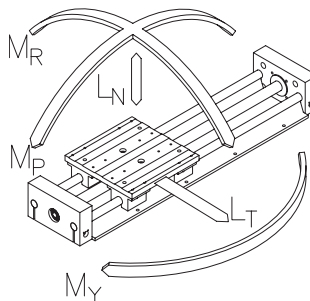
Load rating diagram

Twin Round Shaft Slide Actuator Load/Moment Ratings						
Part Number	Load (lb)			Moment (lb·in)		
	Actuator Thrust	Normal – LN		Transverse	Roll	Pitch	Yaw
		Down	Up	LT	MR	MP	MY
LARSD2-08TxxBP2C	200	920	644	920	1046	1210	1730

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Twin Round Shaft Slide Actuators

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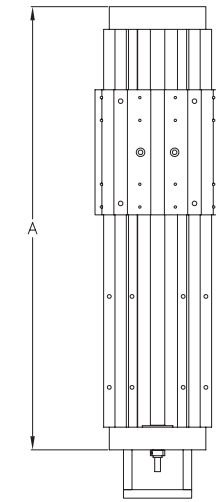
PART NUMBER	A	B (TRAVEL)
LARSD2−08T12BP2C	19.50 [495.3]	12.00 [304.9]
LARSD2−08T24BP2C	31.5 [800.1]	24.00 [609.8]

5.50 [139.7]

2.37 [60.2]

B

5.50 [139.7]
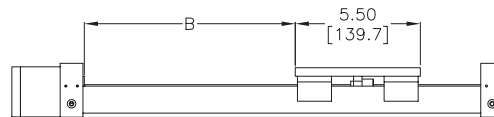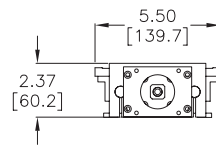
LARSD2-08TxxBP2C

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

Accessories

Twin Round Shaft Slide Actuator Accessories			
Part Number	**Price**	**Description**	**Weight (lb)**
LARSACC-010	$31.50	SureMotion linear ball bushing, open type, 1/2 inch inside diameter, with seals, self-aligning.	0.5
LARSACC-013*	$842.00	SureMotion repair kit, for use with LARSD2-08T12BP2C actuators. Ballscrew, ballnut, end bearings and grease tube included.	3.0
LARSACC-014*	$829.00	SureMotion repair kit, for use with LARSD2-08T24BP2C actuators. Ballscrew, ballnut, end bearings and grease tube included.	5.0
LARSACC-015*	$316.00	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*	$380.00	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.
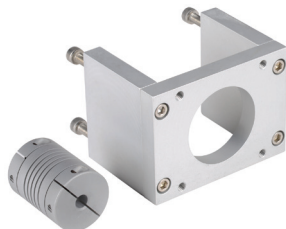
LARSACC-015(16)

LARSACC-013(014)

Some accessories not shown see www.AutomationDirect.com for additional product photos.

Sure motion

Linear Motion Products

Compact Slide Actuators - Generation 2

LACP2-16T06LP5

Description

Self-contained linear actuator designed for light loads in harsh or wet conditions in a very small package. The base is a single piece design with integrated slide surfaces, and is hard anodized all over.

Generation 2 actuators have a reduced part count for more reliable operation, integral wireway through the body and more robust motor mount that fits both NEMA 17 and 23 motors.

Features

- Compact design
- Replacement components available
- Ready for NEMA 17 motor (NEMA 23 motor requires new coupling)
- End-of-travel switch mounts
- AISI 6061-T6 Aluminum Alloy base, Hard Anodized on all surfaces to a depth of 0.0005 to 0.0015"
- 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 (in2)	Constant System Inertia (lbm-in2)	Travel	Weight (lb)	Fits Motor
LACP2-16T06LP5	$1,485.00	Lead screw	0.5 in	52	0.0063	0.016	6in	1.8	NEMA 17
LACP2-16T12LP5	$1,566.00					0.017	12in	2.3	
LACP2-16T24LP5	$2,065.00					0.020	24in	3.5	
LACP2-16T36LP5	$2,460.00					0.024	36in	4.5	
LACP2-16T06L1	$1,485.00		1in	44	0.025	0.022	6in	1.8	
LACP2-16T12L1	$1,566.00					0.023	12in	2.3	
LACP2-16T24L1	$2,065.00					0.026	24in	3.5	
LACP2-16T36L1	$2,460.00					0.030	36in	4.5	
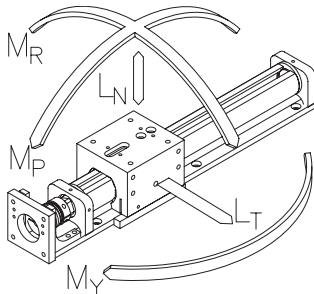
System Inertia Calculation:
- To calculate the inertia reflected to the motor in a particular actuator, multiply the carriage payload by the payload inertia factor and then add the constant system inertia value for that actuator. The constant system inertia value for each system includes the inertia of the shaft coupler, carriage, and lead/ball screw.
- The payload must be in units of lb_m.

Compact Slide Actuator Load/Moment Ratings

Part Number	Load (lb)*				Moment (lb·in)**		
	Actuator Thrust	Normal – LN		Transverse	Roll	Pitch	Yaw
		Down	Up	LT	MR	MP	MY
LACP2-16TxxLP5	51	125	60	125	12	15	33
LACP2-16TxxL1	28	125	60	125	12	15	33

Load rating diagram

* 30lb is the recommended maximum load capacity if the carriage is not externally supported against rolling. The higher load capacities are possible if the carriage is externally supported.

** It is recommended that offset loads be located 5 inches or less from the center of the carriage. When the loads are offset at greater distances, the carriage can vibrate during travel.

Linear Motion Products

Sure motion

Compact Slide Actuators - Generation 2

Dimensions (in [mm])

PART NUMBER	A	B (TRAVEL)
LACP2-16T06LP5	11.57 [293.8]	6.40 [162.6]
LACP2-16T12LP5	17.57 [446.2]	12.40 [315.0]
LACP2-16T24LP5	29.57 [751.0]	24.40 [619.8]
LACP2-16T36LP5	41.57 [1055.8]	36.40 [924.6]
LACP2-16T06L1	11.57 [293.8]	6.40 [162.6]
LACP2-16T12L1	17.57 [446.2]	12.40 [315.0]
LACP2-16T24L1	29.57 [751.0]	24.40 [619.8]
LACP2-16T36L1	41.57 [1055.8]	36.40 [924.6]

2.00 [50.8]

2.28 [57.9]

2.28 [57.8]

2.25 [57.2]

B

A
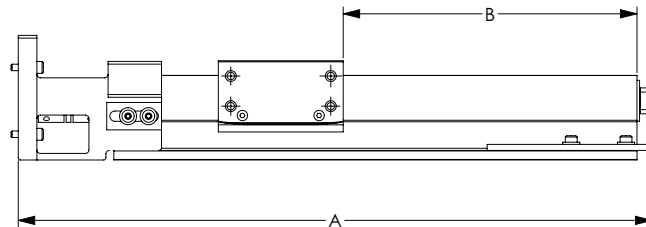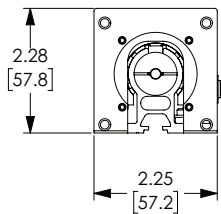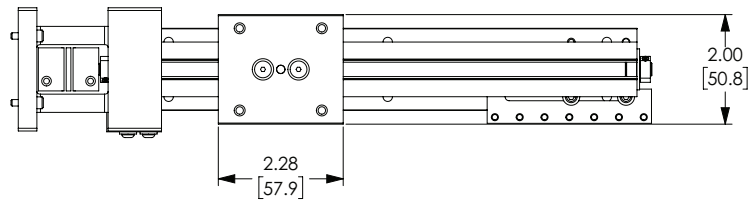
LACP2-16TxxLxx

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

Accessories

Compact Slide Actuator Accessories			
Part Number	**Price**	**Description**	**Weight (lb)**
LAVLACC-003*	$316.00	SureMotion motor adapter, NEMA 23 frame. For use with LAVL2-60 series actuators. 1/4 inch x 5 mm coupler included.	1.0
LACPACC-0021	$856.00	SureMotion repair kit, for use with LACP-16TxxLP5 actuators. Nut, bushings, end bearings and oil syringe included.	0.5
LACPACC-0031	$856.00	SureMotion repair kit, for use with LACP-16TxxL1 actuators. Nut, bushings, end bearings and oil syringe included.	0.5
LACPACC-004	$96.00	SureMotion mounting plate, XY type. For use with LACP2-16 series actuators.	0.5
LACPACC-005	$122.00	SureMotion mounting plate, XY type. For use with LACP2-16 and LARSB1 series actuators.	0.5
LACPACC-0062	$856.00	SureMotion repair kit, for use with LACP2-16TxxLP5 actuators. Nut, bushings, end bearings and oil syringe included.	1.0
LACPACC-0072	$856.00	SureMotion repair kit, for use with LACP2-16TxxL1 actuators. Nut, bushings, end bearings and oil syringe included.	1.0

* Use the coupling and motor mount screws from this kit to adapt any LACP2 actuator assembly to accept a NEMA 23 motor.
¹ These repair kits contain parts to rebuild Generation 1 (LACP series) acutator assemblies.
² These repair kits contain parts to rebuilt current Generation 2 (LACP2 series) actuator assemblies.

LAVLACC-003

LACPACC-002(003)

LACPACC-004(005)

Some accessories not shown see www.AutomationDirect.com for additional product photos.

Sure motion

Linear Motion Products

Value Linear Slide Actuators - Generation 2

LAVL2-60T06LP2

Description

Low-cost linear actuator using the latest in sliding element technology. The base is a single piece design with integrated slide surfaces, and is hard anodized all over. This versatile unit can be mounted horizontally, vertically, or inverted without loss of load capacity.

Generation 2 actuators have a reduced part count for more reliable operation, integral sensor mount grooves on both sides and a more robust motor mount.

Features

- Maintenance-free Rails and Rail Bushings
- Small footprint
- Adjustable carriage pre-load
- Replacement components available
- Ready for NEMA 17 motor
- T-slots enable limit switches to be positioned anywhere
- AISI 6061-T6 Aluminum Alloy base, hard anodized on all surfaces to a depth of 0.0005 to 0.0015"
- AISI 304 Stainless Steel Lead Screw
- Acetal NTA3 Lead Nut
- Drylin® Rail Bushings

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 (in2)	Constant System Inertia (lbm-in2)	Travel	Weight (lb)	Fits Motor
LAVL2-60T06LP2	$1,038.00	Lead screw	0.2 in	47	0.001	0.017	6in	2.0	NEMA 17
LAVL2-60T12LP2	$1,304.00					0.020	12in	2.8	
LAVL2-60T18LP2	$1,578.00					0.023	18in	3.5	
LAVL2-60T24LP2	$1,842.00					0.027	24in	4.2	
LAVL2-60T06LP5	$1,038.00		0.5 in	57	0.0063	0.019	6in	2.0	
LAVL2-60T12LP5	$1,304.00					0.022	12in	2.8	
LAVL2-60T18LP5	$1,578.00					0.025	18in	3.5	
LAVL2-60T24LP5	$1,842.00					0.028	24in	4.2	

NOTE: The Lead Screw is lubricated at the factory with PTFE oil. It should be re-lubed peridocially. Rails and bushing lubrication not required.

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.
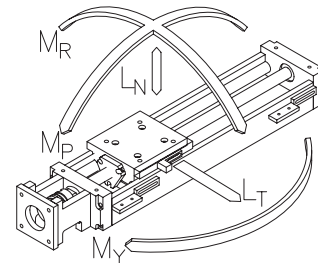
Load rating diagram

Value Linear Slide Actuator Load/Moment Ratings

Part Number	Load (lb)				Moment (lb·in)*		
	Actuator Thrust	Normal – LN		Transverse	Roll	Pitch	Yaw
		Down	Up	LT	MR	MP	MY
LAVL2-60TxxLP2	70	110	110	110	50	32	32
LAVL2-60TxxLP5	50	110	110	110	50	32	32

* It is recommended that offset loads be located 5 inches or less from the center of the carriage. When the loads are offset at greater distances, the carriage can vibrate during travel.

Sure motion

Linear Motion Products

Value Linear Slide Actuators - Generation 2

Dimensions (in [mm])

PART NUMBER	A	B (TRAVEL)
LAVL2-60T06LP2	11.61 [294.8]	6.03 [153.1]
LAVL2-60T12LP2	17.61 [447.2]	12.03 [305.6]
LAVL2-60T18LP2	23.61 [599.6]	18.03 [458.0]
LAVL2-60T24LP2	29.61 [752.0]	24.03 [610.3]
LAVL2-60T06LP5	11.61 [294.8]	6.03 [153.1]
LAVL2-60T12LP5	17.61 [447.2]	12.03 [305.6]
LAVL2-60T18LP5	23.61 [599.6]	18.03 [458.0]
LAVL2-60T24LP5	29.61 [752.0]	24.03 [610.3]

2.40 [61.0]

2.30 [58.4]

2.36 [60.0]

1.52 [38.6]

1.61 [40.9]

B

A
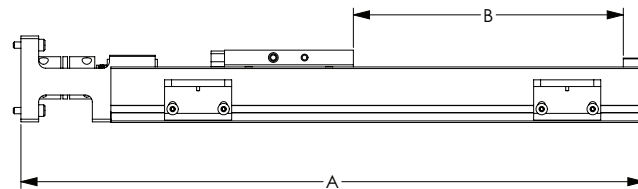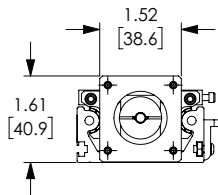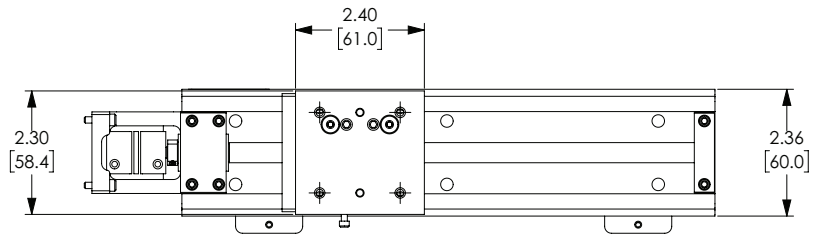
LAVL2-60TxxLPx

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

Accessories

Value Linear Slide Actuator Accessories			
Part Number	**Price**	**Description**	**Weight (lb)**
LAVLACC-001*	$380.00	SureMotion repair kit, for use with LAVL-60TxxLP2 actuators. Nut, bushings, end bearings and oil syringe included.	0.5
LAVLACC-002*	$380.00	SureMotion repair kit, for use with LAVL-60TxxLP5 actuators. Nut, bushings, end bearings and oil syringe included.	0.5
LAVLACC-003	$316.00	SureMotion motor adapter, NEMA 23 frame. For use with LAVL2-60 series actuators. 1/4 inch x 5 mm coupler included.	1.0
LAVLACC-004	$147.00	SureMotion mounting plate, XY type. For use with LAVL2-60 series actuators.	0.5
LAVLACC-005	$331.00	SureMotion mounting plate, XZ type. For use with LAVL2-60 series actuators.	1.0
LAVLACC-006*	$380.00	SureMotion repair kit, for use with LAVL2-60TxxLP2 actuators. Nut, bushings, end bearings and oil syringe included.	1.0
LAVLACC-007*	$380.00	SureMotion repair kit, for use with LAVL2-60TxxLP5 actuators. Nut, bushings, end bearings and oil syringe included.	1.0

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

LAVLACC-003

LAVLACC-001(002)

LAVLACC-004

LAVLACC-005

Some accessories not shown see www.AutomationDirect.com for additional product photos.

Linear Motion Products

Suremotion

Round-Shaft Slide Elements

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.

LARSA1-12L12C

LARSB1-12L12C

Features

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

NOTE: Pillow blocks are shipped without lubrication and should be lubricated prior to use. A lubrication port is available.

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

Part Number	Price	Shaft Diameter	Overall Length (in)	Weight (lb)
LARSA1-08L12C	$354.00	1/2	12	1.5
LARSA1-08L24C	$366.00	1/2	24	2.0
LARSA1-08L36C	$393.00	1/2	36	2.7
LARSA1-12L12C	$447.00	3/4	12	3.0
LARSA1-12L24C	$473.00	3/4	24	4.5
LARSA1-12L36C	$498.00	3/4	36	6.0
LARSA1-16L12C	$597.00	1	12	6.0
LARSA1-16L24C	$637.00	1	24	8.5
LARSA1-16L36C	$671.00	1	36	11.0

(2) single pillow blocks included
* Bushings and pillow blocks are replacement components that are the same as the original components in the slide assemblies.

Closed Type Pillow Blocks and Bushings

Part Number	Price	Fits Shaft Diameter (in)	Weight (lb)	Image
LARSACC-001	$69.00	1/2	0.3	
LARSACC-002	$89.00	3/4	0.6	
LARSACC-003	$125.00	1	1.2	
LARSACC-007	$27.00	1/2	0.1	
LARSACC-008	$31.50	3/4	0.2	
LARSACC-009	$51.00	1	0.3	

Continuously-Supported Slide Rail Systems

Part Number	Price	Shaft Diameter	Overall Length (in)	Weight (lb)
LARSB1-08L12C	$366.00	1/2	12	2.0
LARSB1-08L24C	$456.00	1/2	24	3.0
LARSB1-08L36C	$568.00	1/2	36	4.5
LARSB1-12L12C	$458.00	3/4	12	4.0
LARSB1-12L24C	$597.00	3/4	24	6.2
LARSB1-12L36C	$733.00	3/4	36	9.0
LARSB1-16L12C	$594.00	1	12	6.5
LARSB1-16L24C	$768.00	1	24	10.5
LARSB1-16L36C	$925.00	1	36	14.5

(2) single pillow blocks included
* Bushings and pillow blocks are replacement components that are the same as the original components in the slide assemblies.

Open Type Pillow Blocks and Bushings

Part Number	Price	Fits Shaft Diameter (in)	Weight (lb)	Image
LARSACC-004*	$76.00	1/2	0.3	
LARSACC-005*	$97.00	3/4	0.6	
LARSACC-006*	$138.00	1	1.2	
LARSACC-010	$31.50	1/2	0.1	
LARSACC-011	$39.50	3/4	0.2	
LARSACC-012	$65.00	1	0.3	

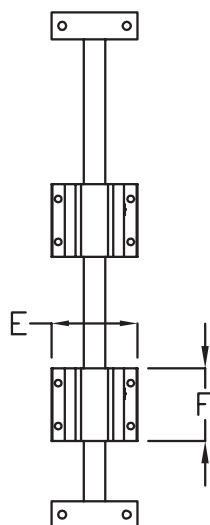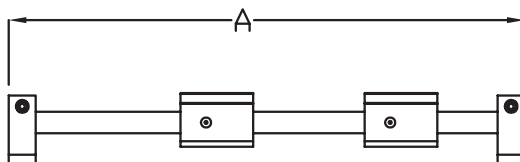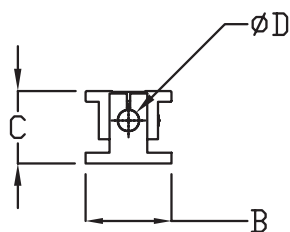***Preload Adjustment available**

Sure *motion*

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
& LARSB1-xxLxxC***

*LARSA1-xxLxxC is shown in drawing. LARSB1-xxLxxC has different appearance, but same dimensions as shown in this table.

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

Sure motion

Precision Ground Linear Shafts

1060 Steel and 440C Stainless Steel

Features

- C1060 steel
- RC60-65 Hardness
- 10RMS Surface Finish
- Tolerance: Class L
  ± 1/32" length tolerance
 + 0.0000" / - 0.0005" diameter tolerance

Features

- 440C Stainless steel
- RC50-55 Hardness
- 10RMS Surface Finish
- Tolerance: Class L
  ± 1/32" length tolerance
  + 0.0000" / - 0.0005" diameter tolerance

Linear Shafts - 1060 Steel				
Part Number	A	ØB	Price	Weight (lb)
LPCS08-12	12.0	0.50	Retired	0.71
LPCS08-24	24.0	0.50	Retired	2.41
LPCS08-36	36.0	0.50	Retired	3.41
LPCS12-12	12.0	0.75	Retired	1.52
LPCS12-24	24.0	0.75	Retired	4.03
LPCS12-36	36.0	0.75	Retired	5.84
LPCS16-12	12.0	1.0	Retired	2.71
LPCS16-24	24.0	1.0	Retired	6.41
LPCS16-36	36.0	1.0	Retired	9.41

Note: All measurements in inches

Linear Shafts - 440C Stainless Steel				
Part Number	A	ØB	Price	Weight (lb)
LPSS08-12	12.0	0.50	Retired	0.71
LPSS08-24	24.0	0.50	Retired	2.41
LPSS08-36	36.0	0.50	Retired	3.41
LPSS12-12	12.0	0.75	Retired	1.52
LPSS12-24	24.0	0.75	Retired	4.03
LPSS12-36	36.0	0.75	Retired	5.84
LPSS16-12	12.0	1.0	Retired	2.71
LPSS16-24	24.0	1.0	Retired	6.41
LPSS16-36	36.0	1.0	Retired	9.41

Note: All measurements in inches

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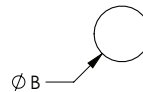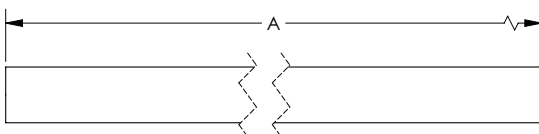
See our website www.AutomationDirect.com for complete Engineering drawings.

igus® Plastic Plain Bearings

igus®

igus® iglide® plastic bearings are economical, dry-running and maintenance-free. Offered in three of the most popular materials with or without flanges, these plain bearings are an excellent choice for a wide range of motion applications.

Features

• 3 popular materials - J (low friction), G300 (general purpose), T500 (high temp)
• Sleeve and flange bearings
• Fits shafts from 1/4" to 1"
• Good chemical resistance
• Link to selection guide materials

CE

igus® iglide® Plain Bearings									
Item Photo	Part Number	Material	Size I.D. (inch)	Size O.D. (inch)	Flange	Qty. per Package	Weight (lb)	Price	Drawing Link
	A-JSI-0406-04	J	1/4	3/8	No	10	0.19	$8.50	PDF
	A-JSI-0810-08		1/2	5/8		10	0.04	$11.00	PDF
	A-JSI-1214-12		3/4	7/8		5	0.03	$10.00	PDF
	A-JSI-1618-16		1	1-1/8		2	0.44	$6.50	PDF
	A-JFI-0406-04		1/4	3/8	Yes	10	0.02	$8.75	PDF
	A-JFI-0810-08		1/2	5/8		10	0.49	$13.50	PDF
	A-JFI-1214-12		3/4	7/8		5	0.49	$10.50	PDF
	A-JFI-1618-16		1	1-1/8		2	0.04	$6.50	PDF
	A-GSI-0405-04	G300	1/4	5/16	No	10	0.02	$8.00	PDF
	A-GSI-0809-08		1/2	9/16		10	0.03	$8.75	PDF
	A-GSI-1214-12		3/4	7/8		5	0.04	$10.50	PDF
	A-GSI-1618-16		1	1-1/8		2	0.04	$7.25	PDF
	A-GFI-0405-04		1/4	5/16	Yes	10	0.02	$8.00	PDF
	A-GFI-0809-08		1/2	9/16		10	0.04	$9.50	PDF
	A-GFI-1214-12		3/4	7/8		5	0.05	$12.00	PDF
	A-GFI-1618-16		1	1-1/8		2	0.03	$7.25	PDF
	A-TSI-0405-04	T500	1/4	5/16	No	5	0.02	$15.00	PDF
	A-TSI-0809-08		1/2	9/16		5	0.02	$16.50	PDF
	A-TSI-1214-12		3/4	7/8		2	0.03	$19.00	PDF
	A-TSI-1618-16		1	1-1/8		2	0.03	$25.00	PDF
	A-TFI-0405-04		1/4	5/16	Yes	5	0.01	$16.00	PDF
	A-TFI-0809-08		1/2	9/16		5	0.02	$25.50	PDF
	A-TFI-1214-12		3/4	7/8		2	0.02	$21.00	PDF
	A-TFI-1618-16		1	1-1/8		2	0.04	$26.50	PDF
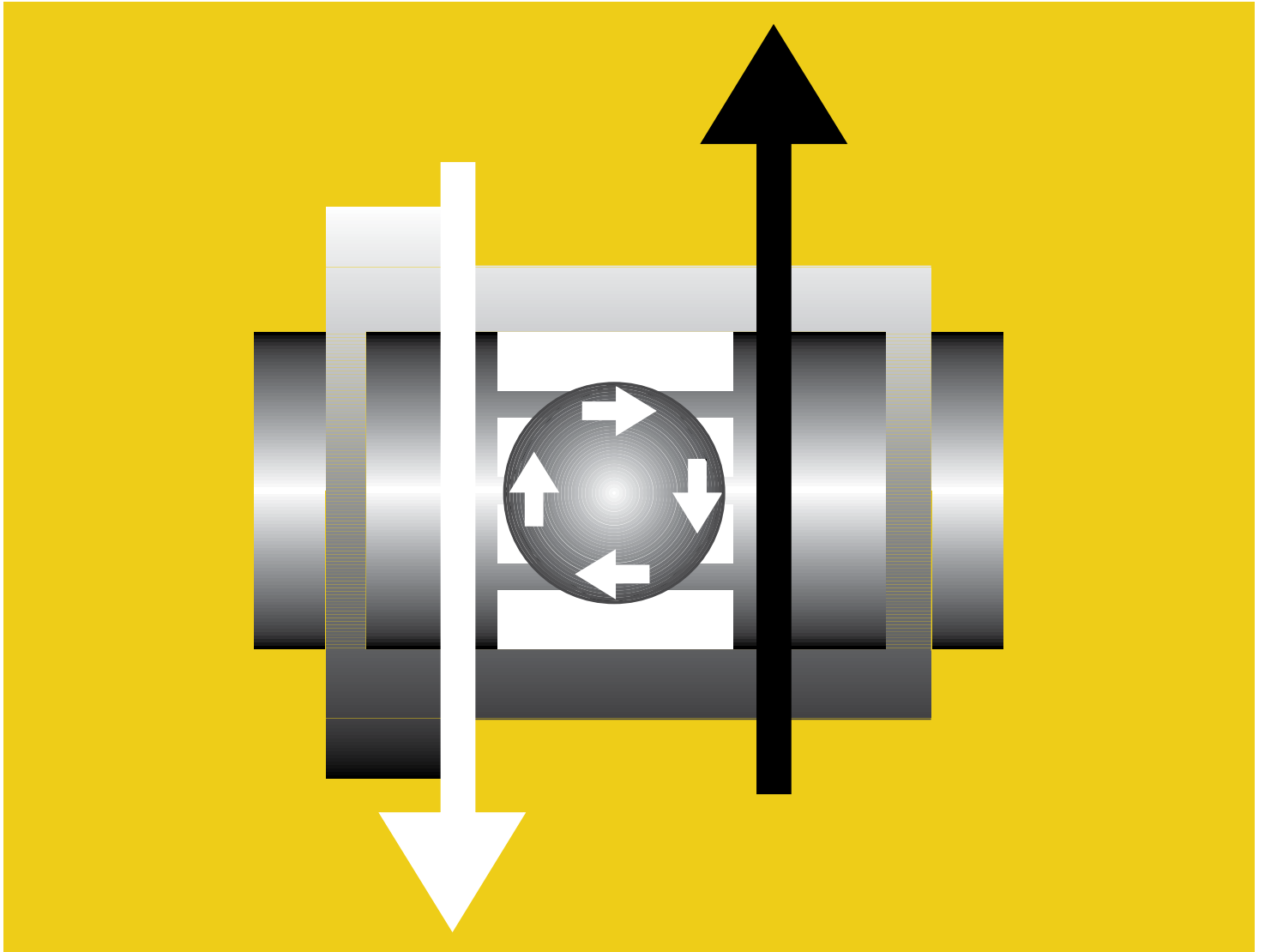
iglide® J

- Low wear against different shaft materials
- Low coefficients of friction running dry
- Vibration dampening
- Good chemical resistance
- Low moisture absorption

iglide® J - The fast and slow motion specialist

Low friction, low wear

Low wear against different
shaft materials

Low coefficients
of friction running dry

Vibration dampening

Good chemical resistance

Best material to use
with soft shaft materials

Low moisture absorption
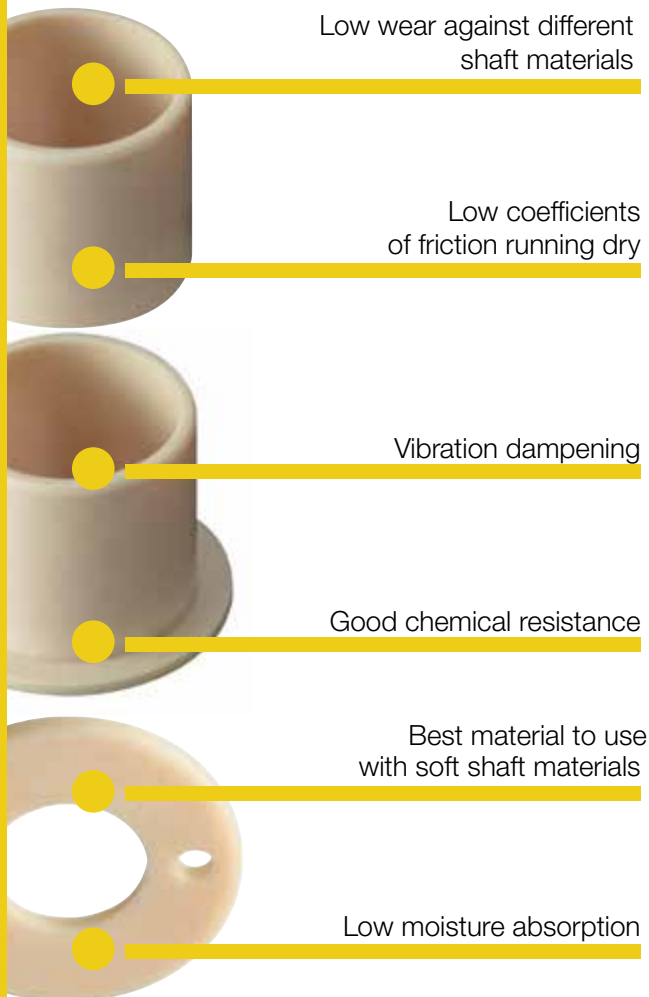
The iglide® J plain bearings are designed for the lowest coefficients of friction while running dry and their low stick-slip tendency. With a maximum permissible surface pressure of 5,076 psi iglide® J bearings are not suitable for extreme loads.

Best Applications

- For high speeds
- For highest wear resistance at low to medium pressures
- When very low coefficients of friction are necessary
- When a cost effective bearing for low pressure loads is needed

Not For Use In Applications

When high pressure loads occur
➤ iglide® G300
When short-term temperatures occur that are greater than 248°F
➤ iglide® G300
When a low-cost bearing for occasional movements is necessary
➤ iglide® G300

Typical application areas

- Automation
- Printing industry
- Cleanroom
- Aerospace engineering
- Beverage technology
- Automation

max.   +194°F
min.   –58°F

Ø 1/4 to 1 inch
more sizes available from igus

Ø 1.5 to 110 mm
metric sizes available from igus

www.igus.com
1-800-521-2747

Material Properties Table

General Properties	Unit	iglide® J	Testing Method
Density	g/cm³	1.49	
Color		yellow	
Max. moisture absorption at 73°F / 50% r.h.	% weight	0.3	DIN 53495
Max. moisture absorption	% weight	1.3	
Coefficient of friction, dynamic against steel	μ	0.06 - 0.18	
pv value, max. (dry)	psi x fpm	9,700	

Mechanical Properties			
Modulus of elasticity	psi	348,100	DIN 53457
Tensile strength at 68°F	psi	10,590	DIN 53452
Compressive strength	psi	8,702	
Permissible static surface pressure (68°F)	psi	5,076	
Shore D-hardness		74	DIN 53505

Physical and Thermal Properties			
Max. long-term application temperature	°F	194	
Max. application temperature, short-term	°F	248	
Min. application temperature	°F	-58	
Thermal conductivity	W/m x K	0.25	ASTM C 177
Coefficient of thermal expansion	K⁻¹ x 10⁻⁵	10	DIN 53752

Electrical Properties			
Specific volume resistance	Ωcm	> 10^{13}	DIN IEC 93
Surface resistance	Ω	> 10^{12}	DIN 53482

Compressive Strength

With a maximum permissible surface pressure of 5,075 psi, iglide® J plain bearings are not suited for extreme loads. The graph shows the elastic deformation of iglide® J for radial loads. At the maximum permissible load of 5,075 psi, the deformation is less than 2.5%.
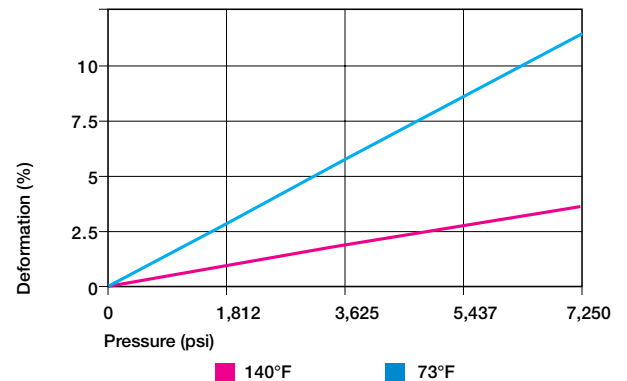
Deformation under load and temperature
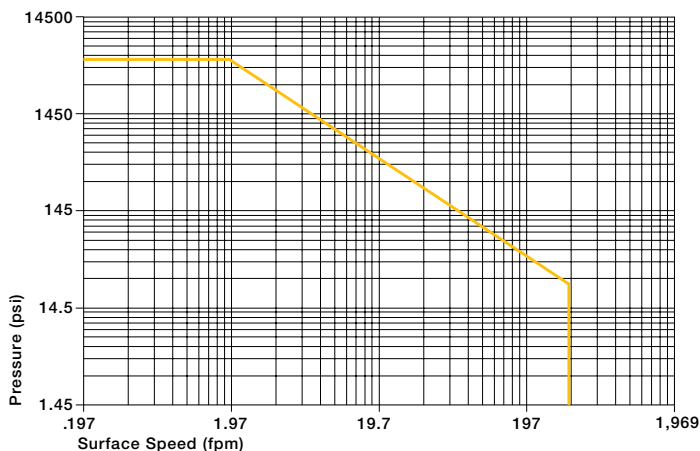
Permissible pv value for iglide® J running dry against steel shaft, at 68°F
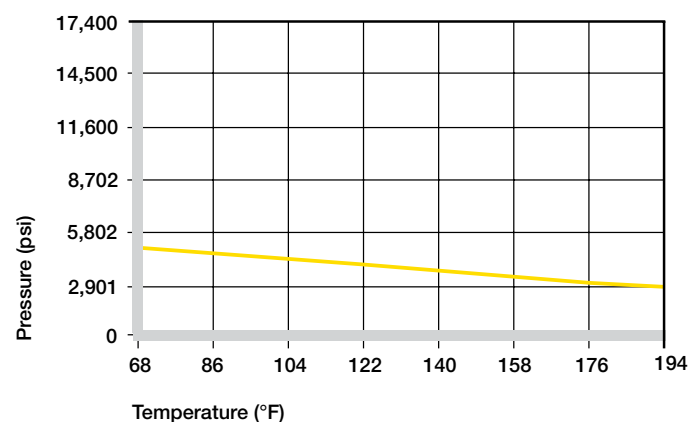
Permissible Surface Speeds

The low coefficient of friction and the extremely low stick-slip tendency of iglide® J plain bearings are especially important at very low speeds. However, iglide® J material can also be used for high speeds of over 197 fpm. In both cases, the static friction is very low and stick-slip does not occur. The maximum values given in the table can only be achieved at the lowest pressure loads. At the given speeds, friction can cause a temperature increase to maximum permissible levels. In practice, though, this temperature level is rarely reached, due to varying application conditions.

	Continuous	Short Term
	fpm	fpm
Rotating	295	590
Oscillating	216	413
Linear	1574	1968

Maximum surface speeds

www.igus.com
1-800-521-2747

iglide® J - Technical data

Temperatures

iglide® J plain bearings can be used between -58°F and 194°F; the short-term maximum permissible temperature is 248°F. The graph shows that the compressive strength of iglide® J plain bearings decreases with increasing temperatures. Also, the wear increases significantly above 176°F


Recommended maximum permissible static surface pressure of iglide® J as a result of the temperature

| iglide® J	Application Temperature
Minimum	- 58°F
Max. long-term	+194°F
Max. short-term	+248°F
Additional axial securing	+140°F

**Temperature limits for iglide® J**

Friction and Wear

The graph to the right shows the coefficients of friction for different loads. The coefficient of friction level is very good for all loads with iglide® J. Friction and wear are also dependent, to a large extent, on the shafting partner. With increasing shaft roughness, the coefficient of friction also increases. For iglide® J a ground surface with an average roughness range of 4 - 12 rms is recommended for the shaft.
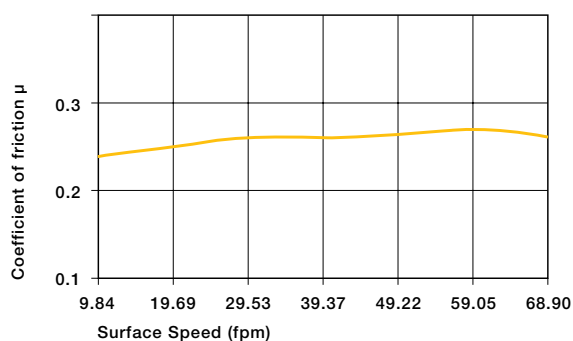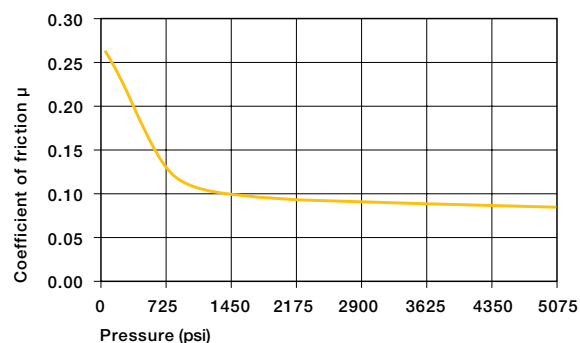
Coefficient of friction of iglide® J as a result of the surface speed; p = 108 psi

Coefficient of friction of iglide® J as a result of the load, v = 1.97 fpm
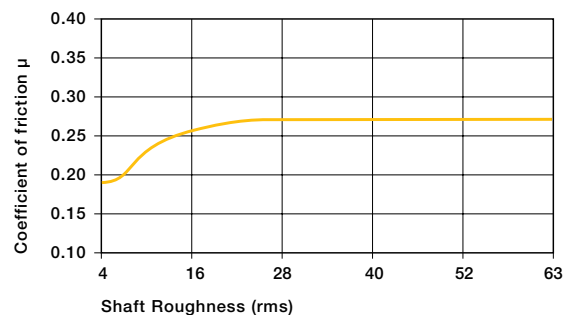
iglide® J	Coefficient of Friction
Dry	0.06 - 0.18
Grease	0.09
Oil	0.04
Water	0.04

Coefficients of friction for iglide® J against steel (Shaft finish = 40 rms, 50 HRC)

Coefficient of friction of iglide® J as a result of the shaft surface (1050 hard chromed)

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iglide® J - Technical data

Shaft Materials

The graphs show results of testing different shaft materials with plain bearings made of iglide® J.

If iglide® J plain bearings are used in rotational applications with loads under 290 psi, several shaft materials are suitable. A Hard Chromed shaft provides the lowest wear in this range. When compared to most iglide® materials, iglide® J has very low wear results at low loads with all shaft materials tested.

Also, for increasing loads up to 725 psi, the wear resistance of iglide® J is excellent. Especially suitable is the combination of 303 stainless steel.

In oscillating operation with Cold Rolled Steel and HR Carbon Steel, the wear of iglide® J is slightly higher than for rotation. For oscillating movements with loads of 290 psi, iglide® J performs best with Cold Rolled Steel shaft.

As shown in the graph, the difference in wear between rotation and oscillating movements is most significant for 303 stainless steel shafts.
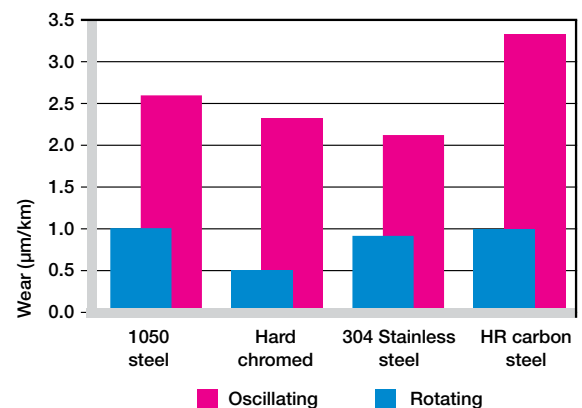
If the shaft material you plan to use is not contained in this list, please contact us.

Legend:
- 1050 Steel
- HR carbon steel
- 304 Stainless
- Hard chromed
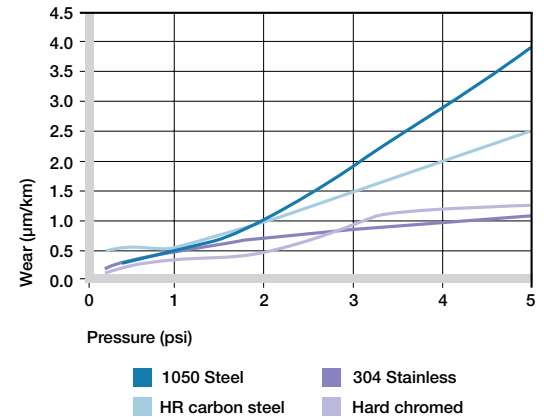
Wear of iglide® J, rotating application with different shaft materials, depending on load
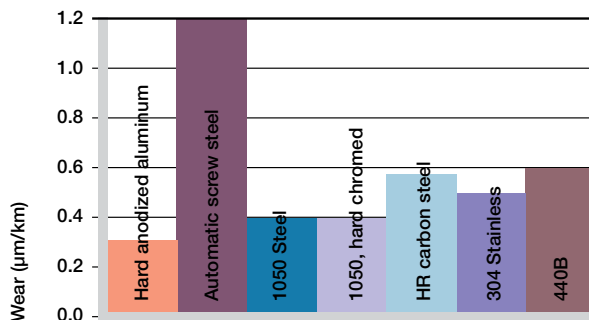
**Wear of iglide® J, rotating application with different shaft materials, p = 108 psi, v = 98 fpm**

Legend:
- Oscillating
- Rotating

Wear for oscillating and rotating applications with different shaft materials under constant load p = 290 psi

Installation Tolerances

iglide® J plain bearings are oversized before being pressfit. After proper installation into a recommended housing bore, the inner diameter adjusts to meet our specified tolerances. Please adhere to the catalog specifications for housing bore and recommended shaft sizes. This will help to ensure optimal performance of iglide® plain bearings.
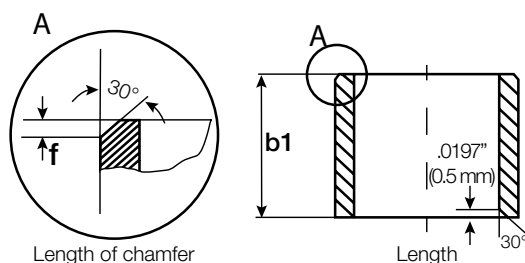
For Inch Size Bearings		
Length Tolerance (b1)		
Length (inches)	Tolerance (h13) (inches)	Length of Chamfer (f) Based on d1
0.1181 to 0.2362	-0.0000 /-0.0071	$f = .012 \rightarrow d_1$ .040" - .236"
0.2362 to 0.3937	-0.0000 /-0.0087	$f = .019 \rightarrow d_1 > .236" - .472"$
0.3937 to 0.7086	-0.0000 /-0.0106	$f = .031 \rightarrow d_1 > .472" - 1.18"$
0.7086 to 1.1811	-0.0000 /-0.0130	$f = .047 \rightarrow d_1 > 1.18"$
1.1811 to 1.9685	-0.0000 /-0.0154	
1.9685 to 3.1496	-0.0000 /-0.0181	

For Metric Size Bearings		
Length Tolerance (b1)		
Length (mm)	Tolerance (h13) (mm)	Length of Chamfer (f) Based on d1
1 to 3	-0 /-140	$f = 0.3 \rightarrow d_1$ 1 - 6 mm
> 3 to 6	-0 /-180	$f = 0.5 \rightarrow d_1 > 6 - 12$ mm
> 6 to 10	-0 /-220	$f = 0.8 \rightarrow d_1 > 12 - 30$ mm
>10 to 18	-0 /-270	$f = 1.2 \rightarrow d_1 > 30$ mm
>18 to 30	-0 /-330	
>30 to 50	-0 /-390	
>50 to 80	-0 /-460	

Length of chamfer

b1

.0197" (0.5 mm)

Length

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Chemical Resistance

iglide® J plain bearings are resistant to diluted lyes and very weak acids, as well as fuels and all types of lubricants. The low moisture absorption also permits use in wet or damp environments. Plain bearings made of iglide® J are resistant to common cleaning agents used in the food industry. The moisture absorption of iglide® J plain bearings is 0.3% in standard atmosphere. The saturation limit in water is 1.3%. These values are so low that possible design changes due to absorption are only necessary in extreme cases.

Medium	Resistance
Alcohol	+
Hydrocarbon	+
Greases, oils without additives	+
Fuels	+
Weak acids	0 to –
Strong acids	–
Weak alkaline	+
Strong alkaline	+ to 0

+ resistant, 0 conditionally resistant, – not resistant

Chemical resistance of iglide® J
All data given concerns the chemical resistance at room temperature (68°F).
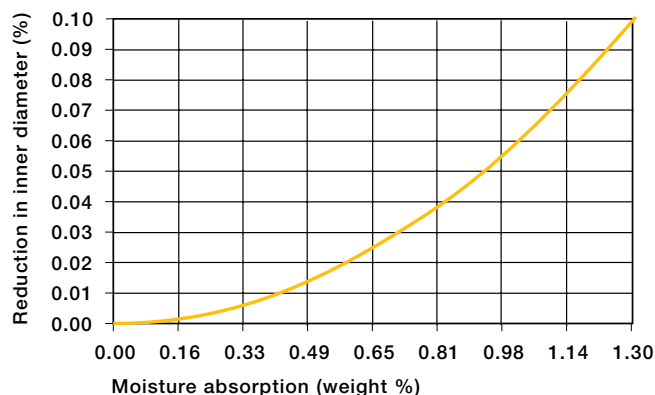
Effect of moisture absorption on iglide® J plain bearings

Radiation Resistance

Plain bearings made from iglide® J are resistant to radiation up to an intensity of 3×10^2 Gy.

UV-Resistance

iglide® J plain bearings become discolored under UV radiation. However, hardness, compressive strength and the wear resistance of the material do not change.

Vacuum

When used in a vacuum environment, the iglide® J plain bearings release moisture as a vapor. Therefore, only dehumidified bearings made of iglide® J are suitable for the vacuum environment.

Electrical Properties

iglide® J plain bearings are electrically insulating.

iglide® J	
Specific volume resistance	$> 10^{13}$ Ωcm
Surface resistance	$> 10^{12}$ Ω

Electrical properties of iglide® G300
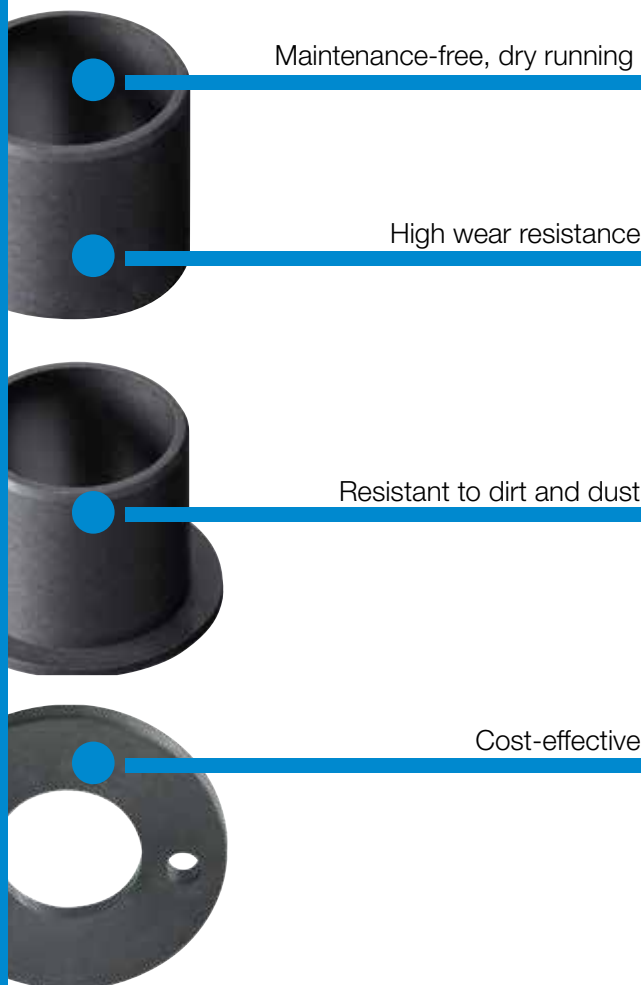
www.igus.com
1-800-521-2747
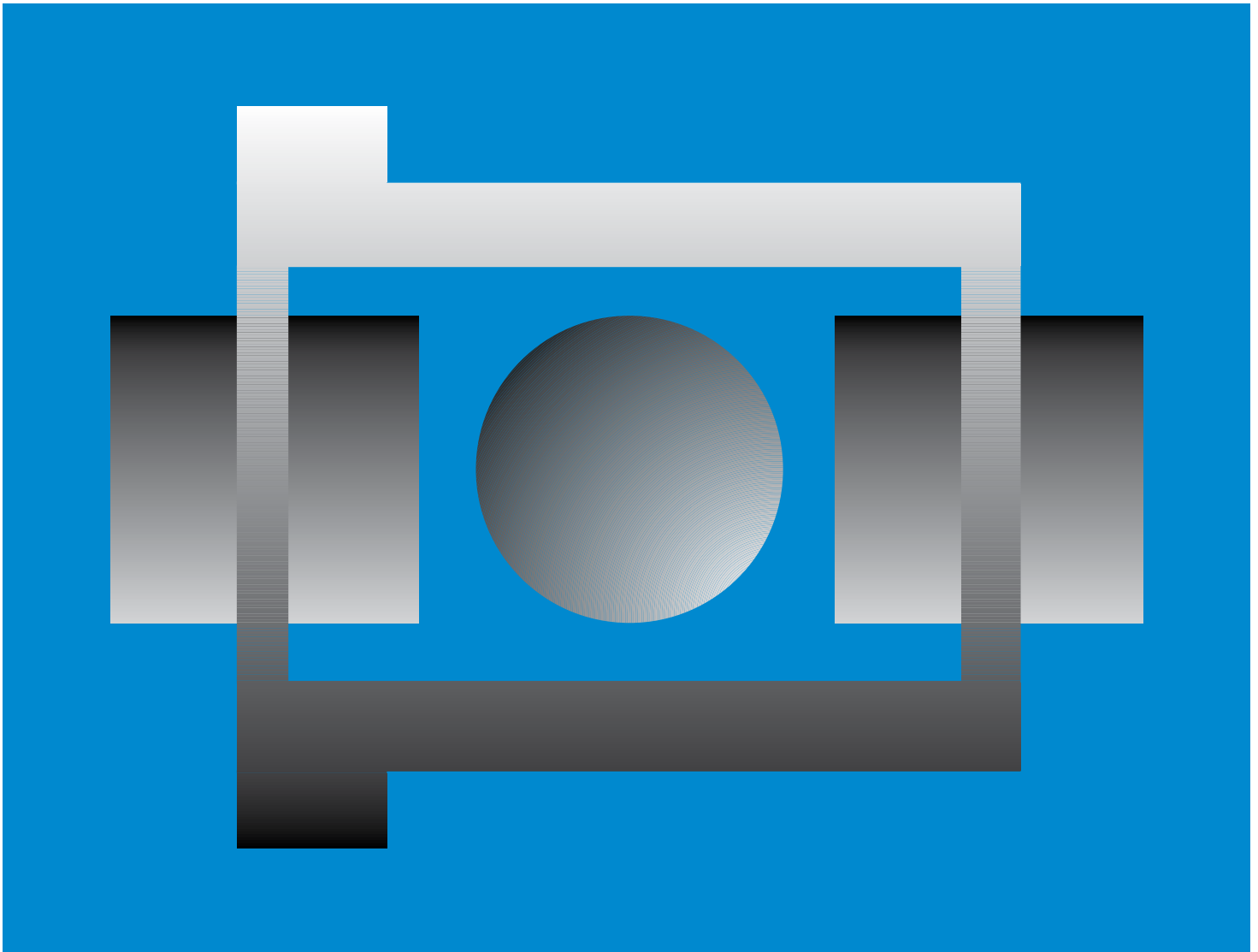
iglide® G300

- High wear resistance
- Resistance to dust and dirt
- Economic
- Self-lubricating and maintenance free

iglide® G300 - General Purpose

Most popular iglide® material worldwide

Maintenance-free, dry running

High wear resistance

Resistant to dirt and dust

Cost-effective

iglide® G300 bearings cover an extremely wide range of different requirements. Typical applications include medium to high loads, medium sliding speeds and medium temperatures. Typical applications include medium to high loads, medium sliding speeds and medium temperatures.

➕ Best Applications

- When you need an economical all-around performance bearing
- For low to average surface speeds
- When the bearing needs to run on different shaft materials
- For oscillating and rotating movements

➖ Not For Use In Applications

- When mechanical reaming of the wall surface is necessary
- When the highest wear resistance is necessary
- When universal chemical resistance is required
  ➤ iglide® T500
- If temperatures are constantly greater than +266°F
  ➤ iglide® T500
- For underwater use

Typical application areas
- Agricultural machines
- Machine building
- Sports and leisure
- Automotive
- Mechatronics
- Construction machinery

max.   +266°F
min.   –40°F

inch Ø 1/4 to 1 inch
more sizes available from igus

mm Ø 1.5 to 150 mm
metric sizes available from igus

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iglide® G300 - Technical Data

Material Properties Table

General Properties	Unit	iglide® G300	Testing Method
Density	g/cm³	1.46	
Color		dark gray	
Max. moisture absorption at 73°F / 50% r.h.	% weight	0.7	DIN 53495
Max. moisture absorption	% weight	4.0	
Coefficient of friction, dynamic against steel	μ	0.08 - 0.15	
pv value, max. (dry)	psi x fpm	12,000	

Mechanical Properties			
Modulus of elasticity	psi	1,131,000	DIN 53457
Tensile strength at 68°F	psi	30,460	DIN 53452
Compressive strength	psi	11,310	
Permissible static surface pressure (68°F)	psi	11,600	
Shore D-hardness		81	DIN 53505

Physical and Thermal Properties			
Max. long-term application temperature	°F	266	
Max. application temperature, short-term	°F	428	
Min. application temperature	°F	-40	
Thermal conductivity	W/m x K	0.24	ASTM C 177
Coefficient of thermal expansion	K^{-1} x 10^{-5}	9	DIN 53752

Electrical Properties			
Specific volume resistance	Ωcm	> 10^{13}	DIN IEC 93
Surface resistance	Ω	> 10^{11}	DIN 53482

Compressive Strength

The graph shows the elastic deformation of iglide® G300 during radial loading. At the maximum permissible load of 11,600 psi, the deformation is less than 5%. The plastic deformation is minimal up to a pressure of approximately 14,500 psi. However, it is also a result of the cycle time.

Deformation under load and temperature
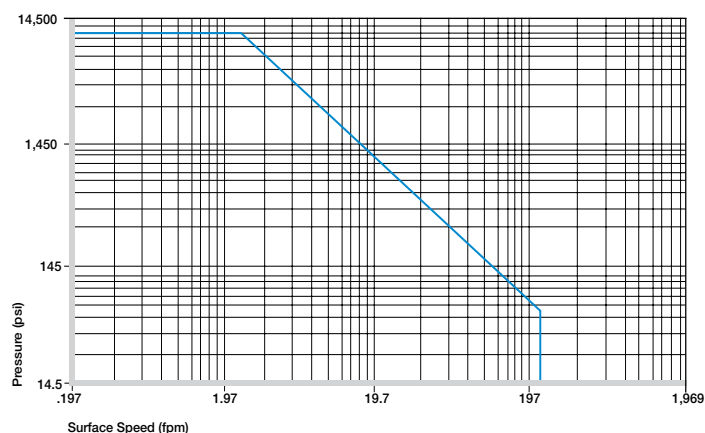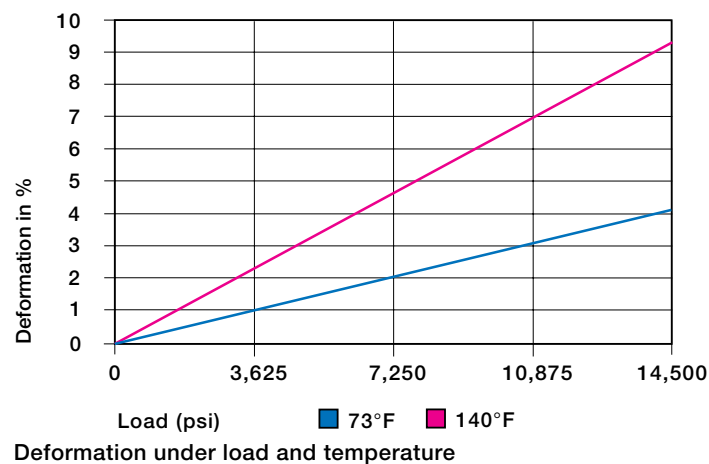
Permissible pv value for iglide® G300 running dry against a steel shaft, at 68°F

Permissible Surface Speeds

iglide® G300 has been developed for low to medium surface speeds. The maximum values shown in the table can only be achieved at low pressure loads. At the given speeds, friction can cause a temperature increase to maximum permissible levels. In practice, though, this temperature level is rarely reached, due to varying application conditions.

	Continuous fpm	Short Term fpm
Rotating	196	393
Oscillating	137	275
Linear	787	984

Maximum surface speeds

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iglide® G300 - Technical Data
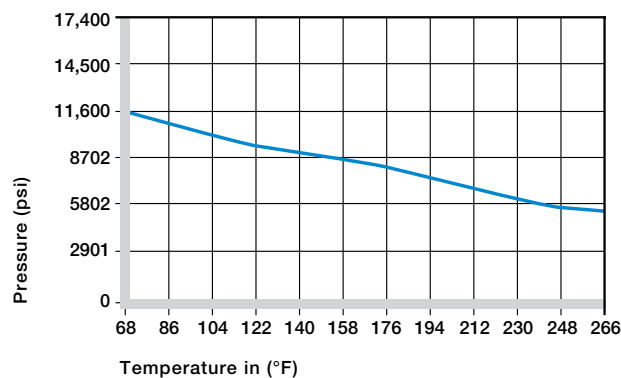
Temperatures

Application temperatures affect the properties of plain bearings greatly. The short-term maximum temperature is 428°F, this allows the use of iglide® G300 plain bearings in heat treating applications in which the bearings are not subjected to additional loading.

With increasing temperatures, the compressive strength of iglide® G300 plain bearings decreases. The graph shows this inverse relationship. However, at the long-term maximum temperature of 266°F, the permissible surface pressure is still above 5,800 psi.

The ambient temperatures that are prevalent in applications also has an effect on the bearing wear. With increasing temperatures, the wear increases and this effect is notable starting at the temperature of 248°F.

**Recommended maximum permissible static surface pressure of iglide® G300 as a result of temperature**

iglide® G300	Application Temperature
Minimum	- 40°F
Max. long-term	+266°F
Max. short-term	+428°F
Additional axial securing	+176°F

Temperature limits for iglide® G300

Friction and Wear

Similar to wear resistance, the coefficient of friction μ also changes with the load. The coefficient of friction decreases with increasing loads, whereas an increase in surface speed causes an increase of the coefficient of friction. This relationship explains the excellent results of iglide® G300 plain bearings for high loads and low speeds.

The friction and wear are also dependent, to a large degree, on the shaft partner. Shafts that are too smooth, increase both the coefficient of friction and the wear of the bearing. For iglide® G300, a ground surface with an average roughness Ra= 32 rms is recommended.
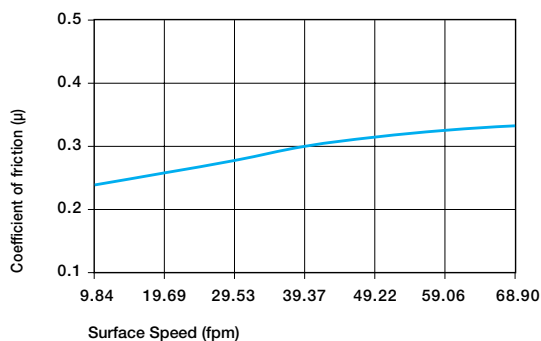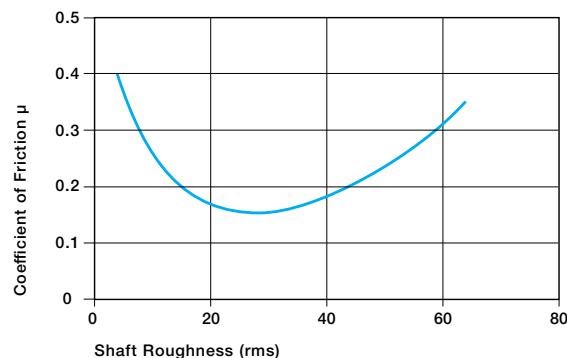

Coefficient of friction of iglide® G300 as a result of the running speed; p = 108 psi

Coefficient of friction of iglide® G300 as a result of the load, v = 1.96 fpm

iglide® G300	Coefficient of Friction
Dry	0.08 - 0.15
Grease	0.09
Oil	0.04
Water	0.04

Coefficient of friction for iglide® G300 against steel (Shaft finish = 40 rms, 50 HRC)
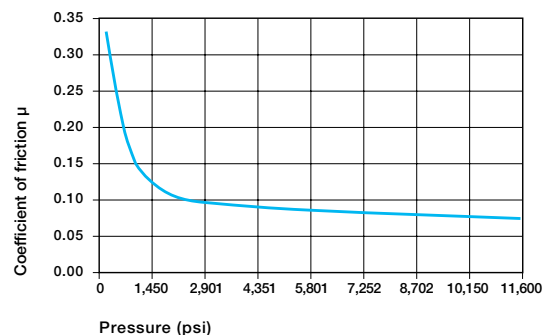
Coefficient of friction as result of the shaft surface (Shaft - 1050 hard chromed)

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iglide® G300 - Technical Data
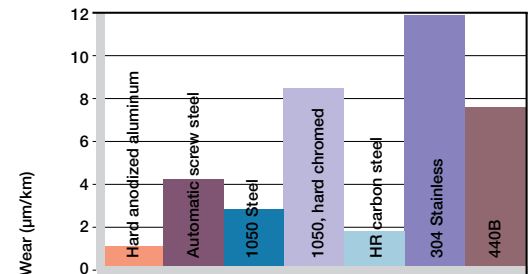
Shaft Materials

The graphs show results of testing different shaft materials with plain bearings made of iglide® G300. In the graph below it is observed that iglide® G300 can be combined with various shaft materials. The simple shaft materials of free-cutting steel and HR Carbon Steel have proven best at low loads. This helps to design cost-effective systems, since both iglide® G300 and the sliding partner are economically priced.

It is important to note that with increasing loads, the recommended hardness of the shaft increases. The "soft" shafts tend to wear more easily and thus increase the wear of the overall system. If the loads exceed 290 psi, it is important to recognize that the wear rate (the slope of the curves) clearly decreases with the hard shaft materials.

The comparison of rotational movements to oscillating movements shows that iglide® G300 can provide advantages in oscillating movements. The wear of the bearing is smaller for equivalent conditions. The higher the load, the larger the difference. This means that iglide® G300 can be used for oscillating movements that are well above the given maximum load of 11,600 psi. For these loads, the use of hardened shafts is recommended. In addition to the shaft materials presented here, many others have been tested. If the shaft material you plan on using is not contained in the test results presented here, please contact us.

Wear of iglide® G300, rotating with different shaft materials, load p = 145 psi, v = 59 fpm
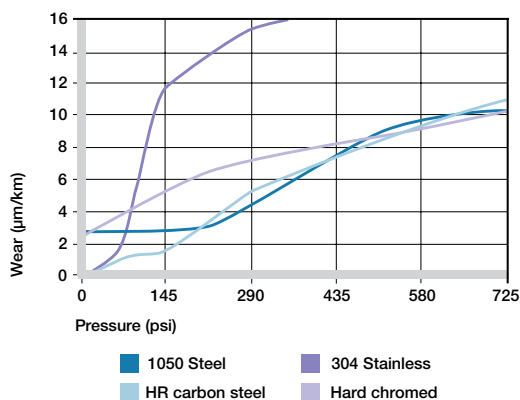
Wear with different shaft materials in rotational operation, as a result of the load
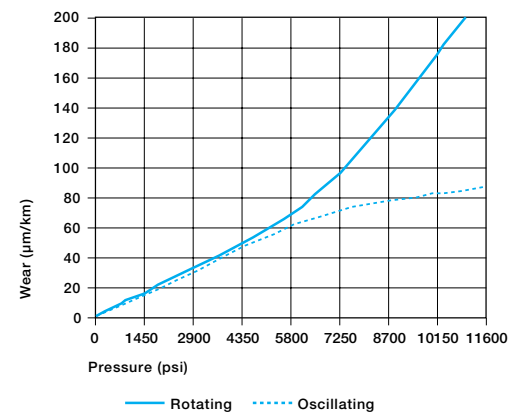
Wear for pivoting and rotating applications with shaft material 1050 hard chromed, as a result of the load

Installation Tolerances

iglide® G300 plain bearings are oversized before being pressfit. After proper installation into a recommended housing bore, the inner diameter adjusts to meet our specified tolerances. Please adhere to the catalog specifications for housing bore and recommended shaft sizes. This will help to ensure optimal performance of iglide® plain bearings.

For Inch Size Bearings

Length Tolerance (b1)		Length of Chamfer (f) Based on d1
Length (inches)	Tolerance (h13) (inches)	
0.1181 to 0.2362	-0.0000 /-0.0071	f = .012 → d_1 .040" - .236"
0.2362 to 0.3937	-0.0000 /-0.0087	f = .019 → d_1 > .236" - .472"
0.3937 to 0.7086	-0.0000 /-0.0106	f = .031 → d_1 > .472" - 1.18"
0.7086 to 1.1811	-0.0000 /-0.0130	f = .047 → d_1 > 1.18"
1.1811 to 1.9685	-0.0000 /-0.0154	
1.9685 to 3.1496	-0.0000 /-0.0181	

For Metric Size Bearings

Length Tolerance (b1)		Length of Chamfer (f) Based on d1
Length (mm)	Tolerance (h13) (mm)	
1 to 3	-0 /-140	f = 0.3 → d_1 1 - 6 mm
> 3 to 6	-0 /-180	f = 0.5 → d_1 > 6 - 12 mm
> 6 to 10	-0 /-220	f = 0.8 → d_1 > 12 - 30 mm
>10 to 18	-0 /-270	f = 1.2 → d_1 > 30 mm
>18 to 30	-0 /-330	
>30 to 50	-0 /-390	
>50 to 80	-0 /-460	

Length of chamfer

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iglide® G300 - Technical Data

Chemical & Moisture Resistance

iglide® G300 plain bearings have strong resistance to chemicals. They are also resistant to most lubricants.
iglide® G300 plain bearings are not affected by most weak organic and inorganic acids.
The moisture absorption of iglide® G300 plain bearings is approximately 1% in the standard atmosphere. The saturation limit submerged in water is 4%. This must be taken into account for these types of applications.
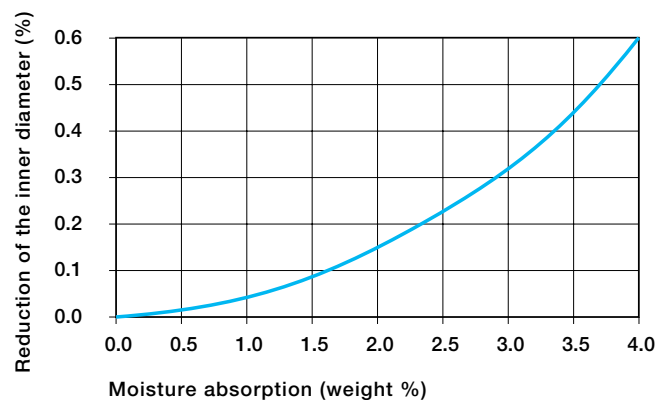➤ Chemical table, Page 1364

Medium	Resistance
Alcohol	+ to 0
Hydrocarbon	+
Greases, oils without additives	+
Fuels	+
Weak acids	0 to −
Strong acids	−
Weak alkaline	+
Strong alkaline	0

+ resistant, 0 conditionally resistant, − not resistant

Chemical resistance of iglide® G300
All data given concerns the chemical resistance at room temperature (68°F).

Effect of moisture absorption on iglide® G300 plain bearings

Radiation Resistance

Plain bearings made from iglide® G300 are resistant to radiation up to an intensity of 3×10^2 Gy.

UV-Resistance

iglide® G300 plain bearings are permanently resistant to UV-radiation.

Vacuum

iglide® G300 plain bearings outgas in a vacuum. Use in a vacuum environment is only possible for dehumidified bearings.

Electrical Properties

iglide® G300 plain bearings are electrically insulating.

iglide® G300	
Specific volume resistance	$> 10^{13}$ Ωcm
Surface resistance	$> 10^{11}$ Ω

Electrical properties of iglide® G300

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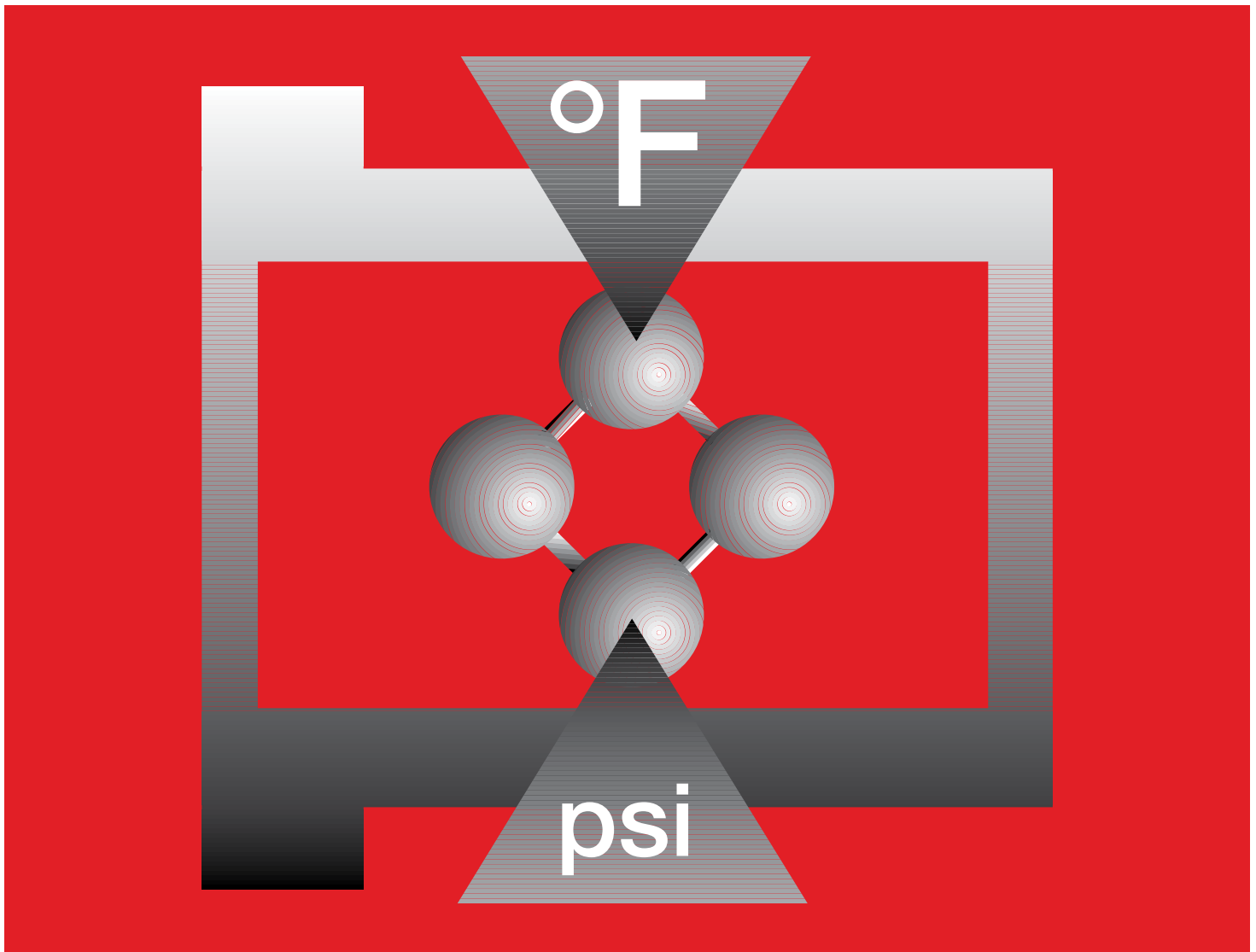
iglide® T500

- Temperature resistant from -148°F to 482°F in continuous operation
- Universal resistance to chemicals
- High compressive strength
- Very low moisture absorption
- Excellent wear resistance through the entire temperature range

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iglide® T500 - High-Tech Problem Solver

High temperature and chemical resistance

Temperature resistant
from -148°F to 482°F in
continuous operation

Universal resistance to chemicals

High compressive strength

Very low moisture absorption

Excellent wear resistance through
the entire temperature range

iglide® T500 is defined by its combination of high temperature resistance with compressive strength, along with high resistance to chemicals. iglide® T500 is designed for higher speeds than other iglide® bearings.

➕ Best Applications

- When especially high temperature resistance is necessary
- For pressure loads up to 21,760 psi
- For linear movements with a hard stainless steel
- For linear movements especially at high temperatures
- When universal resistance to chemicals is required
- Very low moisture absorption

➖ Not For Use In Applications

- For very low wear at high loads
- For economical underwater applications
- For edge compression

Typical application areas
- Beverage technology
- Woodworking
- Aerospace engineering
- Cleanroom
- Plastic processing industry

max.   +482°F
min.   –148°F

Ø 1/4 to 1 inch
more sizes available from igus

Ø 2 to 75 mm
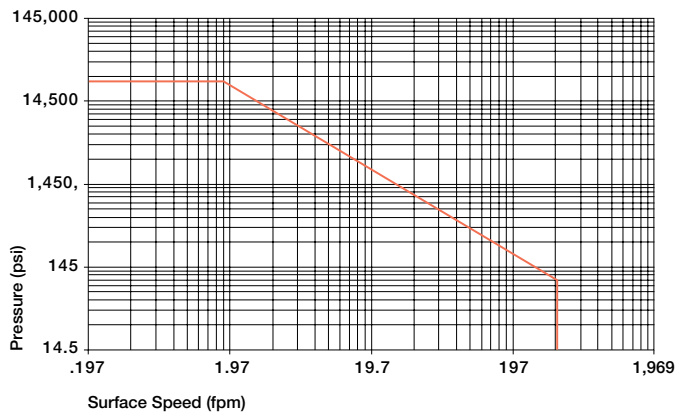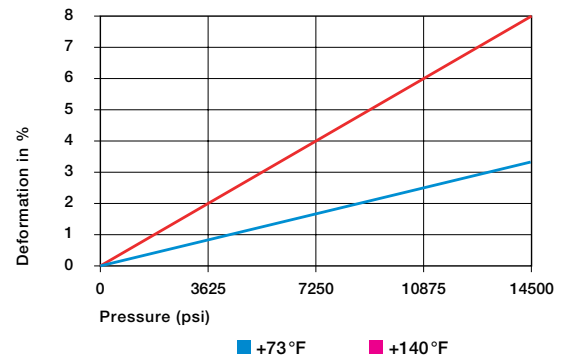metric sizes available from igus

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iglide® **T500** - Technical Data

Material Properties Table

General Properties	Unit	iglide® T500	Testing Method
Density	g/cm³	1.44	
Color		black	
Max. moisture absorption at 73°F / 50% r.h.	% weight	0.1	DIN 53495
Max. moisture absorption	% weight	0.5	
Coefficient of friction, dynamic against steel	μ	0.09 - 0.27	
pv value, max. (dry)	psi x fpm	37,700	
Mechanical Properties			
Modulus of elasticity	psi	1,174,800	DIN 53457
Tensile strength at 68°F	psi	24,660	DIN 53452
Compressive strength	psi	14,500	
Permissible static surface pressure (68°F)	psi	21,760	
Shore D-hardness		85	DIN 53505
Physical and Thermal Properties			
Max. long-term application temperature	°F	482	
Max. application temperature, short-term	°F	599	
Min. application temperature	°F	-148	
Thermal conductivity	W/m x K	0.6	ASTM C 177
Coefficient of thermal expansion	K⁻¹ x 10⁻⁵	5	DIN 53752
Electrical Properties			
Specific volume resistance	Ωcm	$< 10^5$	DIN IEC 93
Surface resistance	Ω	$< 10^3$	DIN 53482

Compressive Strength

The graph shows the special compression resistance of iglide® T500 also at very high temperatures. Even at the highest long-term application temperature of 482°F, iglide® T500 plain bearings still withstand a static surface pressure of approximately 4350 psi.

Deformation under load and temperature

Permissible pv values for iglide® T500 running dry against a steel shaft, at 68°F

Permissible Surface Speeds

iglide® T500 is designed for higher speeds than other iglide® bearings. This is due to its high temperature resistance and excellent heat conductivity. These benefits are readily apparent in the pv values of max. 37,700 psi x fpm. However, only the smallest radial loads may act on the bearings. At the given speeds, friction can cause a temperature increase to maximum permissible levels.

	Continuous	Short Term
	fpm	fpm
Rotating	295	689
Oscillating	216	492
Linear	984	1968

Maximum surface speeds

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iglide® T500 - Technical Data

Temperatures

In terms of temperature resistance, iglide® T500 has taken on a leading position. Having a permissible long-term application temperature of 482°F, iglide® T500 will even withstand 599°F for the short-term.

As in all thermoplastics, the compression resistance of T500 decreases with increasED temperature. However, the wear drops considerably when used within the observed temperature range of 73°F to 302°F. In certain cases, relaxation of the bearing can occur at temperatures greater than 275°F. This could lead to the bearing moving out of the housing after re-cooling. At temperatures over 275°F, the axial securing of the bearing in the housing needs to be tested. If necessary, secondary measures must be taken to mechanically secure the bearing. Please contact us if you have questions on bearing use.
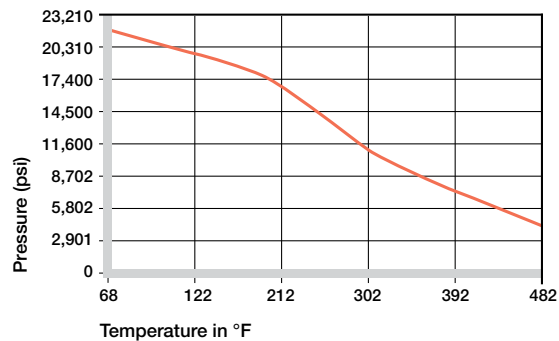
Recommended maximum permissible static surface pressure of iglide® T500 as a result of temperature

| iglide® T500	Application Temperature
Minimum	- 148°F
Max. long-term	+482°F
Max. short-term	+599°F
Additional axial securing	+275°F

Temperature limits for iglide® T500

Friction and Wear

Similar to wear resistance, the coefficient of friction μ also changes with the load. The coefficient of friction increases with an increase in surface speed. On the other hand, an increased load has an inverse effect: the coefficient of friction decreases. This explains the excellent performance of iglide® T500 plain bearings for high loads.

Friction and wear are also dependent to a large degree on the shafting partner. Shafts that are too smooth increase the coefficient of friction of the bearing. For iglide® T500, a ground surface with an average roughness range of 24 - 32 rms is recommended for the shaft.
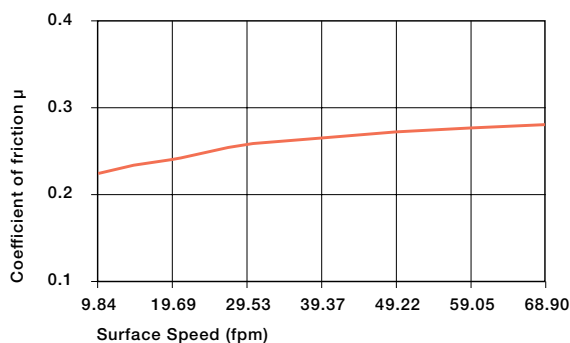
Coefficient of friction for iglide® T500 as a result of the surface speed; p = 108 psi, 1050 hard chromed
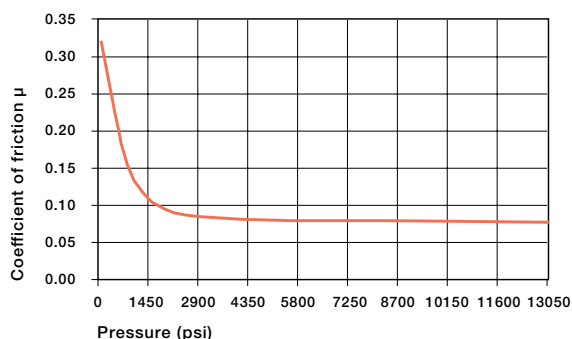
Coefficient of friction for iglide® T500 as a result of the load, v = 1.97 fpm

iglide® T500	Coefficient of Friction
Dry	0.09 - 0.27
Grease	0.09
Oil	0.04
Water	0.04
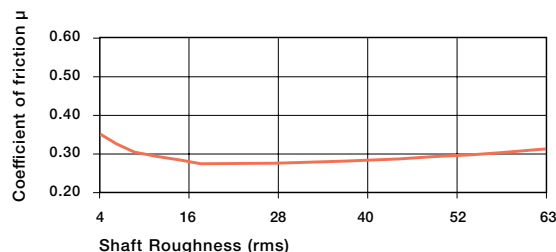
Coefficients of friction as a function of the shaft surface (1050 hard chromed)

Coefficient of friction for iglide® T500 against steel (Shaft finish = 40 rms, 50 HRC)

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Shaft Materials

The graphs show results of testing different shaft materials with plain bearings made of iglide® T500. For low loads in rotating operation, the best wear values are found with 303 Stainless and HR Carbon Steel shafts. However, above a load of 290 psi, the bearing wear greatly increases with these two shaft materials. For the higher load range, hard-chromed shafts or Cold Rolled Steel shafts are advantageous. In oscillating operation at low loads, similar wear values for cold rolled steel and 303 stainless steel shafts occur. The wear is somewhat higher than during rotational movements.

If the shaft material you plan to use is not contained in this list, please contact us.

1050 Steel **HR carbon steel** **304 SS** **Hard chromed**
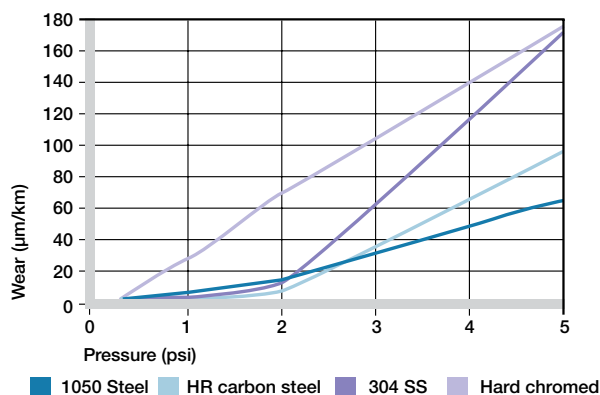
Wear of iglide® T500 with different shaft materials in rotational operation

Wear of iglide® T500 with different shaft materials, p = 108 psi, v = 98 fpm
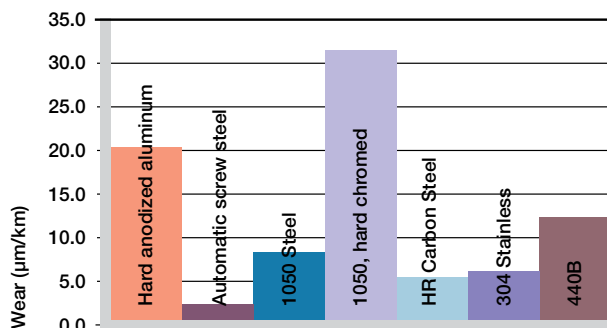
Rotating **Oscillating**
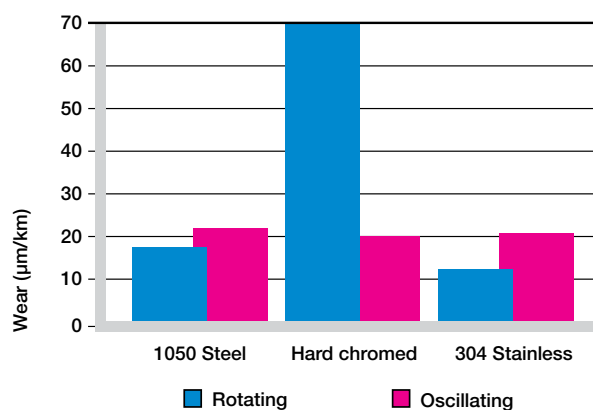
Wear for oscillating and rotating applications with different shaft materials p = 290 psi

Installation Tolerances

iglide® T500 plain bearings are oversized before being pressfit. After proper installation into a recommended housing bore, the inner diameter adjusts to meet our specified tolerances. Please adhere to the catalog specifications for housing bore and recommended shaft sizes. This will help to ensure optimal performance of iglide® plain bearings.

For Inch Size Bearings		
Length Tolerance (b1)		Length of Chamfer (f) Based on d1
Length (inches)	Tolerance (h13) (inches)	
0.1181 to 0.2362	-0.0000 /-0.0071	$f = .012 \rightarrow d_1$ .040" - .236"
0.2362 to 0.3937	-0.0000 /-0.0087	$f = .019 \rightarrow d_1 > .236$" - .472"
0.3937 to 0.7086	-0.0000 /-0.0106	$f = .031 \rightarrow d_1 > .472$" - 1.18"
0.7086 to 1.1811	-0.0000 /-0.0130	$f = .047 \rightarrow d_1 > 1.18$"
1.1811 to 1.9685	-0.0000 /-0.0154	
1.9685 to 3.1496	-0.0000 /-0.0181	

For Metric Size Bearings		
Length Tolerance (b1)		Length of Chamfer (f) Based on d1
Length (mm)	Tolerance (h13) (mm)	
1 to 3	-0 /-140	$f = 0.3 \rightarrow d_1$ 1 - 6 mm
> 3 to 6	-0 /-180	$f = 0.5 \rightarrow d_1 > 6$ - 12 mm
> 6 to 10	-0 /-220	$f = 0.8 \rightarrow d_1 > 12$ - 30 mm
>10 to 18	-0 /-270	$f = 1.2 \rightarrow d_1 > 30$ mm
>18 to 30	-0 /-330	
>30 to 50	-0 /-390	
>50 to 80	-0 /-460	

A

30°

f

Length of chamfer

A

b1

.0197"
(0.5 mm)

30°

Length

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Chemical Resistance

iglide® T500 plain bearings are close to universally resistant to chemicals. They are only attacked by concentrated nitric acid and by sulfuric acid with acidity levels over 65%. The list at the end of this catalog provides more comprehensive detailed information.

Medium	Resistance
Alcohol	+
Hydrocarbon	+
Greases, oils without additives	+
Fuels	+
Weak acids	+
Strong acids	–
Weak alkaline	+
Strong alkaline	+

+ resistant, 0 conditionally resistant, – not resistant

Chemical resistance of iglide® T500
All data given concerns the chemical resistance at room temperature (68°F).
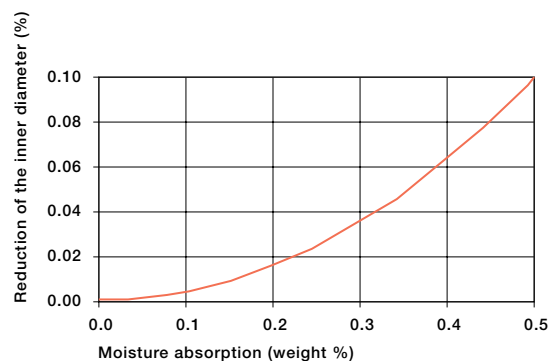
Effect of moisture absorption on iglide® T500 plain bearings

Radiation Resistance

Plain bearings made from iglide® T500 are resistant to radiation up to an intensity of 1×10^5 Gy. iglide® T500 is the most radioactive-resistant material of the iglide® product line. iglide® T500 is extremely resistant to hard gamma radiation and withstands a radiation dose of 1000 Mrad without detectable change in its properties. The material also withstands an alpha or beta radiation of 10,000 Mrad with practically no damage.

UV Resistance

The excellent material properties of iglide® T500 do not change under UV radiation and other weathering effects.

Vacuum

In a vacuum environment, iglide® T500 plain bearings can be used virtually without restrictions. Outgassing takes place to a very limited extent.

Electrical Properties

iglide® T500 plain bearings are electrically conductive.

iglide® T500	
Specific volume resistance	$< 10^5$ Ωcm
Surface resistance	$< 10^3$ Ω

Electrical properties of iglide® T500

igus® Mounted Spherical Bearings

igus® igubal® mounted spherical bearings are made with high quality engineered polymers. They are lubrication-free and maintenance-free. These bearings are lighter and more economical than traditional mounted spherical bearings.

Features

• Five popular mounting configurations
• Four popular shaft sizes
• Maintenance-free
• Excellent wear resistance
• L280 polymer type bearing material

CE

igus® igubal® Mounted Spherical Bearings								
Item Photo	Part Number	Style	Size I.D. (inch)	Thread/ Housing Type	Qty. per Package	Weight (lb)	Price	Drawing Link
	A-KBRI-04	K Series, Female Thread, Rod End	1/4	1/4-28 UNF female	4	0.06	$16.00	PDF
	A-KBRI-08		1/2	1/2-20 UNF female	2	0.12	$24.00	PDF
	A-KBRI-12		3/4	3/4-16 UNF female	1	0.14	$18.50	PDF
	A-KBRI-16		1	1-12 UNF female	1	0.46	$22.50	PDF
	A-KARI-04	K Series, Male Thread, Rod End	1/4	1/4-28 UNF male	4	0.04	$15.50	PDF
	A-KARI-08		1/2	1/2-20 UNF male	2	0.10	$15.50	PDF
	A-KARI-12		3/4	3/4-16 UNF male	1	0.10	$12.50	PDF
	A-KARI-16		1	1-12 UNF male	1	0.34	$20.00	PDF
	A-KSTI-04	K Series, Pillow Block	1/4	Pillow block	4	0.02	$12.00	PDF
	A-KSTI-08		1/2		2	0.07	$16.00	PDF
	A-KSTI-12		3/4		1	0.09	$10.00	PDF
	A-KSTI-16		1		1	0.20	$16.50	PDF
	A-EFOI-04	E Series, 2-Bolt Flange	1/4	2-bolt flange	4	0.03	$15.50	PDF
	A-EFOI-08		1/2		2	0.05	$16.00	PDF
	A-EFOI-12		3/4		1	0.09	$14.50	PDF
	A-EFOI-16		1		1	0.14	$18.00	PDF
	A-EFSI-04	E Series, 4-Bolt Flange	1/4	4-bolt flange	4	0.04	$22.50	PDF
	A-EFSI-08		1/2		2	0.04	$17.00	PDF
	A-EFSI-12		3/4		1	0.12	$13.50	PDF
	A-EFSI-16		1		1	0.17	$16.00	PDF
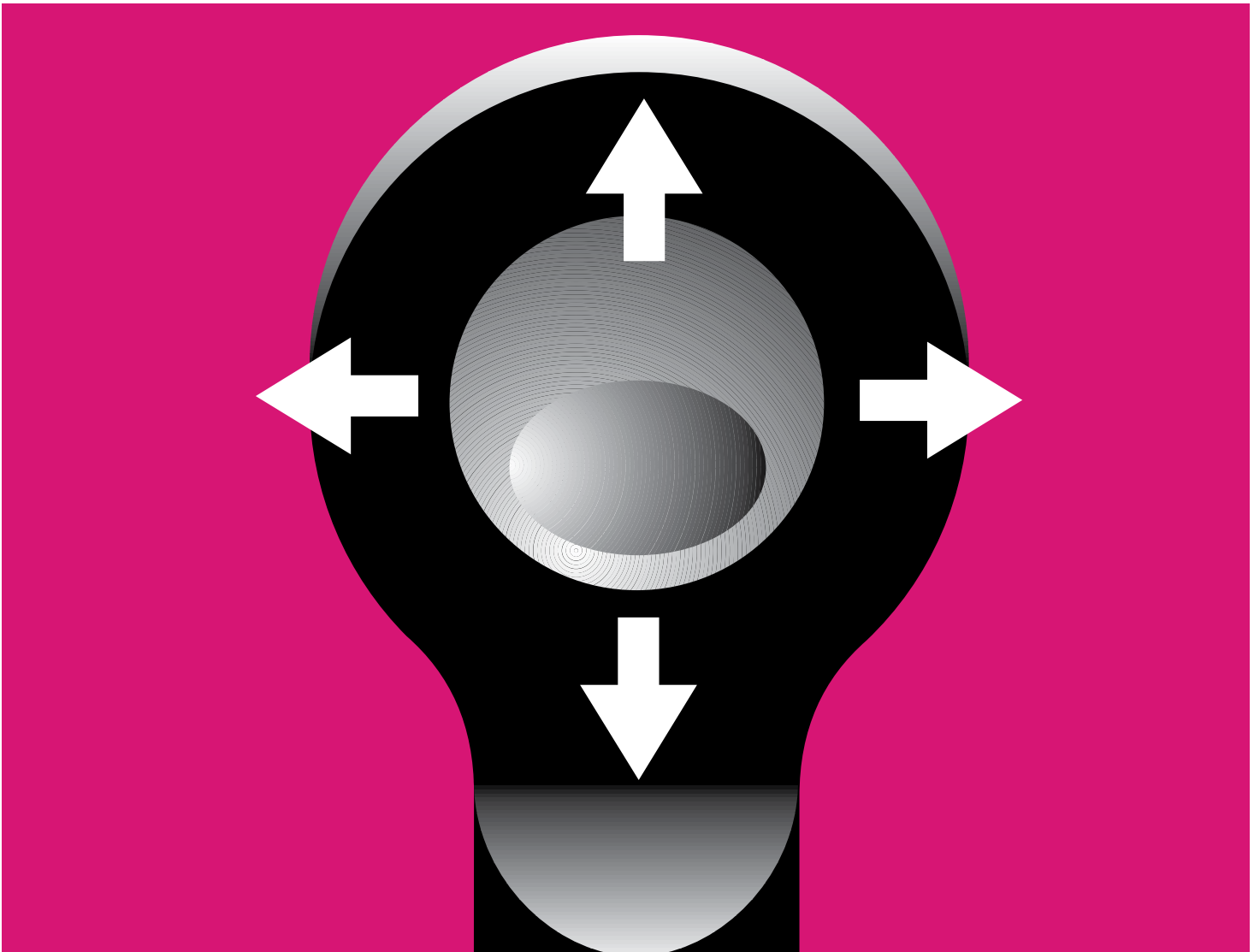
igubal® Rod Ends

- Self-lubricating, maintenance-free
- High strength under impact loads
- High tensile strength
- Compensation of misalignment
- Compensation of edge loads
- Very low weight

igubal® Rod Ends

igubal® rod ends can also be used in rough environments. They are corrosion-resistant in humid environments and resistant to weak acids and bases. The operation temperature is from –40°F up to +176°C. Rod ends are also resistant to dirt and dust.

Maintenance free,
dry-running

High strength
under impact loads

High tensile strength

⊕ Best Applications

● If you want to save weight
● For rotating, oscillating and linear movements
● If high-frequency oscillations/vibrations occur
● If silent operation is required
● If you need an electrically insulating part
● If corrosion resistance is required
● In combination with pneumatic cylinders and gas struts ● If chemical resistance is required
● If high rigidity is required

⊖ Not For Use In Applications

● If temperatures are higher than +176 °F
● If rotation speeds higher than 98.4 fpm (0.5 m/s) are required
● If really high tensile and shear loads occur
● With a hydraulic cylinder
● If dimensions above 1 inch or 30 mm are required
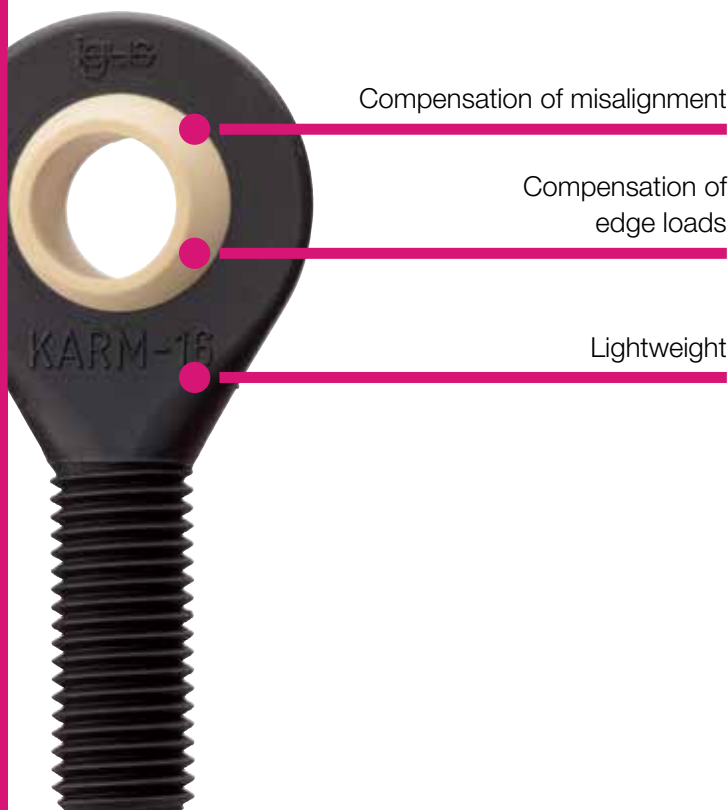
Compensation of misalignment

Compensation of
edge loads

Lightweight

🌡️°F	max. +392°F
	min. –40°F

inch	Ø 1/4 to 1 inch
	more sizes available from igus

mm	Ø 2 to 30 mm
	metric sizes available from igus

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igubal® Rod Ends - Application examples

Typical application areas
- Agricultural machines
- Machine building
- Sports and leisure
- Automotive
- Mechatronics
- Construction machinery

Specialty bikes

Textile industry

Packaging industry

Offshore industry

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igubal® Rod Ends - Technical data

Advantages
● Maintenance-free
● High strength under impact loads
● Very high tensile strength for varying loads
● Compensation for misalignment
● Compensation for edge loads
● Resistant to dirt, dust and lint
● Resistant to corrosion and chemicals
● High vibration dampening capacity
● Suitable for rotating, oscillating and linear movements
● Lightweight
● Dimensional K series and E series, dimensions according
to standard DIN ISO 12240

Product range
igubal® rod ends are available in the dimensional K series and E series for shaft diameters of 3/16 to 1 inch and 2 to 30 mm.

● Form A – with male thread and
● Form B – with female thread

The dimensional K series and, to a limited extent, E are available in inch dimensions, as well as a special version containing a stainless steel sleeve in the inner race. This allows a significantly higher torque than for the standard plastic race.
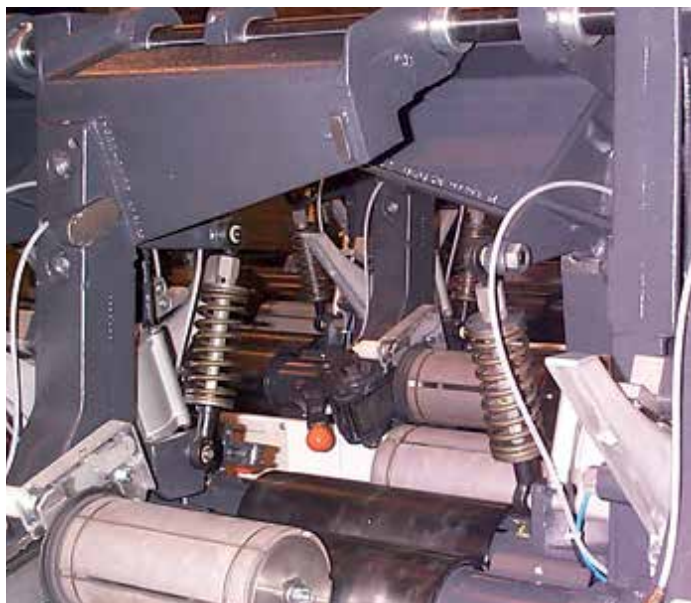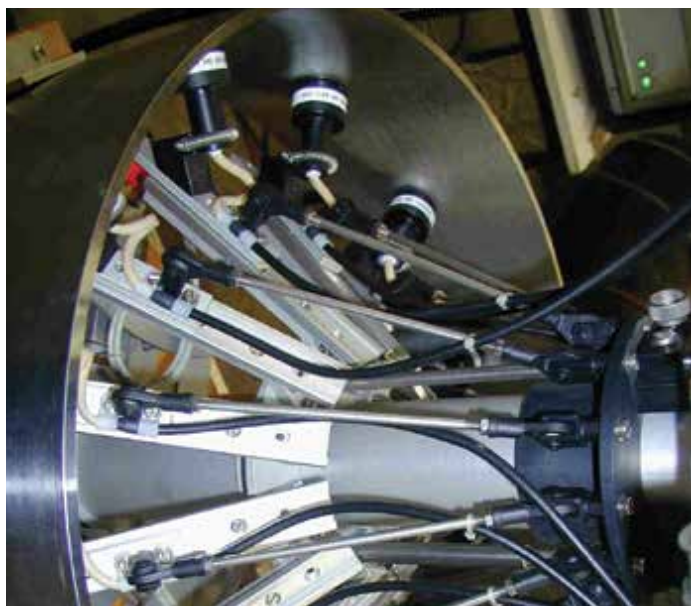
Loads

igubal® rod end bearings handle high loads at normal room temperatures, have excellent dampening properties and weigh only a fifth of traditional metallic rod end bearings. In applications with high continuous loads and high temperatures, the loading capacity of igubal® rod end bearings should be tested in an experiment that duplicates the application.
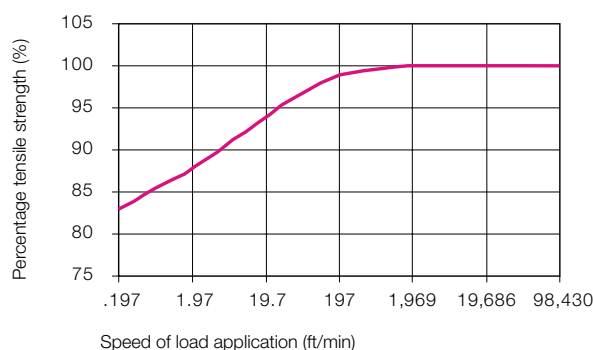
Effect of the speed of load application on the maximum tensile strength of igubal® rod end bearings

Coefficients of Friction and Speed

One important advantage of igubal® spherical bearings is that rapid, rotary movements of a mounted shaft take place directly in the spherical portion. In metallic rod ends, rotary motion takes place between the race and the spherical bearing. High speeds can be achieved with igubal® bearings.
igubal® bearings ares used in such a way that the angular movements of the spherical bearings take place at the spherical outer diameter. In contrast, rotations of the shaft are supported directly in the inner diameter of the spherical portion. The advantage, therefore, lies in the plastic vs. steel relationship. Plastic produces lower friction and permits high speeds, even when running dry.
The maintenance-free igubal® bearing system is also suited for linear and oscillating shaft movements.
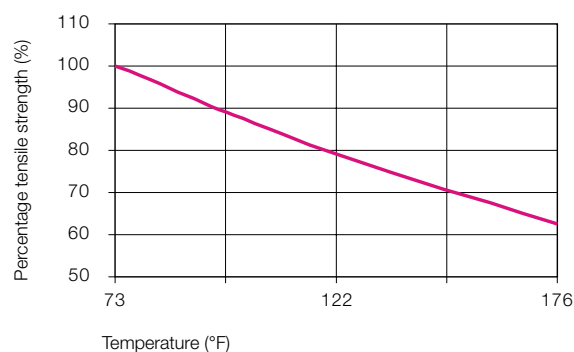
Effect of the temperature on the maximum tensile strength of igubal® rod end bearings

Temperatures

The igubal® rod ends can be used in temperatures from –22 °F up to +176 °F. igubal® rod ends made of HT-Material are suitable for temperatures from -40°F up to +392°F (E series, types A and B).

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igubal® Rod Ends - Technical data

Tolerances

igubal® rod end bearings can be used at different tolerances depending on the individual application. As a standard program, they are designed with a large amount of bearing clearance, which permits secure operation even at high rotational speeds. The bore of the inner race is produced within a standard tolerance range. Shafts should also meet recommended tolerances.

Axial load	Radial load	Tensile	Pivot angle	Maximum torque through ball
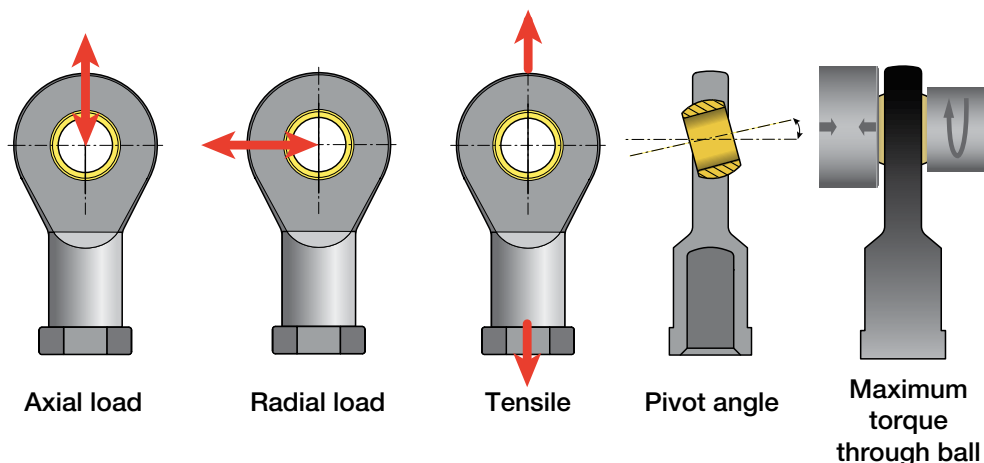
Recommended Shaft Tolerances

Inch	Shaft		Metric	Shaft	
	Min.	Max.		Min.	Max.
3/16	0.1888	0.1900	2mm	1.975	2.000
1/4	0.2485	0.2500	3mm	2.975	3.000
5/16	0.3110	0.3125	5mm	4.970	5.000
3/8	0.3735	0.3750	6mm	5.970	6.000
7/16	0.4358	0.4375	8mm	7.964	8.000
1/2	0.4983	0.5000	10mm	9.964	10.000
5/8	0.6235	0.6250	12mm	11.957	12.000
3/4	0.7479	0.7500	16mm	15.957	16.000
1	0.9980	1.0000	20mm	19.948	20.000

Thread pitches of the igubal® rod end bearings

Thread Name	Pitch (mm)
M 2	0.40
M 3	0.50
M 4	0.70
M 5	0.80
M 6	1.00
M 8	1.25
M 10	1.50
M 10 F	1.25
M 12	1.75
M 12 F	1.25
M 14	2.00
M 16	2.00
M 16 F	1.50
M 18	1.50
M 20	2.50
M 20 M 20	1.50
M 22	1.50
M 24	2.00
M 27	2.00
M 30	2.00

igubal® Pillow Block

- Maintenance-free, dry running
- High tensile strength
- High endurance strength
- Can be used in combination with E series rod ends
- Lightweight

igubal® Pillow Block

The igubal® pillow block bearings consist of a housing with a bearing insert. igubal® pillow block bearings are especially easy to install, able to compensate for misalignment and prevent edge loads.
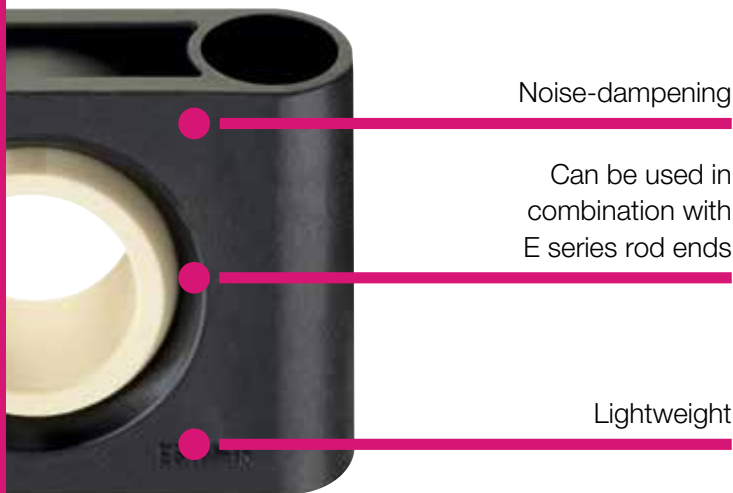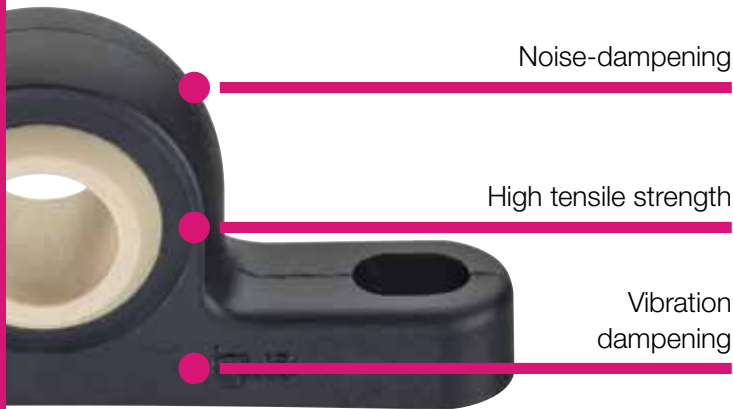
Noise-dampening

High tensile strength

Vibration dampening

➕ Best Applications

● If chemical resistance is required
● If a cost-effective option is requested
● If you need dirt-resistant bearings
● To account for misalignment
● If you need split components

Noise-dampening

Can be used in combination with E series rod ends

Lightweight

➖ Not For Use In Applications

● If temperatures are higher than +176 °F
● If an integrated fixing collar is required
● If diameters above 1 inch or 50 mm are required
● If rotation speeds higher than 98.4 fpm (0.5 m/s) are required

°F max. +176°F
min. −22°F

inch Ø 1/4 to 1 inch
more sizes available from igus

mm Ø 5 to 50 mm
metric sizes available from igus

Typical application areas
- Plant design
- Machine building
- Packaging etc.

Stone processing

Solar technology

Paper industry

Packaging industry

tMNC-147

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igubal® Pillow Block - Technical data

General information

igubal® pillow blocks are made of igumid G according to DIN 71752. The pillow blocks are available in a variety of configurations. igubal® pillow blocks can be used in difficult circumstances without any problems. The pillow blocks are corrosion resistant in moist or wet environments and the sliding bearings are resistant to weak acids and alkalis. The operating temperatures range from -22°F to +176°F. igubal® pillow blocks are made out of a high-wear resistant material which requires no external lubrication.

Advantages
● Maintenance-free, self-lubricating
● High rigidity
● High strength under impact loads
● Compensation for misalignment
● Compensation for edge loads
● Corrosion-free
● Chemically resistant
● Vibration damping
● Suitable for rotating, oscillating and linear movements
● Lightweight
● High radial loads
● Can be used in liquid media
● Space-saving design
● Easy to install
● Predictable lifetime

Chemical resistance

The ability to pivot allows igubal® pillow block bearings to compensate for misalignment and possible shaft deflection. Applications where these effects cannot be prevented are suited for igubal pillow block bearings.

Tolerances

Maintenance-free igubal® pillow block bearings are designed with inside diameter tolerance of E10. The shaft should be made to tolerance class h6 to h9. These recommended tolerances allow for changes in the bearing due to temperature and moisture absorption.

Mounting

igubal® pillow block bearings are designed for mounting with 2 bolts. Precision mounting of the bearing is not necessary, since the spherical ball compensates for misalignment.

Loads

The load capacity of the maintenance-free igubal® bearing elements is very high at normal ambient temperatures. igubal® bearings absorb high forces and weigh only one fifth of traditional, metal bearing housings. The excellent dampening properties are based on the fact that the polymer material of the two part bearing can absorb vibrations differently than steel.
However, plastic specific properties, such as dependence on temperature and behavior under long-term stress, must be taken into consideration when using igubal® bearings. The load capacity of the pillow block should therefore be checked in a practical test, particularly if it will be used under continuous high loads and at elevated temperatures.
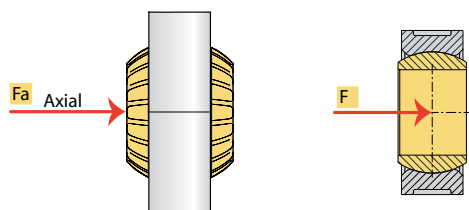
Axial Strength
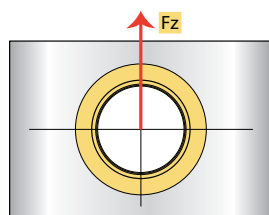
Pivot angle

Radial tensile strength
(upward)
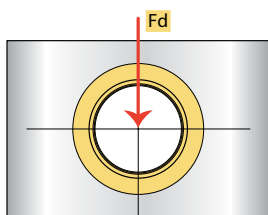
Radial compressive strength
(downward)
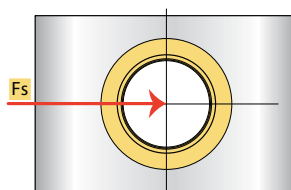
Lateral strength
(radial)
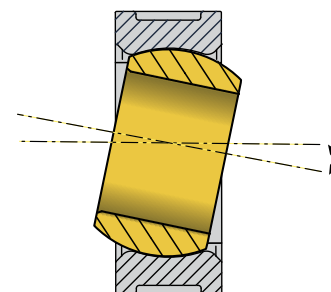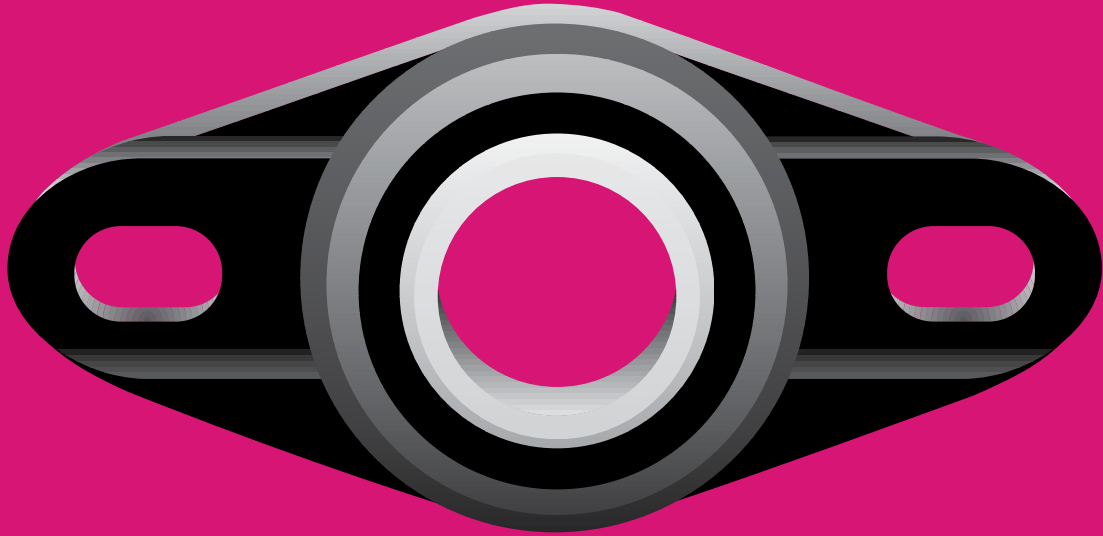
igubal® Flange Bearing

- Maintenance-free, dry running
- High tensile strength
- High endurance strength
- Compensation for alignment errors
- Compensation for edge loads
- Lightweight

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igubal® Flange Bearing

igubal® Flange bearings have been developed for the support of shaft ends or for shafts lead-through. Like all igubal® products, these bearings consist of an igumid G housing and an iglide® L280 spherical ball (with other options available). igubal® Flange bearings are made to the dimensional E series and are offered with two or four mounting holes.
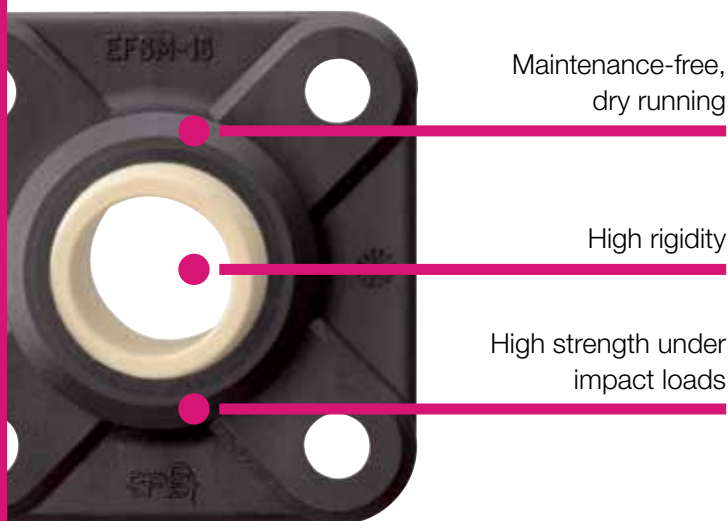
Maintenance-free, dry running

High rigidity

High strength under impact loads

Lightweight

Low installation space

✚ Best Applications

● If chemical resistance is required
● If a cost-effective option is requested
● If you need dirt-resistant bearings
● To adjust misalignment
● If you need split components

⊖ Not For Use In Applications

● If temperatures are higher than +176 °F
● If an integrated fixing collar is required
● If diameters above 1 inch or 50 mm are required
● If rotation speeds higher than 98.4 fpm (0.5 m/s) are required

°F | max.   +176°F
min.   −40°F

inch | Ø 3/8 to 1 inch
more sizes available from igus

mm | Ø 4 to 50 mm
metric sizes available from igus

Typical application areas
- Plant design
- Automation
- Agricultural machines
- Machine building
- Food industry etc.

Conveyor technique

Solar industry

Rotary sorter

Food industry

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igubal® Flange Bearing - Technical data

General Properties

igubal® Flange bearings have been developed for the support of shaft ends or for shafts lead-through. Like all igubal® products, these bearings consist of an igumid G housing and an iglide® L280 spherical ball (with other options available). igubal® Flange bearings are made to the dimensional E series and are offered with two or four mounting holes.

Areas of Application

Since igubal® flange bearings are made for maintenance-free use, they are especially suited for applications in which access to the bearing is limited, in moist or wet environments or clean-room environments. Thus, igubal® flange bearings are also found in electric toothbrushes, awnings, conveyor technology, bakery machines and agriculture to name a few.
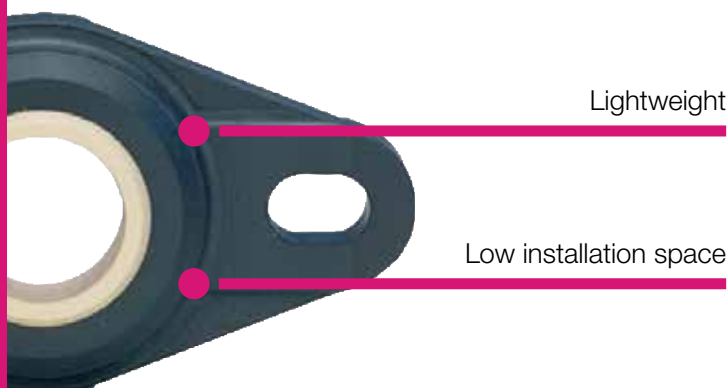
Installation

igubal® flange bearings are designed for mounting with 2 or 4 bolts, depending on the design. The 2-hole types are provided with elongated holes, which allow a problem-free adjustment. An exact positioning of the bearing housing is not necessary, since the spherical ball compensates for misalignment.
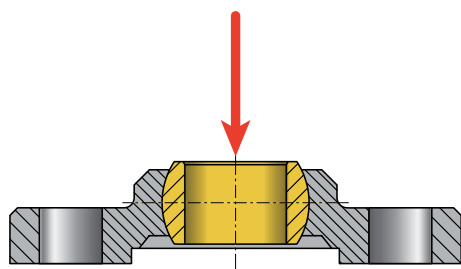
Static axial load
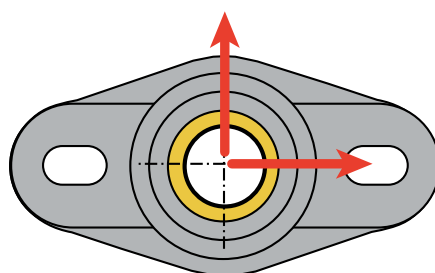
Static radial load

Pivot Angle

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DryLin® R Linear Plain Bearings

igus® DryLin® R linear plain bearings are dimensionally interchangeable with other popular brands, but offer a low cost alternative to recirculating ball bearings. The low friction liner makes DryLin R suitable for wet or dirty enviornments.

Features

• Dimensionally interchangeable with ball bearings
• Available in four shaft diameters in both fixed and self-aligning housings
• Type J polymer is an excellent all-purpose sliding material
• Ideally suited to work with Drylin R hard-anodized aluminum shafting

Item Photo	Part Number	Housing Fit	Size I.D. (inch)	Length (inch)	Housing Type	Bearing Material	Housing Material	Qty. per Package	Weight (lb)	Price	Drawing Link
	A-RJZI-01-04	Fixed housing	1/4	3/4	Closed	Type J polymer	Anodized aluminum	1	0.00	$10.50	PDF
	A-RJUI-01-08		1/2	1-1/4				1	0.04	$12.00	PDF
	A-RJUI-01-12		3/4	1-5/8				1	0.06	$14.50	PDF
	A-RJUI-01-16		1	2-1/4				1	0.23	$22.50	PDF
	A-RJI-01-08		1/2	1-1/4			Type J polymer	1	0.03	$7.25	PDF
	A-RJI-01-12		3/4	1-5/8				1	0.05	$7.75	PDF
	A-RJI-01-16		1	2-1/4				1	0.11	$11.00	PDF
	A-OJUI-01-08		1/2	1-1/4	Open			1	0.11	$16.00	PDF
	A-OJUI-01-12		3/4	1-5/8				1	0.06	$18.00	PDF
	A-OJUI-01-16		1	2-1/4				1	0.23	$25.00	PDF
	A-RJUI-03-08	Self-aligning housing	1/2	1-1/4	Closed		Anodized aluminum	1	0.03	$12.50	PDF
	A-RJUI-03-12		3/4	1-5/8				1	0.06	$14.50	PDF
	A-RJUI-03-16		1	2-1/4				1	0.11	$23.50	PDF
	A-OJUI-03-08		1/2	1-1/4	Open			1	0.11	$12.50	PDF
	A-OJUI-03-12		3/4	1-5/8				1	0.06	$15.50	PDF
	A-OJUI-03-16		1	2-1/4				1	0.23	$23.50	PDF
	A-FJUI-11-08	Fixed housing	1/2	1-11/16	4-bolt flange pillow block			1	0.18	$46.00	PDF
	A-FJUI-11-12		3/4	2-1/16				1	0.46	$55.00	PDF
	A-FJUI-11-16		1	2-13/16				1	1.21	$92.00	PDF
	A-FJUI-13-08	Self-aligning housing	1/2	1-11/16				1	0.18	$46.00	PDF
	A-FJUI-13-12		3/4	2-1/16				1	0.46	$55.00	PDF
	A-FJUI-13-16		1	2-13/16				1	1.21	$92.00	PDF

DryLin® R Round Shaft Guide Systems

- Self-lubricating

- Maintenance-free

- Corrosion-free

- Resistant to dirt

- Low weight

- Dimensionally interchangeable with recirculating
  ball bearings

This page contains igus® factory information and was current as of 1/15/18. Information subject to change without notice.
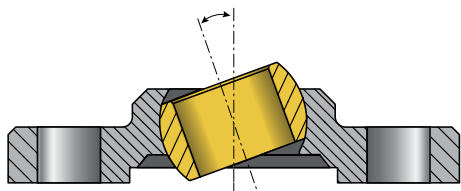
Alternative to ball bearings

Hard-anodized aluminum shafts guarantee optimum running properties

Steel, stainless steel, and carbon fiber shafts available

Round shaft and supported round shafts available

Linear adapter and complete housing made from aluminum

DryLin® liner made from dry-tech® high-performance plastics

5 liner material options available

Lightweight, hard anodized aluminum tubes available

Self-lubricating round shaft guide systems – DryLin® R

DryLin® R is dimensionally interchangeable with linear ball bearings, but offers cleaner, more cost-effective results even in harsh environments. The standard RJUI/RJUM bearing consists of an iglide® J liner slip-fit into an aluminum housing. The unique grooved design of the J liner minimizes clearance, is suitable for use in extremely wet and dirty environments, and is easily replaceable. Dimensionally interchangeable 100% plastic parts RJI/RJM/RJIP/RJMP are also available for cost-savings, weight reduction, and other technical advantages. DryLin® R bearings may also be used with high temperature and chemically resistant iglide® T500 (X)* (TUI/TUM) liners for more demanding applications, and E7 material liners for steel and stainless shafting.

- 100% self-lubricating
- Dimensionally interchangeable with standard recirculating ball bearings
- Large variety of housing options
- Shafts, shaft-end supports and accessories available
- Replaceable bearing liner
- 300 series stainless steel housing available

Typical application areas:
- Packaging
- Lab
- Kiosk
- 3D Printing

max. +482°F (+250°C)
min. -130°F (-90°C)
(depending on material)

8 shaft materials
8 versions
Inner-Ø up to 60 mm

Inch dimensions available

Clean-Room
Cleanroom certified IPA Fraunhofer

C E
Free of toxins ROHS 2011/65/EU

ESD-compatible (electrostatic discharge)

DryLin® R Round Shaft Guide Systems - Product overview

Liners and pressfit bearings
- Low friction, optimized wear quality
- Space saving, lightweight
- High chemical resistance
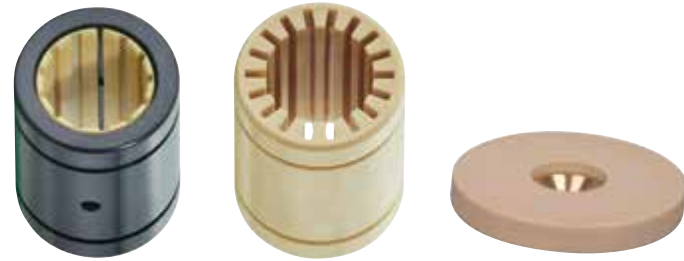
Linear plain bearing
- Aluminum or stainless steel adapter with iglide® material liner
- Solid iglide® plastic bearings available, dimensionally interchangeable with recirculating ball bearings
- Closed or open versions available
- Self-aligning
- Sliding discs available

Pillow blocks and floating pillow blocks
- Easy to assemble
- Stands up to high static load
- Replaceable bearing liners
- Split housing for quick liner replacement available

Open linear plain bearings
- For supported loads using supported shafting
- Round or mounted design
- Adjustable options
- Optional floating bearing for quick assembly and design optimization

Flange bearing
- Easy to fit
- Round or square options available
- Standard or twin flange designs
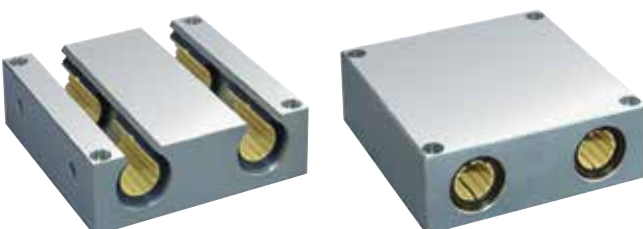
Quad block
- Closed or open design options
- Quad block housing with 4 bearing liners
- Floating bearing available

DryLin® R - Application Examples
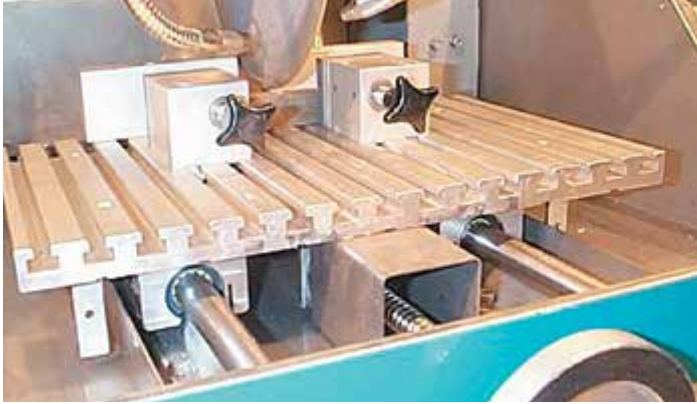
DryLin® R linear plain bearings on supported aluminum shafts are used in the guide for this cutting table. The DryLin® components stand up to the high levels of dust and dirt, and offer accurate, smooth operation.

This saw mill uses a DryLin® linear bearing with iglide® J plastic liner for the angle stops.

This heavy duty application has run reliably for more than three years thanks to DryLin® RJUM-01 linear bearings
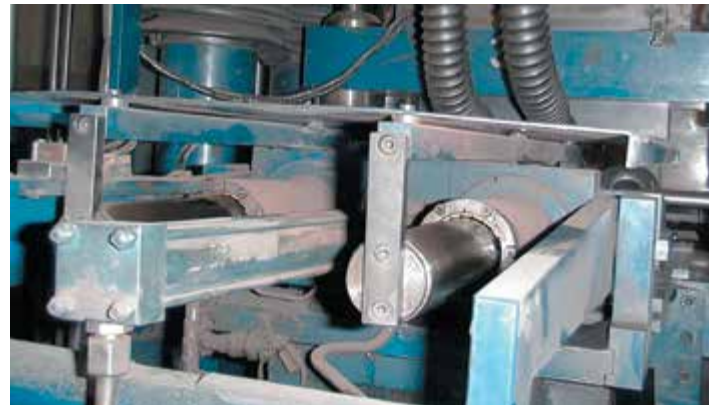
Despite the high stresses from abrasive particles and powder particles, this compactor unit can extend maintenance-free uptime by up to two years after switching to DryLin® R linear bearings.

Maintenance-free, precise, compact, and wear resistant bearing liners were mounted directly in the passages of this machine's frame.

To enable fast, and precise adjustment of a production line without the need for downtime, DryLin® precision linear guides were utilized.

DryLin® R - Technical data

DryLin® R linear plain bearings

The DryLin® standard round bearings consist of a replaceable iglide® J, J200, A180 or T500 (X)* bearing liner, manufactured to fit securely into an anodized aluminum bearing housing, axially secured via a snap ring groove. DryLin® linear bearings are designed as dimensionally interchangeable with standard ball bearings. Made of highly wear resistant iglide® J, J200, A180 or T500 (X)* materials, which offer technical advantages as well as cost savings. Plastic bearings are well suited for applications where machine components are primarily stainless steel, such as in food production and packaging equipment, as well as applications where weight savings are critical. DryLin® R linear plain bearings are designed to fit housings with our recommended tolerances, secured via circlips in the same way as ball bearings.
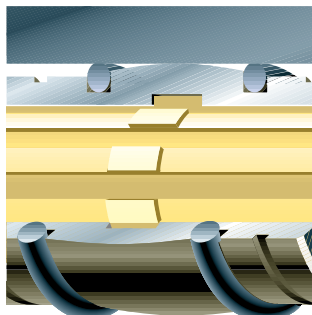
Dirt, dust, fibers

An important feature of all the linear plain bearings is their tolerance of dirt and other abrasive particles. For most conventional bearing systems, the use of wiper or seals is recommended to prevent the accumulation of dirt. With DryLin®, the patented design of the bearing surface, which uses connected slide pads, provides performance benefits for dirty environments. Dirt, even if it becomes wet on the shaft, is wiped away by the individual slide pads and is wiped to an open area. The running sections of the DryLin® bearings then slide on the shaft that has been cleared of all contaminants.

Split linear bearings

Applications on the edge of technical feasibility or in extreme environments often require frequent replacement of linear bearings. DryLin® linear bearings can provide significant increases in service life, and even when replacement is necessary, the replaceable bearing liners can offer substantial cost savings. Replacing only the bearing's liner can reduce maintenance time by 90%. The range of split bearing housings are easily opened, and the split shell means that the shafts are able to stay in place while a new bearing and liner can be installed around the shaft, keeping installation time to a minimum.

	The "all-rounder" – iglide® J	The specialist – iglide® J200	The extreme – iglide® T500 (X)	The marathon runner – iglide® E7	FDA compliant – iglide® A180
Optimal shaft material(s)	all shaft materials	Aluminum, hard anodized	Hardened stainless steel Hard chromed plated steel	Steel stainless steel shaft	all shaft materials
Application temperature	-40°F to +194°F (-40°C to +90°C)	-40°F to +194°F (-40°C to +90°C)	-148°F to +482°F (-100°C to +250°C)	-40°F to +194°F (-40°C to +90°C)	-40°F to +194°F (-40°C to +90°C)
Best coefficient of friction with	Steel shaft	Aluminum, hard anodized	Steel hard chrome-plated	Steel stainless steel shaft	Stainless steel shaft
Maximum life time	Aluminum, hard anodized	Aluminum, hard anodized	Hardened stainless steel	Steel stainless steel shaft	Stainless steel shaft
Permissible stat. surface pressure	35 MPa	23 MPa	150 MPa	18 MPa	28 MPa
Moisture absorption	1.3% weight	0.7% weight	0.5% weight	< 0.1% weight	0.2% weight
Volume resistance	$> 10^{13}$ Ωcm	$> 10^{8}$ Ωcm	$< 10^{5}$ Ωcm	$> 10^{9}$ Ωcm	$> 10^{12}$ Ωcm
Part No.	JUM-...	J200UM-...	TUM-.../XUM-...	E7UM-...	A180UM-...

DryLin® R - Design standards

Eccentric Forces

The 2:1 Rule
When using linear plain bearings it is important to ensure that the acting forces follow the 2:1 Rule (see drawing). If either the load or the drive force (F) is greater than twice the bearing length (1X), then a binding or interrupted motion may occur. If the location of the drive force or load cannot be changed, simply increase the distance between the bearings, or create a counterbalance to move the center-of-gravity back within the 2 to 1 ratio.

Must be < 2x

$F_{(drive/mass)}$

1x

2:1 Rule = permissible distances of the applied forces
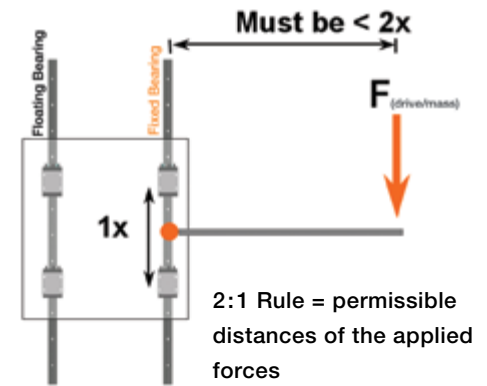
Fixed and Floating Bearing Mounting Instructions

When using systems with 2 parallel rails, one side must be designated as the "fixed" rail, and the opposite side as the "floating" rail.

Why use floating bearings?
● Promotes smooth gliding performance and maximizes bearing life
● Prevents binding caused by parallelism and angle errors
● Decreases necessary drive force and wear by minimizing friction-forces
● Enhances the precision of the system over the bearings' lifetime.
● Reduce assembly time and co

Fixed Bearings
The "fixed" bearing rail should be positioned closest to the drive force. This rail will determine the precision of the system; no system should contain more than two "fixed" bearings.

Floating/Self-Aligning Bearings
The "floating" rail should be the rail located furthest from the drive force. It is to act only as a guide, and will compensate for any misalignments or angle errors in the system ensuring proper functionality.

Mounting Surfaces
The mounting surfaces for rails and bearings should have a very flat surface (e.g milled surface) in order to enhance performance. Variations in these surfaces may be compensated for by using floating bearings.

DryLin® R - Mounting Instructions

DryLin® R linear plain bearings in the 03 Design Series are self-aligning and offer great advantages in applications with parallel shafts. They are able to compensate for alignment and parallelism errors and should be used on the shaft located furthest from the drive mechanism.

The design provides a raised spherical area on the outer diameter of the aluminum adapter for self-alignment. Load capacity is the same as the fixed version.

Even in unfavorable edge-load conditions, the load is supported by the entire projected surface

In order to compensate for parallelism errors between two shafts, the outer diameter is designed to be smaller than the housing bore diameter by 0.2 - 0.3 mm (depending on the size). With the use of mounted O-rings, these bearings have an elastic bearing seat.

Compensation for angle errors
Series RJUI/RJUM/OJUI/OJUM-03 ±0.5°
Series RJUM-06-LL/OJUM-06-LL ±3.5°

Compensation of parallelism errors
Series RJUI/RJUM/OJUI/OJUM-03 ±0.1 mm (.004")
Series RJUM-06-LL/OJUM-06-LL ±3 mm (.12")
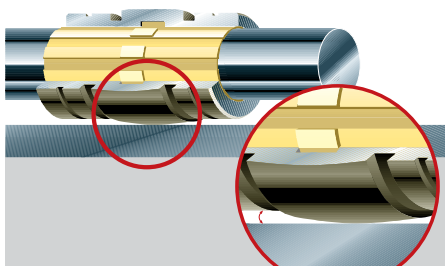
The spherical DryLin® adapters can compensate for alignment errors. A hard-anodization protects the aluminum adapter from wear.
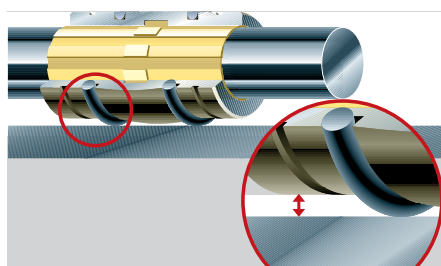
With built in clearances and the use of O-rings, the self-aligning DryLin® R bearings of the 03 Design Series can compensate for parallelism errors.

The self-aligning DryLin® R bearings of the 06 LL design series can compensate parallelism errors up to ± .12" (3mm).

This page contains igus® factory information and was current as of 1/15/18. Information subject to change without notice.

DryLin® R Hard-Anodized Shafts

igus® DryLin® R hard-anodized shafts were specifically developed as the optimal sliding surface for DryLin R linear bearings. Available in four diameters and three lengths of both round shafting and fully supported shafting.

Features

- 6061-T6 aluminum hard-anodized to 450-550 HV surface hardness
- Round and fully supported styles
- Four diameters and three lengths up to 1000mm
- Best choice of shafting to use with DryLin R bearings

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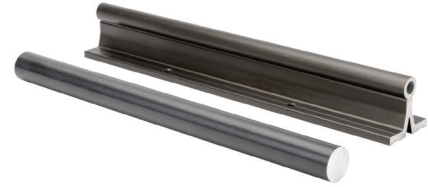
igus® DryLin® R Hard-Anodized Shafts									
Item Photo	Part Number	Shaft Type	Diameter (inch)	Length (mm)	Material	Surface Hardness	Qty. per Package	Weight (lb)	Price	Drawing Link
	A-AWUI-08-250	Supported	1/2	250	Hard-anodized aluminum	450-550 HV	1	0.54	$20.00	PDF
	A-AWUI-08-500			500			1	1.07	$37.00	PDF
	A-AWUI-08-1000			1000			1	2.13	$73.00	PDF
	A-AWUI-12-250		3/4	250			1	0.92	$26.50	PDF
	A-AWUI-12-500			500			1	1.85	$51.00	PDF
	A-AWUI-12-1000			1000			1	3.67	$104.00	PDF
	A-AWUI-16-250		1	250			1	1.23	$31.00	PDF
	A-AWUI-16-500			500			1	2.46	$61.00	PDF
	A-AWUI-16-1000			1000			1	4.92	$124.00	PDF
	A-AWI-04-250	Round	1/4	250			1	0.05	$11.00	PDF
	A-AWI-04-500			500			1	0.10	$19.00	PDF
	A-AWI-04-1000			1000			1	0.20	$39.00	PDF
	A-AWI-08-250		1/2	250			1	0.19	$12.50	PDF
	A-AWI-08-500			500			1	0.39	$23.00	PDF
	A-AWI-08-1000			1000			1	0.77	$46.00	PDF
	A-AWI-12-250		3/4	250			1	0.43	$18.00	PDF
	A-AWI-12-500			500			1	0.87	$33.50	PDF
	A-AWI-12-1000			1000			1	1.73	$66.00	PDF
	A-AWI-16-250		1	250			1	0.77	$24.50	PDF
	A-AWI-16-500			500			1	1.53	$46.00	PDF
	A-AWI-16-1000			1000			1	3.05	$93.00	PDF

DryLin® Shafting

- Available in supported versions
- Aluminum for low weight
- Diameters 1/2 - 1 inch

DryLin® Shafts

	The "all-rounder" – iglide® J	The specialist – iglide® J200	The extreme – iglide® T500 (X)*	The marathon runner – iglide® E7	FDA compliant – iglide® A180
Optimal shaft material(s)	all shaft materials	Aluminum, hard anodized	Hardened stainless steel Hard chromed plated steel	Steel stainless steel shaft	all shaft materials
Application temperature	-40°F to +194°F (-40°C to +90°C)	-40°F to +194°F (-40°C to +90°C)	-148°F to +482°F (-100°C to +250°C)	-40°F to +194°F (-40°C to +90°C)	-40°F to +194°F (-40°C to +90°C)
Best coefficient of friction with	Steel shaft	Aluminum, hard anodized	Steel, hard chrome-plated, SS	Steel stainless steel shaft	Stainless steel shaft
Maximum life time	Aluminum, hard anodized	Aluminum, hard anodized	Hardened stainless steel	Steel stainless steel shaft	Stainless steel shaft
Permissible stat. surface pressure	35 MPa	23 MPa	150 MPa	18 MPa	28 MPa
Moisture absorption	1.3% weight	0.7% weight	0.5% weight	< 0.1% weight	0.2% weight
Volume resistance	> 10^{13} Ωcm	> 10^8 Ωcm	< 10^5 Ωcm	> 10^9 Ωcm	> 10^{12} Ωcm
Part No.	JUM-...	J200UM-...	TUM-.../XUM-...	E7UM-...	A180UM-...

Available shaft materials:

Aluminum
● Ideal in combination with liners made from iglide® J/J200
● Lightweight
● Lower wear
● Corrosion resistant
● Available from stock

Steel
● Ideal with E7 liner
● Low-priced standard
● High load capacity
● Dry area applications
● Hard chrome-plated also available
● Lower coefficient of friction against plastic bearings

Stainless steel
● Ideal with E7 liner
● High corrosion resistance
● High chemical resistance
● Ideal solution for wet applications
● 300 series for extremely chemical intensive applications

> ℹ️ **Please remember that this is a technical surface. Small color variations are possible due to variable coating depths.**
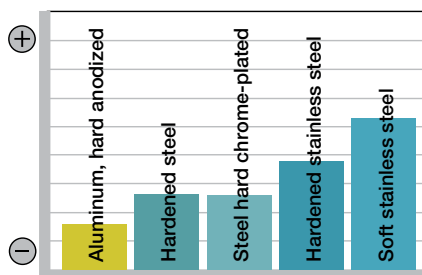
Wear
iglide ®J against particular shaft materials
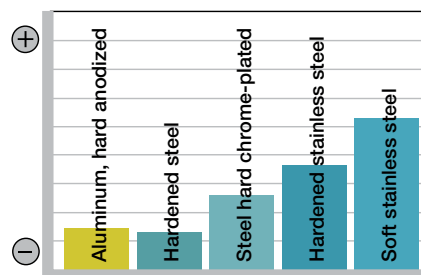
Coefficient of friction
iglide ®J against particular shaft materials
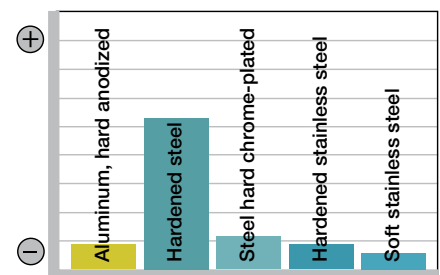
Corrosion
iglide ®J against particular shaft materials

Weight
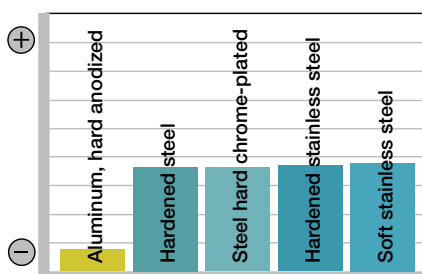
Costs
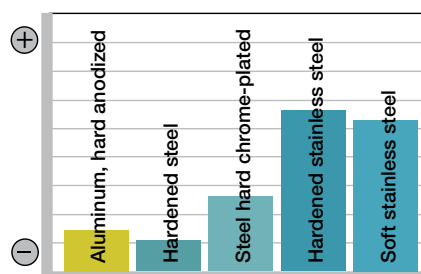
Chemical contamination
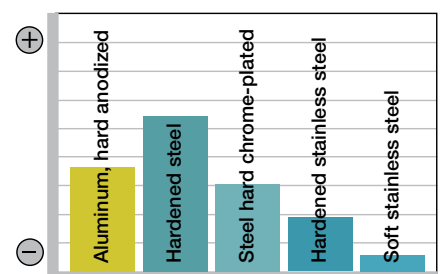
*X is the European equivalent material for iglide® T500

www.igus.com
1-800-521-2747

Transfer Process of Liner to Shaft

The interaction of the Frelon® material and the shafting creates a natural, microscopic transfer of the Frelon to the running surface. A thin film is deposited on the shaft, and the valleys in the surface finish are filled in with Frelon material during the initial break-in period. This transfer creates the self-lubricating condition of Frelon riding on Frelon. This break-in period varies depending on several criteria:

1. Preparation of the shafting prior to installation – it is best to clean the shafting with a 3-in-1 type oil before installing the bearings. This ensures that the surface will receive a full transfer of material.

2. Speed, load, and length of stroke specific to the application – typically the initial transfer process will take approximately 50-100 strokes of continuous operation. The running clearance on the bearing will increase an average of 0.0002" to 0.0005", depending on the length of the stroke and surface requiring the transfer.

3. How often the shafting is cleaned – if the shafting is cleaned regularly, increased wear will be seen in the bearings. This is due to the transfer process being performed over and over again.

Before / **After**

Shaft / Shaft

At break-in, Frelon deposits a microscopic film on the shaft and fills the valleys in the surface finish creating a Frelon-on-Frelon running condition that is true self-lubrication.

Pillow Blocks and Flange Mounts

• Made of aluminum alloy
• Clear anodized finish (Standard)
• Pillow blocks are interchangeable with industry standard ball bearing pillow blocks
• Critical centerline dimensions hold accuracy within ±0.001".

Self-Alignment

Standard pillow blocks have built-in self-alignment in all directions:

• Standard pillow blocks have 1/2° misalignment from centerline
• This feature is built into the housing with a spherical radius at the midpoint of the block
• This self-aligning capability will allow for some shaft deflection and misalignment

1/2° **Play** / 1/2° **Play**

Compensated plain bearings may feel too loose when installed. This is normal, and required, to prevent binding when used with dual shafts

Simplicity Plain Bearing
Fines embed in Frelon liner eliminating shaft damage
Wiping action cleans shaft

Frelon liner is self-lubricating
Additional lubrication is optional

Running Clearance

Simplicity bearings are available with two classes of running clearance:

Precision–"FL":

• Performs like a preloaded ball bearing
• Tightest running clearance approximately 0.001" (0.025 mm)
• Used in applications that require high precision

Not recommended for all parallel shaft applications. Any misalignment can cause binding on the shaft.
Recommend: Compensated–"FLC" (see below).

Compensated–"FLC":

• Performs like a standard ball bearing
• Additional clearance built into the I.D.–all other dimensions are the same as the precision bearings
• Ideally suited for parallel shaft applications

Many parallel shaft applications will run "FL" precision on one rail and "FLC" compensation on the opposite rail to accommodate slight misalignments.

RUNNING CLEARANCE

Standard "FL"
Performs like a preloaded linear ball bearing

0.0005" per side clearance average (0.0127 mm)

Shaft

Compensated "FLC"
Performs like a standard linear ball bearing

0.0015" + per side clearance average (0.0381 + mm)

Shaft

PBC Linear®

PBC Simplicity®
Plain Bearings

PBC Linear Plain Bearing Features

- Class III Plain Bearing
- Self lubricating
- Maintenance free
- Coefficient of friction: 0.125
- Temperature range: ± 400° F
- Bearing Liner Material: FrelonGOLD® (PTFE)
- Bearing Shell Material: Aluminum Alloy with anodized finish
- For Linear, oscillating, rotary motion, or combination of all 3

Closed Bearing   **Open Bearing**

Performance Ratings (for Linear Motion)

Plain bearings are rated by their limiting Pressure Velocity (PV), which is a combination of load over a given surface area and the velocity.

$(-)C_O$ = Static Load on bearing

A = Bearing effective surface area

V = velocity (speed) in ft/min (m/min.)

P = Pressure on Bearing = C_O/A

PV = Pressure Velocity

PV$_{max}$	P$_{max}$	V_{max}		
		No Lube Continuous Motion	No Lube Intermittent Motion	With Lubrication*
20000 (psi x ft./min.)	3000 psi	300 ft/min	825 ft/min	825 ft/min
430 (kgf/cm2 x m/min.)	210.9 kgf/cm2	1.524 m/sec.	4.19 m/sec.	4.19 m/sec.

*Depending on the lubrication used, loads, and frequency of continuous or intermittent motion, speeds can be in excess of the numbers shown.

Recommended Lubricants:
- Waylube oil
- Light weight oils
- Petroleum based grease
- 3-in-1 oils

Not Recommended Lubricants:
- WD-40
- PTFE sprays
- Fluorocarbons
- Silicon oils

Simplicity Series Plain Bearings

Part Number	Price	Nominal ID	Bearing Form Factor	Effective Surface Area (A)	Running Clearance (Both Sides)	Max Static Load Rating (C$_O$)	Drawing Links
FL04	$19.50	1/4 in	closed	0.20 in^2	0.0005 in	600 lbs	PDF
FL06	$21.50	3/8 in		0.34 in^2		1020 lbs	PDF
FL08	$22.50	1/2 in		0.65 in^2		1950 lbs	PDF
FL10	$25.50	5/8 in		0.98 in^2		2940 lbs	PDF
FL12	$26.00	3/4 in		1.27 in^2		3810 lbs	PDF
FL16	$47.50	1 in		2.35 in^2		7050 lbs	PDF
FL20	$80.00	1 1/4 in		3.43 in^2		10830 lbs	PDF
FLN08	$30.00	1/2 in	open	0.65 in^2		1950 lbs	PDF
FLN10	$32.00	5/8 in		0.98 in^2		2940 lbs	PDF
FLN12	$33.50	3/4 in		1.27 in^2		3810 lbs	PDF
FLN16	$57.00	1 in		2.35 in^2		7050 lbs	PDF
FLN20	$95.00	1 1/4 in		3.43 in^2		10830 lbs	PDF
FLC04	$19.50	1/4 in	closed	0.20 in^2	0.0015 in	600 lbs	PDF
FLC06	$21.50	3/8 in		0.34 in^2		1020 lbs	PDF
FLC08	$22.50	1/2 in		0.65 in^2		1950 lbs	PDF
FLC10	$25.50	5/8 in		0.98 in^2		2940 lbs	PDF
FLC12	$26.00	3/4 in		1.27 in^2		3810 lbs	PDF
FLC16	$47.50	1 in		2.35 in^2		7050 lbs	PDF
FLC20	$80.00	1 1/4 in		3.43 in^2		10830 lbs	PDF
FLCN08	$22.50	1/2 in	open	0.65 in^2		1950 lbs	PDF
FLCN10	$25.50	5/8 in		0.98 in^2		2940 lbs	PDF
FLCN12	$26.00	3/4 in		1.27 in^2		3810 lbs	PDF
FLCN16	$47.50	1 in		2.35 in^2		7050 lbs	PDF
FLCN20	$80.00	1 1/4 in		3.43 in^2		10830 lbs	PDF

PV CHART (Dry Running)

SPEED (m/min.)

Frelon GOLD

LOAD (PSI)

SPEED (ft/min.)

LOAD (kgf/cm²)

FrelonGOLD not recommended for use with deionized water and other harsh chemicals. See the chemical reaction chart page tMNC-167

$-C_O = C_O$

$-C_O = 40\% * C_O$

C_O

C_O

$L_t = C_O$

$L_t = 70\% * C_O$

Motion Control

tMNC-164

For the latest prices, please check AutomationDirect.com.

PBC Linear

PBC Simplicity®
Pillow Blocks

PBC Linear Simplicity Pillow Block Features

- Simplicity Plain Bearing Pre-installed
- Pillow Block Housing Material: Aluminum alloy with clear anodize finish
- Centerline tolerance: ± 0.001″
- Internal self-aligning feature provides ± 1/2° bearing movement in all directions allowing for some shaft deflection and misalignment
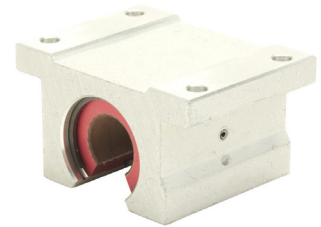
Closed Bearing   **Open Bearing**

Simplicity Pillow Block								
Part Number	Price	Nominal ID	Installed Bearing	Form Factor	Effective Surface Area (A)	Running Clearance (Both Sides)	Max Static Load Rating (C$_0$)	Drawing Links
P04	$55.00	1/4in	FL04	closed type	0.20 in^2	0.0005 in	600 lbs	PDF
P06	$57.00	3/8in	FL06		0.34 in^2		1020 lbs	PDF
P08	$63.00	1/2in	FL08		0.65 in^2		1950 lbs	PDF
P10	$70.00	5/8in	FL10		0.98 in^2		2940 lbs	PDF
P12	$73.00	3/4in	FL12		1.27 in^2		3810 lbs	PDF
P16	$106.00	1in	FL16		2.35 in^2		7050 lbs	PDF
P20	$160.00	1-1/4in	FL20		3.43 in^2		10830 lbs	PDF
PN08	$73.00	1/2in	FLN08	open type	0.65 in^2		1950 lbs	PDF
PN10	$85.00	5/8in	FLN10		0.98 in^2		2940 lbs	PDF
PN12	$91.00	3/4in	FLN12		1.27 in^2		3810 lbs	PDF
PN16	$129.00	1in	FLN16		2.35 in^2		7050 lbs	PDF
PN20	$194.00	1-1/4in	FLN20		3.43 in^2		10830 lbs	PDF
P04C	$55.00	1/4in	FLC04	closed type	0.20 in^2	0.0015 in	600 lbs	PDF
P06C	$57.00	3/8in	FLC06		0.34 in^2		1020 lbs	PDF
P08C	$63.00	1/2in	FLC08		0.65 in^2		1950 lbs	PDF
P10C	$70.00	5/8in	FLC10		0.98 in^2		2940 lbs	PDF
P12C	$74.00	3/4in	FLC12		1.27 in^2		3810 lbs	PDF
P16C	$106.00	1in	FLC16		2.35 in^2		7050 lbs	PDF
P20C	$160.00	1-1/4in	FLC20		3.43 in^2		10830 lbs	PDF
PN08C	$73.00	1/2in	FLCN08	open type	0.65 in^2		1950 lbs	PDF
PN10C	$85.00	5/8in	FLCN10		0.98 in^2		2940 lbs	PDF
PN12C	$92.00	3/4in	FLCN12		1.27 in^2		3810 lbs	PDF
PN16C	$129.00	1in	FLCN16		2.35 in^2		7050 lbs	PDF
PN20C	$192.00	1-1/4in	FLCN20		3.43 in^2		10830 lbs	PDF
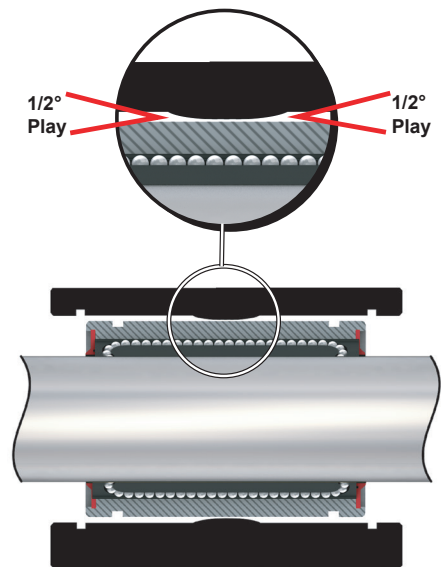
1/2° Play   1/2° Play

Internal Self-aligning Feature

FrelonGOLD® not recommended for use with deionized water and other harsh chemicals. See the chemical reaction chart page tMNC-167

PBC Linear

PBC Simplicity®
Flange Mount Bearings

PBC Linear Simplicity Flange Mount Features

- Simplicity Plain Bearing Pre-installed
- Flange Mount Housing Material: Aluminum alloy with clear anodize finish
- Internal self-aligning feature provides ± 1/2° bearing movement in all directions allowing for some shaft deflection and misalignment

Simplicity Flange Mount Bearing							
Part Number	Price	Nominal ID	Installed Bearing	Effective Surface Area (A)	Running Clearance (Both Sides)	Max Static Load Rating (C_0)	Drawing Links
SFP06	$108.00	3/8 in	SFP06	0.34 in^2		1020 lbs	PDF
SFP08	$86.00	1/2 in	SFP08	0.65 in^2		1950 lbs	PDF
SFP12	$94.00	3/4 in	SFP12	1.27 in^2	0.0005 in	3810 lbs	PDF
SFP16	$134.00	1 in	SFP16	2.35 in^2		7050 lbs	PDF
SFP20	$212.00	1 1/4 in	SFP20	3.43 in^2		10830 lbs	PDF
SFP06C	$108.00	3/8 in	SFP06C	0.34 in^2		1020 lbs	PDF
SFP08C	$86.00	1/2 in	SFP08C	0.65 in^2		1950 lbs	PDF
SFP12C	$95.00	3/4 in	SFP12C	1.27 in^2	0.0015 in	3810 lbs	PDF
SFP16C	$134.00	1 in	SFP16C	2.35 in^2		7050 lbs	PDF
SFP20C	$212.00	1 1/4 in	SFP20C	3.43 in^2		10830 lbs	PDF
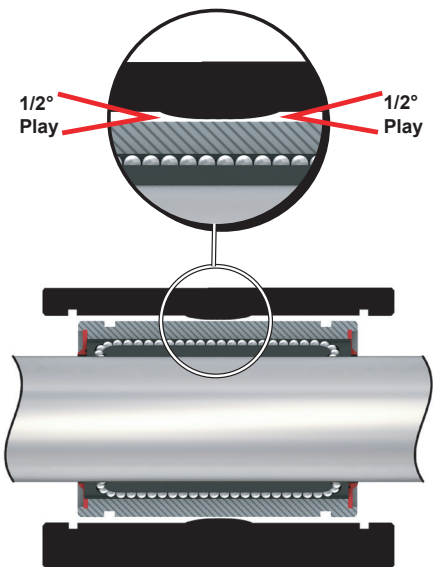
1/2° Play   1/2° Play

Internal Self-aligning Feature

FrelonGOLD® not recommended for use with deionized water and other harsh chemicals. See the chemical reaction chart page tMNC-167

PBC Linear®

Chemical Reaction Chart for Simplicity® Bearings

The FrelonGOLD® material is a composite of PTFE and a bearing filler. The PTFE is chemically inert. The chemical resistance shown in the chart below is defined by the compatibility of the filler with the various chemicals.

Other data in the chart below applies to the bearing shell and pillow block materials. The table is provided as a reference only. The data given will be affected by factors such as temperature, PV, degree of contact, strength of solution, etc. In each specific application, it is always advisable to conduct specific testing to determine suitability of use. This table only addresses general corrosion, NOT galvanic, SCC, or other types of corrosion. Corrosion rates are at room temperature unless otherwise noted.

Standard and hard coat data only apply when the coating is intact. If the coating is worn through or damaged, an area of galvanic and pitting corrosion will be created. Then use the bare aluminum data.

Standard Simplicity products use aluminum alloy, which is known to have the best corrosion resistance of the high strength aluminum alloys. The sulfuric bath anodizing and nickel acetate sealing provide the best corrosion resistance available in anodized coatings. They can withstand a rigorous 14-day exposure in a 5% salt spray solution at 96°F per military specifications without significant damage. With the coating intact, it is considered to be inert in most fluids with a pH value between 5 and 8. Hard coat anodizing provides the same chemical resistance but is applied to a 0.002" thickness, providing a more durable surface that will stand up to greater abuse. However, if the coating is penetrated, the resistance is reduced.

Special stainless steel bearings use AISI 316 stainless, which has superior resistance over 303, 304, 420, 440, 17-4PH, and most other common stainless grades. 316 is generally considered to be the most corrosion resistant of conventional stainless steels.

This information was compiled for Pacific Bearing® Company by Materials Engineering, Inc. of Virgil, IL. This specification information is believed to be accurate and reliable, however, no liability is assumed. Information is for reference only. User must test specific applications.

Performance	Wear
E = Excellent	< 0.002" per year
G = Good	< 0.020" per year
S = Satisfactory	< 0.050" per year
U = Unsatisfactory	> 0.040" per year

Chemical	Frelon GOLD	Bare Aluminum	Standard & Hard Coat Anodized Aluminum	316 Stainless Steel
Acetic Acid, 20%	U	G	G	E
Acetone	G	E	E	E
Ammonia, Anhydrous	G	E	E	E
Ammonium Hydroxide, 10%	U	U	U	E
Ammonium Chloride, 10%	U	U	U	G
Ammyl Acetate (122°F / 50°C)	G	E	E	E
Barium Hydroxide	U	U	U	G
Beer	G	E	E	E
Boric Acid Solutions	G	E	E	G
Butane	G	G	G	G
Calcium Chloride, 20%	G	G	G	G
Calcium Hydroxide, 10%	G	G	G	G
Carbon Dioxide	G	E	E	G
Carbon Monoxide	G	E	E	E
Chlorine Gas, Dry	G	G	G	G
Chlorine Gas, Wet	U	U	U	U
Chromic Acid, 10%	U	G	E	E
Citric Acid, 5%	G	E	E	E
Ethyl Acetate	G	E	E	G
Ethyl Alcohol	G	E	E	G
Ethylene Glycol	G	E	E	G
Ferric Chloride, 50%	U	U	U	U
Formic Acid - Anhydrous	U	E	E	E
Gasoline, Unleaded	G	G	G	G
Hydrochloric Acid, 20%	U	U	U	U
Hydrochloric Acid, 35%	U	U	U	U
Hydrocyanic Acid, 10%	U	G	G	G
Hydrofluoric Acid - Dilute	U	U	U	U
Hydrofluoric Acid, 48%	U	U	U	U
Hydrogen	G	E	E	E
Hydrogen Peroxide - Dilute	U	E	E	G

Chemical	Frelon GOLD	Bare Aluminum	Standard & Hard Coat Anodized Aluminum	316 Stainless Steel
Hydrogen Sulfide, Dry	U	G	E	E
JP-4	G	G	G	G
Kerosene	G	G	G	G
Lacitic Acid, 10%	G	G	G	E
Magnesium Chloride, 50%	G	U	U	G
Mercury	U	U	U	E
Methyl Alcohol	G	G	G	G
Methyl Ethyl Ketone	G	G	G	G
Methylene Chloride	G	E	E	G
Mineral Oil	G	G	G	G
Naptha	G	G	G	G
Nitric Acid, 70%	U	U	U	E
Phosphoric Acid, 10%	U	U	U	E
Sodium Chloride	G	U	U	E
Sodium Hydroxide, 20%	G	U	U	G
Sodium Hypochlorite, 20%	U	G	G	U
Sodium Peroxide, 10%	U	G	G	G
Steam (see water)	-	-	-	-
Sulfur Dioxide, Wet	U	U	U	U
Sulfur Dioxide, Dry	G	G	G	G
Sulfur Trioxide	U	G	G	G
Sulfuric Acid, 50%	U	U	U	U
Sulfurous Acid	U	G	G	E
Toluene (122°F / 50°C)	G	E	E	E
Turpentine	G	G	E	E
Water, Demineralized	U	G	E	E
Water, Distilled	G	U	S	G
Sea Water	G	G	E	G
Water, Sewage	G	U	S	G
Xylene	G	G	G	G
Zinc Chloride Solutions	U	U	U	G

PBC Linear

PBC Linear
Ball Bearings

High Precision and Rigidity

The ball bearing is produced from a solid steel outer cylinder and incorporates an industrial strength polymer retainer.

Ease of Assembly

The standard type of linear ball bearing can be loaded from any direction. Precision control is possible using only the shaft supporter, and the mounting surface can be machined easily.

Ease of Replacement

Linear ball bearings of each type are completely interchangeable because of their standardized dimensions and strict precision control. Replacement because of wear or damage is therefore easy and accurate.

Materials

Ball bearings consist of an outer cylinder, ball retainer, balls, double seals, and two end rings. The ball retainer which holds the balls in the recirculating tracks is held inside the outer cylinder by end rings.

- Parts are assembled to optimize their required functions.
- The outer shell is heat treated to ensure long life.
- The ball retainer is molded from a durable polymer to ensure smooth and quiet motion.
- Double seals are standard.
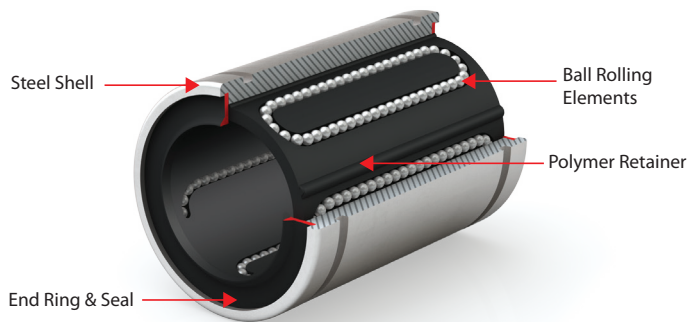
Ball Bearing
Better performance for moment loading
Balls provide precise, low-friction performance but are susceptible to contamination
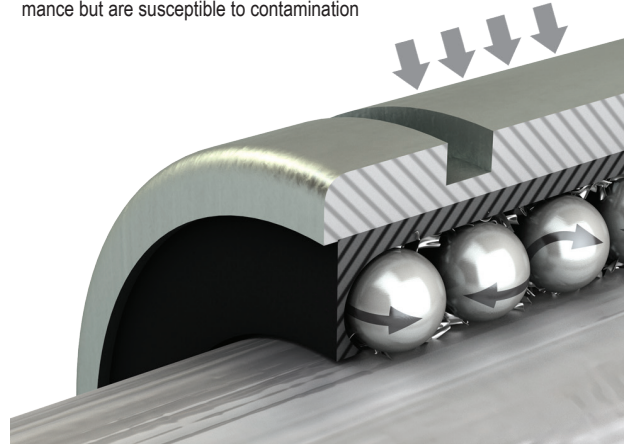
Pillow Blocks and Flange Mounts

- Made of aluminum alloy
- Clear anodized finish (Standard)
- Pillow blocks are interchangeable with industry standard ball bearing pillow blocks
- Critical centerline dimensions hold accuracy within ±0.001".

Self-Alignment

Standard pillow blocks have built-in self-alignment in all directions:

- Standard pillow blocks have 1/2° misalignment from centerline
- This feature is built into the housing with a spherical radius at the midpoint of the block
- This self-aligning capability will allow for some shaft deflection and misalignment

Steel Shell

Ball Rolling Elements

Polymer Retainer

End Ring & Seal

1/2° Play

1/2° Play

Motion Control   tMNC-168
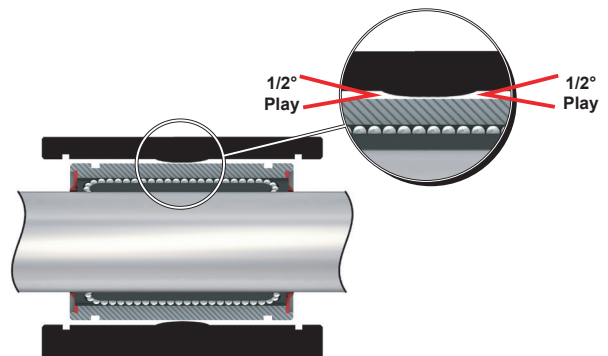
PBC Linear

PBC Linear Ball Bearings

PBC Linear Ball Bearing Features

- For Linear, oscillating, rotary motion, or combination of all 3
- End Seals included
- Bearing Shell Material: GCr15 Steel, heat treated
- Bearing Material: GCr15 Steel
- Bearing Retainer Material: Polyoxymethylene polymer
- Lubrication required

Performance Ratings (for Linear Motion)

- Coefficient of friction: 0.05
- Maximum Speed (V_{max}): 590 ft/min
- IP04G-xx thru IP16G-xx ID tolerance: 0/-0.0005"
- IP20G-xx ID tolerance: 0/-0.0006"

Closed Bearing

Open Bearing

$-C_O = C_O$

C_O

$L_t = C_O$

$-C_O = 40\% * C_O$

C_O

$L_t = 70\% * C_O$
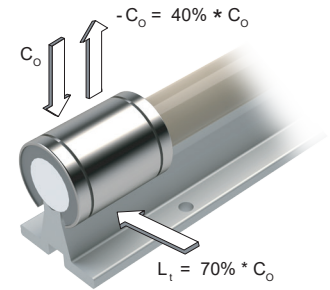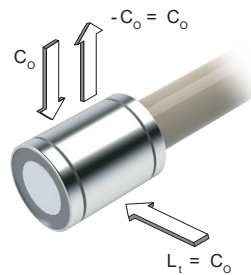
PBC Linear Ball Bearing								
Part Number	Price	Nominal ID	Bearing Form Factor	OD	Overall Length	Static Load Rating (C_O)	Dynamic Load Rating (C)	Drawing Links
IP04G	$16.00	1/4 in	closed	1/2 in	3/4 in	59 lbs	46 lbs	PDF
IP06G	$17.00	3/8 in		5/8 in	7/8 in	70 lbs	50 lbs	PDF
IP08G	$17.50	1/2 in		7/8 in	1 1/4 in	178 lbs	114 lbs	PDF
IP10G	$19.50	5/8 in		1 1/8 in	1 1/2 in	265 lbs	174 lbs	PDF
IP12G	$21.50	3/4 in		1 1/4 in	1 5/8 in	307 lbs	193 lbs	PDF
IP16G	$39.00	1 in		1 9/16 in	2 1/4 in	352 lbs	220 lbs	PDF
IP20G	$66.00	1 1/4 in		2 in	2 5/8 in	615 lbs	352 lbs	PDF
IP08G-OP	$25.50	1/2 in	open	7/8 in	1 1/4 in	178 lbs	114 lbs	PDF
IP10G-OP	$26.50	5/8 in		1 1/8 in	1 1/2 in	265 lbs	174 lbs	PDF
IP12G-OP	$28.50	3/4 in		1 1/4 in	1 5/8 in	307 lbs	193 lbs	PDF
IP16G-OP	$53.00	1 in		1 9/16 in	2 1/4 in	352 lbs	220 lbs	PDF
IP20G-OP	$89.00	1 1/4 in		2 in	2 5/8 in	615 lbs	352 lbs	PDF

PBC Linear

PBC Linear Ball-Bearing Pillow Blocks

PBC Linear Ball Bearing Pillow Block Features

- PBC Linear Ball Bearing Pre-installed
- Pillow Block Housing Material: Aluminum alloy with clear anodize finish
- Centerline tolerance: ± 0.001″
- Internal self-aligning feature provides ± 1/2° bearing movement in all directions allowing for some shaft deflection and misalignment
- IPP(x)04G thru IPP(x)16G ID tolerance: 0/-0.0005″
- IPP(x)20G ID tolerance: 0/-0.0006″

Closed Bearing

Open Bearing

PBC Ball Bearing Pillow Block							
Part Number	Price	Nominal ID	Installed Bearing	Form Factor	Static Load Rating (C_O)	Dynamic Load Rating (C)	Drawing Links
IPP04G	$28.50	1/4in	IP04G		59 lbs	48 lbs	PDF
IPP06G	$53.00	3/8in	IP06G		70 lbs	50 lbs	PDF
IPP08G	$58.00	1/2in	IP08G		178 lbs	114 lbs	PDF
IPP10G	$64.00	5/8in	IP10G	closed type	265 lbs	174 lbs	PDF
IPP12G	$68.00	3/4in	IP12G		307 lbs	193 lbs	PDF
IPP16G	$96.00	1in	IP16G		352 lbs	220 lbs	PDF
IPP20G	$145.00	1-1/4in	IP20G		615 lbs	352 lbs	PDF
IPPN08G	$70.00	1/2in	IP08G-OP		178 lbs	114 lbs	PDF
IPPN10G	$81.00	5/8in	IP10G-OP		265 lbs	174 lbs	PDF
IPPN12G	$88.00	3/4in	IP12G-OP	open type	307 lbs	193 lbs	PDF
IPPN16G	$126.00	1in	IP16G-OP		352 lbs	220 lbs	PDF
IPPN20G	$189.00	1-1/4in	IP20G-OP		615 lbs	352 lbs	PDF

1/2° Play   1/2° Play
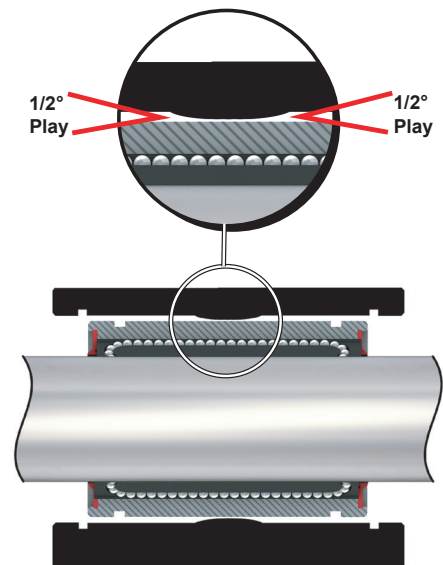
Internal Self-aligning Feature

PBC Linear

PBC Linear Shafts and Shaft Supports

PBC Linear Simplicity® 60 Plus Linear Shaft Features

- Optimized surface finish for plain and ball bearings
- Straightness: 0.001"–0.002" per ft cumulative
- Length Tolerance: ±0.030"
- Surface Finish: 8-12Ra
- Hardness:
  - RC60-65 for 1060 Steel
  - RC50-55 for 440C Stainless Steel
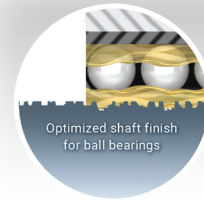
Optimized shaft finish for ball bearings
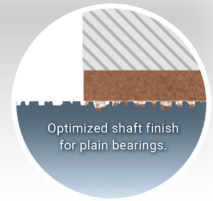
Optimized shaft finish for plain bearings.

In most applications, smoother is not better; in fact it means decreased performance and shortened life. PBC Linear has engineered the surface finish for optimum performance

PBC Linear Shafts (1060 Carbon Steel)

Part Number	Price	Nominal Diameter	Length	Material	Drawing Links
NIL04-006.000-SL	$4.75	1/4in	6.0 in		PDF
NIL04-012.000-SL	$9.25		12.0 in		PDF
NIL06-006.000-SL	$5.25	3/8in	6.0 in		PDF
NIL06-012.000-SL	$10.50		12.0 in		PDF
NIL06-018.000-SL	$15.50		18.0 in		PDF
NIL08-012.000-SL	$11.00	1/2in	12.0 in		PDF
NIL08-024.000-SL	$21.50		24.0 in		PDF
NIL08-036.000-SL	$33.00		36.0 in		PDF
NIL10-012.000-SL	$13.50	5/8in	12.0 in	1060 steel	PDF
NIL10-024.000-SL	$27.00		24.0 in		PDF
NIL10-036.000-SL	$40.50		36.0 in		PDF
NIL12-012.000-SL	$17.50	3/4in	12.0 in		PDF
NIL12-024.000-SL	$35.00		24.0 in		PDF
NIL12-036.000-SL	$53.00		36.0 in		PDF
NIL16-012.000-SL	$24.00	1in	12.0 in		PDF
NIL16-024.000-SL	$47.50		24.0 in		PDF
NIL16-036.000-SL	$70.00		36.0 in		PDF
NIL20-012.000-SL	$30.00	1-1/4in	12.0 in		PDF
NIL20-024.000-SL	$60.00		24.0 in		PDF
NIL20-036.000-SL	$91.00		36.0 in		PDF

PBC Linear Shafts (440C Stainless Steel)

Part Number	Price	Nominal Diameter	Length	Material	Drawing Links
NIL06SS-006.000-SL	$13.50	3/8in	6.0 in		PDF
NIL06SS-012.000-SL	$27.50		12.0 in		PDF
NIL08SS-012.000-SL	$26.00	1/2in	12.0 in		PDF
NIL08SS-024.000-SL	$52.00		24.0 in		PDF
NIL08SS-036.000-SL	$77.00		36.0 in		PDF
NIL10SS-012.000-SL	$33.00	5/8in	12.0 in		PDF
NIL10SS-024.000-SL	$66.00		24.0 in		PDF
NIL10SS-036.000-SL	$100.00		36.0 in	440C stainless steel	PDF
NIL12SS-012.000-SL	$36.50	3/4in	12.0 in		PDF
NIL12SS-024.000-SL	$73.00		24.0 in		PDF
NIL12SS-036.000-SL	$110.00		36.0 in		PDF
NIL16SS-012.000-SL	$52.00	1in	12.0 in		PDF
NIL16SS-024.000-SL	$103.00		24.0 in		PDF
NIL16SS-036.000-SL	$155.00		36.0 in		PDF
NIL20SS-012.000-SL	$57.00	1-1/4in	12.0 in		PDF
NIL20SS-024.000-SL	$113.00		24.0 in		PDF
NIL20SS-036.000-SL	$170.00		36.0 in		PDF

PBC Linear Shaft Support Features

- End support blocks can be used for end or intermediate shaft support
- Instant bolt-down installation
- Lightweight and strong.
- Can be used with all shaft types.
- Should be used where deflection between supports is not a problem.
- Material: Aluminum with anodize finish
- Center height tolerance: +/- 0.001"

PBC Shaft Support

Part Number	Price	Nominal Diameter	Center Height	Drawing Links
NSB04	$21.50	1/4 in	11/16 in	PDF
NSB06	$22.00	3/8 in	3/4 in	PDF
NSB08	$30.00	1/2 in	1 in	PDF
NSB10	$31.50	5/8 in	1 in	PDF
NSB12	$33.00	3/4 in	1-1/4 in	PDF
NSB16	$40.50	1 in	1-1/2 in	PDF
NSB20	$48.50	1-1/4 in	1-3/4 in	PDF

Motion Control

PBC Linear

PBC Linear
Supported Shafts

PBC Linear Simplicity®
60 Plus Supported Linear
Shaft Features

- Optimized surface finish for plain and ball bearings
- Straightness: 0.001"–0.002" per ft cumulative
- Length Tolerance: ±0.030"
- Surface Finish: 8-12Ra
- Hardness:
  - RC60-65 for 1060 Steel
  - RC50-55 for 440C Stainless Steel
- Shaft support material: Aluminum
- Centerline tolerance: ±0.002"
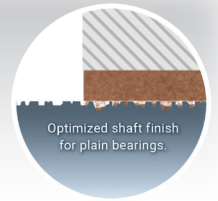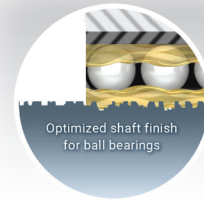
Optimized shaft finish for ball bearings

Optimized shaft finish for plain bearings.

In most applications, smoother is not better; in fact it means decreased performance and shortened life. PBC Linear has engineered the surface finish for optimum performance

PBC Supported Linear Shafts (1060 Carbon Steel)					
Part Number	Price	Nominal Diameter	Length	Material	Drawing Links
SRA08-012.000-SL	$103.00		12.0 in		PDF
SRA08-024.000-SL	$206.00	1/2in	24.0 in		PDF
SRA08-036.000-SL	$311.00		36.0 in		PDF
SRA10-012.000-SL	$115.00		12.0 in		PDF
SRA10-024.000-SL	$228.00	5/8in	24.0 in		PDF
SRA10-036.000-SL	$341.00		36.0 in		PDF
SRA12-012.000-SL	$124.00		12.0 in		PDF
SRA12-024.000-SL	$246.00	3/4in	24.0 in	1060 steel	PDF
SRA12-036.000-SL	$372.00		36.0 in		PDF
SRA16-012.000-SL	$158.00		12.0 in		PDF
SRA16-024.000-SL	$315.00	1in	24.0 in		PDF
SRA16-036.000-SL	$475.00		36.0 in		PDF
SRA20-012.000-SL	$177.00		12.0 in		PDF
SRA20-024.000-SL	$351.00	1-1/4in	24.0 in		PDF
SRA20-036.000-SL	$526.00		36.0 in		PDF

PBC Supported Linear Shafts (440C Stainless Steel)					
Part Number	Price	Nominal Diameter	Length	Material	Drawing Links
SRA08SS-012.000-SL	$160.00		12.0 in		PDF
SRA08SS-024.000-SL	$320.00	1/2in	24.0 in		PDF
SRA08SS-036.000-SL	$480.00		36.0 in		PDF
SRA10SS-012.000-SL	$160.00		12.0 in		PDF
SRA10SS-024.000-SL	$320.00	5/8in	24.0 in		PDF
SRA10SS-036.000-SL	$480.00		36.0 in		PDF
SRA12SS-012.000-SL	$191.00		12.0 in		PDF
SRA12SS-024.000-SL	$382.00	3/4in	24.0 in	440C stainless steel	PDF
SRA12SS-036.000-SL	$568.00		36.0 in		PDF
SRA16SS-012.000-SL	$215.00		12.0 in		PDF
SRA16SS-024.000-SL	$423.00	1in	24.0 in		PDF
SRA16SS-036.000-SL	$634.00		36.0 in		PDF
SRA20SS-012.000-SL	$294.00		12.0 in		PDF
SRA20SS-024.000-SL	$589.00	1-1/4in	24.0 in		PDF
SRA20SS-036.000-SL	$878.00		36.0 in		PDF

1-800-633-0405

SureGear High-Precision
Inline Strain Wave Gearboxes

Strain wave gearboxes offer many advantages over planetary and helical gearboxes. Strain wave technology allows for a higher gear ratio and efficiency in an inline form-factor and smaller size. Many different gear ratios and input flange sizes are available and are designed to work with SureServo2 and SureStep motors.

Strain wave technology provides:
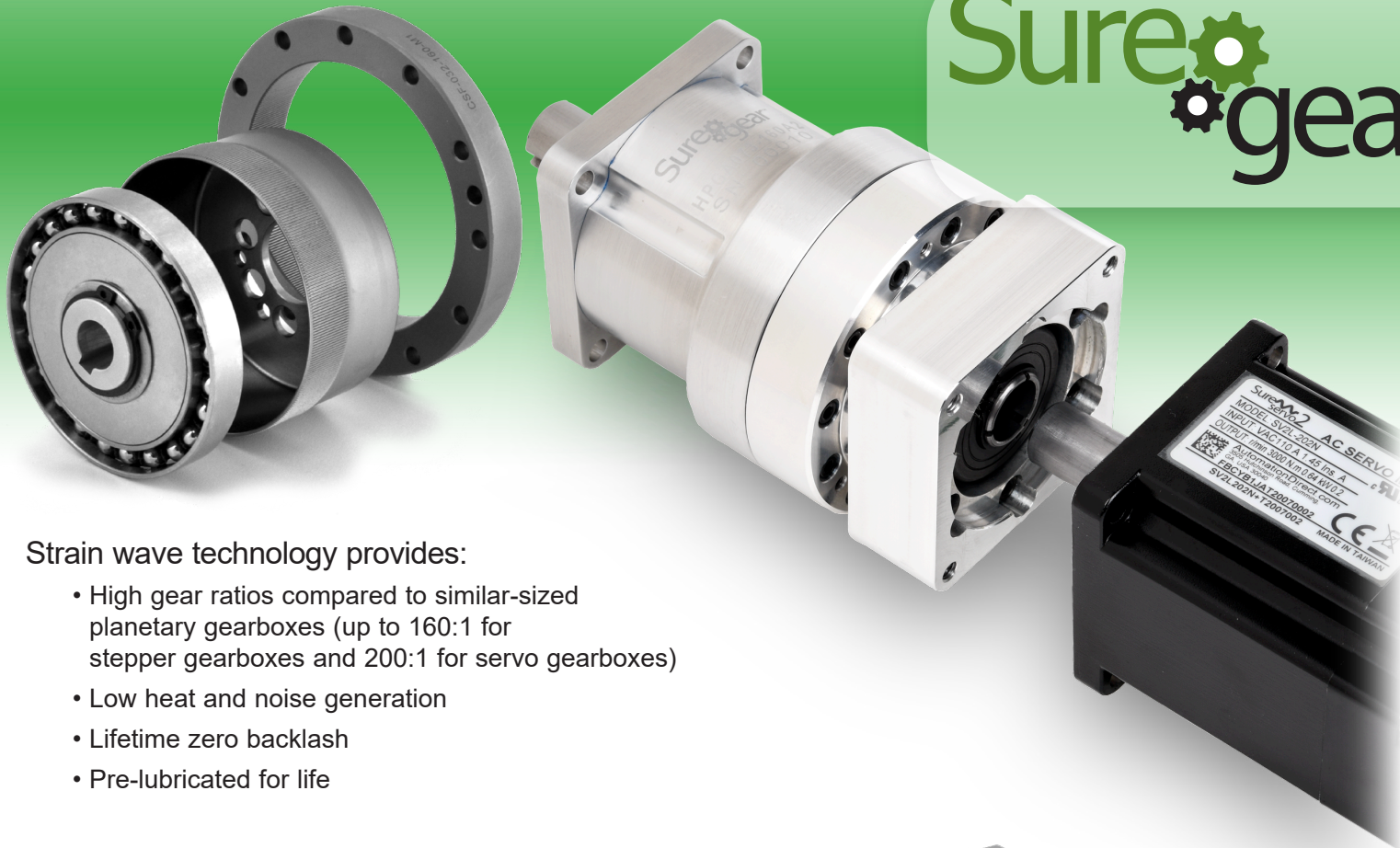
- High gear ratios compared to similar-sized planetary gearboxes (up to 160:1 for stepper gearboxes and 200:1 for servo gearboxes)
- Low heat and noise generation
- Lifetime zero backlash
- Pre-lubricated for life
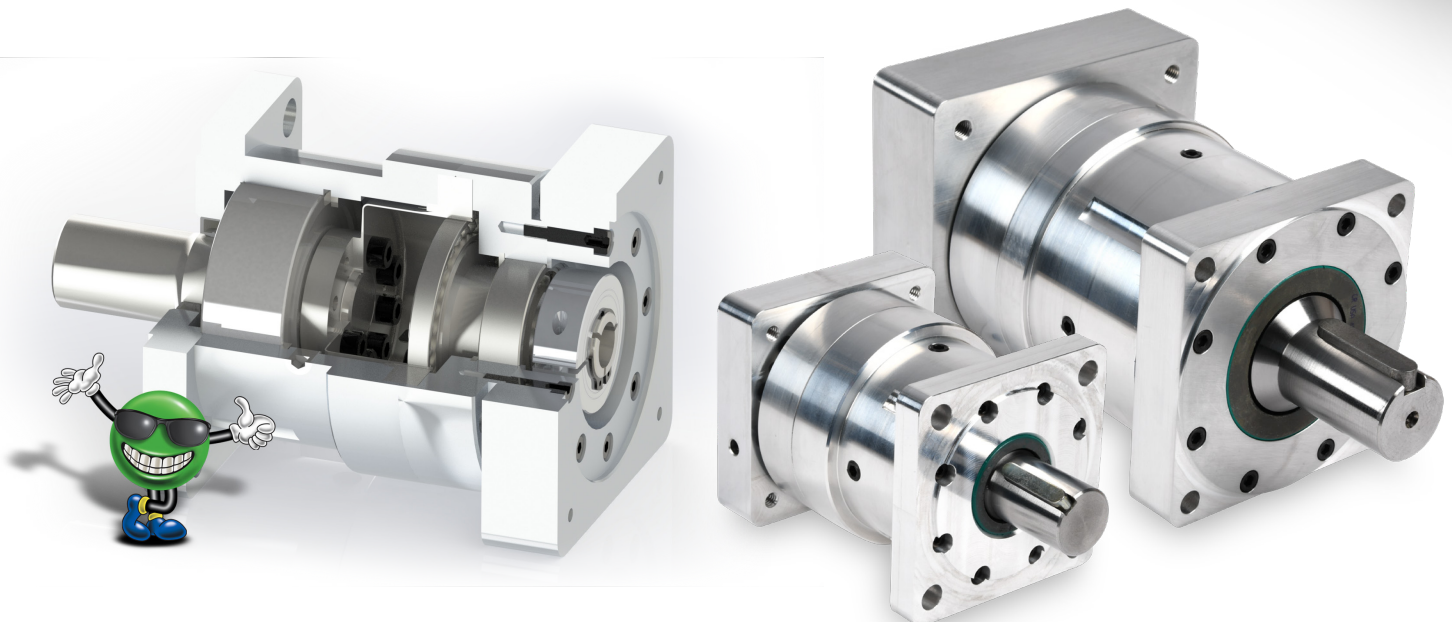
Planetary Gearboxes for NEMA Motors

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
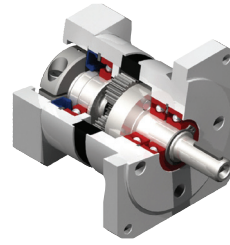
Applications

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

SureGear® NEMA Planetary Gearboxes

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 Inertia (kg·cm2 [lb·in2])	Efficiency (%)	Approx Weight (kg [lb])	Fits SureStep Stepper Motor (STP-MTR, STP-MTRH, STP-MTRAC)	Drawing Links
PGCN17-055M	$411.00	5:1		6.5 [58]	13 [115]	26 [230]	<25			0.8 [7.5]	0.0096 [0.003]	94	0.45 [1.0]		PDF
PGCN17-105M	$411.00	10:1		5.0 [44]	10 [89]	20 [177]	<25			0.5 [4.4]	0.0078 [0.003]	94	0.45 [1.0]		PDF
PGCN17-255M	$516.00	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(x)-17xxx(x)	PDF
PGCN17-505M	$516.00	50:1		16 [142]	20 [177]	32 [283]	<30			0.8 [7.5]	0.0078 [0.003]	92	0.55 [1.2]		PDF
PGCN17-1005M	$516.00	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]		PDF
PGCN23-0525	$453.00	5:1		6.5 [58]	13 [115]	26 [230]	<20			0.9 [8.0]		94	0.45 [1.0]		PDF
PGCN23-1025	$453.00	10:1		5.0 [44]	10 [89]	20 [177]	<20			0.6 [5.3]		94	0.45 [1.0]		PDF
PGCN23-2525	$531.00	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(x)-23xxx(x)	PDF
PGCN23-5025	$531.00	50:1		16 [142]	20 [177]	32 [283]	<25			0.9 [8.0]		92	0.55 [1.2]		PDF
PGCN23-10025	$531.00	100:1		5.0 [44]	10 [89]	20 [177]	<25			0.6 [5.3]		92	0.55 [1.2]		PDF
PGCN34-0550	$539.00	5:1		26 [230]	44 [389]	84 [743]	<15			2.4 [21.2]	0.36 [0.123]	94	1.1 [2.4]		PDF
PGCN34-1050	$539.00	10:1		16 [142]	24 [212]	62 [549]	<15			1.3 [11.5]	0.34 [0.116]	94	1.1 [2.4]		PDF
PGCN34-2550	$731.00	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(x)-34xxx(x)*	PDF
PGCN34-5050	$731.00	50:1		42 [372]	52 [460]	84 [743]	<20			2.4 [21.2]	0.34 [0.116]	92	1.4 [3.1]		PDF
PGCN34-10050	$731.00	100:1		16 [142]	24 [212]	62 [549]	<20			1.3 [11.5]	0.34 [0.116]	92	1.4 [3.1]		PDF

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.
*Does NOT fit STP-MTRAC-34156(D)

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	$26.00	Motor shaft bushing for SureGear NEMA size 17 gearboxes, fits 5mm diameter motor shaft	
PGCN17-BSH8M	$26.00	Motor shaft bushing for SureGear NEMA size 17 gearboxes, fits 8mm diameter motor shaft	
PGCN17-BSH9M	$26.00	Motor shaft bushing for SureGear NEMA size 17 gearboxes, fits 9mm diameter motor shaft	
PGCN17-BSH25	$26.00	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	$26.00	Motor shaft bushing for SureGear NEMA size 23 gearboxes, fits 8mm diameter motor shaft	
PGCN23-BSH9M	$26.00	Motor shaft bushing for SureGear NEMA size 23 gearboxes, fits 9mm diameter motor shaft	
PGCN23-BSH25	$26.00	Motor shaft bushing for SureGear NEMA size 23 gearboxes, fits 1/4 inch diameter motor shaft	
PGCN23-BSH37	$26.00	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	$26.00	Motor shaft bushing for SureGear NEMA size 34 gearboxes, fits 9mm diameter motor shaft	
PGCN34-BSH11M	$26.00	Motor shaft bushing for SureGear NEMA size 34 gearboxes, fits 11mm diameter motor shaft	
PGCN34-BSH37	$26.00	Motor shaft bushing for SureGear NEMA size 34 gearboxes, fits 3/8 inch diameter motor shaft	
PGCN34-BSH50	$26.00	Motor shaft bushing for SureGear NEMA size 34 gearboxes, fits 1/2 inch diameter motor shaft	

SureGear® Strain Wave Zero Backlash Gearbox
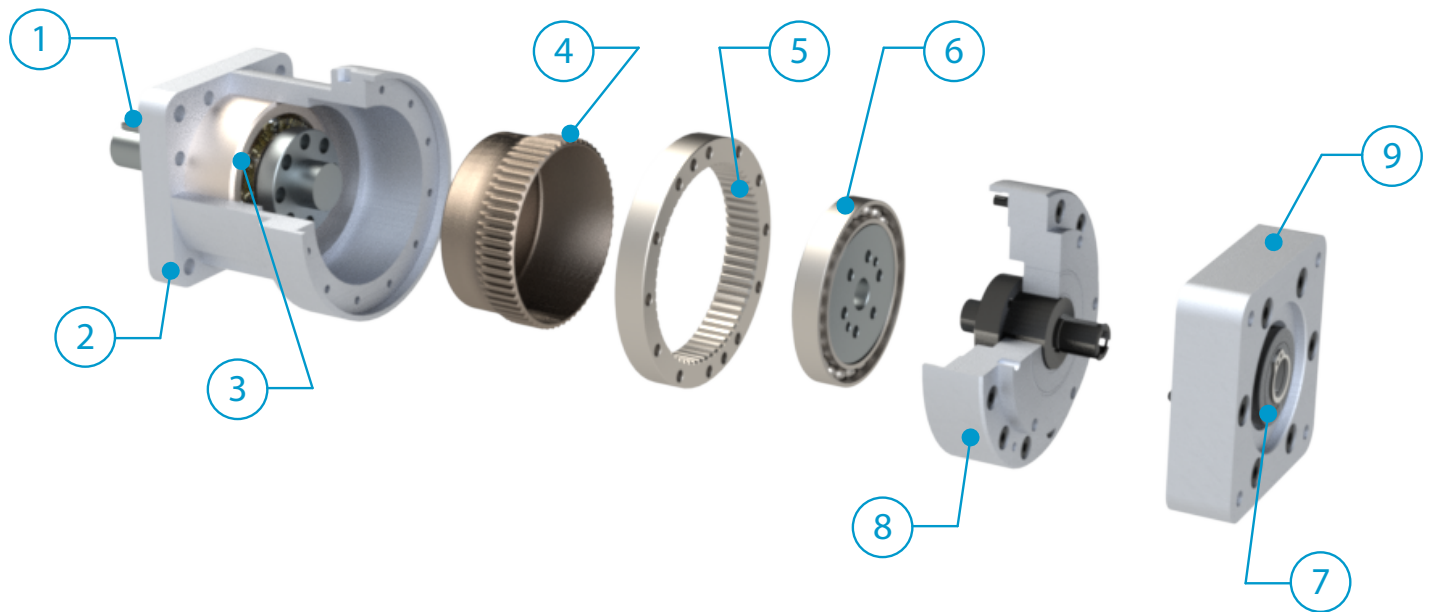
SureGear® Strain Wave Gearboxes – Overview

1. **Stressproof® Output Shaft** – provides a minimum 115,000 psi tensile strength, resistance to fatigue and excellent wearability

2. **Output Flange** – has a precision pilot and is available in metric, NEMA 17, 23, & 34 sizes

3. **Double Row Angular Contact Bearing** – provides a precision output with high stiffness, high radial and axial load capacities

4. **Flexspline** – a thin walled external spline that progressively engages with the Circular Spline with a zero backlash tooth mesh

5. **Circular Spline** – precision shaped internal spline, remains stationary and engages the Flexspline

6. **Wave Generator** – precision elliptical ball bearing that turns with the input motor and causes the rotating elliptical wave form on the Flexspline

7. **Sealed Bearing** – a precision bearing axially fixes the input shaft and wave generator positions

8. **Quick Connection Motor Coupling** – a socket head tightened clamping collar provides a reliable and simple motor connection

9. **Input Flange** – factory machined to match your motor dimensions and available in metric and standard NEMA 17, 23,& 34 sizes

10. **Lubrication** – Mobil Beacon 325 grease. The gearbox is sealed and pre–lubricated for its lifetime and does not require a change of lubricant.

SureGear® Strain Wave Features and Benefits

- Lifetime zero backlash
- Lifetime lubrication
- Lifetime ultra-high repeatability
- Lifetime high positional accuracy
- Single stage, high reduction ratios of 50:1 to 200:1
- Low noise and heat generation
- High efficiency, torsional stiffness and torque-to-weight ratio
- High torque capacity with a large number of teeth sharing load

Circular Spline

Flexspline
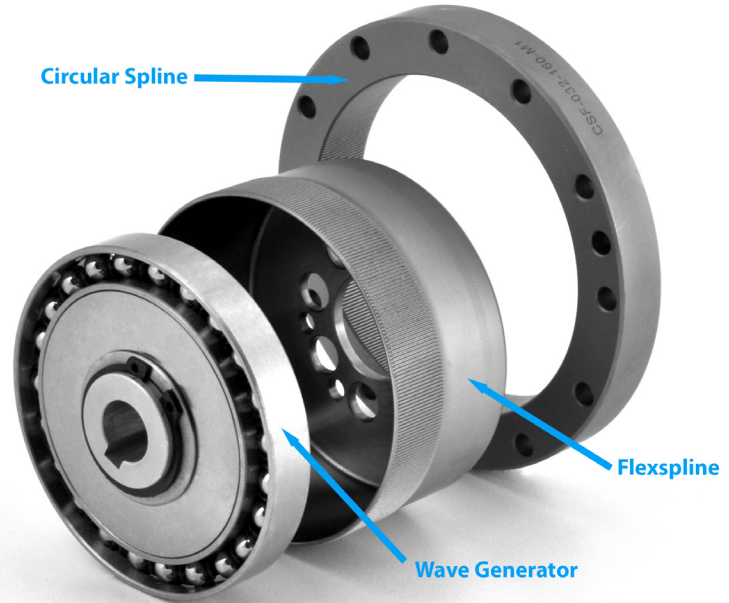
Wave Generator

Harmonic Gearing Tooth Engagement

Tooth engagement between the Flexspline and the Circular Spline takes place at two areas located 180° from each other on the ellipse's major axis. The rotation of the wave generator inside the Flexspline generates relative motion between the two splines.

90°   180°
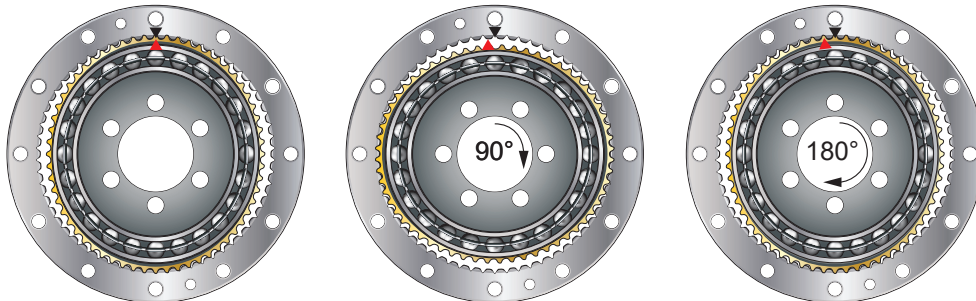
Example: with 100:1 ratio, 100 clockwise input motor rotations results in 1 counterclockwise output rotation.
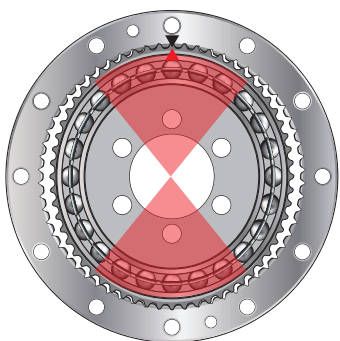
Characteristically, 30-40 percent of the teeth are engaged dependent upon the ratio, and load is shared amongst many teeth giving the drive its high torque capacity.
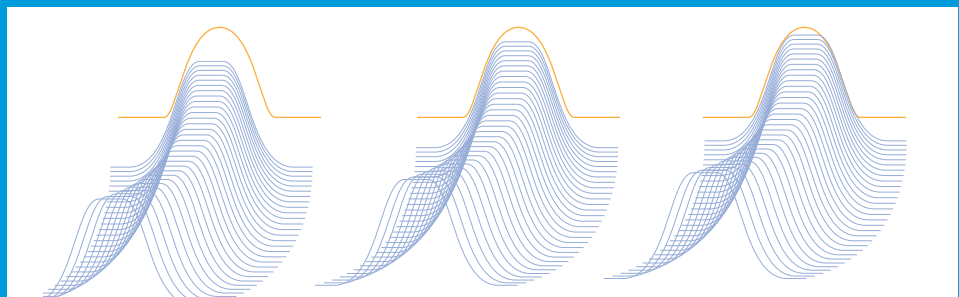
Tooth Engagement Zones

SureGear® Strain Wave Zero Backlash Gearbox

Features

- Lifetime zero backlash
- Fits SureServo® SVL-201 and SV2L-201B servo motors and SureStep® NEMA17 stepper motors
- Single stage, high reduction ratios from 50 to 100:1

- High output torque in a compact gearbox
- Low noise and heat generation
- High efficiency, torsional stiffness and torque-to-weight ratio

SureGear® Strain Wave Gearboxes	
Nominal Input Speed[1]	3000 RPM
Maximum Input Speed[2]	7300 RPM
Maximum Radial Load[3]	1268 N
Maximum Axial Load[4]	870 N
Service Life[5]	25000 hr
Repeatability	±10 arc-sec
Positional Accuracy	±90 arc-sec
Backlash	0 arc-sec
Noise Level	<67 dB(A)
Protection Class	IP64
Permitted Housing Temperature	90°C
Permitted Ambient Temperature	-40°C to 90°C
Torsional Rigidity[6]	2.6 N·m/arc-min
Moment of Inertia	0.047 kgcm2
Weight[7]	0.68 kg
Lubrication	Permanent (Mobil Beacon 325 Grease)

HPGA063-50A1

HPGCN17-505M

1. Input speed at rated output torque for an average life of 25,000 hours
2. The maximum intermittent input speed
3. At key center line, calculated at 100 rpm output speed and nominal output torque
4. At end of output shaft, calculated at 100 rpm output speed and nominal output
5. Average life at nominal load and input speed
6. Torsional rigidity at nominal torque. Typically, stiffness lessens when applied torque reduces.
7. Weight may vary slightly dependent upon adapter options

SureGear® Strain Wave Gearboxes						
Part Number	HPGA063-50A1	HPGA063-80A1	HPGA063-100A1	HPGCN17-505M	HPGCN17-805M	HPGCN17-1005M
Price	$1,051.00	$1,051.00	$1,051.00	$1,051.00	$1,051.00	$1,051.00
Ratio (actual)	50:1	80:1	100:1	50:1	80:1	100:1
Nominal Output Torque[1]	12 N·m (106 lb·in)		15 N·m (133 lb·in)	12 N·m (106 lb·in)		15 N·m (133 lb·in)
Maximum Output Torque[2]	24 N·m (212 lb·in)		30 N·m (266 lb·in)	24 N·m (212 lb·in)		30 N·m (266 lb·in)
No-Load Starting Torque[3]	5.4 N·cm	3.3 N·cm	3 N·cm	5.4 N·cm	3.3 N·cm	3 N·cm
No-Load Back Driving Torque[4]	2.3 N·m	2.6 N·m	2.7 N·m	2.3 N·m	2.6 N·m	2.7 N·m
Fits	SureServo and SureServo2 SV(2)L-201(B) motors			SureStep NEMA 17 motors		
Drawing Link	PDF	PDF	PDF	PDF	PDF	PDF

1. Rated torque at 3,000 rpm input for an average life of 25,000 hours
2. Exceeding the maximum output torque limit may immediately damage the drive
3. Minimum input torque required to turn the output shaft with no load
4. Minimum torque, if applied to the output shaft, that will cause the unit to back drive

SureGear® Strain Wave Zero Backlash Gearbox

Features

- Lifetime zero backlash
- Fits SureServo® SVL-202, SVL-204, SV2L-202B, and SV2L-204B servo motors and SureStep® NEMA23 stepper motors
- Single stage, high reduction ratios from 50 to 160:1
- High output torque in a compact gearbox
- Low noise and heat generation
- High efficiency, torsional stiffness and torque-to-weight ratio

SureGear® Strain Wave Gearboxes	
Nominal Input Speed[1]	3000 RPM
Maximum Input Speed[2]	6500 RPM
Maximum Radial Load[3]	2376 N
Maximum Axial Load[4]	1557 N
Service Life[5]	25000 hr
Repeatability	±10 arc-sec
Positional Accuracy	±90 arc-sec
Backlash	0 arc-sec
Noise Level	<67 dB(A)
Protection Class	IP64
Permitted Housing Temperature	90°C
Permitted Ambient Temperature	-40°C to 90°C
Torsional Rigidity[6]	4.5 N·m/arc-min
Moment of Inertia	0.161 kgcm2
Weight[7]	1.2 kg
Lubrication	Permanent (Mobil Beacon 325 Grease)

HPGCN23-5025

HPGA073-50A2

1. Input speed at rated output torque for an average life of 25,000 hours
2. The maximum intermittent input speed
3. At key center line, calculated at 100 rpm output speed and nominal output torque
4. At end of output shaft, calculated at 100 rpm output speed and nominal output
5. Average life at nominal load and input speed
6. Torsional rigidity at nominal torque. Typically, stiffness lessens when applied torque reduces.
7. Weight may vary slightly dependent upon adapter options

SureGear® Strain Wave Gearboxes

Part Number	HPGA073-50A2	HPGA073-80A2	HPGA073-100A2	HPGA073-120A2	HPGA073-160A2	HPGCN23-5025	HPGCN23-8025	HPGCN23-10025	HPGCN23-12025	HPGCN23-16025
Price	$1,219.00	$1,219.00	$1,219.00	$1,219.00	$1,219.00	$1,219.00	$1,219.00	$1,219.00	$1,219.00	$1,219.00
Ratio (actual)	50:1	80:1	100:1	120:1	160:1	50:1	80:1	100:1	120:1	160:1
Nominal Output Torque[1]	25 N·m (221 lb·in)	30 N·m (266 lb·in)				25 N·m (221 lb·in)	30 N·m (266 lb·in)			
Maximum Output Torque[2]	50 N·m (442 lb·in)	60 N·m (532 lb·in)				50 N·m (442 lb·in)	60 N·m (532 lb·in)			
No-Load Starting Torque[3]	6.2 N·cm	4.6 N·cm	4.3 N·cm	3.3 N·cm	2.3 N·cm	6.2 N·cm	4.6 N·cm	4.3 N·cm	3.3 N·cm	2.3 N·cm
No-Load Back Driving Torque[4]	4 N·m	4.2 N·m	4.5 N·m	6.6 N·m	7 N·m	4 N·m	4.2 N·m	4.5 N·m	6.6 N·m	7 N·m
Fits	SureServo and SureServo2 SV(2)L-202(B) and SV(2)L-204(B) motors					SureStep NEMA 23 motors				
Drawing Link	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF

1. Rated torque at 3,000 rpm input for an average life of 25,000 hours
2. Exceeding the maximum output torque limit may immediately damage the drive
3. Minimum input torque required to turn the output shaft with no load
4. Minimum torque, if applied to the output shaft, that will cause the unit to back drive

SureGear® Strain Wave Zero Backlash Gearbox

Features

- Lifetime zero backlash
- Fits SureServo® SVL-207 and SV2L-207B servo motors and SureStep® NEMA34 stepper motors
- Single stage, high reduction ratios from 50 to 160:1

- High output torque in a compact gearbox
- Low noise and heat generation
- High efficiency, torsional stiffness and torque-to-weight ratio

SureGear® Strain Wave Gearboxes

Nominal Input Speed[1]	3000 RPM
Maximum Input Speed[2]	5600 RPM
Maximum Radial Load[3]	2230 N
Maximum Axial Load[4]	3717 N
Service Life[5]	25000 hr
Repeatability	±10 arc-sec
Positional Accuracy	±90 arc-sec
Backlash	0 arc-sec
Noise Level	<67 dB(A)
Protection Class	IP64
Permitted Housing Temperature	90°C
Permitted Ambient Temperature	-40°C to 90°C
Torsional Rigidity[6]	24 N·m/arc-min
Moment of Inertia	0.506 kgcm2
Weight[7]	2.6 kg
Lubrication	Permanent (Mobil Beacon 325 Grease)
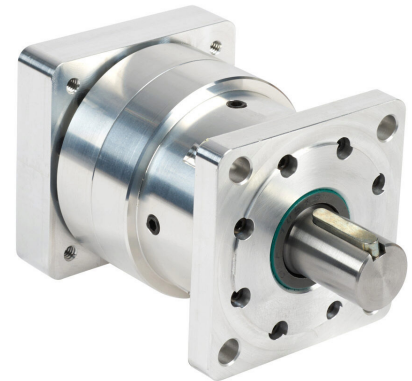
HPGCN34-5050

HPGA088-50A3

1. Input speed at rated output torque for an average life of 25,000 hours
2. The maximum intermittent input speed
3. At key center line, calculated at 100 rpm output speed and nominal output torque
4. At end of output shaft, calculated at 100 rpm output speed and nominal output
5. Average life at nominal load and input speed
6. Torsional rigidity at nominal torque. Typically, stiffness lessens when applied torque reduces.
7. Weight may vary slightly dependent upon adapter options

SureGear® Strain Wave Gearboxes

Part Number	HPGA088-50A3	HPGA088-80A3	HPGA088-100A3	HPGA088-120A3	HPGA088-160A3	HPGCN34-5050	HPGCN34-8050	HPGCN34-10050	HPGCN34-12050	HPGCN34-16050
Price	$1,385.00	$1,385.00	$1,385.00	$1,385.00	$1,385.00	$1,385.00	$1,385.00	$1,385.00	$1,385.00	$1,385.00
Ratio (actual)	50:1	80:1	100:1	120:1	160:1	50:1	80:1	100:1	120:1	160:1
Nominal Output Torque[1]	40 N·m (354 lb·in)	50 N·m (443 lb·in)				40 N·m (354 lb·in)	50 N·m (443 lb·in)			
Maximum Output Torque[2]	80 N·m (708 lb·in)	100 N·m (886 lb·in)				80 N·m (708 lb·in)	100 N·m (886 lb·in)			
No-Load Starting Torque[3]	14 N·cm	7 N·cm	7 N·cm	6 N·cm	6 N·cm	14 N·cm	7 N·cm	7 N·cm	6 N·cm	6 N·cm
No-Load Back Driving Torque[4]	7 N·m	7.2 N·m	8.5 N·m	9 N·m	11.3 N·m	7 N·m	7.2 N·m	8.5 N·m	9 N·m	11.3 N·m
Fits	SureServo and SureServo2 SV(2)L-207(B) motors					SureStep NEMA 34 motors				
Drawing Link	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF

1. Rated torque at 3,000 rpm input for an average life of 25,000 hours
2. Exceeding the maximum output torque limit may immediately damage the drive
3. Minimum input torque required to turn the output shaft with no load
4. Minimum torque, if applied to the output shaft, that will cause the unit to back drive

![SureGear logo]

SureGear® Strain Wave Zero Backlash Gearbox

Features

- Lifetime zero backlash
- Fits SureServo® SVL-210, SVM-210, and SV2L-210B servo motors
- Single stage, high reduction ratios from 50 to 200:1
- High output torque in a compact gearbox
- Low noise and heat generation
- High efficiency, torsional stiffness and torque-to-weight ratio

SureGear® Strain Wave Gearboxes	
Nominal Input Speed[1]	3000 RPM
Maximum Input Speed[2]	4800 RPM
Maximum Radial Load[3]	6012 N
Maximum Axial Load[4]	3985 N
Service Life[5]	25000 hr
Repeatability	±10 arc-sec
Positional Accuracy	±90 arc-sec
Backlash	0 arc-sec
Noise Level	<67 dB(A)
Protection Class	IP64
Permitted Housing Temperature	90°C
Permitted Ambient Temperature	-40°C to 90°C
Torsional Rigidity[6]	32 N·m/arc-min
Moment of Inertia	2.12 kgcm2
Weight[7]	6.3 kg
Lubrication	Permanent (Mobil Beacon 325 Grease)
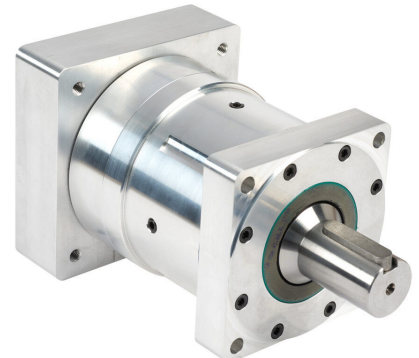
HPGA116-50A5

HPGA116-50A4

1. Input speed at rated output torque for an average life of 25,000 hours
2. The maximum intermittent input speed
3. At key center line, calculated at 100 rpm output speed and nominal output torque
4. At end of output shaft, calculated at 100 rpm output speed and nominal output
5. Average life at nominal load and input speed
6. Torsional rigidity at nominal torque. Typically, stiffness lessens when applied torque reduces.
7. Weight may vary slightly dependent upon adapter options

| SureGear® Strain Wave Gearboxes											
Part Number	HPGA116-50A4	HPGA116-80A4	HPGA116-100A4	HPGA116-135A4	HPGA116-160A4	HPGA116-200A4	HPGA116-50A5	HPGA116-80A5	HPGA116-100A5	HPGA116-135A5	HPGA116-160A5	HPGA116-200A5
Price	$1,654.00	$1,654.00	$1,654.00	$1,654.00	$1,654.00	$1,654.00	$1,654.00	$1,654.00	$1,654.00	$1,654.00	$1,654.00	$1,654.00
Ratio (actual)	50:1	80:1	100:1	135:1	160:1	200:1	50:1	80:1	100:1	135:1	160:1	200:1
Nominal Output Torque[1]	100 N·m (885 lb·in)			120 N·m (1062 lb·in)			100 N·m (885 lb·in)			120 N·m (1062 lb·in)		
Maximum Output Torque[2]	200 N·m (1770 lb·in)			240 N·m (2124 lb·in)			200 N·m (1770 lb·in)			240 N·m (2124 lb·in)		
No-Load Starting Torque[3]	38 N·cm	18 N·cm	16 N·cm	14 N·cm	12 N·cm	11 N·cm	38 N·cm	18 N·cm	16 N·cm	14 N·cm	12 N·cm	11 N·cm
No-Load Back Driving Torque[4]	11 N·m	14 N·m	15 N·m	20 N·m	21 N·m	22 N·m	11 N·m	14 N·m	15 N·m	20 N·m	21 N·m	22 N·m
Fits	SureServo and SureServo2 SV(2)L-210(B) motors						SureServo SVM-210(B) motors					
Drawing Link	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF

1. Rated torque at 3,000 rpm input for an average life of 25,000 hours
2. Exceeding the maximum output torque limit may immediately damage the drive
3. Minimum input torque required to turn the output shaft with no load
4. Minimum torque, if applied to the output shaft, that will cause the unit to back drive

WON

WON Linear Bearings and Rails

Product Overview

H-Series has 4 rows of ball bearings continuously circulating and making 45° contact with an arc-groove feature in the rail. This unique configuration provides 4-direction equal load sharing in any direction. This translates into lower friction resistance, smooth motion, and long life.
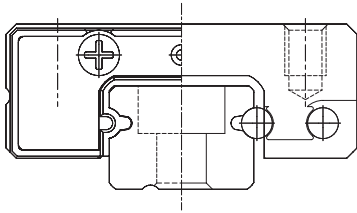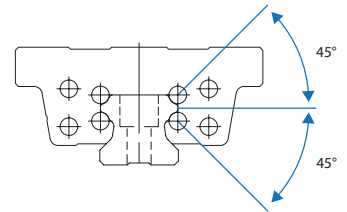
M & MB-Series have 2 rows of ball bearings continuously circulating and making 4 point 45° contact with an gothic-arc-groove feature in the Rail. This unique configuration provides 4-direction equal load sharing in any direction, in a very compact assembly. This translates into lower friction resistance, smooth motion, and long life.

End Seals are included with all products offered to protect against dust and foreign materials which induce premature wear and shorter life. Optional Inside Seals are offered, on the H-Series for additional protection.

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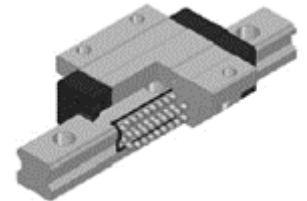
WON Linear Bearings and Rails

H-Series Bearings and Rail Features

- Bearing Preload: Moderate
- Precision Classification: Moderate (no symbol)
- Radial Clearance Classification: Common Clearance
- Material: Carbon Steel

- Rail Hardness: HRC58-64
- End Seals included with all bearings
- Grease fitting included

Part Number	Price	Bearing Form Factor	Inside Seal	Series Size	Static (Co)	Dynamic (C)	Pitch Moment (M_P)		Yaw Moment (M_y)		Roll Moment (M_R)	Drawing Links
							1 Linear Bearing	2 Linear Bearing	1 Linear Bearing	2 Linear Bearing		
H15FSSG0	$74.00	flanged	yes	H15	16200 N	9900 N	115 N·m	552 N·m	115 N·m	552 N·m	129 N·m	PDF
H15FUUG0	$66.00	flanged	no									PDF
H15RSSG0	$71.00	rectangular	yes									PDF
H15RUUG0	$64.00	rectangular	no									PDF
H20FSSG0	$80.00	flanged	yes	H20	23900 N	14900 N	221 N·m	1049 N·m	221 N·m	1049 N·m	251 N·m	PDF
H20FUUG0	$72.00	flanged	no									PDF
H20RSSG0	$75.00	rectangular	yes									PDF
H20RUUG0	$68.00	rectangular	no									PDF
H25FSSG0	$99.00	flanged	yes	H25	33100 N	22100 N	337 N·m	1636 N·m	337 N·m	1636 N·m	398 N·m	PDF
H25FUUG0	$92.00	flanged	no									PDF
H25RSSG0	$96.00	rectangular	yes									PDF
H25RUUG0	$88.00	rectangular	no									PDF
H30FSSG0	$112.00	flanged	yes	H30	57100 N	38400 N	711 N·m	3384 N·m	711 N·m	3384 N·m	828 N·m	PDF
H30FUUG0	$105.00	flanged	no									PDF
H30RSSG0	$108.00	rectangular	yes									PDF
H30RUUG0	$100.00	rectangular	no									PDF
H35FSSG0	$158.00	flanged	yes	H35	74600 N	51100 N	1062 N·m	5012 N·m	1062 N·m	5012 N·m	1298 N·m	PDF
H35FUUG0	$150.00	flanged	no									PDF
H35RSSG0	$151.00	rectangular	yes									PDF
H35RUUG0	$146.00	rectangular	no									PDF

With Inside Seal

Without Inside Seal

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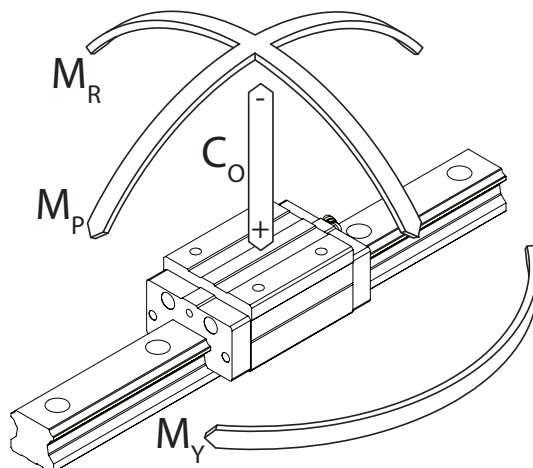
WON Linear Bearings and Rails

H-Series Linear Rails

Part Number	Price	Series Size	Length	Parallelism	Mass/Length	Drawing Links
H15-400L	$75.00	H15	400 mm	8 µm	1300 g/m	PDF
H15-580L	$107.00		580 mm	11 µm		PDF
H15-760L	$141.00		760 mm	12 µm		PDF
H15-1000L	$184.00		1000 mm	13 µm		PDF
H20-400L	$77.00	H20	400 mm	8 µm	2200 g/m	PDF
H20-580L	$110.00		580 mm	11 µm		PDF
H20-760L	$146.00		760 mm	12 µm		PDF
H20-1000L	$191.00		1000 mm	13 µm		PDF
H25-400L	$85.00	H25	400 mm	8 µm	3000 g/m	PDF
H25-580L	$124.00		580 mm	11 µm		PDF
H25-760L	$164.00		760 mm	12 µm		PDF
H25-1000L	$215.00		1000 mm	13 µm		PDF
H30-360L	$84.00	H30	360 mm	8 µm	4850 g/m	PDF
H30-520L	$119.00		520 mm	11 µm		PDF
H30-760L	$173.00		760 mm	12 µm		PDF
H30-1000L	$230.00		1000 mm	13 µm		PDF
H35-360L	$112.00	H35	360 mm	8 µm	6580 g/m	PDF
H35-520L	$161.00		520 mm	11 µm		PDF
H35-760L	$234.00		760 mm	12 µm		PDF
H35-1000L	$309.00		1000 mm	13 µm		PDF

H-Series Dimensions

Bearing with Rail	Bearing Form Factor	Height, H (mm)	Width, W (mm)	Length, L (mm)	Clearance, H1 (mm)	Rail Width, W1 (mm)
H15Rxxxx	rectangular	28	34	57	4.7	15
H15Fxxxx	flanged	24	47			
H20Rxxxx	rectangular	30	44	72.7	6	20
H20Fxxxx	flanged	30	63			
H25Rxxxx	rectangular	40	48	83	7	23
H25Fxxxx	flanged	36	70			
H30Rxxxx	rectangular	45	60	97.8	7.5	28
H30Fxxxx	flanged	42	90			
H35Rxxxx	rectangular	55	70	110	9	34
H35Fxxxx	flanged	48	100			

Rectangular

Flanged

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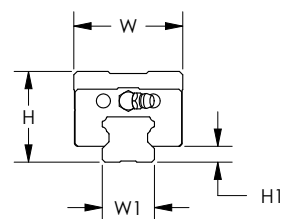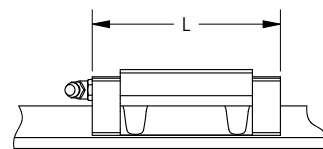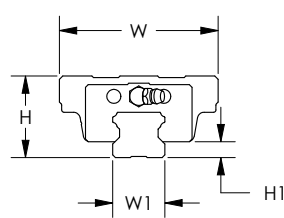
WON Linear Bearings and Rails

M-Series Bearings and Rail Features

- Low Profile
- Bearing Preload: Moderate
- Precision Classification: Moderate (no symbol)
- Radial Clearance Classification: Common Clearance
- Bearing Block Housing Material: Stainless Steel

- Rail Material: Stainless Steel
- Bearing Material: SUJ2 Bearing Steel
- Rail Hardness: HRC58-64
- End Seals included with all bearings

M-Series Linear Bearing Ratings

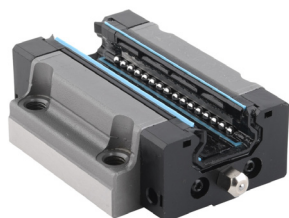| Part Number | Price | Bearing Form Factor | Series Size | Load Ratings | | | | | | | Drawing Links |
| | | | | Static (Co) | Dynamic (C) | Pitch Moment (MP) | | Yaw Moment (My) | | Roll Moment (MR) | |
						1 Linear Bearing	2 Linear Bearing	1 Linear Bearing	2 Linear Bearing		
M7LUUG0	$52.00	rectangular long	M7	2650 N	1631 N	10.1 N·m	50 N·m	10.1 N·m	50 N·m	9.67 N·m	PDF
M7NUUG0	$46.50	rectangular		1703 N	1197 N	4.2 N·m	23.1 N·m	4.2 N·m	23.1 N·m	6.22 N·m	PDF
M9LUUG0	$58.00	rectangular long	M9	4030 N	2375 N	21.9 N·m	102.8 N·m	21.9 N·m	102.8 N·m	18.74 N·m	PDF
M9NUUG0	$49.50	rectangular		2545 N	1721 N	9.3 N·m	46.6 N·m	9.3 N·m	46.6 N·m	11.84 N·m	PDF
M12LUUG0	$63.00	rectangular long	M12	6200 N	4246 N	34.8 N·m	169.1 N·m	34.8 N·m	169.1 N·m	38.44 N·m	PDF
M12NUUG0	$55.00	rectangular		3816 N	3023 N	14.4 N·m	75.8 N·m	14.4 N·m	75.8 N·m	23.66 N·m	PDF

M-Series Linear Rails

Part Number	Price	Series Size	Length	Parallelism	Mass/ Length	Drawing Links
M7-85L	$16.50	M7	85 mm	11 µm	253 g/m	PDF
M7-190L	$36.50		190 mm	14 µm		PDF
M7-370L	$70.00		370 mm	18 µm		PDF
M7-610L	$114.00		610 mm	22 µm		PDF
M9-95L	$16.00	M9	95 mm	11 µm	391 g/m	PDF
M9-175L	$29.00		175 mm	14 µm		PDF
M9-495L	$81.00		495 mm	21 µm		PDF
M9-695L	$113.00		695 mm	23 µm		PDF
M12-195L	$37.50	M12	195 mm	15 µm	679 g/m	PDF
M12-320L	$60.00		320 mm	18 µm		PDF
M12-470L	$89.00		470 mm	21 µm		PDF
M12-695L	$133.00		695 mm	23 µm		PDF
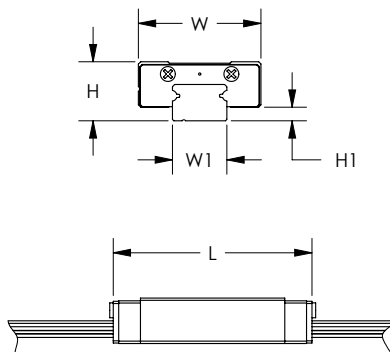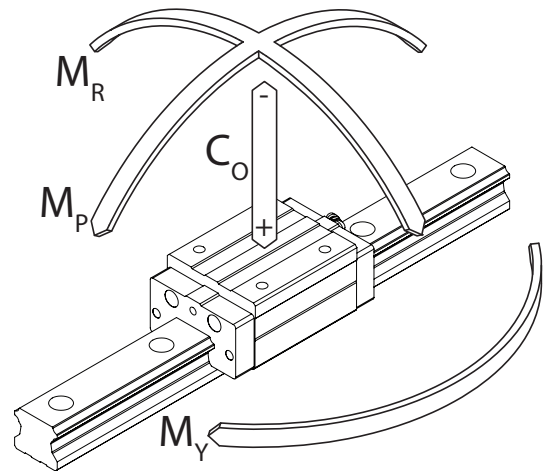
M-Series Dimensions

Bearing with Rail	Height, H (mm)	Width, W (mm)	Length, L (mm)	Clearance, H1 (mm)	Rail Width, W1 (mm)
M7LUUG0	8	17	31.8	1.5	7
M7NUUG0			24.3		
M9LUUG0	10	20	41.4	2	9
M9NUUG0			31.3		
M12LUUG0	13	27	45.4	3	12
M12LUUG0			34.9		

WON

WON Linear Bearings and Rails
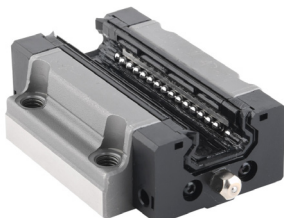
MB-Series Bearings and Rail Features

- Wide, Low Profile
- Bearing Preload: Moderate
- Precision Classification: Moderate (no symbol)
- Radial Clearance Classification: Common Clearance
- Bearing Block Housing Material: Stainless Steel

- Rail Material: Stainless Steel
- Bearing Material: SUJ2 Bearing Steel
- Rail Hardness: HRC58-64
- End Seals included with all bearings

MB-Series Linear Bearing Ratings

| Part Number | Price | Bearing Form Factor | Series Size | Load Ratings | | | | | | | Drawing Links |
| | | | | Static (Co) | Dynamic (C) | Pitch Moment (MP) | | Yaw Moment (My) | | Roll Moment (MR) | |
						1 Linear Bearing	2 Linear Bearing	1 Linear Bearing	2 Linear Bearing		
MB7LUUG0	$65.00	rectangular long	MB7	3975 N	2166 N	22.5 N·m	106.1 N·m	22.5 N·m	106.1 N·m	28.42 N·m	PDF
MB7NUUG0	$59.00	rectangular		2650 N	1631 N	10.1 N·m	51.1 N·m	10.1 N·m	51.1 N·m	18.95 N·m	PDF
MB9LUUG0	$73.00	rectangular long	MB9	5303 N	2878 N	37.8 N·m	172.9 N·m	37.8 N·m	172.9 N·m	48.52 N·m	PDF
MB9NUUG0	$66.00	rectangular		3606 N	2197 N	18.2 N·m	87.6 N·m	18.2 N·m	87.6 N·m	33 N·m	PDF
MB12LUUG0	$76.00	rectangular long	MB12	9062 N	5539 N	73.8 N·m	338.7 N·m	73.8 N·m	338.7 N·m	110.56 N·m	PDF
MB12NUUG0	$69.00	rectangular		5723 N	4015 N	31.2 N·m	152.2 N·m	31.2 N·m	152.2 N·m	69.83 N·m	PDF

MB-Series Linear Rails

Part Number	Price	Series Size	Length	Parallelism	Mass/ Length	Drawing Links
MB7-80L	$30.00	MB7	80 mm	11 μm	560 g/m	PDF
MB7-200L	$75.00		200 mm	15 μm		PDF
MB7-410L	$156.00		410 mm	20 μm		PDF
MB7-690L	$235.00		690 mm	23 μm		PDF
MB9-80L	$39.00	MB9	80 mm	11 μm	912 g/m	PDF
MB9-200L	$98.00		200 mm	15 μm		PDF
MB9-410L	$199.00		410 mm	20 μm		PDF
MB9-690L	$298.00		690 mm	23 μm		PDF
MB12-110L	$64.00	MB12	110 mm	12 μm	1369 g/m	PDF
MB12-270L	$159.00		270 mm	17 μm		PDF
MB12-430L	$254.00		430 mm	20 μm		PDF
MB12-750L	$436.00		750 mm	23 μm		PDF
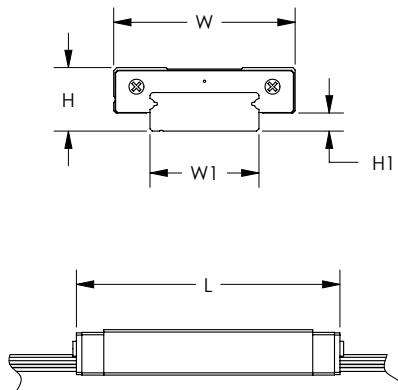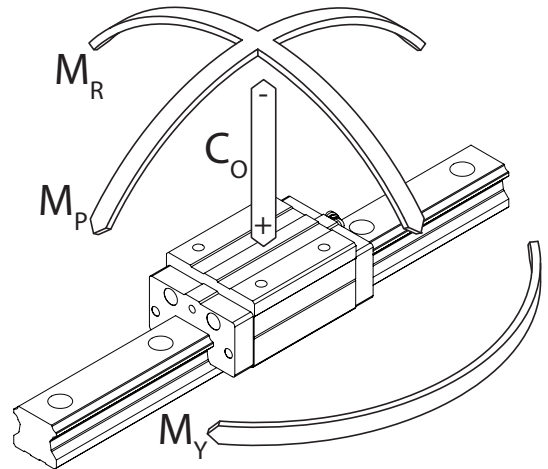
MB-Series Dimensions

Bearing with Rail	Height, H (mm)	Width, W (mm)	Length, L (mm)	Clearance, H1 (mm)	Rail Width, W1 (mm)
MB7LUUG0	9	25	43.5	2	14
MB7NUUG0			33		
MB9LUUG0	12	30	52	3	18
MB9NUUG0			40.2		
MB12LUUG0	14	40	59.7	4	24
MB12NUUG0			44.5		

GAM Rack and Pinion

GAM helical rack and pinion components are part of a complete linear motion solution.

GAM

- High precision helical rack for smooth, quiet operation available in module sizes of 1.5, 2 and 3 that mate with GAM pinions
- Pinions can be mounted to SureGear® gearboxes, are hardened to work with ISO 10 hardened rack
- Pinions available in module sizes of 1.5, 2 and 3 from 18 to 40 teeth
- Most cost-effective solution for linear motion greater than 2 meters
- Rack installation gauges available for use when installing multiple racks

Rack and Pinion

Rack and Pinions

The GAM Helical Rack and Pinion series, along with our broad gearbox offering, provide a complete linear solution. Simply select the rack and pinion needed then match it with the right gearbox for your application.

- High-precision helical rack for smooth, quiet operation
- Pinions can be mounted to SureGear® gearboxes
- Pinions are hardened and work with ISO 10 hardened rack

What is Rack & Pinion?

A linear actuator that converts the rotary motion of the (circular) pinion to linear motion at the (linear) rack.

Why use a Rack & Pinion System?

A rack and pinion system is the most cost-effective installation for linear movements greater than 2 meters.

Why use a GAM Rack & Pinion System?

GAM matches their high-quality rack and pinion with the best precision gearboxes for your application.
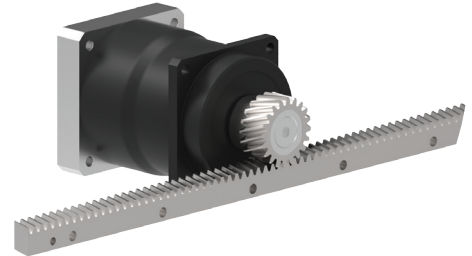
GAM Pinions										
Part Number	Price	Module	Teeth	Mounting	Pitch Diameter	Travel per Rotation	Max Feed Force	Mounting Distance	Fits	Drawing Links
84010001	$434.00	1.5	20	set screw	31.831mm	100mm	1.3 kN	31.4mm	SureGear PGCN23 series gearboxes	PDF
84010002	$434.00	2	18	keyed shaft	38.197mm	120mm	2.8 kN	41.1mm	SureGear PGCN34 series gearboxes	PDF
84010003	$434.00	2	18	keyed shaft	38.2mm	120mm	12.88 kN	41.1mm	SureGear PGA070 and PGB070 series gearboxes	PDF
84010004	$440.00	2	20	keyed shaft	42.44mm	133.33mm	13.37 kN	43.22mm	SureGear PGA090 and PGB090 series gearboxes	PDF
84010005	$558.00	2	30	keyed shaft	63.66mm	200mm	15.02 kN	53.83mm	SureGear PGA120 and PGB120 series gearboxes	PDF
84010006	$694.00	3	22	keyed shaft	70.03mm	220mm	20.05 kN	61.01mm	SureGear PGA155 and PGB155 series gearboxes	PDF
84010007	$688.00	2	26	bolt-through	55.174mm	173.334mm	13.4 kN	50.4mm	SureGear PGD064 series gearboxes	PDF
84010008	$797.00	2	33	bolt-through	70.028mm	220mm	18.4 kN	57.8mm	SureGear PGD090 series gearboxes	PDF
84010009	$847.00	2	40	bolt-through	84.883mm	266.667mm	14.8 kN	65.2mm	SureGear PGD110 series gearboxes	PDF

NOTE: Shaft Key is not included with Pinions

Set Screw Pinion
84010001

Keyed Pinion
84010002

Bolt Through Pinion
84010007

GAM Pinion General Specifications	
Quality	ISO Q06
Material	4140 carbon steel
Helix Angle	Left Hand 19° 31'42"
Pressure Angle	20 degrees
Induction Hardened	55 - 60 HRC

One inspection pin included for use with rack height adjustments

GAM Racks

Part Number	Price	Description	Drawing Links
74020012	$220.00	GAM helical rack, Module 1.5, 200 tooth, 1m length. For use with Module 1.5 pinions.	PDF
74020004	$220.00	GAM helical rack, Module 2, 150 tooth, 1m length. For use with Module 2.0 pinions.	PDF
74020005	$247.00	GAM helical rack, Module 3, 100 tooth, 1m length. For use with Module 3.0 pinions.	PDF

Rack
74020012

GAM Rack General Specifications

Module	1.5	2.0	3.0
Quality	ISO Q10		
Material	1045 carbon steel		
Helix Angle	Right Hand 19° 31'42"		
Pressure Angle	20 degrees		
Induction Hardened	50 - 55 HRC		
Tooth Thickness Tolerance (µm)	-124	-124	-124
Single Pitch Error (µm)	≤37	≤37	≤39
Total Pitch Error (µm)	≤148	≤148	≤162

Rack Installation

These are the three main steps to installing a GAM rack. Installation of multiple rack pieces end-to-end requires an opposite tooth installation gauge:

GAM Gauges			
Part Number	Price	Description	Drawing Links
74030010	$63.00	GAM helical rack installation gauge, for use with Module 1.5 racks.	PDF
74030001	$63.00	GAM helical rack installation gauge, for use with Module 2.0 racks.	PDF
74030002	$75.00	GAM helical rack installation gauge, for use with Module 3.0 racks.	PDF

Step 1

Put the racks on the base, end to end, loosely installing the screws

NOTE: Ensure the mounting surface of installation is clean and clear of debris and within tolerance (Perpendicularity and Flatness≤0.02mm)
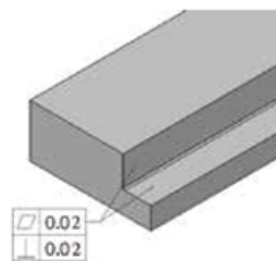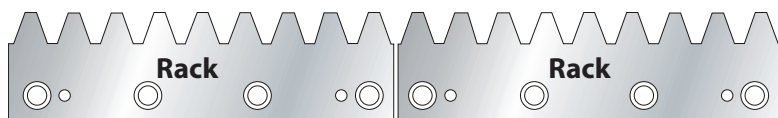
Step 2

Put the Rack Gauge across the ends of the joined racks and adjust the pitch. The ends of the racks each form half a tooth
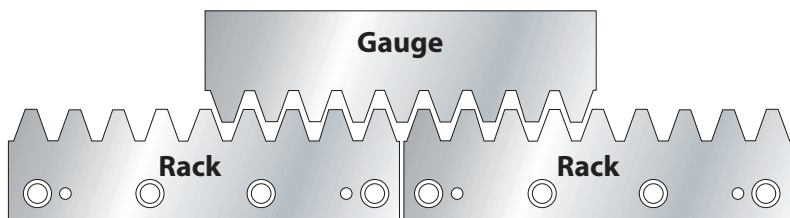
Step 3

Bolt the racks to the base in sequence. Install dowel pins
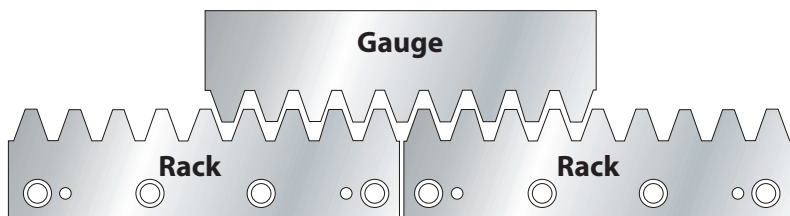
Rack and Pinion Alignment

For best performance, the rack and pinion must be installed with proper tooth engagement. To perform this check, apply the Gear Marking Compound to the Pinion and drive the pinion along the rack UNDER LOAD CONDITIONS.

Correct

The Gear Marking Compound is consistently deposited across most the face of the tooth
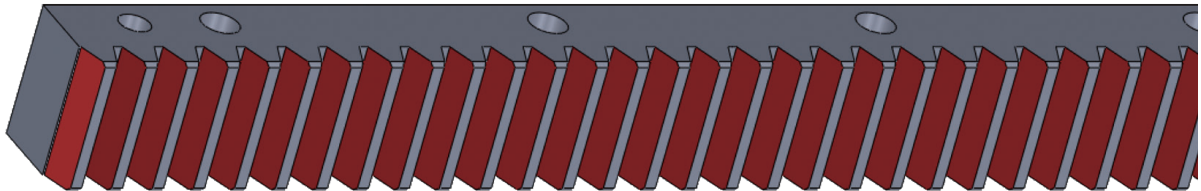
Pinion is Not Parallel to Rack

If the Gear Marking Compound forms a triangular shape across the face of the tooth, then the pinion and rack are not parallel. Adjust the pinion so the face of the pinion and the side of the rack are parallel. the axis of the pinion should be perpendicular to the rack.
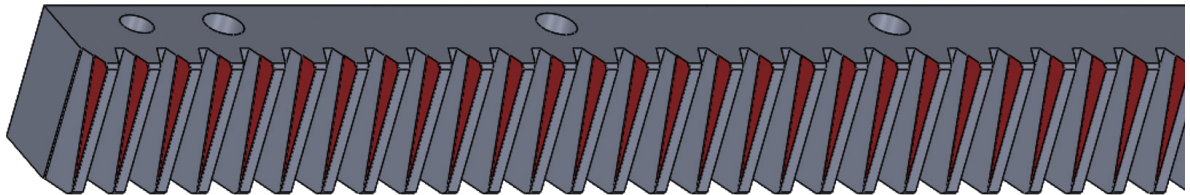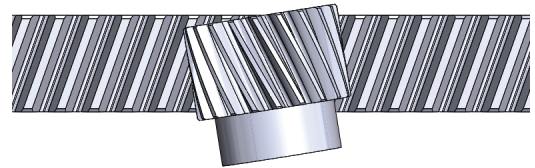
Incorrect Mounting Distance

If the Gear Marking Compound appears only on the top half across the face of the tooth, then there is insufficient tooth contact between the rack and pinion. Adjust the center distance between the rack and the pinion. The pinion specification tables include the center distance for each size pinion.

Mounting Distance
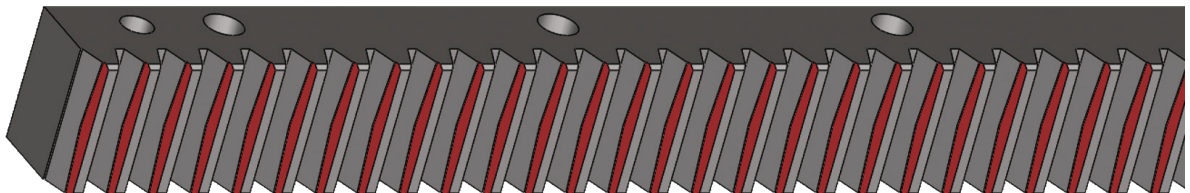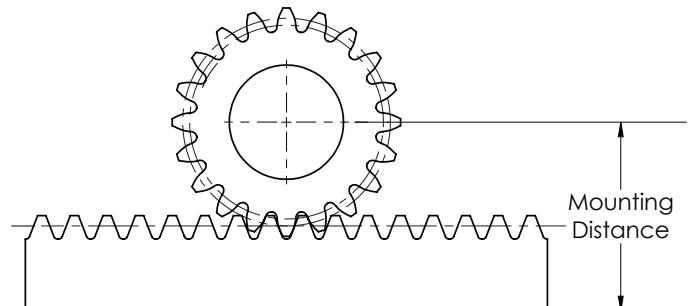
Rack and Pinion

Rack and Pinion Terminology

Module

The module is the relative size of the rack and pinion as described by the pinion. It is the ratio of the diameter of a gear to the number of teeth on the gear. The module and number of teeth give the reference pitch diameter:

$$\text{Module (M)} = \frac{\text{Pitch Diameter}}{\text{Number of Teeth (z)}}$$

Reference Pitch Diameter = Module (M) x Number of Teeth (z)

NOTE: The rack and pinion must have the same module.

ISO Quality Number

The ISO Quality Number describes the accuracy of the gear including the tooth alignment and profile, spacing variation, and radial runout among other things. AutomationDirect.com stocks Q6 and Q10 racks along with Q6 pinions.

ISO	DIN	AGMA	JIS
6	6	12	2
10	10	8	6

Tooth Thickness Tolerance

Tooth Thickness Tolerance is the relationship between tooth thickness and a measuring pin measurement.

- The tooth thickness of racks is usually measured via the pin measurement as tooth thickness can not be measured directly.
- A measuring pin is put into the teeth and measured to the back of the rack.
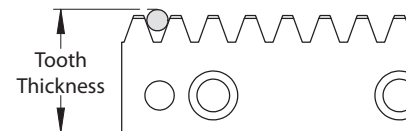
Pitch Error
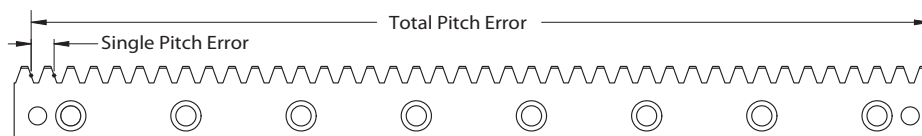
Pitch: Distance between teeth as measured from a point on one rack tooth to the corresponding point on the next gear tooth.

Single Pitch Error: Error in the pitch between two teeth relative to the ideal.

Total Pitch Error: Cumulative pitch error over the length of the rack

Circular Pitch: The distance from a point on one gear tooth to the corresponding point on the next gear tooth, measured along the pitch circle.

Pitch Circle: A circle transcribing the contact point on the teeth where the rack and pinion mesh correctly

Pitch Diameter: The diameter of the pinion's pitch circle.

Pressure Angle: The angle made by the sides of the tooth as it angles towards the top of the tooth. Mating gears and racks must have the same pressure angle.

Mounting Distance: Distance between the center of the pinion and the bottom of the rack that ensures proper mesh. The Mounting distance should stay consistent for the length of the rack.
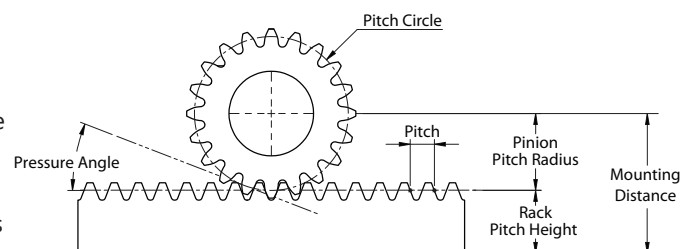
Mounting Distance = Pitch Height of Rack + Pitch Radius of Pinion

Rack and Pinion Terminology (Cont'd)

Helix Angle: Angle of the rack or gear tooth. GAM racks and pinions use a common helix angle of 19°31'42"

Helix Angle

Face Width
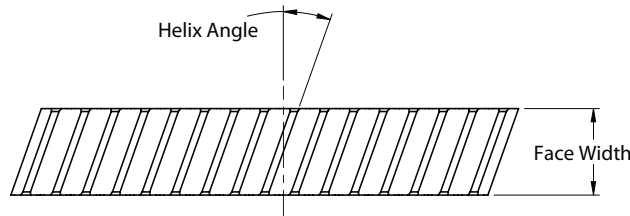
Gear Strength and Durability

Gear strength and durability depends on transmitted forces and power.

$$\text{Power } (P_{kW}) = \text{ Force } (F_N) \times \text{Linear Velocity } (V_{mm/s})$$

$$\text{Force } (F_N) = \frac{1000 \times \text{Torque } (T_{Nm})}{\text{Pitch Radius } (r_{mm})}$$

$$\text{Linear Velocity } (V_{mm/s}) = \frac{\pi r_{mm} \times N_{RPM}}{60}$$

$$\text{Power } (P_{kW}) = \frac{T_{Nm} \times N_{RPM}}{9550}$$

The feed force required by the application should be less than the feed force capacity of the pinion or gearbox-pinion system as listed in this catalog. The feed force rating should be derated by the Overload Factor (K_a) and the Life Factor (K_L)

$$\text{Application Feed Force } (F) < \frac{K_L}{K_a} \times \text{Rated Feed Force } (F)$$

Overload Factor (K_a)			
Impact from Prime Mover	**Impact from Load Side**		
	Uniform Load	**Medium Impact**	**Heavy Impact**
Uniform Load	1	1.25	1.75
Light Impact	1.25	1.5	2
Medium Impact	1.5	1.75	2.25

Life Factor (K_L)	
Number of Cycles	**Hardness (HRC) ≥ 45**
Under 10,000	1.5
~10^5	1.5
~10^6	1.1
~10^7	1.0

LS ELECTRIC

iX7NH Series Servo Systems

EtherCAT®

Modbus TCP

Drive features

• Power: 400W–3.5 kW three-phase 230VAC
  400W–750W single-phase 230VAC capable
  400W 110VAC capable

• Fully digital control with up to 1kHz velocity loop response

• Easy setup and diagnostics with Drive CM PC-based software

• Field upgradeable firmware ensures the drive can always be upgraded to the latest operating system

• Capable of both EtherCAT® and Modbus TCP control. Uses XBF-PN04B/XBF-PN08B EtherCAT® PLC modules for EtherCAT® operation and final commissioning. For Modbus TCP operation and final commissioning, use any Modbus TCP Client (Productivity, BRX, Click, etc.).

• Command options over EtherCAT® control and Modbus TCP include:

Command Option	EtherCAT® Control	Modbus TCP Control
Position Mode (PP)	✓	✓
Homing Mode (HM)	✓	✓
Velocity Mode (PV)	✓	✓
Torque Mode (PT)	✓	✓
Cyclic Synchronous Position Mode (CSP)	✓	
Cyclic Synchronous Velocity Mode (CSV)	✓	
Cyclic Synchronous Torque Mode (CST)	✓	

• ±10V Analog Torque Limit (not torque control)

• The 1 kHz bandwidth allows for high-level automatic tuning. Several modes of tuning are available including Off-Line Auto Tuning (the drive initiates its own move commands while Auto tuning), On-Line Auto Tuning (an external controller sends the move commands while the drive Auto tunes), and Manual Tuning (all tuning values are adjusted by the user).

• (6) Optically isolated configurable digital inputs and (3) user configurable outputs, (1) torque limit analog input. Two configurable analog outputs for monitoring various servo parameters (actual speed, torque, current, position, etc.)

• Advanced Scope feature that can monitor a variety of command and status signals, including output speed, torque, power, etc.

• Future proof your system - use Modbus TCP now and convert to EtherCAT® control in the future.

Motor features

• Low and Medium inertia motors available:
  - Low: 100W, 200W, 400W, 750W, 1kW, and 1.5 kW; @5000rpm
  - Medium: 1.6 kW, 2.2 kW, and 3.5 kW; @3000rpm

• Permanent magnet 3-phase synchronous motor

• Keyed drive shafts support clamp-on style couplings or key-style couplings

• Integrated multi-turn absolute encoder with 19-bit resolution (524,288 pulses per revolution)

• Optional 24 VDC spring-set holding brakes (AMK2 and DMK2 motors)

• Standard hook-up cables for motor power, encoder, and brake (separate brake cable for FBL/FCL brake motors)

• Motor cables available in standard or flex-rated lengths of 3, 5, 10, and 20m

• Standard 20-pin DIN-rail mounted break-out kit for the drive's CN1 connector (with screw terminal connections), or 20-pin cables with flying leads

Note: These parts available for sale to North American locations only.

Tuning Technology

The iX7NH drive closes the loop on current, velocity, and position (depending on control mode selection). The 1kHz bandwidth in the drive assures precise speed and current control and easy tuning. Proportional gain, integral gain and compensation, feed forward compensation, command low pass filter, and four (4) notch filters for resonance suppression are available. Auto Tuning has been greatly improved and can tune motors up to 20:1 inertia mismatch.

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

The drive has several tuning methods available:

• Online Auto Tuning–the drive can either tune the load live while an external controller moves the load to different positions or using the drive's internal tuning motion profile.

• Offline Auto Tuning–the drive tunes the load using the drive's internal tuning motion profile.

• Manual Tuning–all parameters are available to give power users the ultimate flexibility to tune their systems.

Control Modes

When connected to an EtherCAT® Master, the iX7NH drive can run in Cyclic Synchronous Modes (Position, Velocity, Torque) where the Master controller sends an updated setpoint every EtherCAT® cycle (~1millisecond). In these modes, the upper controller plans the motion path.

The drive can also work in Profile Modes (Position, Velocity, Torque) where the Master Controller sends one setpoint for each move. In these cases, the drive's accel, decel, and max speed settings determine the motion path planning. The drive also has 21 different homing modes to accommodate most applications.

When connected to a Modbus TCP client, the drive can operate in Profile Modes (Position, Velocity, and Torque) and in Homing Mode. Because Modbus TCP is not deterministic, servos controlled by ModTCP typically aren't operated in Cyclic Synchronous modes.

Optional Holding Brake

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

LS Electric MSS Series In-Line Planetary Precision Gearboxes for Servo Motors

Need more torque from the motor? Have an inertia balancing issue in your design? The LS Electric MSS series gearboxes easily mate to FBL/FCL/FE/FF motors. Everything you need for mounting is included!

• Three gear ratios available (5:1, 10:1, 20:1)

• Mounting hardware included for attaching to FBL/FCL/FE/FF motors.

• Industry-standard mounting dimensions

• Thread-in mounting style

• Very low backlash: 7 arc-min single stage (5:1 and 10:1 ratios), 9 arc-min two-stage (20:1 ratios*).

• 1-year warranty

LS ELECTRIC

iX7NH Series Servo Systems

Servo drive overview

LED Display

The 5-digit display is used to indicate servo status and alarm.

Analog Connector

4-pin analog monitoring connector (two +/- 10V analog outputs). See L7P-CON-F and L7P-CON-G for optional connectors.

DC Bus Charge LED

Visual indication of the drive's DC bus voltage level. Do not work on the drive until the Charge LED is OFF.

2 Rotary DIPswitch

Sets EtherCAT® Node ID from 0 to 97. Setting to 99 enables Modbus TCP with built-in webserver, while setting to 98 enables Modbus TCP w/o webserver.*

Status LED

Indicates current state of EtherCAT® communication.

Motor Power Terminal

Incoming single or three phase 200-230 VAC (-15% to+10%, 50/60Hz)

USB Connector

Used by Drive CM software for servo configuration. Connect with a standard USB A to USB mini-B cable (SV2-PGM-USB15, MOSAIC-CSU, or similar). Use USB OTG adapter cable (USB A Female to Mini USB B) if needed)

Firmware Upgrade: Use Drive CM software or attach a USB thumb drive with the new FW and update using USB On the Go (no PC required). See the UM for details.

DC Reactor Connectors

Regenerative Resistor Terminal

Connection for optional external braking resistor

EtherCAT® Com Ports

(ECAT IN, ECAT OUT). Use ECAT IN port (only) if using Modbus TCP.

Control Power Terminal

Incoming single phase 200-230 VAC (-15% to +10%, 50/60Hz)

Safe Torque Off Connector (STO)

Motor Output Terminal

Output power to the servo motor. LS motor power cables available in 3, 5, 10, and 20 meter lengths in standard and flexing cables.

Input/Output Connector (I/O)

20-pin CN1 connector for drive I/O. Signals include high speed pulse inputs, 6 digital inputs, 3 digital outputs, 1 analog input (torque limit), and scalable encoder output.

Model Number

Clearly displayed on bottom of drive face for easy identification.

* Node 98 functionality available in firmware 1.15 and above.

Encoder Connector

14-pin CN2 connector for the motor encoder. LS Encoder cables available in 3, 5, 10, and 20 meter lengths in standard and flexing cables.

The LS Electric iX7NH servo drives are fully digital and include over 300 parameters to configure the drive for almost any application. For convenience, the parameters are grouped into several categories including:

- Basic parameters
- Gain parameters
- I/O parameters
- Velocity parameters
- Misc. parameters
- Monitor parameters

All parameters have commonly used default values which allow you to operate the iX7NH drive "out-of-the-box". The drive auto-detects the LS servo motor (through the serial encoder) and sets up the default gains and limits based on the connected motor.

The drive can still be easily configured to your specific application, however. The Drive CM configuration software has a built-in Setup Wizard that will guide you through all the basic setup parameters. The Setup Wizard will quickly and easily get your application started – from setting up the I/O to determining the appropriate homing sequence. When using ModTCP (Node 99) drive configuration can also be accomplished via a built-in webserver. This function can be disabled by setting Node ID to 98*****.

Using XGB XBF-PN04B or XBF-PN08B EtherCAT® motion modules, you can also configure your drive from the XG5000 interface. See the Interactive PLC Guide for videos on how to commission and program the PLC/servo system.

After configuration is complete, the Auto Tune features of the drive will get your application tuned for optimal responsiveness and performance.

LS ELECTRIC

iX7NH Series Servo Systems

How to select and apply iX7NH 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 servo 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. The Drive CM software has the ability to measure the load (reflected) inertia and accurately measure the motor torque output.

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 https://support.automationdirect.com/products/lselectric.html.

Motion Profile

Desired Load Velocity

Required Motor Torque

time

Servo System → Mechanical Transmission → Load

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. iX7NH Auto Tuning will still tune a system with very high response, up to 20:1 inertia mismatch. Higher system ratios 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. The iX7NH servo systems may be tuned automatically by the software/drive or manually by the user.

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 or torque). If you have an iX7NH system, these values are easily captured and recorded with the Scope feature built into the Drive CM software. If you are designing the system from scratch, use VisualSizer to define the system and calculate expected inertia and required power.

Compare the application's Continuous and Intermittent torque requirements to the torque-speed curves found in Chapter 11.3 of the iX7NH User Manual or in the system torque charts found on "iX7NH AC servo drive, motor, and cable combinations" on page tMNC-199.

Peak Torque Limited by Current Limit

Peak Torque Limited by Voltage Limit

300%

Torque

Intermittent Operating Region

200%

100%

Continuous Operating Region

1000 2000 3000 4000 5000

Speed (r.p.m.)

LS ELECTRIC

iX7NH Series Servo Systems

Application tip - coupling considerations

The LS Electric FBL/FCL motors have keyed shafts that can be used with keyed couplings or with clamp-on or compression style couplings. For standard keyed couplings, the servo key must be "fitted" into the keyway for optimum performance and longevity. Some minor filing and pressing of the key may be required. "Servo-grade" clamp-on or compression style couplings are usually the best choice when you consider stiffness, torque rating, and inertia. Higher stiffness (lb-in/radian) is needed for better response but there is a trade-off between stiffness and the added inertia of the coupling. Concerning the torque rating of the coupling, use a safety factor of 1.25 over the servo's **peak** torque requirement of your application.

Click here for Available Couplings

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. Matched gearboxes are available from LS Electric that will work with the LS servo motors. Each gearbox is selected to accept the 300% maximum available torque that could be generated by the motor. Gearboxes are available in 5:1, 10:1, and 20:1 ratios. 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, keep the reflected load inertia as low as possible while using the full range of servo speed. The LS Electric motors can rotate at a rated speed of 2000 or 3000 rpm (rated torque at rated speed). Their max speed (slightly less available torque) is 3000 or 5000 rpm. See the speed-torque curves for more information.

Example: A gearbox reduces the motor's 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.

Here is a link to our Timing Belts and Pulleys

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

LS Electric servo 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.

Motor	Brake Motor	LS Electric MSS Planetary In-Line Gearboxes		
		5:1 Gearbox	10:1 Gearbox	20:1 Gearbox
APMC-FBL01AMK-AD	APMC-FBL01AMK2-AD	96200004	96200005	96200103
APMC-FBL02AMK-AD	APMC-FBL02AMK2-AD			
APMC-FBL04AMK-AD	APMC-FBL04AMK2-AD			
APMC-FCL08AMK-AD	APMC-FCL08AMK2-AD	96200007	96200008	96200257
APMC-FCL10AMK-AD	APMC-FCL10AMK2-AD			
APM-FE15AMK-AD	APM-FE15AMK2-AD	96200373	96200378	96200393
APM-FE16DMK-AD	APM-FE16DMK2-AD	96200459	96200464	96200479
APM-FE22DMK-AD	APM-FE22DMK2-AD	96200010	96200011	96200445
APM-FF35DMK-AD	APM-FF35DMK2-AD	96200013	96200014	96200701

Ordering Guide

The following pages are your ordering guide for LS Electric iX7NH servo systems. Each system has a torque-speed curve included for reference. This is the fundamental information that you need to select the servo motor and matching drive for your application.

Each system needs:
- Drive and Motor
- Motor Power Cable
- Motor Encoder Cable
- I/O connections (either a 20-pin CN1 cable+terminals kit or a 20-pin flying lead cable (user provides terminal blocks))
- FBL/FCL brake motors require a brake cable. FE/FF brake motors have brake wiring included in the power cable.
- STO cable (APCS-STOxxA-AD) or STO bypass plug (APCS-CN6K-AD). An STO bypass plug is included with each drive.

LS ELECTRIC

iX7NH Series Servo Systems

iX7NH series drives and motors part numbering system

Drives

iX7NH A 0 3 5 U - A D

Component Option
AutomationDirect special packaging
(*standard LS Electric parts*)

Encoder
U: Universal

Capacity
004: 400W
008: 750W
010: 1000W
020: 2000W
035: 3500W

Input Voltage
A: 230VAC

Series Name
iX7NH: iX7 series with Network High-performance

Motors

APM(C) F E P 1 5 A M K 2 - A D

Component Option
AutomationDirect special packaging
(*standard LS Electric Parts*)

Options
Blank: No option   2: With holding brake

Shaft End Shape
K: Round end shaft with key

Encoder Type
M: Serial 19-bit multi-turn type

Rated RPM
A: 3000 rpm
D: 2000 rpm

Motor Capacity

01: 100W	08: 750W	15: 1500W	35: 3500W
02: 200W	09: 900W	16: 1600W	22: 2200W
04: 400W	10: 1000W	22: 2200W	

Input Voltage
Blank: 230V

Flange Size
BL: 60mm   CL: 80mm   E: 130mm   F: 180mm

Motor Shape
F: Flat

Servo Motor

Example of what you will need to build a complete servo system:

Servo Drive   **Servo Motor**   **Motor Power Cable**   **Motor Encoder Cable**   **I/O Interface**

+ + + +

NOTE: AMPC-FBL/FCL brake equipped motors will also require a separate brake power cable.

Completed motor assembly (with optional gearbox)

NOTE: Required programming software (free download). Use a standard USB-A to USB mini-B cable for connectivity (SV2-PGM-USB15, MOSAIC-CSU, or equivalent)

NOTE: If you need a gear box for your configuration, reference the gearbox chart on the previous page. Ratios of 5:1, 10:1, and 20:1 are available for each motor.

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iX7NH Series Servo Systems

Torque to iX7NH System Quick Reference

Input Voltage	System Rated Torque (N·m)	System Maximum Torque (N·m)	Suggested Servo Motor	Required Servo Drive
120/230 VAC	0.32	0.96	APMC-FBL01AMK-AD	IX7NHA004U-AD
			APMC-FBL01AMK2-AD	
	0.64	1.91	APMC-FBL02AMK-AD	
			APMC-FBL02AMK2-AD	
	1.27	3.82	APMC-FBL04AMK-AD	
			APMC-FBL04AMK2-AD	
230VAC	2.39	7.16	APMC-FCL08AMK-AD	IX7NHA008U-AD
			APMC-FCL08AMK2-AD	
	3.10	9.55	APMC-FCL10AMK-AD	IX7NHA010U-AD
			APMC-FCL10AMK2-AD	
	4.77	14.32	APM-FE15AMK-AD	IX7NHA020U-AD
			APM-FE15AMK2-AD	
	7.63	22.92	APM-FE16DMK-AD	
			APM-FE16DMK2-AD	
	10.5	31.51	APM-FE22DMK-AD	IX7NHA035U-AD
			APM-FE22DMK2-AD	
	16.7	50.1	APM-FF35DMK-AD	
			APM-FF35DMK2-AD	

For information on using single-phase supply, please see "Drive Adjustments for Single-phase Usage" on page tMNC-203

LS ELECTRIC

iX7NH Series Servo Systems

iX7NH AC servo drive, motor, and cable combinations

xx = Cable length in meters
BN/EN/PN = Standard cable (not continuous flex)
BF/EF/PF = Flex-rated cable

AMK/DMK motors = no brake
AMK2/DMK2 motors = mechanical holding brake

230V FBL/FCL Motor Systems

Type	System Torque Chart	iX7NH Drive	APM/APMC Motor	Power Cable	Encoder Cable	Brake Cable	I/O Cable and Breakout
100W Low Inertia System		IX7NHA004U-AD	APMC-FBL01AMK-AD	APCS-PNxxxLSX-AD	APCS-ENxxxES1-AD	n/a	
				APCS-PFxxxLSX-AD	APCS-EFxxxES1-AD		
			APMC-FBL01AMK2-AD	APCS-PNxxxLSX-AD	APCS-ENxxxES1-AD	APCS-BNxxQS-AD	
				APCS-PFxxxLSX-AD	APCS-EFxxxES1-AD	APCS-BFxxQS-AD	
200W Low Inertia System		IX7NHA004U-AD	APMC-FBL02AMK-AD	APCS-PNxxxLSX-AD	APCS-ENxxxES1-AD	n/a	
				APCS-PFxxxLSX-AD	APCS-EFxxxES1-AD		
			APMC-FBL02AMK2-AD	APCS-PNxxxLSX-AD	APCS-ENxxxES1-AD	APCS-BNxxQS-AD	APCS-L7NCN1Txx-AD or APCS-CN10xA-AD
				APCS-PFxxxLSX-AD	APCS-EFxxxES1-AD	APCS-BFxxQS-AD	
400W Low Inertia System		IX7NHA004U-AD	APMC-FBL04AMK-AD	APCS-PNxxxLSX-AD	APCS-ENxxxES1-AD	n/a	
				APCS-PFxxxLSX-AD	APCS-EFxxxES1-AD		
			APMC-FBL04AMK2-AD	APCS-PNxxxLSX-AD	APCS-ENxxxES1-AD	APCS-BNxxQS-AD	
				APCS-PFxxxLSX-AD	APCS-EFxxxES1-AD	APCS-BFxxQS-AD	
750W Low Inertia System		IX7NHA008U-AD	APMC-FCL08AMK-AD	APCS-PNxxxLSX-AD	APCS-ENxxxES1-AD	n/a	
				APCS-PFxxxLSX-AD	APCS-EFxxxES1-AD		
			APMC-FCL08AMK2-AD	APCS-PNxxxLSX-AD	APCS-ENxxxES1-AD	APCS-BNxxQS-AD	
				APCS-PFxxxLSX-AD	APCS-EFxxxES1-AD	APCS-BFxxQS-AD	

For the latest prices, please check AutomationDirect.com.

LS ELECTRIC

iX7NH Series Servo Systems

iX7NH AC servo drive, motor, and cable combinations, *continued*

xx = Cable length in meters
BN, EN, or PN = Standard cable (not continuous flex)
BF, EF, or PF = Flex-rated cable

AMK/DMK motors = no brake
AMK2/DMK2 motors = mechanical holding brake

Type	System Torque Chart	iX7NH Drive	APMC Motor	Power Cable	Encoder Cable	Brake Cable	I/O Cable and Breakout
1.0k W Low Inertia System		IX7NHA010U-AD *	APMC-FCL10AMK-AD	APCS-PNxxxLSX-AD	APCS-ENxxxES1-AD	n/a	APCS-L7NCN1Txx-AD or APCS-CN10xA-AD
				APCS-PFxxxLSX-AD	APCS-EFxxxES1-AD		
			APMC-FCL10AMK2-AD	APCS-PNxxxLSX-AD	APCS-ENxxxES1-AD	APCS-BNxxQS-AD	
				APCS-PFxxxLSX-AD	APCS-EFxxxES1-AD	APCS-BFxxQS-AD	

* Note - For 1kW drive single-phase supply, derate motor max torque to 200%, or upsize the drive to iX7NHA020U-AD for the torque curves in the graph.

230V FE Motor Systems

Type	System Torque Chart	iX7NH Drive	APM/APMC Motor	Power Cable**	Encoder Cable	I/O Cable and Breakout
1.5 kW Low Inertia System		IX7NHA020U-AD***	APM-FE15AMK-AD	APCS-PNxxHSX1-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxHSX1-AD	APCS-EFxxxDS1-AD	
			APM-FE15AMK2-AD	APCS-PNxxNBX1-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxNBX1-AD	APCS-EFxxxDS1-AD	
1.6 kW Medium Inertia System		IX7NHA020U-AD***	APM-FE16DMK-AD	APCS-PNxxHSX-AD	APCS-ENxxxDS1-AD	APCS-L7NCN1Txx-AD or APCS-CN10xA-AD
				APCS-PFxxHSX-AD	APCS-EFxxxDS1-AD	
			APM-FE16DMK2-AD	APCS-PNxxNBX-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxNBX-AD	APCS-EFxxxDS1-AD	
2.2 kW Medium Inertia System		IX7NHA020U-AD***	APM-FE22DMK-AD	APCS-PNxxHSX-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxHSX-AD	APCS-EFxxxDS1-AD	
			APM-FE22DMK2-AD	APCS-PNxxNBX-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxNBX-AD	APCS-EFxxxDS1-AD	

** Note - Power cables with "B" in the part number are combination power/brake cables, providing power for both the motor and the brake. A brake cable is not required.
*** Note - For single-phase supply, upsize the drive to iX7NHA035U-AD (2.2 kW motor max torque limited to 150%, 1.5/1.6 kW motors limited to 200% max motor torque).

LS ELECTRIC

iX7NH Series Servo Systems

iX7NH AC servo drive, motor, and cable combinations, *continued*

xx = Cable length in meters
BN, EN, or PN = Standard cable (not continuous flex)
BF, EF, or PF = Flex-rated cable

AMK/DMK motors = no brake
AMK2/DMK2 motors = mechanical holding brake

230V FF Motor Systems

Type	System Torque Chart	iX7NH Drive	APM/APMC Motor	Power Cable*	Encoder Cable	I/O Cable and Breakout
3.5 kW Medium Inertia System	Torque (N.m) chart — Instantaneous Operation Range, Continuous Operating Range; Speed [RPM] axis 0–3000; Torque axis 0–50.0	IX7NHA035U-AD	APM-FF35DMK-AD	APCS-PNxxISX-AD	APCS-ENxxxDS1-AD	APCS-L7NCN1Txx-AD or APCS-CN10xA-AD
				APCS-PFxxISX-AD	APCS-EFxxxDS1-AD	
			APM-FF35DMK2-AD	APCS-PNxxPBX-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxPBX-AD	APCS-EFxxxDS1-AD	

*Note - Power cables with "B" in the part number are combination power/brake cables, providing power for both the motor and the brake. A brake cable is not required.

i7XNH Servo drive specifications

i7XNH Servo Drive Specifications					
Model	**IX7NHA004U-AD**	**IX7NHA008U-AD**	**IX7NHA010U-AD**	**IX7NHA020U-AD**	**IX7NHA035U-AD**
Price	$561.00	$691.00	$703.00	$793.00	$823.00
Drawing	PDF	PDF	PDF	PDF	PDF
Power / **Input Power**	One phase 100–120 VAC One phase 200–240 VAC Three phase 200–230 VAC (-15 to +10%), 50–60Hz**	One phase 200–240 VAC	Three phase 200–230 VAC (-15 to +10%), 50–60Hz**		
Rated Current [Amps]	3.0	5.2	6.75	13.5	16.0
Peak Current [Amps]	10.5	18.2	20.25	40.5	48.0
Inrush Current	TBD		TBD		TBD
Encoder Type	Quadrature (Incremental), BiSS-B, BiSS-C (Absolute, Incremental) Tamagawa Serial (Absolute, Incremental), EnDat 2.2, Sinusoidal, Analog Hall, SSI, Nikon, Panasonic				
Encoder Decimation Output	Differential Line Drive 3 channels AO, /AO, BO, /BO, ZO, /ZO up to 6.5 Mpps on 4x interpolation				
Control Performance / **Speed Control Range**	Maximum 1:5000				
Frequency Response	Maximum 1kHz (for a 19-bit serial encoder)				
Speed Variation Ratio	± 0.01 % or lower (when load changes between 0 and 100%), ± 0.1 % or lower (temperature 25±10°C)				
Accel/Decel Time	Straight line acceleration/deceleration (0–10,000 ms) and/or S-curve (0–1000 ms)				
Torque Control Repetition Accuracy	± 1% or less				
Recommended Breaker (UL 489)	15A (max)		30A (max)		
Recommended Fuse*	15A (max)		30A (max)		
SCCR Rating*	5kA				
EtherCAT® Specification / **Communication Standard**	FoE (Firmware download), EoE (parameter setting by UDP, Tuning, Secondary function, Parameter copy) CoE (IEC 61158 Type 12, IEC 61800-7 CiA 402 Drive Profile)				
Physical Layer	100BASE-TX (IEEE802.3)				
Connector	RJ45 x 2				
Communication Distance	Distance between nodes 100m or less				
DC (Distributed Clock)	Synchronization by DC (Distributed Clock) mode. Minimum DC cycle: 125µs				
LED Display	L/A0 & L/A1 (Link Activity) LED for EtherCAT In & Out status				
CiA 402 Drive Profile	Profile Position Mode, Profile Velocity Mode, Profile Torque Mode, Cyclic Synchronous Position Mode, Cyclic Synchronous Velocity Mode, Cyclic Synchronous Torque Mode, Homing Mode				
Digital I/O Specifications / **Digital Input**	Input voltage range: 12–24 VDC, total 6 input channels (configurable) 15 different selectable functions for assignment. (*POT, *NOT, *HOME, *STOP, *PCON, *GAIN2, P_CL, N_CL, PROBE1, PROBE2, EMG, A_RST, SV_ON, LVSF1, LVSF2)				
Digital Output	Service rating: 24VDC ± 10%, 120mA, 3 output channels are configurable 11 different selectable functions for assignment (*BRAKE, *ALARM, *READY, ZSPD, INPOS, TLMT, VLMT, INPOS2, INSPD, WARN, TGON)				
Analog I/O / **Analog Input**	Input voltage range: ±10V Function: analog torque limit (1 channel, not configurable)				
Analog Output	12-bit resolution, ±10V output range, total 2 channels (configurable): able to selectively configure 25 types of output				
Continued on next page					

* Basic allocation signal.
** See Single-phase power input section on the following page for single phase considerations.
*** Use class CC or High Speed J (JHL series) current limiting fuses to prevent nuisance tripping and to increase panel SCCR rating.

i7XNH Servo drive specifications, *continued*

i7XNH Servo Drive Specifications, *continued*		
Continued from previous page		
Model	**All iX7NH Series Drives**	
Safety Function	2 Input Channels (STO1 and STO2), 1 Output Channel (EDM)	
USB Communication	**Function**	Firmware download, tuning, test drive, monitoring, parameter duplication
	Communication Standard	Complies with USB 2.0 Full Speed and OTG 2.0 standards.
	Accessible Device	PC or USB storage device
Internal Function	**Dynamic Braking**	Standard built-in brake (activated when the servo alarm goes off or when the servo is off)
	Regenerative Braking	Built-in by default
	Display Function	7-segment display (5 digits)
	Self-setting Function	Drive node address setting is possible using two rotary switches
	Additional Function	Gain tuning, alarm history, jog operation, home searching
	Protection Function	Overcurrent, overload, overheat, overvoltage, insufficient voltage, overspeed, abnormal state of encoder, position following error, current detecting error
Operation Environment	**Operating Temperature**	0–50 ℃ [32–122 ℉]
	Storage Temperature	-20–65 ℃ [-4–149 ℉]
	Operating Humidity	Under 80% relative humidity
	Storage Humidity	Under 90% relative humidity (non-condensing)
	Environment	Keep indoors, avoid corrosive/flammable gas or liquid
Approvals	$_C$UL$_{US}$ (E479434), CE, UKCA, KC	

Single-phase Power Input

Although designed with 3-phase AC input power in mind, some iX7NH systems are capable of supporting single-phase AC input power. With three phase AC supply, the iX7NH motor/drive combination supplies 300% rated maximum motor torque (see the instantaneous Operation Range in the torque-speed charts on previous pages). With single phase AC supply some ratings will have limited maximum/intermittent motor torque, and/or the next larger drive size will be required.

Drive Derating for Single-phase Usage		
3-phase Motor Rating	**Drive to use with Single-phase Input**	**Motor Torque Derating for Single-phase Input**
100W/200W/400W	iX7NHA004U-AD (400W)	No upsizing/derating required. Single phase and three phase input both produce 300% max torque
750W	iX7NHA008U-AD (1kW)	No upsizing/derating required. Single phase and three phase input both produce 300% max torque
1kW	iX7NHA010U-AD (1kW) or iX7NHA020U-AD (2kW)	2kW drive produces 300% max torque. The 1kW drive can be used, but the motor can only provide 200% max torque.
1.5 kW/1.6 kW	iX7NHA035U-AD (3.5 kW)	With single phase supply, this drive only produces 150% max motor torque with a 2.2 kW motor. 3.5kW drive produces 200% max torque with 1.5 kW and 1.6 kW motors.
2.2 kW		
3.5 kW	n/a	No single phase capability

LS ELECTRIC

iX7NH Series Servo Systems

iX7NH Drive Standard Installation

iX7NH Drive Installation Spacing
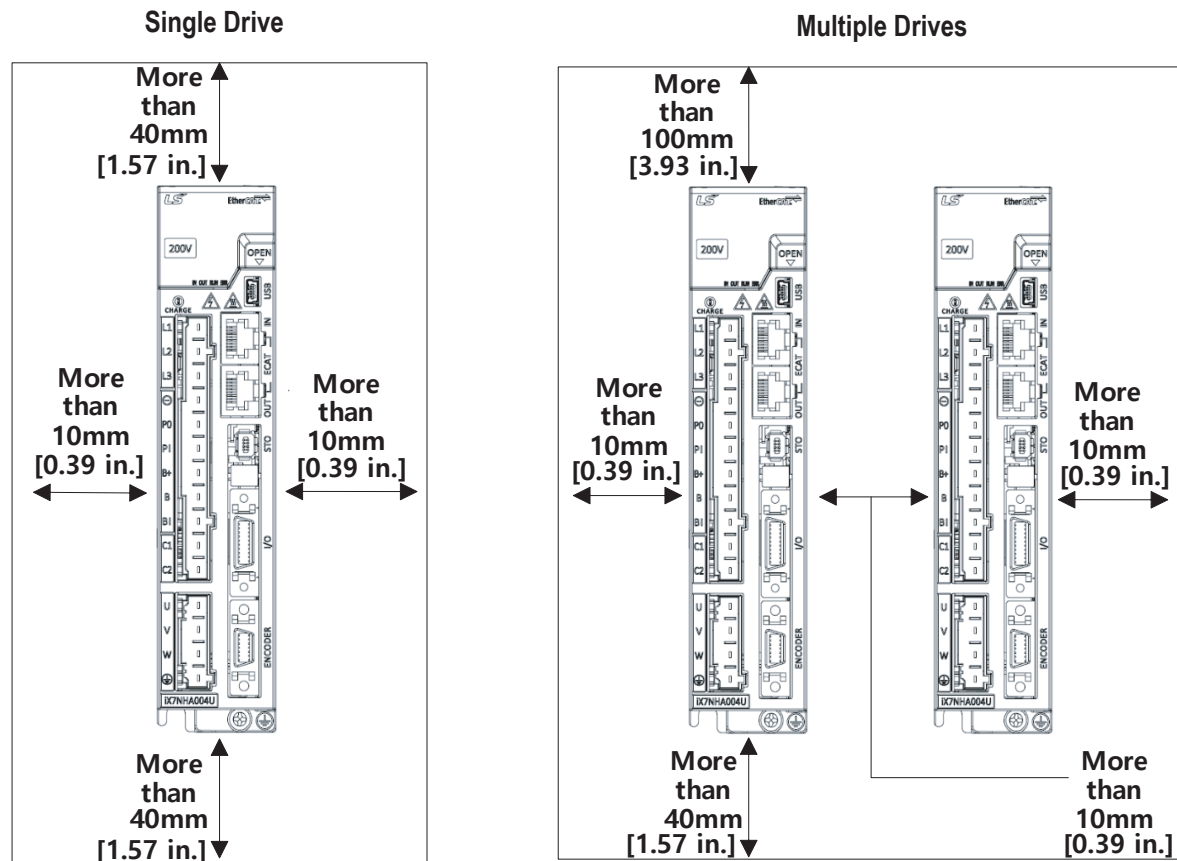
Single Drive

Multiple Drives

iX7NH Drive Installation Concerns:

- Install external regenerative resistors so that any heat generated does not affect the drive.
- Vertical installation only. For proper heat dissipation, ensure the back of the drive makes good contact with the subpanel.
- Protect the drive from metal chips and other falling debris during control panel assembly.
- Make sure that oil, water, or metal dust do not enter the drive.
- Protect the control panel by using an air purge system when installing it in any area where there are harmful gases or dust.

LS ELECTRIC

iX7NH Series Servo Systems

iX7NH Drive Wiring

iX7NH Power Supply Wiring

NOTE: Single-phase can use 2 of R, S, or T. See "Single-phase Power Input" on page tMNC-203 for more information.

AC 200~230[V]
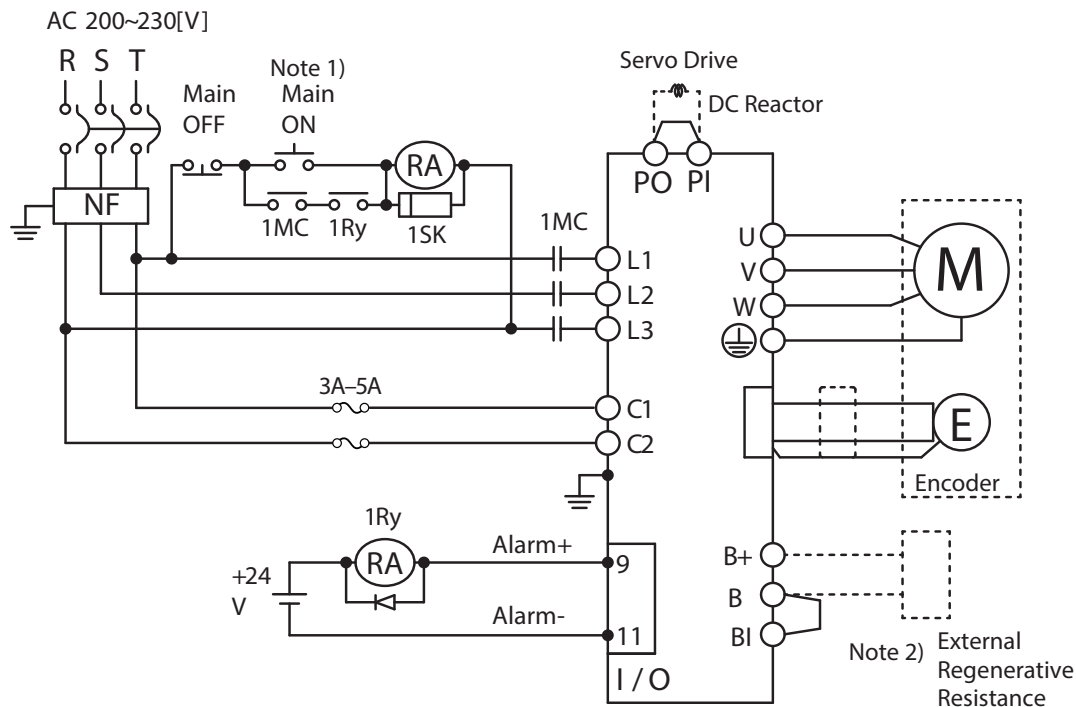
NOTE 1: About 2.5–3 seconds are required from main power supply to alarm signal output. Hold the main power on for 3 seconds until the alarm circuit ("1Ry") will latch main power ON.

NOTES 2 & 3: Remove the jumper for the internal resistor between B and BI, and connect the external resistor to the B+ and B pins. If an external regen resistor is required, see the available regen resistors under the Motion Control category at AutomationDirect.com (APCS-140R50-AD, APCS-300R30-AD, etc.).

LS ELECTRIC L7C AC Servo Systems

Drive features

- Power: 100W–1kW single-phase 220VAC
- Fully digital with up to 1kHz velocity loop response
- Easy setup and diagnostics with built-in keypad/display or the DriveCM PC-based software
- Field upgradeable firmware ensures the drive can always be upgraded to the latest operating system
- Command options include:
  - ± 10V torque or velocity command
  - Pulse train or master encoder position command (accepts line driver or open collector) with real-time selectable electronic gearing
  - Internal Indexer for position/speed-based moves. 64 individual move statements can be configured in the drive. Each Index contains its own distance, speed, accel, decel , and dwell parameters. These indexes can be set up through DriveCM software or modified in real-time with serial communication (PLC, HMI, etc.). The indexes can be initiated via Digital Inputs or through serial comms.
- The 1 kHz bandwidth allows for high-level automatic tuning. Several modes of tuning are available including Off-Line Auto Tuning (the drive initiates its own move commands while Auto tuning), On-Line Auto Tuning (an external controller sends the move commands while the drive Auto tunes), and Manual Tuning (all tuning values are adjusted by the user).
- Optically isolated digital inputs (10) and (5) general purpose (user-configurable) outputs + (3) outputs permanently configured as alarm/status binary code, analog inputs for speed and torque control (2), and line driver output for encoder (with scalable resolution).
- Advanced Scope feature that can monitor a variety of command and status signals, including output speed, torque, power, etc.

Motor features

- Low inertia models:
  - 100W, 200W, 400W, 750W and 1kW
  - Speeds up to 5,000 rpm
- Permanent magnet 3-phase synchronous motor
- Keyed drive shafts support clamp-on style couplings or key-style couplings
- Integrated encoder with 17-bit resolution (131,072 pulses per revolution)
- Optional 24 VDC spring-set holding brakes (AYK2 motors)
- Standard hook-up cables for motor power, encoder, and brake (separate brake cable for brake motors)
- Motor cables available in standard or flex-rated lengths of 3, 5, 10, and 20m
- Standard 50-pin DIN-rail mounted break-out kit for the drive's CN1 connector (with screw terminal connections), or 50-pin cables with flying leads

Note: These parts available for sale to North American locations only.

Tuning Technology

The L7C drive closes the loop on current, velocity, and position (depending on control mode selection). The 1kHz bandwidth in the drive assures precise speed and current control and easy tuning. Proportional gain, integral gain and compensation, feed forward compensation, command low pass filter, and four (4) notch filters for resonance suppression are available. Auto Tuning has been greatly improved and can tune FBL/FCL motors up to 20:1 inertia mismatch.

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

The drive has several tuning methods available:

- Online Auto Tuning–the drive can either tune the load live while an external controller moves the load to different positions or using the drive's internal tuning motion profile.
- Offline Auto Tuning–the drive tunes the load using the drive's internal tuning motion profile.
- Manual Tuning–all parameters are available to give power users the ultimate flexibility to tune their systems.

Built-in Indexer

While the L7C drives can accept traditional commands from host controllers, they can also provide their own internal motion control. 64 point-to-point position moves can be configured in the drive. These moves can be populated through the DriveCM configuration software or they can be written to by a PLC through the drive's RS422/485 serial port. The moves can be initiated by digital inputs or by serial commands. and can be sequenced internally with delays in between the moves or moves can be linked together so they are processed one after the other.

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

Optional Holding Brake

Each L7C motor can be ordered with an optional 24VDC spring-set holding brake that holds the motor in place when power is removed.

LS Electric MSS Series In-Line Planetary Precision Gearboxes for Servo Motors

Need more torque from the motor? Have an inertia balancing issue in your design? The LS Electric MSS series gearboxes easily mate to FBL/FCL motors. Everything you need to mount your LS electric servo is included!

- Three gear ratios available (5:1, 10:1, 20:1)
- Mounting hardware included for attaching to FBL/FCL motors.
- Industry-standard mounting dimensions
- Thread-in mounting style
- Very low backlash: 7 arc-min single stage (5:1 and 10:1 ratios), 9 arc-min for two-stage (20:1 ratios).
- 1-year warranty

LS ELECTRIC L7C Series AC Servo Systems

Servo drive overview

LED Display

The 5-digit display is used to indicate servo status and alarm. The keys can be used to configure the drive and to set up monitoring values (but we highly recommend using the Drive CM software instead).

Keypad

Four Function keys:

MODE, UP, DOWN, SET

Model Number

Clearly displayed on the front panel for easy identification.

USB Connector

Used by Drive CM software for servo configuration. Connect with a standard USB A to USB miniB cable (SV2-PGM-USB15, MOSAIC-CSU, or similar).

Main Power Terminal

Incoming single phase 200-230 VAC (-15% to +10%, 50/60Hz)

CN1 I/O Signal Connector

50-pin CN1 connector for drive I/O. Signals include high speed pulse inputs, 10 digital inputs, 8 digital outputs, 2 analog inputs (voltage and torque), serial Modbus RS422 (compatible with RS485 PLCs) and scalable encoder output.

Regenerative Resistor Terminal

Connection for optional external braking resistor (APCS-140R50-AD or APCS-300R30-AD)

Motor Output Terminal

Output power to the servo motor. LS motor power cables available in 3, 5, 10, and 20 meter lengths in standard and flexing cables.

Encoder Connector

14-pin CN2 connector for the motor encoder. LS Encoder cables available in 3, 5, 10, and 20 meter lengths in standard and flexing cables.

Ground Terminals

Separate ground screws for incoming power supply ground and motor cable ground.

The LS Electric L7C servo drives are fully digital and include over 300 parameters to configure the drive for almost any application. For convenience, the parameters are grouped into several categories including:

• Basic parameters
• Gain parameters
• I/O parameters
• Velocity parameters
• Misc. parameters
• Monitor parameters
• Index parameters

All parameters have commonly used default values which allow you to operate the L7C drive "out-of-the-box". The drive auto-detects the LS servo motor (through the serial encoder) and sets up the default gains and limits based on the connected motor.

The drive can still be easily configured to your specific application, however. The Drive CM configuration software has a built-in Setup Wizard that will guide you through all the basic setup parameters. So, whether you want to use high speed pulse input, analog velocity, analog torque, or the powerful internal indexer for a control mode (or any multi-mode combination of these modes), the Setup Wizard will quickly and easily get your application started – from setting up the I/O to determining the appropriate homing sequence.

After configuration is complete, the Auto Tune features of the drive will get your application tuned for optimal responsiveness and performance.

LS ELECTRIC L7C Series AC Servo Systems

Servo motor overview

Encoder Connector

9-pin watertight connector (8 pins used) for the 17-bit serial encoder. The encoder transmits motor/encoder identification information to the drive at power-up and it sends position feedback during operation.

Non-Braking Motor

Motor Power Connector

4-pin watertight connector for motor power (U, V, W, and ground)

IP67 Housing

Low Inertia Motors

Low inertia designs result in high responsiveness and high speeds.

- 100W   60mm flange
- 200W   60mm flange
- 400W   60mm flange
- 750W   80mm flange
- 1kW   80mm flange

Keyed Shafts

"FBL and FCL motors are supplied with extra-large keyways, and slightly oversized keys which must be "fitted" into the keyway for performance and longevity. Clamp or compression couplings (without key) are recommended".

- 100W   14mm diameter shaft
- 200W   14mm diameter shaft
- 400W   14mm diameter shaft
- 750W   19mm diameter shaft
- 1kW   19mm diameter shaft

All LS Electric L7C motors have keyed shafts for use with servo-grade clamp or compression couplings (recommended) or servo-grade keyed couplings. Some sanding/filing of the key may be required before pressing into the keyway. Do not modify the shaft/keyway.

Brake Power Connector

2-pin watertight connector available on brake motors only. The 24VDC brake is located between the motor coils and the encoder. Motors ending in AYK2 have brakes. The brakes must have 24VDC applied to them before the motor is set in motion.

Encoder Connector

9-pin watertight connector (8 pins used) for the 17-bit serial encoder. The encoder transmits motor/encoder identification information to the drive at power-up and it sends position feedback during operation.

Brake Motor

Motor Power Connector

4-pin watertight connector for motor power (U, V, W, and ground)

Keyed Shafts

"FBL and FCL motors are supplied with extra-large keyways, and slightly oversized keys which must be "fitted" into the keyway for performance and longevity. Clamp or compression couplings (without key) are recommended".

- 100W   14mm diameter shaft
- 200W   14mm diameter shaft
- 400W   14mm diameter shaft
- 750W   19mm diameter shaft
- 1kW   19mm diameter shaft

IP67 Housing

LSᴇʟᴇᴄᴛʀɪᴄ L7C AC Servo Systems

How to select and apply L7C 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 servo 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. The Drive CM software has the ability to measure the load (reflected) inertia and accurately measure the motor torque output.

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 https://support.automationdirect.com/products/sureservo.html.

Motion Profile

Desired Load Velocity

time

Required Motor Torque

| Servo System | → | Mechanical Transmission | → | Load |

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. L7C Auto Tuning will still tune a system with very high response, up to 20:1 inertia mismatch. Higher system ratios 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. The L7C servo systems may be tuned automatically by the software/drive or manually by the user.

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 or torque). If you have an L7C system, these values are easily captured and recorded with the Scope feature built into the Drive CM software. If you are designing the system from scratch, use VisualSizer to define the system and calculate expected inertia and required power.

Compare the application's Continuous and Intermittent torque requirements to the torque-speed curves found in Chapter 16 of the L7C User Manual.

Peak Torque Limited by Current Limit

Peak Torque Limited by Voltage Limit

300%

Torque

200%

Intermittent Operating Region

100%

Continuous Operating Region

1000 2000 3000 4000 5000

Speed (r.p.m.)

LS ELECTRIC L7C AC Servo Systems

Application tip - coupling considerations

The LS Electric FBL/FCL motors have keyed shafts that can be used with keyed couplings or with clamp-on or compression style couplings. For standard keyed couplings, the servo key must be "fitted" into the keyway for optimum performance and longevity. Some minor filing and pressing of the key may be required. "Servo-grade" clamp-on or compression style couplings are usually the best choice when you consider stiffness, torque rating, and inertia. Higher stiffness (lb-in/radian) is needed for better response but there is a trade-off between stiffness and the added inertia of the coupling. Concerning the torque rating of the coupling, use a safety factor of 1.25 over the servo's **peak** torque requirement of your application.

Click here for Available Couplings

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. Matched gearboxes are available from LS Electric that will work with the FBL and FCL motors. Each gearbox is selected to accept the 300% maximum available torque that could be generated by the motor. Gearboxes are available in 5:1, 10:1, and 20:1 ratios. 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. The LS Electric motors can rotate at a rated speed of 3000rpm (rated torque at rated speed). Their max speed (slightly less available torque) is 5000rpm. See the speed-torque curves for more information.

Example: A gearbox reduces the motor's 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

FBL/FCL 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.

Motor	Brake Motor	LS Electric MSS Planetary In-Line Gearboxes		
		5:1 Gearbox	10:1 Gearbox	20:1 Gearbox
APMC-FBL01AYK-AD	APMC-FBL01AYK2-AD	96200004 (MSS0601A-005KS-B3110103C14)	96200005 (MSS0601A-010KS-B3110103C14)	96200103 (MSS0902B-020KS-B3110103C14)
APMC-FBL02AYK-AD	APMC-FBL02AYK2-AD			
APMC-FBL04AYK-AD	APMC-FBL04AYK2-AD			
APMC-FCL08AYK-AD	APMC-FCL08AYK2-AD	96200007 (MSS0901A-005KS-C3110103C19)	96200008 (MSS0901A-010KS-C3110103C19)	96200257 (MSS1152B-020KS-C3110103C19)
APMC-FCL10AYK-AD	APMC-FCL10AYK2-AD			

Here is a link to our Timing Belts and Pulleys

Ordering guide instructions

The following four pages are your ordering guide for LS Electric L7C servo systems. Each system has a torque-speed curve included for reference. This is the fundamental information that you need to select the servo motor and matching drive for your application.

Each system needs:
- Motor
- Drive
- Motor Power Cable
- Motor Encoder Cable
- I/O connections (either a 50-pin CN1 cable+terminals kit or a 50-pin flying lead cable(user provides terminal blocks))
- For brake motors you will also need a brake cable (connectorized on the motor end, two ferruled flying leads on the opposite end).

LS ELECTRIC L7C Series AC Servo Systems

L7C series drives and motors part numbering system

Drives L7C A 004 U -AD

Component Option
AutomationDirect special packaging
(*standard LS Electric parts*)

Encoder
U: Universal

Capacity
001: 100W
002: 200W
004: 400W
008: 750W
010: 1kW

Input Voltage
A: 200VAC

Series Name
L7C: L7 series with standard I/O

Motors APMC F BL 01 A Y K 2 -AD

Component Option
AutomationDirect special packaging
(*standard LS Electric Parts*)

Options
Blank: No option   2: With holding brake

Shaft End Shape
K: Round end shaft with key

Encoder Type
Y: Serial BISS, 17bit Single Turn Absolute (magnetic)

Rated RPM
A: 3000 rpm

Motor Capacity
01: 100W   08: 750W
02: 200W   10: 1000W
04: 400W

Flange Size
BL: 60 Flange   CL: 80 Flange

Motor Shape
F: Flat

Servo Motor

Example of what you will need to build a complete servo system:

Servo Drive   **Servo Motor**   **Motor Power Cable**   **Motor Encoder Cable**   **I/O Interface**

+ + + +

NOTE: Brake equipped motors (AYK2 series) will also require a brake power cable.

**Completed motor assembly
(with optional gearbox)**

NOTE: Unit can be programmed via keypad. Optional programming software (free download). Use a standard USB-A to USB miniB cable for connectivity (SV2-PGM-USB15, MOSAIC-CSU, or equivalent)

NOTE: If you need a gear box for your configuration, reference the gearbox chart on the previous page. Ratios of 5:1, 10:1, and 20:1 are available for each FBL/FCL motor.

Torque to L7C System Quick Reference

System Rated Torque (N·m)	System Maximum Torque (N·m)	Suggested Servo Motor	Required Servo Drive
0.32	0.96	APMC-FBL01AYK-AD	L7CA004U-AD
		APMC-FBL01AYK2-AD	
0.64	1.91	APMC-FBL02AYK-AD	
		APMC-FBL02AYK2-AD	
1.27	3.82	APMC-FBL04AYK-AD	
		APMC-FBL04AYK2-AD	
2.39	7.16	APMC-FCL08AYK-AD	L7CA010U-AD
		APMC-FCL08AYK2-AD	
3.18	9.55	APMC-FCL10AYK-AD	
		APMC-FCL10AYK2-AD	

LS ELECTRIC L7C Series AC Servo Systems

L7C AC servo drive, motor, and cable combinations

xx = Cable length in meters
BN, EN, or PN = Standard cable (not continuous flex)
BF, EF, or PF = Flex-rated cable

AYK motors = no brake
AYK2 motors = mechanical holding brake

Type	System Torque Chart	L7C Drive	APMC Motor	Power Cable	Encoder Cable	Brake Cable	I/O Cable and Breakout
100W Low Inertia System		L7CA004U-AD	APMC-FBL01AYK-AD	APCS-PNxxLSC-AD	APCS-ENxxES-AD	n/a	APC-VSCN1Txx-AD or APC-CN10xA-AD
				APCS-PFxxLSC-AD	APCS-EFxxES-AD	n/a	
			APMC-FBL01AYK2-AD	APCS-PNxxLSC-AD	APCS-ENxxES-AD	APCS-BNxxQS-AD	
				APCS-PFxxLSC-AD	APCS-EFxxES-AD	APCS-BFxxQS-AD	
200W Low Inertia System		L7CA004U-AD	APMC-FBL02AYK-AD	APCS-PNxxLSC-AD	APCS-ENxxES-AD	n/a	
				APCS-PFxxLSC-AD	APCS-EFxxES-AD	n/a	
			APMC-FBL02AYK2-AD	APCS-PNxxLSC-AD	APCS-ENxxES-AD	APCS-BNxxQS-AD	
				APCS-PFxxLSC-AD	APCS-EFxxES-AD	APCS-BFxxQS-AD	
400W Low Inertia System		L7CA004U-AD	APMC-FBL04AYK-AD	APCS-PNxxLSC-AD	APCS-ENxxES-AD	n/a	
				APCS-PFxxLSC-AD	APCS-EFxxES-AD	n/a	
			APMC-FBL04AYK2-AD	APCS-PNxxLSC-AD	APCS-ENxxES-AD	APCS-BNxxQS-AD	
				APCS-PFxxLSC-AD	APCS-EFxxES-AD	APCS-BFxxQS-AD	

LS ELECTRIC L7C Series AC Servo Systems

L7C AC servo drive, motor, and cable combinations, *continued*

Type	System Torque Chart	L7C Drive	APMC Motor	Power Cable	Encoder Cable	Brake Cable	I/O Cable and Breakout
750W Low Inertia System		L7CA010U-AD	APMC-FCL08AYK-AD	APCS-PNxxLSC-AD	APCS-ENxxES-AD	n/a	APC-VSCN1Txx-AD or APC-CN10xA-AD
				APCS-PFxxLSC-AD	APCS-EFxxES-AD	n/a	
			APMC-FCL08AYK2-AD	APCS-PNxxLSC-AD	APCS-ENxxES-AD	APCS-BNxxQS-AD	
				APCS-PFxxLSC-AD	APCS-EFxxES-AD	APCS-BFxxQS-AD	
1.0k W Low Inertia System		L7CA010U-AD	APMC-FCL10AYK-AD	APCS-PNxxLSC-AD	APCS-ENxxES-AD	n/a	
				APCS-PFxxLSC-AD	APCS-EFxxES-AD	n/a	
			APMC-FCL10AYK2-AD	APCS-PNxxLSC-AD	APCS-ENxxES-AD	APCS-BNxxQS-AD	
				APCS-PFxxLSC-AD	APCS-EFxxES-AD	APCS-BFxxQS-AD	

LS ELECTRIC L7C Series AC Servo Systems

L7C Servo drive specifications

L7C Servo Drive Specifications			
Model		*L7CA004U-AD*	*L7CA010U-AD*
Price		$325.00	$408.00
Drawing		PDF	PDF
Power	**Input Power**	Single phase AC200 - 230V(-15 to +10%), 50–60Hz	
	Rated Current [Amps]	3.6	8.0
	Peak Current [Amps]	9.0	20.25
	Inrush Current	34A @ 240VAC	36A @ 240VAC
Control Performance	**Speed Control Range**	Maximum 1:5000	
	Frequency Response	Maximum 1KHz or above (when using 17-Bit Serial Encoder)	
	Speed Variation Ratio	± 0.01 % or lower (when load changes between 0 and 100%), ± 0.1 % or lower (temperature 25±10°C)	
	Accel/Decel Time	Straight or S-curve acceleration/deceleration (0–10,000 ms), increment by 1ms	
	Input Frequency	1Mpps, line driver / 200kpps, open collector	
	Input Pulse Type	Pulse+Direction, CW+CCW, A/B Phase	
Recommended Breaker		5A max	10A max
Recommended Fuse		15A max	30A max
SCCR Rating		5000A	
RS-422	**Specification**	ANSI/TIA/EIA - 422 standard specifications - connects to PLCs with RS485 ports (Click, P-Series, Do-More, etc.)	
	Protocol	MODBUS-RTU	
	Synchro Method	Asynchronous	
	Power Consumption	100mA	
	Transmission Speed (bps)	9,600 / 19,200 / 38,400 / 57,600	
	Distance	200m maximum	
	Terminating Resistance	Optional built-in 120Ω resistor for end-of-line termination	
Digital I/O Specifications	**Digital Input**	Input voltage range: 12–24 VDC Total 10 input channels (configurable) 34 different selectable functions for assignment. (*SV_ON, *SPD/LVSF1, *SPD2/LVSF2, *SPD3, *A-RST, *JDIR, *POT, *NOT, *EMG, *STOP, START, REGT, HOME, HSTART, ISEL0, ISEL1, ISEL2, ISEL3, ISEL4, ISEL5, PCON, GAIN2, P_CL, N_CL, MODE, PAUSE, ABSRQ, JSTART, PCLR, AOVR, INHIBIT, EGEAR1, EGEAR2, ABS_RESET)	
	Digital Output	Service rating: 24VDC ± 10%, 120mA 5 of 8 output channels are configurable, 3 channels are fixed with AL00, AL01, and AL02 19 different selectable functions for assignment (*ALARM, *READY, *ZSPD, *BREAK, *INPOS1, ORG, EOS, TGON, TLMT, VLMT, INSPD, WARN, INPOS2, IOUT0, IOUT1, IOUT2, IOUT3, IOUT4, IOUT5)	
	Analog Input	2 channel Analog speed input (Command/Override) ± 10V Analog torque input (Command/Override) ± 10V	
USB Communication	**Connect**	PC	
	Communication Standard	USB 2.0 full speed (applies standard)	
	Specification	PC, USB 2.0 full speed (applies standard)	
Continued on next page			

* Basic allocation signal

LSᴇʟᴇᴄᴛʀɪᴄ L7C Series AC Servo Systems

L7C Servo drive specifications, *continued*

<table>
<tr><th colspan="4">L7C Servo Drive Specifications, continued</th></tr>
<tr><td colspan="4">Continued from previous page</td></tr>
<tr><td colspan="2">Model</td><td>L7CA004U-AD</td><td>L7CA010U-AD</td></tr>
<tr><td rowspan="5">Internal Function</td><td>Dynamic Braking</td><td colspan="2">Standard built-in brake (activated when the servo alarm goes off or when the servo is OFF)</td></tr>
<tr><td>Regenerative Braking</td><td>3.0 kW capacity with external resistor APCS-140R50</td><td>5.0 kW capacity with external resistor APCS-300R30</td></tr>
<tr><td>Display Function</td><td colspan="2">7 segments (5DIGIT)</td></tr>
<tr><td>Additional Function</td><td colspan="2">Gain tuning, alarm history, JOG operation, homing</td></tr>
<tr><td>Protection Function</td><td colspan="2">Excessive current/voltage/overload/overheating/speed, excessive current limit, low voltage, encoder/position following/current sensing fail</td></tr>
<tr><td rowspan="5">Operation Environment</td><td>Operating Temperature</td><td colspan="2">0–50 °C</td></tr>
<tr><td>Storage Temperature</td><td colspan="2">-20 to -65°C</td></tr>
<tr><td>Operating Humidity</td><td colspan="2">Below 80% relative humidity</td></tr>
<tr><td>Storage Humidity</td><td colspan="2">Below 90% relative humidity (avoid dew-condensation)</td></tr>
<tr><td>Environment</td><td colspan="2">Indoor, avoid corrosive, inflammable gas, or liquid and electrically conductive dust</td></tr>
<tr><td colspan="2">Approvals</td><td colspan="2">$_C$UL$_{US}$ (E479434), CE</td></tr>
</table>

LS ELECTRIC L7C Series AC Servo Systems

L7C Drive Standard Installation

L7C Drive Installation Spacing
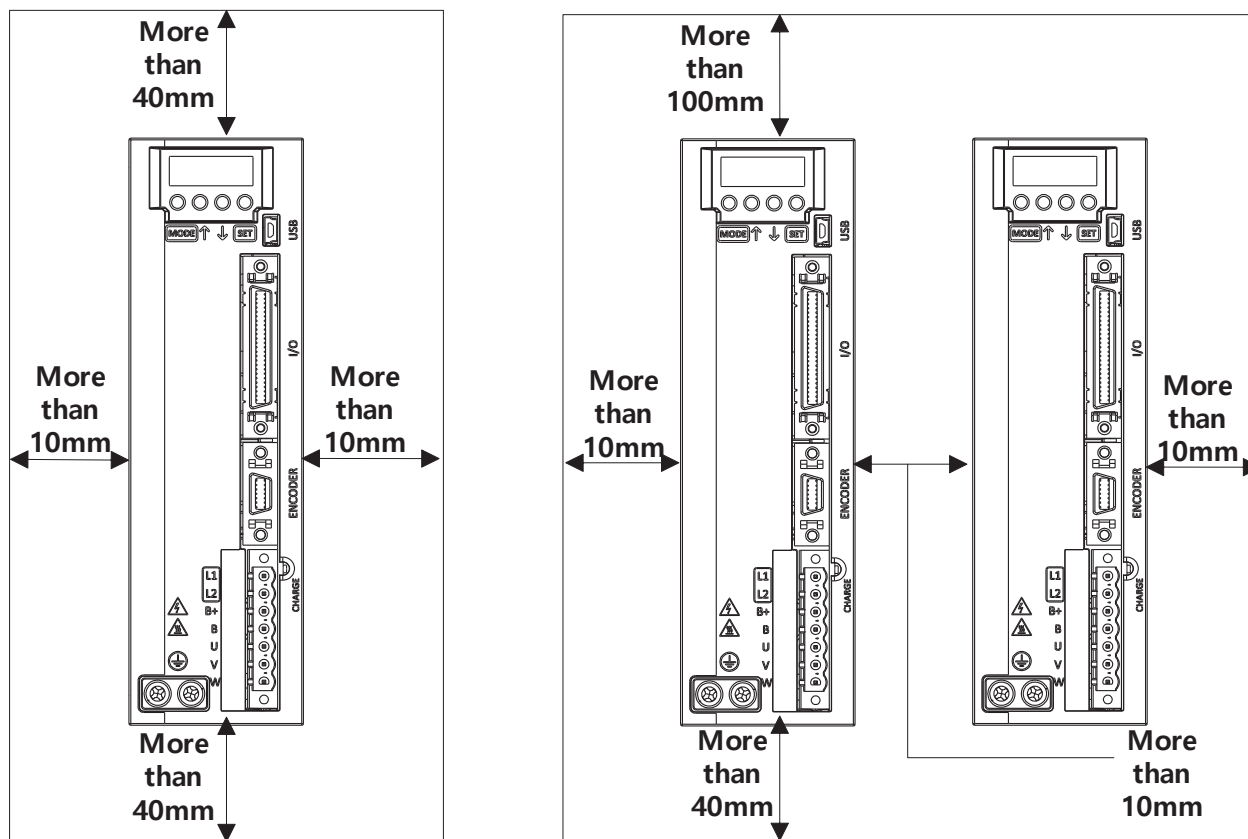
L7C Drive Installation Concerns:

- Install external regenerative resistors so that any heat generated does not affect the drive.
- Vertical installation only. For proper heat dissipation, ensure the back of the drive makes good contact with the subpanel.
- Protect the drive from metal chips and other falling debris during control panel assembly.
- Make sure that oil, water, or metal dust do not enter the drive.
- Protect the control panel by using an air purge system when installing it in any area where there are harmful gases or dust.

LS *ELECTRIC* **L7C Series AC Servo Systems**

L7C Drive Wiring

L7C Power Supply Wiring
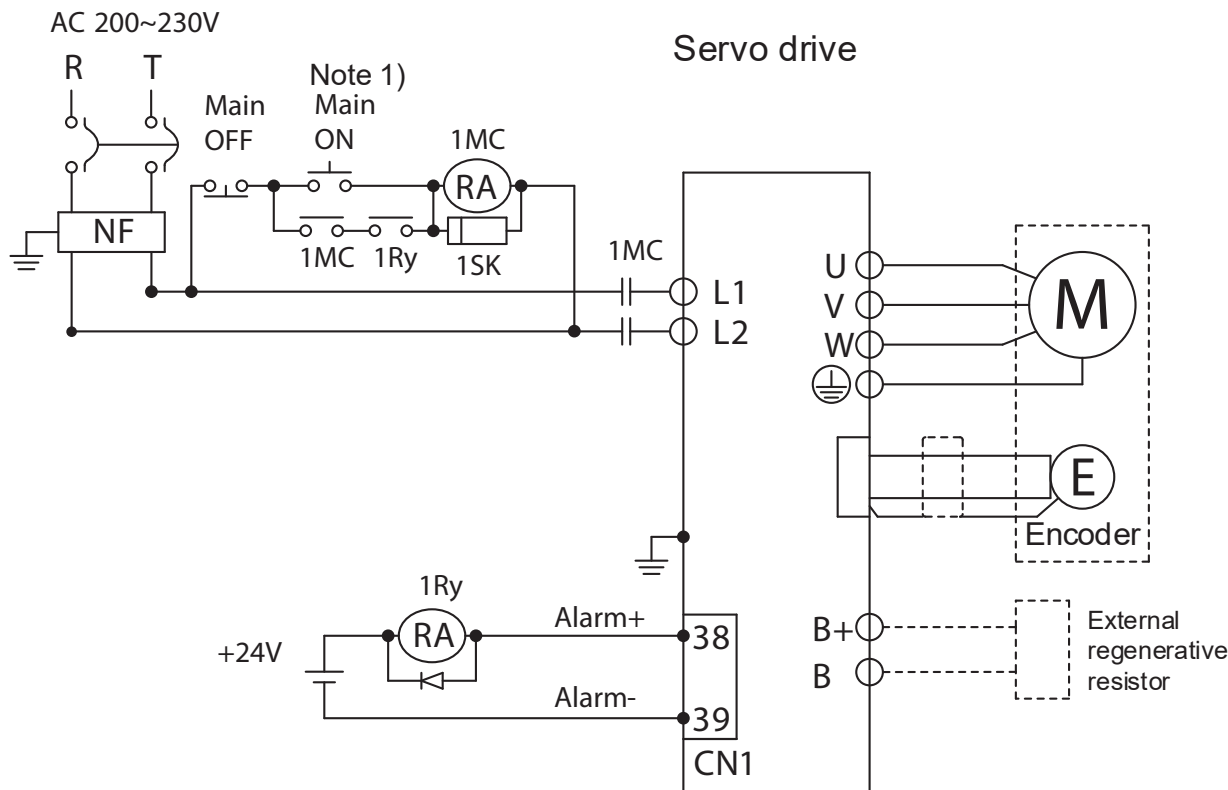
NOTE 1: About 1–2 seconds are required from main power supply to alarm signal output. Hold the main power on for 2 seconds until the alarm circuit ("1Ry") will latch main power ON.

NOTE: If an external regen resistor is required, connect a regenerative resistance of 50W/100Ω for the L7CA004U-AD, and 100W/40Ω for the L7CA010U-AD.

Connect the L7C RS422 port to a PLC with an RS485 port:

To use RS422 with AutomationDirect PLCs with RS485 ports

PLC RS485 terminals

2	TXD+
3	TXD−
6	RXD+
7	RXD−
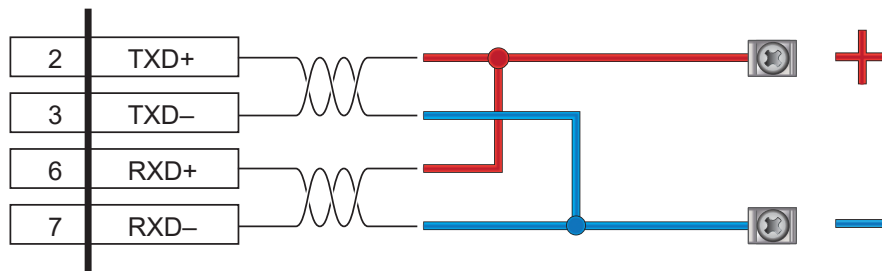
NOTE: Do not use APC-VSCN1T(xx)-AD feedthrough terminal block if using PLC/Drive serial communication. Communication errors may occur due to disconnects in cable shields. Use APC-CN10xA-AD flying lead cables.

LS ELECTRIC L7C Series AC Servo Systems

Non-brake Motor Specifications

L7C Non-brake Motor Specifications					
Model	APMC-FBL01AYK-AD	APMC-FBL02AYK-AD	APMC-FBL04AYK-AD	APMC-FCL08AYK-AD	APMC-FCL10AYK-AD
Price	$238.00	$281.00	$295.00	$349.00	$426.00
Drawing	PDF	PDF	PDF	PDF	PDF
Flange Size	60	60	60	80	80
Rated Power [kW]	0.1	0.2	0.4	0.75	1
Rated Torque [N·m] Note 1	0.32	0.64	1.27	2.39	3.18
Max. Torque [N·m]	0.96	1.91	3.82	7.16	9.55
Rated Speed [rpm]	3000				
Max. Speed [rpm]	5000				
Mechanical Time Constant [ms]	0.926	0.518	0.374	0.609	0.492
Rated current [Amps] rms	0.95	1.45	2.6	5.02	5.83
Max. Instantaneous Current [Amps] rms	2.85	4.35	7.8	15.07	17.5
Rated Power Rate [kW/s]	11.09	27.6	27.07	45.09	62.08
Electrical Time Constant [ms]	2.416	3.488	4.271	5.774	6.919
Insulation Class	Class BE (CE, UL)				
Insulation Resistance	>10MΩ, 500VDC				
Insulation Strength	1.8 kVAC, 1 second				
Rotor Inertia [x10^{-4} kg m^2]	0.091	0.147	0.248	1.264	1.632
Allowable Load Inertia Ratio	20 times motor inertia			15 times motor inertia	
Max Radial Loading [N]	206			255	
Max Axial Loading [N]	69			98	
Vibration Grade [µm]	V15				
Vibration Capacity	19.6m/s^2 or lower (2.5G)				

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions: 250mm x 250mm x 6mm made from aluminum (or mounted to equipment with an equivalent heat sinking capability).

LS ELECTRIC L7C Series AC Servo Systems

Non-brake Motor Specifications, *continued*

L7C Non-brake Motor Specifications, *continued*					
Model	APMC-FBL01AYK-AD	APMC-FBL02AYK-AD	APMC-FBL04AYK-AD	APMC-FCL08AYK-AD	APMC-FCL10AYK-AD
Speed/Position Detector	Serial Single-Turn Encoder (17-bit), built-in				
IP Rating	Fully closed, self cooling IP67				
Rated Time	Continuous				
Operating Temperature	0°C to 40°C				
Storage Temperature	-10°C to 60°C				
Operating Humidity	Below 80% relative humidity				
Storage Humidity	Below 90% relative humidity, no condensation				
Atmosphere	Avoid direct sunlight, no corrosive gas, inflammable gas, oil mist, or dust				
E/V	Elevation/vibration 49m/s^2 (5G)				
Weight [kg]	0.56	0.74	1.06	2.68	3.3
Agency Approvals	$_C$UR$_{US}$ (E255738), CE				

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions: 250mm x 250mm x 6mm made from aluminum (or mounted to equipment with an equivalent heat sinking capability).

LS ELECTRIC L7C Series AC Servo Systems

Brake Motor Specifications

L7C Brake Motor Specifications					
Model	*APMC-FBL01AYK2-AD*	*APMC-FBL02AYK2-AD*	*APMC-FBL04AYK2-AD*	*APMC-FCL08AYK2-AD*	*APMC-FCL10AYK2-AD*
Price	$438.00	$492.00	$503.00	$549.00	$645.00
Drawing	PDF	PDF	PDF	PDF	PDF
Flange Size	60	60	60	80	80
Rated Power [kW]	0.1	0.2	0.4	0.75	1
Rated Torque [N·m] Note 1	0.32	0.64	1.27	2.39	3.18
Max. Torque [N·m]	0.96	1.91	3.82	7.16	9.55
Rated Speed [rpm]	3000				
Max. Speed [rpm]	5000				
Mechanical Time Constant [ms]	0.926	0.518	0.374	0.609	0.492
Rated current [Amps] rms	0.95	1.45	2.6	5.02	5.83
Max. Instantaneous Current [Amps] rms	2.85	4.35	7.8	15.07	17.5
Rated Power Rate [kW/s]	11.09	27.6	27.07	45.09	62.08
Electrical Time Constant [ms]	2.416	3.488	4.271	5.774	6.919
Insulation Class	Class BE (CE, UL)				
Insulation Resistance	>10MΩ, 500VDC				
Insulation Strength	1.8 kVAC, 1 second				
Rotor Inertia [x10^{-4} kg m^2]	0.091	0.147	0.248	1.264	1.632
Allowable Load Inertia Ratio	20 times motor inertia			15 times motor inertia	
Max Radial Loading [N]	206			255	
Max Axial Loading [N]	69			98	
Brake Holding Torque [N·m (min)]	1.47			3.23	
Brake Power Consumption (at 20°C) [W]	6.5			9	
Brake Release Time [ms (max)]	20				
Brake Pull-in Time [ms (max)]	50			60	
Vibration Grade [µm]	V15				
Vibration Capacity	19.6m/s^2 or lower (2.5G)				

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions: 250mm x 250mm x 6mm made from aluminum (or mounted to equipment with an equivalent heat sinking capability).

LS ELECTRIC L7C Series AC Servo Systems

Brake Motor Specifications, *continued*

L7C Brake Motor Specifications, *continued*					
Model	APMC-FBL01AYK2-AD	APMC-FBL02AYK2-AD	APMC-FBL04AYK2-AD	APMC-FCL08AYK2-AD	APMC-FCL10AYK2-AD
Speed/Position Detector	Serial Multi-Turn Built-in Type (17-bit)				
IP Rating	Fully closed, self cooling IP67				
Rated Time	Continuous				
Operating Temperature	0°C to 40°C				
Storage Temperature	-10°C to 60°C				
Operating Humidity	Below 80% relative humidity				
Storage Humidity	Below 90% relative humidity, no condensation				
Atmosphere	Avoid direct sunlight, no corrosive gas, inflammable gas, oil mist, or dust				
E/V	Elevation/vibration 49m/s^2 (5G)				
Weight [kg]	1.28	1.46	1.78	3.45	4.07
Agency Approvals	$_C$UR$_{US}$ (E255738), CE				

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions: 250mm x 250mm x 6mm made from aluminum (or mounted to equipment with an equivalent heat sinking capability).

LS ELECTRIC

L7P Series AC Servo Systems

Drive features

- Power: 100W–7.5 kW three-phase 230VAC/460VAC
  100W–2.2 kW single-phase 230VAC capable
- Fully digital control with up to 1kHz velocity loop response
- Easy setup and diagnostics with DriveCM PC-based software
- Field upgradeable firmware ensures the drive can always be upgraded to the latest operating system
- Command options include:
  - ± 10V torque or velocity command
  - Pulse train or master encoder position command (accepts line driver or open collector)
  - Internal Indexer for position/speed-based moves include the option for simple registration correction. 64 individual move statements can be configured in the drive. Each Index contains its own distance, speed, accel, decel , and dwell parameters. These indexes can be set up through DriveCM software or modified in real-time with serial communication (PLC, HMI, etc.). The indexes can be initiated via Digital Inputs or through serial comms.
- The 1 kHz bandwidth allows for high-level automatic tuning. Several modes of tuning are available including Off-Line Auto Tuning (the drive initiates its own move commands while Auto tuning), On-Line Auto Tuning (an external controller sends the move commands while the drive Auto tunes), and Manual Tuning (all tuning values are adjusted by the user).
- (16) Optically isolated digital inputs and (8) general purpose (user configurable) outputs, analog inputs for speed and torque control (2), and line driver and open collector output for encoder (with scalable resolution). Two configurable analog outputs for monitoring various servo parameters (actual speed, torque, current, position, etc.)
- Advanced Scope feature that can monitor a variety of command and status signals, including output speed, torque, power, etc.

Motor features

- Low and Medium inertia motors available:
  - Low: 100W, 200W, 400W, 750W, 900W, 1kW, and 1.5 kW; @5000rpm
  - Medium: 1.6 kW, 2.2 kW, 3.5 kW, 5.5 kW, and 7.5 kW; @3000rpm
- Permanent magnet 3-phase synchronous motor
- Keyed drive shafts support clamp-on style couplings or key-style couplings
- Integrated multi-turn absolute encoder with 19-bit resolution (524,288 pulses per revolution)
- Optional 24 VDC spring-set holding brakes (AMK2 and DMK2 motors)
- Standard hook-up cables for motor power, encoder, and brake (separate brake cable for FBL/FCL brake motors)
- Motor cables available in standard or flex-rated lengths of 3, 5, 10, and 20m
- Standard 50-pin DIN-rail mounted break-out kit for the drive's CN1 connector (with screw terminal connections), or 50-pin cables with flying leads

Note: These parts available for sale to North American locations only.

Tuning Technology

The L7P drive closes the loop on current, velocity, and position (depending on control mode selection). The 1kHz bandwidth in the drive assures precise speed and current control and easy tuning. Proportional gain, integral gain and compensation, feed forward compensation, command low pass filter, and four (4) notch filters for resonance suppression are available. Auto Tuning has been greatly improved and can tune motors up to 20:1 inertia mismatch.

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

The drive has several tuning methods available:

- Online Auto Tuning–the drive can either tune the load live while an external controller moves the load to different positions or using the drive's internal tuning motion profile.
- Offline Auto Tuning–the drive tunes the load using the drive's internal tuning motion profile.
- Manual Tuning–all parameters are available to give power users the ultimate flexibility to tune their systems.

Built-in Indexer

While the L7P drives can accept traditional commands from host controllers, they can also provide their own internal motion control. 64 point-to-point position moves can be configured in the drive. These moves can be populated through the DriveCM configuration software or they can be written to by a PLC through the drive's RS422/485 serial port. The moves can be initiated by digital inputs or by serial commands and include the ability to handle simple registration, and can be sequenced internally with delays in between the moves or moves can be linked together so they are processed one after the other.

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

Optional Holding Brake

Each L7P motor can be ordered with an optional 24VDC spring-set holding brake that holds the motor in place when power is removed.

LS Electric MSS Series In-Line Planetary Precision Gearboxes for Servo Motors

Need more torque from the motor? Have an inertia balancing issue in your design? The LS Electric MSS series gearboxes easily mate to FBL/FCL/FE/FF motors. Everything you need for mounting is included!

- Three gear ratios available (5:1, 10:1, 20:1*)
- Mounting hardware included for attaching to FBL/FCL/FE/FF motors.
- Industry-standard mounting dimensions
- Thread-in mounting style
- Very low backlash: 7 arc-min single stage (5:1 and 10:1 ratios), 9 arc-min two-stage (20:1 ratios*).
- 1-year warranty

* *The available gearbox ratios for the 7.5 kW motors are 5:1, 10:1, and 15:1, but the featuers are otherwise equivalent.*

LS ELECTRIC

L7P Series AC Servo Systems

Servo drive overview

LED Display
The 5-digit display is used to indicate servo status and alarm.

Analog Connector
4-pin analog monitoring connector (two +/- 10V analog outputs). See L7P-CON-F and L7P-CON-G for optional connectors

DC Bus Charge LED
Visual indication of the drive's DC bus voltage level. Do not work on the drive until the Charge LED is OFF.

DIPswitch #2
120Ω terminating resistor for the RS422/RS485 network (use at the end of a multi-drop network

Rotary DIPswitch (0–15)
Sets RS422/485 comms station ID. Switch #3 adds 16 to the Node ID (so total addressable Node IDs = 0–31)

Motor Power Terminal
Incoming single or three phase 200-230 VAC or three phase 380-480 VAC, model dependent. (-15% to+10%, 50/60Hz)

USB Connector
Used by Drive CM software for servo configuration. Connect with a standard USB A to USB mini-B cable (SV2-PGM-USB15, MOSAIC-CSU, or similar).

Firmware Upgrade: Use DriveCM software or attach a USB thumb drive with the new FW and update using USB On the Go (no PC required). See the UM for details.

Regenerative Resistor Terminal
Connection for optional external braking resistor

RJ45 Connectors
Serial Modbus RS422 (compatible with RS485 PLCs). Use standard ethernet cables (not crossover cables) to connect multiple drives in a serial network.

Control Power Terminal
Incoming single phase 200-230 VAC (or 380-480 VAC for "PB" models)(-15% to +10%, 50/60Hz)

CN1 I/O Signal Connector
50-pin CN1 connector for drive I/O. Signals include high speed pulse inputs, 16 digital inputs, 8 digital outputs, 2 analog inputs (voltage and torque), and scalable encoder output.

Motor Output Terminal
Output power to the servo motor. LS motor power cables available in 3, 5, 10, and 20 meter lengths in standard and flexing cables.

Encoder Connector
14-pin CN2 connector for the motor encoder. LS Encoder cables available in 3, 5, 10, and 20 meter lengths in standard and flexing cables.

Model Number
Clearly displayed on bottom of drive face for easy identification.

The LS Electric L7P servo drives are fully digital and include over 300 parameters to configure the drive for almost any application. For convenience, the parameters are grouped into several categories including:

- Basic parameters
- Gain parameters
- I/O parameters
- Velocity parameters
- Misc. parameters
- Monitor parameters
- Index parameters

All parameters have commonly used default values which allow you to operate the L7P drive "out-of-the-box". The drive auto-detects the

LS servo motor (through the serial encoder) and sets up the default gains and limits based on the connected motor.

The drive can still be easily configured to your specific application, however. The Drive CM configuration software has a built-in Setup Wizard that will guide you through all the basic setup parameters. So, whether you want to use high speed pulse input, analog velocity, analog torque, or the powerful internal indexer for a control mode (or any multi-mode combination of these modes), the Setup Wizard will quickly and easily get your application started – from setting up the I/O to determining the appropriate homing sequence.

After configuration is complete, the Auto Tune features of the drive will get your application tuned for optimal responsiveness and performance.

LS ELECTRIC

L7P/iX7NH AC Servo Systems

Servo motor overview

Encoder Connector

9-pin watertight connector for the 19-bit serial encoder. The encoder transmits motor/encoder identification information to the drive at power-up and it sends position feedback during operation.

FBL/FCL Series Motor

Motor Power Connector

4-pin watertight connector for motor power (U, V, W, and ground)

Brake Power Connector

2-pin watertight connector available on FBL/FCL brake motors only. The 24VDC brake is located between the motor coils and the encoder. Motors ending in AMK2 and DMK2 have brakes. The brakes must have 24VDC applied to them before the motor is set in motion.

Low Inertia Motors

Low inertia designs (AMK series) result in high responsiveness at high speeds for lighter loads.

• 100–100W motors available
• 60 and 80 mm flanges

Keyed Shafts

FBL and FCL motors are supplied with extra-large keyways, and slightly oversized keys which may need to be "fitted" into the keyway for performance and longevity. Clamp or compression couplings (without key) are recommended.

• 100W	14mm diameter shaft
• 200W	14mm diameter shaft
• 400W	14mm diameter shaft
• 750W	19mm diameter shaft
• 1000W	19mm diameter shaft

IP67 Housing

All LS Electric FBL/FCL/FE/FF motors have keyed shafts for use with servo-grade clamp or compression couplings (recommended) or servo-grade keyed couplings. Some sanding/filing of the key may be required before pressing into the keyway. Do not modify the shaft/keyway.

Encoder Connector

17-pin watertight connector for the 19-bit serial encoder. The encoder transmits motor/encoder identification information to the drive at power-up and it sends position feedback during operation.

FE/FF Series Motor

Motor Power Connector

4-pin watertight connector for motor power (U, V, W, and ground). For brake models, also supports brake wiring.

Low and Medium Inertia Motors

Low inertia designs (AMK series) result in high responsiveness at high speeds for lighter loads.

• 1500W motors with 130mm flanges available

Medium inertia designs (DMK series) result in high responsiveness at moderate speeds for heavier loads.

• 1600–7500W motors available
• 130 and 180 mm flanges

Keyed Shafts

FE and FF motors are supplied with extra-large keyways, and slightly oversized keys which may need to be "fitted" into the keyway for performance and longevity. Clamp or compression couplings (without key) are recommended.

• 900W	19mm diameter shaft
• 1500W	19mm diameter shaft
• 1600W	22mm diameter shaft
• 2200W	24mm diameter shaft
• 3500W	35mm diameter shaft
• 5500W	35mm diameter shaft
• 7500W	42mm diameter shaft

IP65 Housing
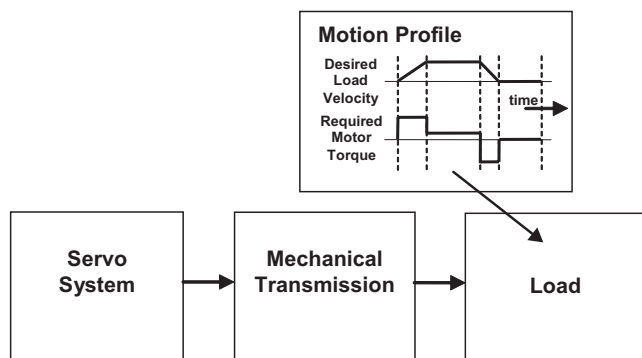
LS ELECTRIC | # L7P Series AC Servo Systems

How to select and apply L7P 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 servo 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. The Drive CM software has the ability to measure the load (reflected) inertia and accurately measure the motor torque output.

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 https://support.automationdirect.com/products/lselectric.html.

Motion Profile

Desired Load Velocity

Required Motor Torque

time

| Servo System | → | Mechanical Transmission | → | Load |

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.
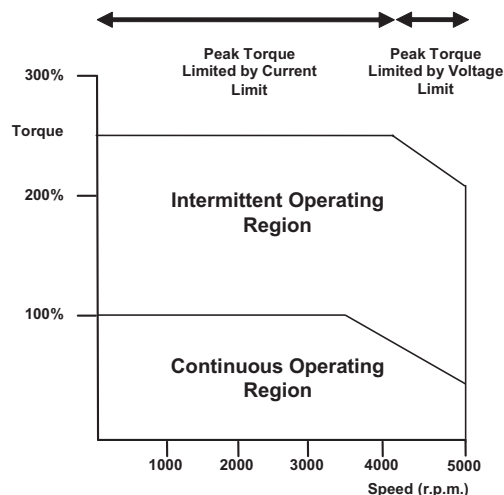
In general, applications that need high response or bandwidth

will benefit from keeping the ratio of load inertia to motor inertia as low as possible and ideally under 10:1. L7P Auto Tuning will still tune a system with very high response, up to 20:1 inertia mismatch. Higher system ratios 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. The L7P servo systems may be tuned automatically by the software/drive or manually by the user.

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 or torque). If you have an L7P system, these values are easily captured and recorded with the Scope feature built into the Drive CM software. If you are designing the system from scratch, use VisualSizer to define the system and calculate expected inertia and required power.

Compare the application's Continuous and Intermittent torque requirements to the torque-speed curves found in Chapter 16 of the L7P User Manual or in the system torque charts found on "L7P AC servo drive, motor, and cable combinations" on page tMNC-205.

Peak Torque Limited by Current Limit | Peak Torque Limited by Voltage Limit

300%

Torque

200%

Intermittent Operating Region

100%

Continuous Operating Region

1000 2000 3000 4000 5000

Speed (r.p.m.)

LS ELECTRIC

L7P Series AC Servo Systems

Application tip - coupling considerations

The LS Electric FBL/FCL motors have keyed shafts that can be used with keyed couplings or with clamp-on or compression style couplings. For standard keyed couplings, the servo key must be "fitted" into the keyway for optimum performance and longevity. Some minor filing and pressing of the key may be required. "Servo-grade" clamp-on or compression style couplings are usually the best choice when you consider stiffness, torque rating, and inertia. Higher stiffness (lb-in/radian) is needed for better response but there is a trade-off between stiffness and the added inertia of the coupling. Concerning the torque rating of the coupling, use a safety factor of 1.25 over the servo's **peak** torque requirement of your application.

Click here for <u>Available Couplings</u>

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. Matched gearboxes are available from LS Electric that will work with the LS servo motors. Each gearbox is selected to accept the 300% maximum available torque that could be generated by the motor. Gearboxes are available in 5:1, 10:1, and 20:1 ratios. 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, keep the reflected load inertia as low as possible while using the full range of servo speed. The LS Electric motors can rotate at a rated speed of 2000 or 3000 rpm (rated torque at rated speed). Their max speed (slightly less available torque) is 3000 or 5000 rpm. See the speed-torque curves for more information.

Example: A gearbox reduces the motor's 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.

Here is a link to our <u>Timing Belts and Pulleys</u>

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

LS Electric servo 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.
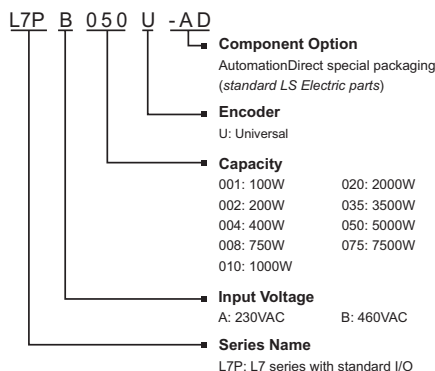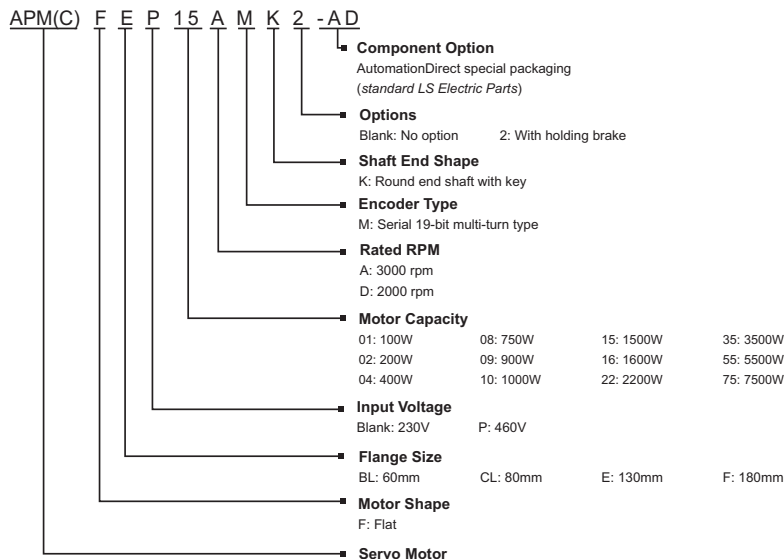
Ordering guide instructions

The following four pages are your ordering guide for LS Electric L7P servo systems. Each system has a torque-speed curve included for reference. This is the fundamental information that you need to select the servo motor and matching drive for your application.

Each system needs:
- Motor
- Drive
- Motor Power Cable
- Motor Encoder Cable
- I/O connections (either a 50-pin CN1 cable+terminals kit or a 50-pin flying lead cable(user provides terminal blocks))
- FBL/FCL brake motors require a brake cable. FE/FF brake motors have brake wiring included in the power cable.

Motor	Brake Motor	LS Electric MSS Planetary In-Line Gearboxes		
		5:1 Gearbox	10:1 Gearbox	20:1 Gearbox
APMC-FBL01AMK-AD	APMC-FBL01AMK2-AD	96200004	96200005	96200103
APMC-FBL02AMK-AD	APMC-FBL02AMK2-AD			
APMC-FBL04AMK-AD	APMC-FBL04AMK2-AD			
APMC-FCL08AMK-AD	APMC-FCL08AMK2-AD	96200007	96200008	96200257
APMC-FCL10AMK-AD	APMC-FCL10AMK2-AD			
APM-FEP09AMK-AD	APM-FEP09AMK2-AD	96200373	96200378	96200393
APM-FE15AMK-AD	APM-FE15AMK2-AD			
APM-FEP15AMK-AD	APM-FEP15AMK2-AD			
APM-FE16DMK-AD	APM-FE16DMK2-AD	96200459	96200464	96200479
APM-FEP16DMK-AD	APM-FEP16DMK2-AD			
APM-FE22DMK-AD	APM-FE22DMK2-AD	96200010	96200011	96200445
APM-FEP22DMK-AD	APM-FEP22DMK2-AD			
APM-FF35DMK-AD	APM-FF35DMK2-AD	96200013	96200014	96200701
APM-FFP35DMK-AD	APM-FFP35DMK2-AD			
APM-FF55DMK-AD	APM-FF55DMK2-AD			
APM-FFP55DMK-AD	APM-FFP55DMK2-AD			
APM-FF75DMK-AD	APM-FF75DMK2-AD	96200016	96200017	96200862 (15:1 gear ratio)
APM-FFP75DMK-AD	APM-FFP75DMK2-AD			

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L7P Series AC Servo Systems

L7P series drives and motors part numbering system

Drives

L7P B 050 U -AD

Component Option
AutomationDirect special packaging
(*standard LS Electric parts*)

Encoder
U: Universal

Capacity
001: 100W	020: 2000W
002: 200W	035: 3500W
004: 400W	050: 5000W
008: 750W	075: 7500W
010: 1000W	

Input Voltage
A: 230VAC   B: 460VAC

Series Name
L7P: L7 series with standard I/O

Motors

APM(C) F E P 15 A M K 2 -AD

Component Option
AutomationDirect special packaging
(*standard LS Electric Parts*)

Options
Blank: No option   2: With holding brake

Shaft End Shape
K: Round end shaft with key

Encoder Type
M: Serial 19-bit multi-turn type

Rated RPM
A: 3000 rpm
D: 2000 rpm

Motor Capacity
01: 100W	08: 750W	15: 1500W	35: 3500W
02: 200W	09: 900W	16: 1600W	55: 5500W
04: 400W	10: 1000W	22: 2200W	75: 7500W

Input Voltage
Blank: 230V   P: 460V

Flange Size
BL: 60mm   CL: 80mm   E: 130mm   F: 180mm

Motor Shape
F: Flat

Servo Motor

Example of what you will need to build a complete servo system:

Servo Drive	Servo Motor	Motor Power Cable	Motor Encoder Cable	I/O Interface

+ + + +

**Completed motor assembly
(with optional gearbox)**

NOTE: AMPC-FBL/FCL brake equipped motors will also require a separate brake power cable.

NOTE: Unit can be programmed via keypad. Optional programming software (free download). Use a standard USB-A to USB miniB cable for connectivity (SV2-PGM-USB15, MOSAIC-CSU, or equivalent)

NOTE: If you need a gear box for your configuration, reference the gearbox chart on the previous page. Ratios of 5:1, 10:1, and 20:1 are available for each motor.

L7P Series AC Servo Systems

Torque to L7P System Quick Reference

Input Voltage	System Rated Torque (N·m)	System Maximum Torque (N·m)	Suggested Servo Motor	Required Servo Drive
230VAC	0.32	0.96	APMC-FBL01AMK-AD	L7PA004U-AD
			APMC-FBL01AMK2-AD	
	0.64	1.91	APMC-FBL02AMK-AD	
			APMC-FBL02AMK2-AD	
	1.27	3.82	APMC-FBL04AMK-AD	
			APMC-FBL04AMK2-AD	
	2.39	7.16	APMC-FCL08AMK-AD	L7PA010U-AD*
			APMC-FCL08AMK2-AD	
	3.10	9.55	APMC-FCL10AMK-AD	
			APMC-FCL10AMK2-AD	
	4.77	14.32	APM-FE15AMK-AD	L7PA020U-AD
			APM-FE15AMK2-AD	
	7.63	22.92	APM-FE16DMK-AD	
			APM-FE16DMK2-AD	
	10.5	31.51	APM-FE22DMK-AD	
			APM-FE22DMK2-AD	
	16.7	50.1	APM-FF35DMK-AD	L7PA035U-AD
			APM-FF35DMK2-AD	
	26.25	78.76	APM-FF55DMK-AD	L7PA050U-AD
			APM-FF55DMK2-AD	
	35.81	89.53	APM-FF75DMK-AD	L7PA075U-AD
			APM-FF75DMK2-AD	
460VAC	2.86	8.59	APM-FEP09AMK-AD	L7PB010U-AD
			APM-FEP09AMK2-AD	
	4.77	14.32	APM-FEP15AMK-AD	L7PB020U-AD
			APM-FEP15AMK2-AD	
	7.64	22.92	APM-FEP16DMK-AD	
			APM-FEP16DMK2-AD	
	10.5	31.51	APM-FEP22DMK-AD	
			APM-FEP22DMK2-AD	
	16.71	50.13	APM-FFP35DMK-AD	L7PB035U-AD
			APM-FFP35DMK2-AD	
	26.26	65.65	APM-FFP55DMK-AD	L7PB050U-AD
			APM-FFP55DMK2-AD	
	35.81	89.52	APM-FFP75DMK-AD	L7PB075U-AD
			APM-FFP75DMK2-AD	

* 1kW motors only: For single-phase supply, derate motor max torque to 200% or upsize the drive to L7PA020U-AD for max motor torque.
** 2.2 kW motors only: For single-phase supply, upsize the drive to L7PA035U-AD for max motor torque.

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L7P Series AC Servo Systems

L7P AC servo drive, motor, and cable combinations
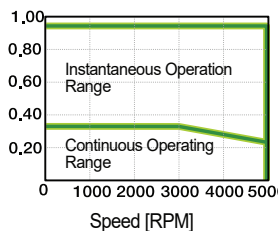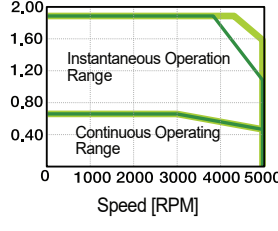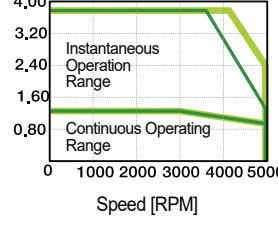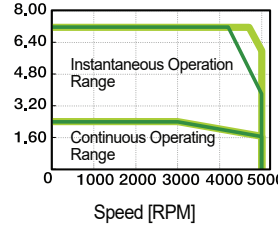
xx = Cable length in meters
BN/EN/PN = Standard cable (not continuous flex)
BF/EF/PF = Flex-rated cable

AMK/DMK motors = no brake
AMK2/DMK2 motors = mechanical holding brake

230V FBL/FCL Motor Systems

Type	System Torque Chart	L7P Drive	APM/APMC Motor	Power Cable	Encoder Cable	Brake Cable	I/O Cable and Breakout
100W Low Inertia System		L7PA004U-AD	APMC-FBL01AMK-AD	APCS-PNxxLS-AD	APCS-ENxxxES1-AD	n/a	
				APCS-PFxxLS-AD	APCS-EFxxxES1-AD		
			APMC-FBL01AMK2-AD	APCS-PNxxLS-AD	APCS-ENxxxES1-AD	APCS-BNxxQS-AD	
				APCS-PFxxLS-AD	APCS-EFxxxES1-AD	APCS-BFxxQS-AD	
200W Low Inertia System		L7PA004U-AD	APMC-FBL02AMK-AD	APCS-PNxxLS-AD	APCS-ENxxxES1-AD	n/a	
				APCS-PFxxLS-AD	APCS-EFxxxES1-AD		
			APMC-FBL02AMK2-AD	APCS-PNxxLS-AD	APCS-ENxxxES1-AD	APCS-BNxxQS-AD	APC-VSCN1Txx-AD or APC-CN10xA-AD
				APCS-PFxxLS-AD	APCS-EFxxxES1-AD	APCS-BFxxQS-AD	
400W Low Inertia System		L7PA004U-AD	APMC-FBL04AMK-AD	APCS-PNxxLS-AD	APCS-ENxxxES1-AD	n/a	
				APCS-PFxxLS-AD	APCS-EFxxxES1-AD		
			APMC-FBL04AMK2-AD	APCS-PNxxLS-AD	APCS-ENxxxES1-AD	APCS-BNxxQS-AD	
				APCS-PFxxLS-AD	APCS-EFxxxES1-AD	APCS-BFxxQS-AD	
750W Low Inertia System		L7PA010U-AD	APMC-FCL08AMK-AD	APCS-PNxxLS-AD	APCS-ENxxxES1-AD	n/a	
				APCS-PFxxLS-AD	APCS-EFxxxES1-AD		
			APMC-FCL08AMK2-AD	APCS-PNxxLS-AD	APCS-ENxxxES1-AD	APCS-BNxxQS-AD	
				APCS-PFxxLS-AD	APCS-EFxxxES1-AD	APCS-BFxxQS-AD	

LS ELECTRIC
L7P Series AC Servo Systems

L7P AC servo drive, motor, and cable combinations, *continued*

xx = Cable length in meters
BN, EN, or PN = Standard cable (not continuous flex)
BF, EF, or PF = Flex-rated cable

AMK/DMK motors = no brake
AMK2/DMK2 motors = mechanical holding brake

Type	System Torque Chart	L7P Drive	APMC Motor	Power Cable	Encoder Cable	Brake Cable	I/O Cable and Breakout
1.0k W Low Inertia System		L7PA010U-AD	APMC-FCL10AMK-AD	APCS-PNxxxLS-AD	APCS-ENxxxES1-AD	n/a	APC-VSCN1Txx-AD or APC-CN10xA-AD
				APCS-PFxxxLS-AD	APCS-EFxxxES1-AD		
			APMC-FCL10AMK2-AD	APCS-PNxxxLS-AD	APCS-ENxxxES1-AD	APCS-BNxxQS-AD	
				APCS-PFxxxLS-AD	APCS-EFxxxES1-AD	APCS-BFxxQS-AD	

* Note - For single-phase supply, derate motor max torque to 200%, or upsize the drive to L7PA020U-AD for the torque curves in the graph.

230V FE Motor Systems

Type	System Torque Chart	L7P Drive	APM/APMC Motor	Power Cable**	Encoder Cable	I/O Cable and Breakout
1.5 kW Low Inertia System		L7PA020U-AD***	APM-FE15AMK-AD	APCS-PNxxHS-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxHS-AD	APCS-EFxxxDS1-AD	
			APM-FE15AMK2-AD	APCS-PNxxNB-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxNB-AD	APCS-EFxxxDS1-AD	
1.6 kW Medium Inertia System		L7PA020U-AD***	APM-FE16DMK-AD	APCS-PNxxHS-AD	APCS-ENxxxDS1-AD	APC-VSCN1Txx-AD or APC-CN10xA-AD
				APCS-PFxxHS-AD	APCS-EFxxxDS1-AD	
			APM-FE16DMK2-AD	APCS-PNxxNB-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxNB-AD	APCS-EFxxxDS1-AD	
2.2 kW Medium Inertia System		L7PA020U-AD***	APM-FE22DMK-AD	APCS-PNxxHS-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxHS-AD	APCS-EFxxxDS1-AD	
			APM-FE22DMK2-AD	APCS-PNxxNB-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxNB-AD	APCS-EFxxxDS1-AD	

** Note - Power cables with "B" in the part number are combination power/brake cables, providing power for both the motor and the brake. A brake cable is not required.
*** Note - For single-phase supply, upsize the drive to L7PA035U-AD for the torque curves in the graph.

LS ELECTRIC L7P Series AC Servo Systems

L7P AC servo drive, motor, and cable combinations, *continued*

xx = Cable length in meters
BN, EN, or PN = Standard cable (not continuous flex)
BF, EF, or PF = Flex-rated cable

AMK/DMK motors = no brake
AMK2/DMK2 motors = mechanical holding brake

230V FF Motor Systems

Type	System Torque Chart	L7P Drive	APM/APMC Motor	Power Cable*	Encoder Cable	I/O Cable and Breakout
3.5 kW Medium Inertia System		L7PA035U-AD	APM-FF35DMK-AD	APCS-PNxxIS-AD	APCS-ENxxxDS1-AD	APC-VSCN1Txx-AD or APC-CN10xA-AD
				APCS-PFxxIS-AD	APCS-EFxxxDS1-AD	
			APM-FF35DMK2-AD	APCS-PNxxPB-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxPB-AD	APCS-EFxxxDS1-AD	
5.5 kW Medium Inertia System		L7PA050U-AD	APM-FF55DMK-AD	APCS-PNxxJS-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxJS-AD	APCS-EFxxxDS1-AD	
			APM-FF55DMK2-AD	APCS-PNxxLB-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxLB-AD	APCS-EFxxxDS1-AD	
7.5 kW Medium Inertia System		L7PA075U-AD	APM-FF75DMK-AD	APCS-PNxxJS2-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxJS2-AD	APCS-EFxxxDS1-AD	
			APM-FF75DMK2-AD	APCS-PNxxLB2-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxLB2-AD	APCS-EFxxxDS1-AD	

*Note - Power cables with "B" in the part number are combination power/brake cables, providing power for both the motor and the brake. A brake cable is not required.

LS ELECTRIC

L7P Series AC Servo Systems

L7P AC servo drive, motor, and cable combinations, *continued*

xx = Cable length in meters
BN, EN, or PN = Standard cable (not continuous flex)
BF, EF, or PF = Flex-rated cable

AMK/DMK motors = no brake
AMK2/DMK2 motors = mechanical holding brake

460V FEP Motor Systems

Type	System Torque Chart	L7P Drive	APM/APMC Motor	Power Cable*	Encoder Cable	I/O Cable and Breakout
1kW Low Inertia System		L7PB010U-AD	APM-FEP09AMK-AD	APCS-PNxxHS-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxHS-AD	APCS-EFxxxDS1-AD	
			APM-FEP09AMK2-AD	APCS-PNxxNB-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxNB-AD	APCS-EFxxxDS1-AD	
1.5 kW Low Inertia System		L7PB020U-AD	APM-FEP15AMK-AD	APCS-PNxxHS-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxHS-AD	APCS-EFxxxDS1-AD	
			APM-FEP15AMK2-AD	APCS-PNxxNB-AD	APCS-ENxxxDS1-AD	APC-VSCN1Txx-AD or APC-CN10xA-AD
				APCS-PFxxNB-AD	APCS-EFxxxDS1-AD	
1.6 kW Medium Inertia System		L7PB020U-AD	APM-FEP16DMK-AD	APCS-PNxxHS-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxHS-AD	APCS-EFxxxDS1-AD	
			APM-FEP16DMK2-AD	APCS-PNxxNB-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxNB-AD	APCS-EFxxxDS1-AD	
2.2 kW Medium Inertia System		L7PB020U-AD	APM-FEP22DMK-AD	APCS-PNxxHS-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxHS-AD	APCS-EFxxxDS1-AD	
			APM-FEP22DMK2-AD	APCS-PNxxNB-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxNB-AD	APCS-EFxxxDS1-AD	

*Note - Power cables ending in "B-AD" are combination power/brake cables, and provide power for both the motor and the brake. A separate brake cable is not required.

LS ELECTRIC
L7P Series AC Servo Systems

L7P AC servo drive, motor, and cable combinations, *continued*

xx = Cable length in meters
BN, EN, or PN = Standard cable (not continuous flex)
BF, EF, or PF = Flex-rated cable

AMK/DMK motors = no brake
AMK2/DMK2 motors = mechanical holding brake

460V FFP Motor Systems

Type	System Torque Chart	L7P Drive	APM/APMC Motor	Power Cable*	Encoder Cable	I/O Cable and Breakout
3.5 kW Medium Inertia System		L7PB035U-AD	APM-FFP35DMK-AD	APCS-PNxxIS-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxIS-AD	APCS-EFxxxDS1-AD	
			APM-FFP35DMK2-AD	APCS-PNxxPB-AD	APCS-ENxxxDS1-AD	
				APCS-PFxxPB-AD	APCS-EFxxxDS1-AD	
5.5 kW Medium Inertia System		L7PB050U-AD	APM-FFP55DMK-AD	APCS-PFxxJS1-AD**	APCS-ENxxxDS1-AD	APC-VSCN1Txx-AD
				APCS-PFxxJS1-AD	APCS-EFxxxDS1-AD	or
			APM-FFP55DMK2-AD	APCS-PFxxLB1-AD**	APCS-ENxxxDS1-AD	APC-CN10xA-AD
				APCS-PFxxLB1-AD	APCS-EFxxxDS1-AD	
7.5 kW Medium Inertia System		L7PB075U-AD	APM-FFP75DMK-AD	APCS-PFxxJS1-AD**	APCS-ENxxxDS1-AD	
				APCS-PFxxJS1-AD	APCS-EFxxxDS1-AD	
			APM-FFP75DMK2-AD	APCS-PFxxLB1-AD**	APCS-ENxxxDS1-AD	
				APCS-PFxxLB1-AD	APCS-EFxxxDS1-AD	

*Note - Power cables ending in "B-AD" or "B1-AD" are combination power/brake cables, and provide power for both the motor and the brake. A separate brake cable is not required.

** - Non-flex power cable not available for some motors, use the flex cable for both flex and non-flex applications.

LS ELECTRIC L7P Series AC Servo Systems

L7P Servo drive specifications

		L7P Servo Drive Specifications										
Model		L7PA004U-AD	L7PA010U-AD	L7PA020U-AD	L7PA035U-AD	L7PA050U-AD	L7PA075U-AD	L7PB010U-AD	L7PB020U-AD	L7PB035U-AD	L7PB050U-AD	L7PB075U-AD
Price		$446.00	$559.00	$714.00	$733.00	$1,060.00	$1,517.00	$617.00	$739.00	$761.00	$1,063.00	$1,201.00
Drawing		PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Power	**Input Power**	Three phase 200–230 VAC (-15 to +10%), 50–60Hz**						Three phase 380–480 VAC (-15 to +10%), 50–60Hz				
	Rated Current [Amps]	3.0	6.75	13.5	16.7	32.0	39.4	3.7	8	10.1	17.6	22.8
	Peak Current [Amps]	9.0	20.25	40.5	50.1	90.9	98.5	11.1	24	30.3	47.25	67
	Inrush Current	35A @ 230VAC		55A @ 230VAC		66A @ 230VAC	82A @ 230VAC	68A @ 480VAC			114A @ 480VAC	56A @ 480VAC
Control Performance	**Speed Control Range**	Maximum 1:5000										
	Frequency Response	Maximum 1KHz or above (when using 19-Bit Serial Encoder)										
	Speed Variation Ratio	± 0.01 % or lower (when load changes between 0 and 100%), ± 0.1 % or lower (temperature 25±10°C)										
	Accel/Decel Time	Straight or S-curve acceleration/deceleration (0–10,000 ms) and 0–1000 ms, unit configurable										
	Input Frequency	1Mpps, line driver / 200kpps, open collector										
	Input Pulse Type	Pulse and direction, CW+CCW, A/B Phase (quadrature)										
	Recommended Breaker (UL 489)	15A C trip curve		30A C trip curve		40A B trip curve	50A B trip curve	10A B trip curve	20A B trip curve		30A B trip curve	
	Recommended Fuse*	15A	20A	40A	70A	125A	150A	15A	25A	35A	50A	65A
	SCCR Rating*	5kA										
RS-422	**Specification**	ANSI/TIA/EIA - 422 standard specifications - connects to PLCs with RS485 ports (Click, P-Series, Do-More, etc.)										
	Protocol	MODBUS-RTU										
	Synchro Method	Asynchronous										
	Power Consumption	100mA or below										
	Transmission Speed (bps)	9,600 / 19,200 / 38,400 / 57,600 (can be configured at [0x3002]										
	Distance	200m maximum										
	Terminating Resistance	DIP S/W #2 (On/Off), Built-In 120Ω										
Digital I/O Specifications	**Digital Input**	Input voltage range: 12–24 VDC Total 16 input channels (configurable) 34 different selectable functions for assignment. (*SV_ON, *POT, *NOT, *A-RST, *START, *STOP, *REGT, *EMG, *HOME, *HSTART, *ISEL0, *ISEL1, *ISEL2, *ISEL3, *ISEL4, *ISEL5, PCON, GAIN2, P_CL, N_CL, MODE, PAUSE, ABSRQ, JSTART, JDIR, PCLR, AOVR, SPD1/LVSF1, SPD2/LVSF2, SPD3, PROBE1, PROBE2)										
	Digital Output	Service rating: 24VDC ± 10%, 120mA 8 output channels are configurable 19 different selectable functions for assignment (*ALARM±, *READY±, *BRAKE±, *INPOS1±, *ORG±, *EOS±, *TGON±, *TLMT,± VLMT±, INSPD±, ZSPD±, WARN±, INPOS2±, IOUT0±, IOUT1±, IOUT2±, IOUT3±, IOUT4±, IOUT5±)										
Analog I/O	**Analog Input**	2 channel Analog speed input (Command/Override) ± 10V Analog torque command (Command/Override) ± 10V										
	Analog Output	2 channels 15 function outputs can be selectively allocated ± 10V										
		Continued on next page										

* Basic allocation signal.
** See Single-phase power input section on the following page for single phase considerations.
*** Use class CC or High Speed J (JHL series) current limiting fuses to prevent nuisance tripping and to increase panel SCCR rating.

LS ELECTRIC   L7P Series AC Servo Systems

L7P Servo drive specifications, *continued*

L7P Servo Drive Specifications, *continued*		
Continued from previous page		
Model	**L7PA004U-AD**	***All Other L7P Series Drives***
USB Communication — *Connect*		Configuration/Monitor: PC Firmware Update: PC or USB On the Go (no PC needed)
USB Communication — *Communication Standard*		USB 2.0 full speed (applies standard)
USB Communication — *Specification*		PC, USB 2.0 full speed (applies standard)
Internal Function — *Mechanical Brake*		Standard built-in brake (activated when the servo alarm goes off or when the servo is OFF)
Internal Function — *Regenerative Braking*		Default built-in, external installation possible
Internal Function — *Display Function*		7-segment display (5 digits)
Internal Function — *Self-setting Function*		Drive node address can be set using rotary switch and DIP switch #3 (available Nodes = 0–31)
Internal Function — *Additional Function*		Gain tuning, alarm history, JOG operation, homing
Internal Function — *Protection Function*		Excessive current/current limit/voltage/speed, overload, overheating, low voltage, encoder failure, position following failure, current sensing failure
Operation Environment — *Operating Temperature*		0–50 °C [32–122 °F]
Operation Environment — *Storage Temperature*		-20 to -70°C [-4 to 158 °F]
Operation Environment — *Operating Humidity*		Below 80% relative humidity
Operation Environment — *Storage Humidity*		Below 90% relative humidity (avoid dew-condensation)
Operation Environment — *Environment*		Indoor, avoid corrosive, inflammable gas, or liquid and electrically conductive dust
Approvals	$_CUR_{US}$ (E479434), CE	$_CUL_{US}$ (E479434), CE

Single-phase Power Input

Although designed with 3-phase AC input power in mind, some L7P systems are capable of supporting single-phase AC input power. With three phase AC supply, the L7P motor/drive combination supplies 300% rated maximum motor torque (see the Instantaneous Operation Range in the torque-speed charts above). With single phase AC supply some ratings will have limited maximum/intermittent torque, and/or the next larger drive size will be required.
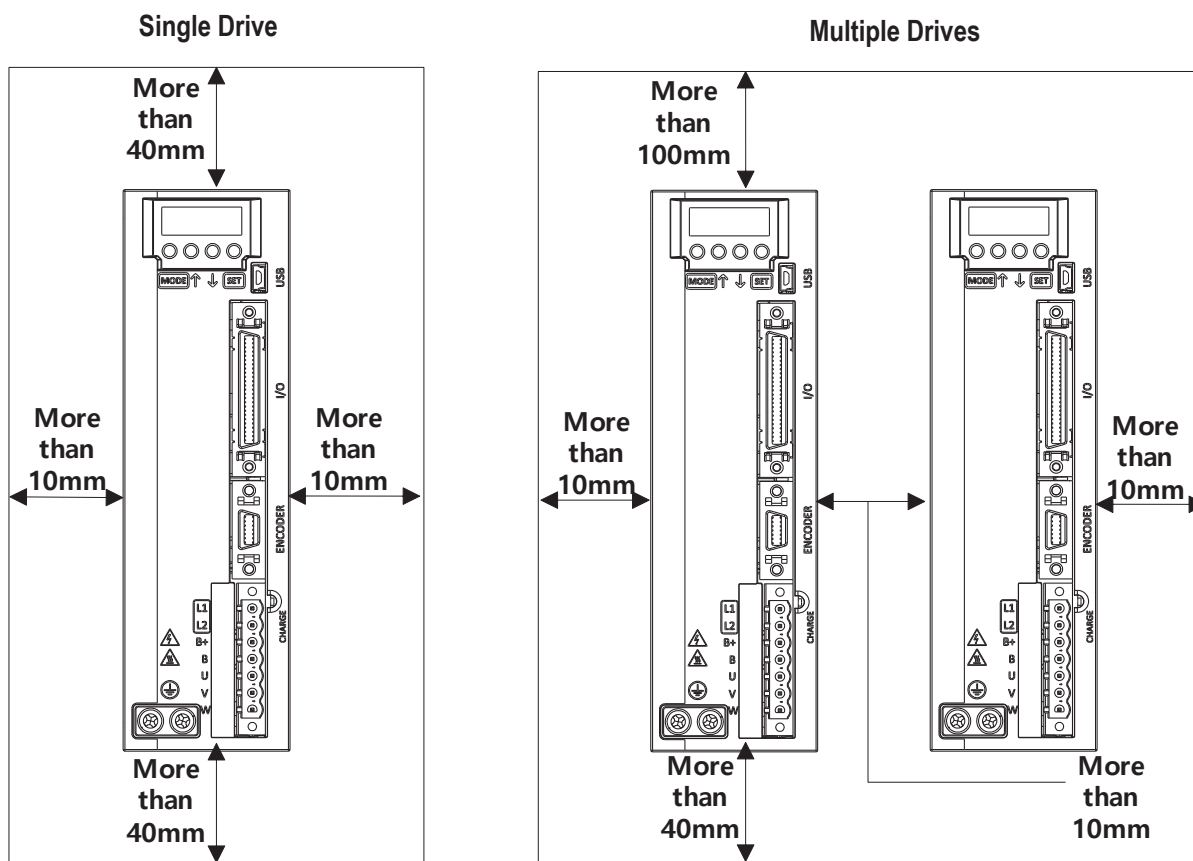
Drive Derating for 230V Single-phase Usage		
3-phase Motor/Drive Rating	***Drive to use with Single-phase Input***	***Motor Torque Derating for Single-phase Input***
100W/200W/400W	L7PA004U-AD	Single phase and three phase input both produce 300% max torque. No derating required.
750W	L7PA010U-AD	Single phase and three phase input both produce 300% max torque. No derating required.
1kW	L7PA010U-AD or L7PA020U-AD	2kW drive produces 300% max torque. The 1kW drive can be used, but the motor can only provide 200% max torque.
1.5 kW/1.6 kW	L7PA035U-AD	3.5 kW drive produces 200% max torque
2.2 kW		3.5 kW drive produces 150% max torque
3.5 kW and up	n/a	No single phase capability

LS ELECTRIC L7P Series AC Servo Systems

L7P Drive Standard Installation

L7P Drive Installation Spacing

Single Drive

More than 40mm

More than 10mm

More than 10mm

More than 40mm

Multiple Drives

More than 100mm

More than 10mm
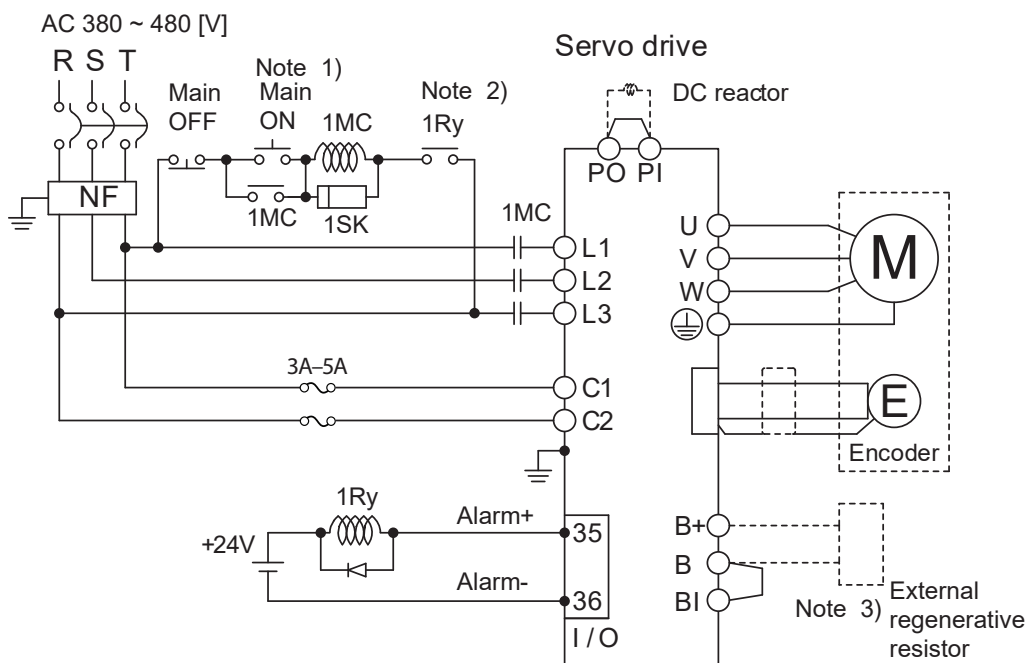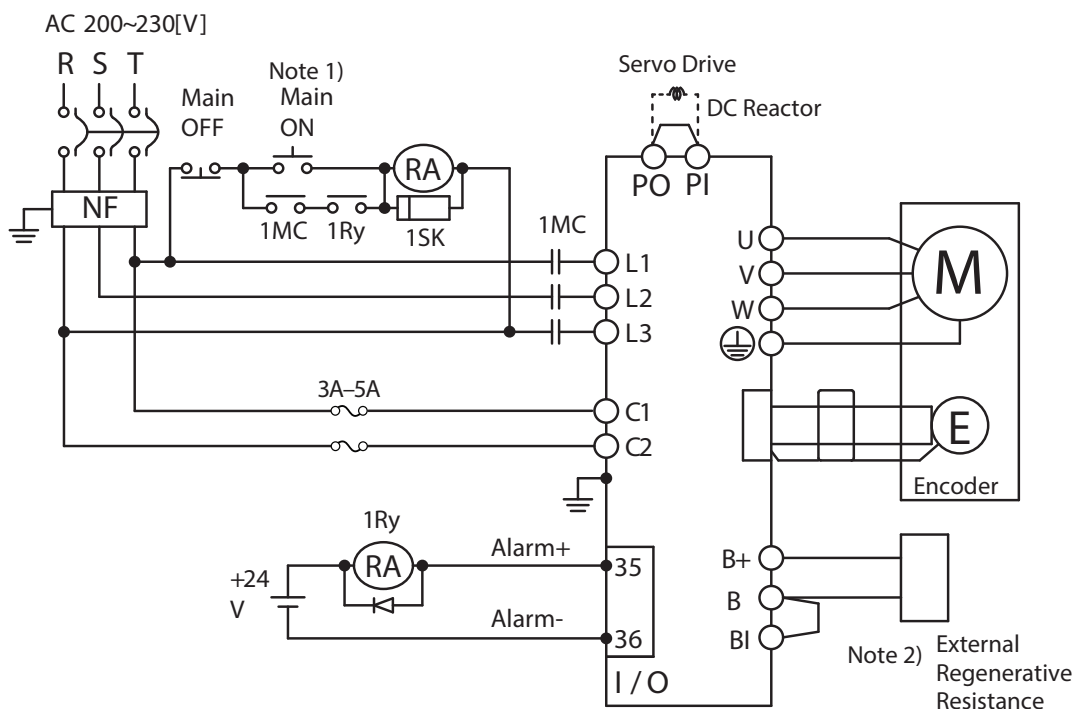
More than 10mm

More than 40mm

More than 10mm

L7P Drive Installation Concerns:

• Install external regenerative resistors so that any heat generated does not affect the drive.
• Vertical installation only. For proper heat dissipation, ensure the back of the drive makes good contact with the subpanel.
• Protect the drive from metal chips and other falling debris during control panel assembly.
• Make sure that oil, water, or metal dust do not enter the drive.
• Protect the control panel by using an air purge system when installing it in any area where there are harmful gases or dust.

LS ELECTRIC — L7P Series AC Servo Systems

L7P Drive Wiring

L7P Power Supply Wiring

NOTE: Single phase can use 2 of R, S, or T. See "Single-phase Power Input" on page tMNC-209 for more information.

AC 200~230[V]

R S T

Main OFF
Note 1) Main ON
RA
1MC 1Ry 1SK
1MC
NF
Servo Drive
DC Reactor
PO PI
L1
L2
L3
3A–5A
C1
C2
1Ry
RA
+24 V
Alarm+
35
Alarm-
36
I/O
U
V
W
M
E
Encoder
B+
B
BI
Note 2) External Regenerative Resistance

AC 380 ~ 480 [V]

R S T

Main OFF
Note 1) Main ON
1MC
Note 2) 1Ry
1MC 1SK
1MC
NF
Servo drive
DC reactor
PO PI
L1
L2
L3
3A–5A
C1
C2
1Ry
+24V
Alarm+
35
Alarm-
36
I/O
U
V
W
M
E
Encoder
B+
B
BI
Note 3) External regenerative resistor

NOTE 1: About 1–2 seconds are required from main power supply to alarm signal output. Hold the main power on for 2 seconds until the alarm circuit ("1Ry") will latch main power ON.

NOTES 2 & 3: Remove the jumper for the inertnal resistor between B and BI, and connect the external resistor to the B+ and B pins. If an external regen resistor is required, see the available regen resistors under the Motion Control category at AutomationDirect.com (APCS-140R50-AD, APCS-300R30-AD, etc.).

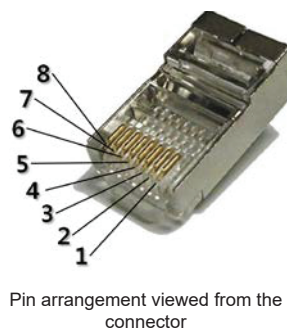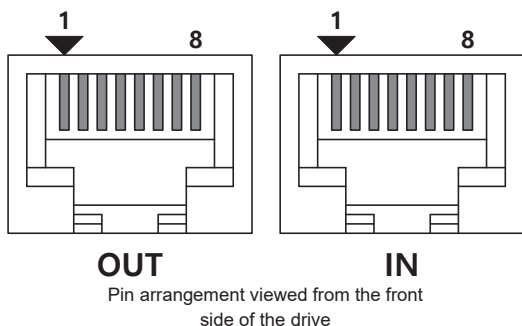# LS ELECTRIC L7P Series AC Servo Systems

L7P Drive Wiring, continued

Connect the L7P RS422 port to a PLC with an RS485 port:

NOTE: When connecting a single RS422 servo to an RS485 PLC, use the following wiring:

PLC RS485 terminals
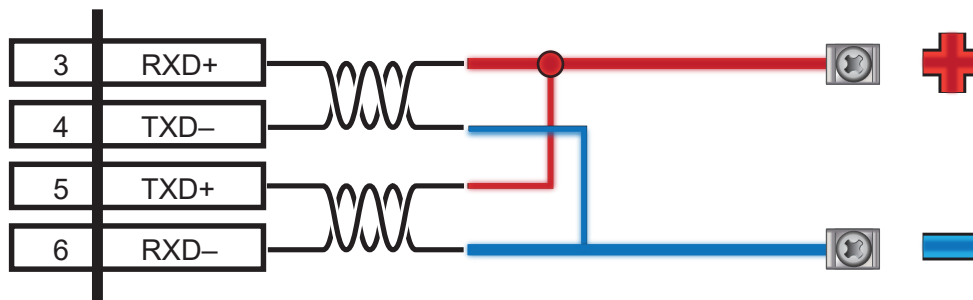
3	RXD+
4	TXD–
5	TXD+
6	RXD–

For best performance (and when communicating with multiple servos), use an RS485 to RS422 adapter with the PLC

OUT
Pin arrangement viewed from the front side of the drive

IN

Pin arrangement viewed from the connector

Pin #	Pin Function
1	Not used
2	Not used
3	RXD+
4	TXD-
5	TXD+
6	RXD-
7	Not used
8	Not used

NOTE: When connecting multiple drives, use a standard RJ45 ethernet patch cable (not a crossover cable) for the serial network. On the last drive only, set DIP switch #2 = ON (120 Ohm terminating resistor).

60–80 mm Frame Motor Specifications

L7P/iX7NH 60–80 mm Frame Motor Specifications										
Model	APMC-FBL01AMK-AD	APMC-FBL02AMK-AD	APMC-FBL04AMK-AD	APMC-FCL08AMK-AD	APMC-FCL10AMK-AD	APMC-FBL01AMK2-AD	APMC-FBL02AMK2-AD	APMC-FBL04AMK2-AD	APMC-FCL08AMK2-AD	APMC-FCL10AMK2-AD
Price	$309.00	$361.00	$373.00	$458.00	$508.00	$556.00	$583.00	$595.00	$684.00	$725.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Input Voltage	230VAC									
Drive Compatibility	L7P and iX7NH drives									
Integrated Brake	No					Yes				
Flange Size (mm)	60		80			60			80	
Rated Power [kW]	0.1	0.2	0.4	0.75	1	0.1	0.2	0.4	0.75	1
Rated Torque [N·m][Note 1]	0.32	0.64	1.27	2.39	3.18	0.32	0.64	1.27	2.39	3.18
Max. Torque [N·m]	0.96	1.91	3.82	7.16	9.55	0.96	1.91	3.82	7.16	9.55
Rated Speed [rpm]	3000									
Max. Speed [rpm]	5000									
Mechanical Time Constant [ms]	0.926	0.518	0.374	0.609	0.492	0.926	0.518	0.374	0.609	0.492
Rated current [Amps] rms	0.95	1.45	2.6	5.02	5.83	0.95	1.45	2.6	5.02	5.83
Max. Instantaneous Current [Amps] rms	2.85	4.35	7.8	15.07	17.5	2.85	4.35	7.8	15.07	17.5
Rated Power Rate [kW/s]	11.09	27.6	27.07	45.09	62.08	11.09	27.6	27.07	45.09	62.08
Electrical Time Constant [ms]	2.416	3.488	4.271	5.774	6.919	2.416	3.488	4.271	5.774	6.919
Insulation Class	Class BE (CE, UL)									
Insulation Resistance	>10MΩ, 500VDC									
Insulation Strength	1.8 kVAC, 1 second									
Rotor Inertia [x10⁻⁴ kg m²]	0.091	0.147	0.248	1.264	1.632	0.091	0.147	0.248	1.264	1.632
Allowable Load Inertia Ratio	20 times motor inertia		15 times motor inertia			20 times motor inertia			15 times motor inertia	
Max Radial Loading [N]	206		255			206			255	
Max Axial Loading [N]	69		98			69			98	
Vibration Grade [μm]	V15									
Vibration Capacity	19.6 m/s² or lower (2.5G)									
Speed/Position Detector	Serial multi-turn built-in type (19-bit)									
Weight [kg]	0.56	0.74	1.06	2.68	3.3	1.28	1.46	1.78	3.45	4.07

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions: 250mm x 250mm x 6mm made from aluminum (or mounted to equipment with an equivalent heat sinking capability).

For the latest prices, please check AutomationDirect.com.

LS ELECTRIC

L7P/iX7NH AC Servo Systems

130mm Frame Motor Specifications

Model	APM-FE15AMK-AD	APM-FE16DMK-AD	APM-FE22DMK-AD	APM-FE15AMK2-AD	APM-FE16DMK2-AD	APM-FE22DMK2-AD	APM-FEP09AMK-AD	APM-FEP15AMK-AD	APM-FEP16DMK-AD	APM-FEP22DMK-AD	APM-FEP09AMK2-AD	APM-FEP15AMK2-AD	APM-FEP16DMK2-AD	APM-FEP22DMK2-AD
Price	$729.00	$782.00	$719.00	$957.00	$1,012.00	$922.00	$669.00	$732.00	$791.00	$727.00	$899.00	$994.00	$1,054.00	$930.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Input Voltage	230VAC						460VAC							
Drive Compatibility	L7P and iX7NH drives						L7P drives							
Integrated Brake	No			Yes			No				Yes			
Flange Size (mm)	130													
Rated Power [kW]	1.5	1.6	2.2	1.5	1.6	2.2	0.9	1.5	1.6	2.2	0.9	1.5	1.6	2.2
Rated Torque [N·m] Note 1	4.77	7.63	10.5	4.77	7.63	10.5	2.86	4.77	7.64	10.5	2.86	4.77	7.64	10.5
Max. Torque [N·m]	14.32	22.92	31.51	14.32	22.92	31.51	8.59	14.32	22.92	31.51	8.59	14.32	22.92	31.51
Rated Speed [rpm]	3000	2000		3000	2000		3000	2000			3000	2000		
Max. Speed [rpm]	5000	3000		5000	3000		5000	3000			5000	3000		
Mechanical Time Constant [ms]	1.520	1.278	1.176	1.520	1.278	1.176	2.428	1.609	1.337	1.261	2.428	1.609	1.337	1.261
Rated current [Amps] rms	9.15	10.98	12.97	9.15	10.98	12.97	3.47	6.68	4.97	6.8	3.47	6.68	4.97	6.8
Max. Instantaneous Current [Amps] rms	27.45	32.94	38.91	27.45	32.94	38.91	10.4	20.03	14.92	20.4	10.4	20.03	14.92	20.4
Rated Power Rate [kW/s]	22.38	39.89	57.9	22.38	39.89	57.9	14.5	22.4	39.92	57.95	14.5	22.4	39.92	57.95
Electrical Time Constant [ms]	9.819	10.352	11.284	9.819	10.352	11.284	7.763	9.761	10.656	10.623	7.763	9.761	10.656	10.623
Insulation Class	B													
Insulation Resistance	10MΩ													
Insulation Strength	1.8 kVAC, 1 second						2.2 kVAC, 1 second							
Rotor Inertia [x10⁻⁴ kg m²]	10.18	14.62	19.43	10.18	14.62	19.43	5.659	10.179	14.619	19.04	5.659	10.179	14.619	19.04
Allowable Load Inertia Ratio	10 times motor inertia													
Max Radial Loading [N]	725													
Max Axial Loading [N]	362													
Vibration Grade [μm]	15													
Vibration Capacity	5G													
Speed/Position Detector	Serial type (19-bit)													
Weight [kg]	6.7	8.5	10.1	8.28	10.02	11.59	5.04	6.7	8.5	10.1	6.58	8.28	10.02	11.59

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions: 250mm x 250mm x 6mm made from aluminum (or mounted to equipment with an equivalent heat sinking capability).

Motion Control tMNC-246

LS ELECTRIC

L7P/iX7NH AC Servo Systems

180mm Frame Motor Specifications

Model	APM-FF35DMK-AD	APM-FF55DMK-AD	APM-FF75DMK-AD	APM-FF35DMK2-AD	APM-FF55DMK2-AD	APM-FF75DMK2-AD	APM-FFP35DMK-AD	APM-FFP55DMK-AD	APM-FFP75DMK-AD	APM-FFP35DMK2-AD	APM-FFP55DMK2-AD	APM-FFP75DMK2-AD
L7P/iX7NH 180mm Frame Motor Specifications												
Price	$945.00	$1,045.00	$1,238.00	$1,224.00	$1,317.00	$1,500.00	$945.00	$1,041.00	$1,241.00	$1,240.00	$1,312.00	$1,504.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Input Voltag e	230VAC						460VAC					
Drive Compatibility	L7P and iX7NH drives						L7P drives					
Integrated Brake	No			Yes			No			Yes		
Flange Size (mm)	180											
Rated Power [kW]	3.5	5.5	7.5	3.5	5.5	7.5	3.5	5.5	7.5	3.5	5.5	7.5
Rated Torque [N·m]Note 1	16.7	26.25	35.81	16.7	26.25	35.81	16.71	26.26	35.81	16.71	26.26	35.81
Max. Torque [N·m]	50.1	78.76	89.53	50.1	78.76	89.53	50.13	65.65	89.52	50.13	65.65	89.52
Rated Speed [rpm]	2000											
Max. Speed [rpm]	3000											
Mechanical Time Constant [ms]	1.222	0.829	0.723	1.222	0.829	0.723	1.058	0.847	0.764	1.058	0.847	0.764
Rated current [Amps] rms	16.48	28.78	32.95	16.48	28.78	32.95	9.09	14.70	18.97	9.09	14.70	18.97
Max. Instantaneous Current [Amps] rms	49.44	86.34	82.38	49.44	86.34	82.38	27.26	36.75	47.42	27.26	36.75	47.42
Rated Power Rate [kW/s]	59.89	93.27	120.15	59.89	93.27	120.15	59.98	93.38	120.15	59.98	93.38	120.15
Electrical Time Constant [ms]	15.021	19.086	20.567	15.021	19.086	20.567	14.452	23.484	20.351	14.452	23.484	20.351
Insulation Class	B											
Insulation Resistance	10MΩ											
Insulation Strength	1.8 kVAC, 1 second						2.2 kVAC, 1 second					
Rotor Inertia [x10-4 kg m2]	46.56	73.85	106.7	46.56	73.85	106.7	46.56	73.85	106.73	46.56	73.85	106.73
Allowable Load Inertia Ratio	5 times motor inertia											
Max Radial Loading [N]	1548											
Max Axial Loading [N]	519											
Vibration Grade [µm]	15											
Vibration Capacity	5G											
Speed/Position Detector	Serial type (19-bit)											
Weight [kg]	17.4	25.2	34	24.6	32.4	39	17.4	25.2	34	24.6	32.4	39

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions: 250mm x 250mm x 6mm made from aluminum (or mounted to equipment with an equivalent heat sinking capability).

LS *ELECTRIC*

L7P/iX7NH AC Servo Systems

Environmental Specifications

L7P/iX7NH Motor Environmental Specifications			
Model Series	*APMC-FBL/FCL Motors*	*FE/FEP Motors*	*FF/FFP Motors*
IP Rating	Fully closed self-cooling IP67[1]	Fully closed self-cooling IP65[1]	
Rated Time	Continuous		
Operating Temperature	0 to 40 °C [32 to 104 °F]		
Storage Temperature	-10 to 60 °C [14 to 140 °F]		
Operating Humidity	Below 80% RH		
Storage Humidity	Below 90% RH (non condensing)		
Atmosphere	Avoid direct sunlight and corrosive/flammable gas or liquid		
E/V	Elevation/vibration 49m/s^2 (5G)		
Agency Approvals	$_C$UR$_{US}$ (E255738), CE		

Note 1 - Shaft connection not included. The IP rating for attached reducers/gearboxes is not guaranteed. Cables may not qualify marked IP rating if bent beyond designated specifications. Use suggested cables for maintaining IP rating.

LS ELECTRIC

LS Electric AC Servo Systems

Drive Software

Drive CM Configuration Software

Drive CM is an optional free downloadable configuration software package for LS Electric servo drives. A PC may be directly connected to the servo drive via any standard USB-A to USB mini-B cable (SV2-PGM-USB15 or SV2-PGM-USB30 recommended).

Features
- Easy-to-use setup wizard guides you through the most common setup functions.
- Digital I/O / Jog Control allows the user to operate the servo system from the PC. This allows the servo to perform some basic motion and check the I/O during startup.
- Parameter Object editor for setting up all drive parameters.
- Tune and check the servo response in real-time using the scope feature.
- Upload and download the drive configuration. Save the drive configuration as a file for backup or future use.
- Edit the drive configuration.
- View all drive faults.
- View drive variable trends in real-time.
- (L7P/L7C series only) Set up 64 internal Indexes (point-to-point moves) that can be triggered by digital inputs or serial communications. Indexes can repeat and can initiate another Index when one move completes.
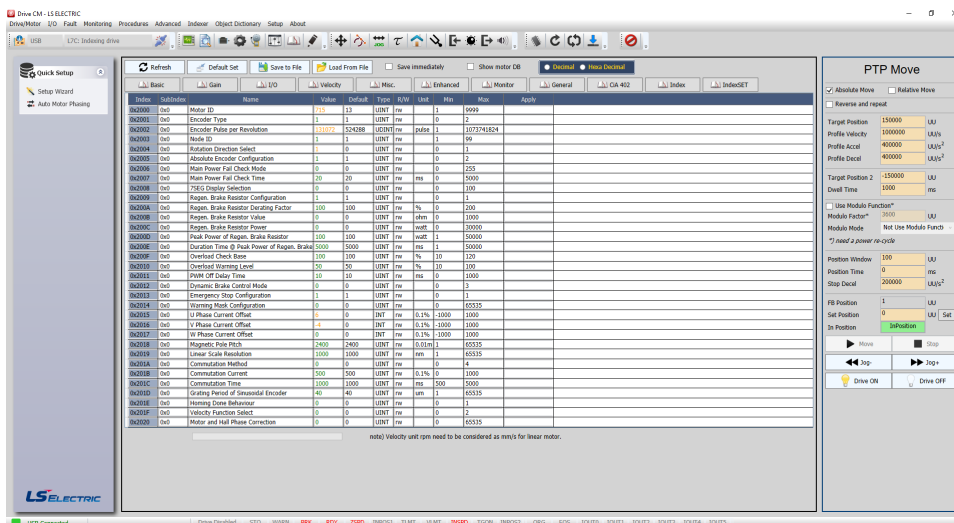
Download
Download the Drive CM software from AutomationDirect's LS Electric support page:

https://support.automationdirect.com/products/lselectric.html
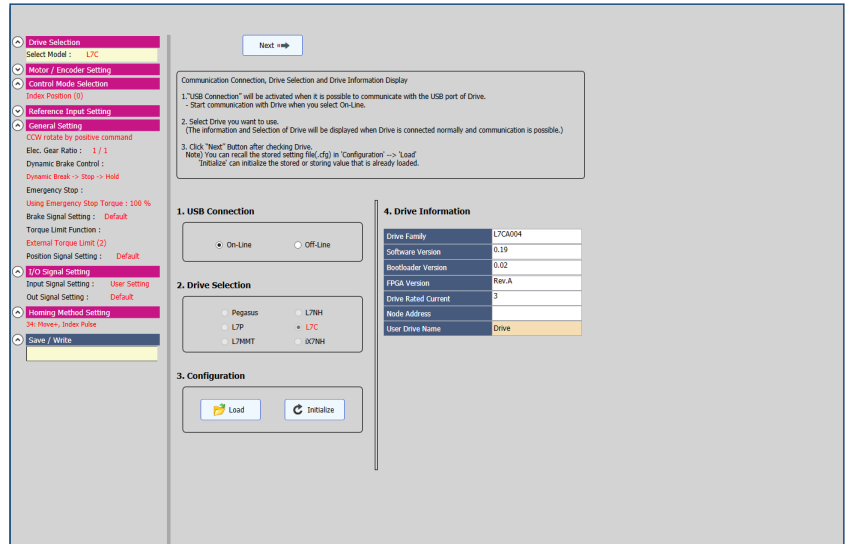
Setup Wizard Screen

Drive CM Software Interface

Parameter Object Editor

The Drive CM configuration tool logically organizes all servo drive object parameters for viewing and editing using the Object Dictionary screen. Each parameter has a factory default that usually allows the servo to run "out-of-the-box".

The parameters can be easily changed with available setting ranges displayed. Tuning modes and parameters can also be changed using Drive CM. 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.

Using the Drive CM software you can also configure and commission your drive without having to be connected to the master controller.
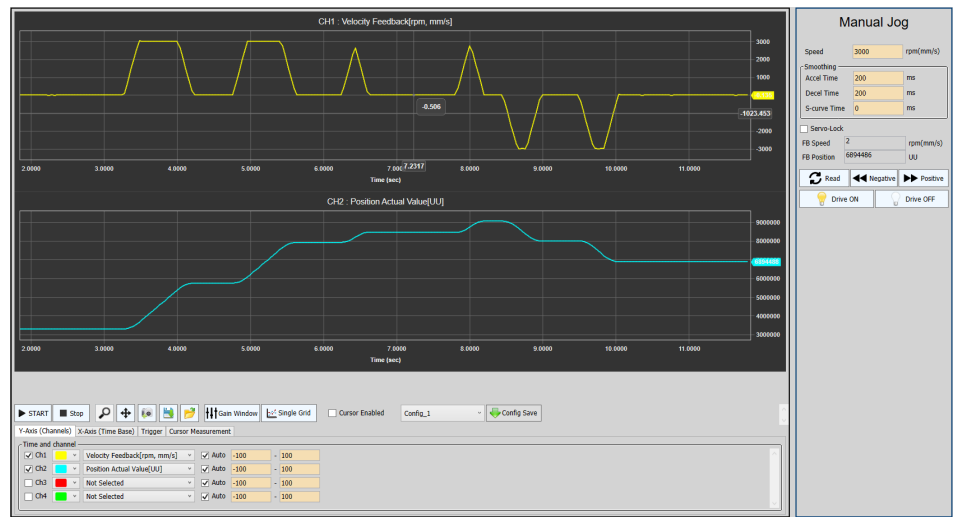
LS ELECTRIC

LS Electric AC Servo Systems

Drive Software, *continued*

Digital I/O, Jog Control, and Scope

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

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

Jog Control / Scope Screen

General Setup Screen

Alarm History Screen

Indexer Setting Screen
(L7P/L7C series only)

Object Dictionary Screen

LS Electric AC Servo Systems

Drive Software, *continued*

Modbus TCP Webserver (iX7NH Series)

When using Modbus TCP as the control mode, the drive can generate a built-in webserver to accomplish most of the tasks Drive CM is used for (configuration, jog, fault monitoring/reset, firmware upgrade, etc.). Setting the drive DIP swtiches to Node 99 enables Modbus TCP and enables the webserver. If your IT security policy does not allow webservers on your network, the webserver can be disabled by using Node 98 (enables Modbus TCP with no webserver). The Node 98 functionality is available in firmware versions 1.15 and above.

Example Webserver Screen

LS ELECTRIC

L7C/L7P Series AC Servo Systems

Accessories

CN1 Accessories

For L7x series drives, two methods are available for creating I/O connections.

Option 1:
Terminal blocks + cables:

- APC-VSCN1T-AD
- APC-VSCN1T01-AD
- APC-VSCN1T02-AD

APC-VSCN1T terminals ship with a universal labeling strip (A1-A25, B1-B25). A labeling template with designations specifically for the L7x drive can be downloaded from any of the drive pages or the terminal block page (www.automationdirect.com/pn/apc-vscn1t-ad).

APC-VSCN1T-AD

Option 2:
Flying lead cables:

- APC-CN101A-AD
- APC-CN102A-AD
- APC-CN103A-AD

APC-CN101A-AD

NOTE: For L7C drives, do not use APC-VSCN1T(xx)-AD feedthrough terminal block if using PLC/Drive serial communication. Communication errors may occur due to disconnects in cable shields. Use APC-CN10xA-AD flying lead cables.

Part Number	Price	Description	Cable Length	Drawing	Compatible Drives
APC-VSCN1T-AD	$85.00	LS Electric CN1 feedthrough terminal block, 50-pole, DIN rail mount	0.5 m [1.6 ft]	PDF	All L7C and L7P drives
APC-VSCN1T01-AD	$96.00		1.0 m [3.2 ft]	PDF	
APC-VSCN1T02-AD	$105.00		2.0 m [6.5 ft]	PDF	
APC-CN101A-AD	$52.00	LS Electric control cable, 50-pin connector to pigtail.	1.0 m [3.2 ft]	PDF	
APC-CN102A-AD	$57.00		2.0 m [6.5 ft]	PDF	
APC-CN103A-AD	$63.00		3.0 m [9.8 ft]	PDF	

1-800-633-0405

For the latest prices, please check AutomationDirect.com.

LS ELECTRIC L7C Series AC Servo Systems

Accessories

L7C Terminal Assignment Table

CAUTION: This terminal assignment table is for use with L7C drives ONLY. Using this table with non-L7C series drives could damage your equipment as terminal assignments are different for each drive series.

APC-VSCN1T-AD

You can download a printable terminal label at https://www.automationdirect.com/pn/APC-VSCN1T-AD

| | 1 (A1) | 2 (B1) |
| | 3 (A2) | 4 (B2) |

Terminal	Drive I/O Pin/Wire #	Description	Wire Color	Stripe Color	Number of Stripes
A1	1	AI-1 (TRQCOM)	Orange	Black	1
B1	2	TXD+	Orange	Red	1
A2	3	TXD-	Orange	Black	2
B2	4	Z0	Orange	Red	2
A3	5	/Z0	Orange	Black	3
B3	6	RXD+	Orange	Red	3
A4	7	RXD-	Orange	Black	4
B4	8	A-GND	Orange	Red	4
A5	9	PF+	Orange	Black	5
B5	10	PF-	Orange	Red	5
A6	11	PR+	Yellow	Black	1
B6	12	PR-	Yellow	Red	1
A7	13	N/C	Yellow	Black	2
B7	14	DO-8	Yellow	Red	2
A8	15	DO-7	Yellow	Black	3
B8	16	DO-6	Yellow	Red	3
A9	17	DI-5	Yellow	Black	4
B9	18	DI-9	Yellow	Red	4
A10	19	DI-8	Yellow	Black	5
B10	20	DI-7	Yellow	Red	5
A11	21	DI-4	Gray	Black	1
B11	22	DI-3	Gray	Red	1
A12	23	DI-2	Gray	Black	2
B12	24	DO-GND24	Gray	Red	2
A13	25	DO-GND24	Gray	Black	3
B13	26	N/C	Gray	Red	3
A14	27	AI-2 (SPDCOM)	Gray	Black	4
B14	28	N/C	Gray	Red	4
A15	29	N/C	Gray	Black	5
B15	30	B0	Gray	Red	5
A16	31	/B0	White	Black	1
B16	32	AO	White	Red	1
A17	33	/AO	White	Black	2
B17	34	+12V	White	Red	2
A18	35	-12V	White	Black	3
B18	36	ENC SG	White	Red	3
A19	37	N/C	White	Black	4
B19	38	DO-1+	White	Red	4
A20	39	DO-1-	White	Black	5
B20	40	DO-2+	White	Red	5
A21	41	DO-2-	Pink	Black	1
B21	42	N/C	Pink	Red	1
A22	43	DO-3	Pink	Black	2
B22	44	DO-4	Pink	Red	2
A23	45	DO-5	Pink	Black	3
B23	46	DI-6	Pink	Red	3
A24	47	DI-1	Pink	Black	4
B24	48	DI-A	Pink	Red	4
A25	49	PULCOM	Pink	Black	5
B25	50	+24v	Pink	Red	5

L7C Drive Terminal Assignments

www.automationdirect.com — Motion Control — tMNC-253

LS ELECTRIC L7P Series AC Servo Systems

Accessories

L7P Terminal Assignment Table

CAUTION: This terminal assignment table is for use with L7P drives ONLY. Using this table with non-L7P series drives could damage your equipment as terminal assignments are different for each drive series.
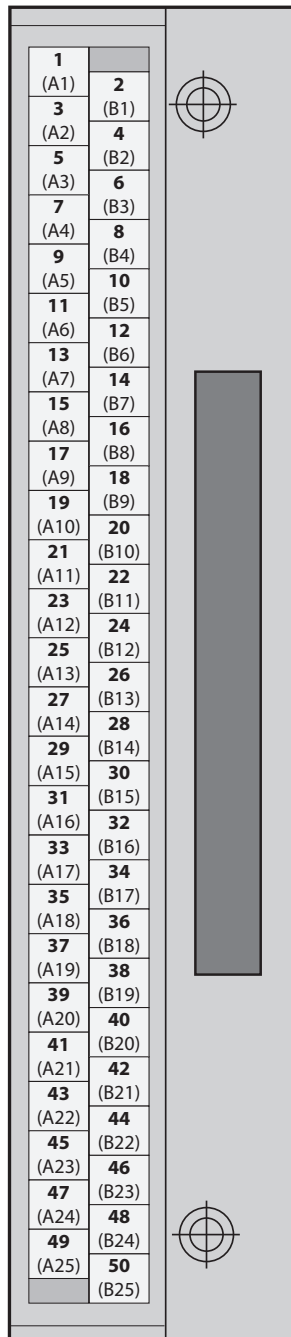
APC-VSCN1T-AD

You can download a printable terminal label at
https://www.automationdirect.com/pn/APC-VSCN1T-AD

L7P Drive Terminal Assignments					
Terminal	Drive I/O Pin/ Wire #	Description	Wire Color	Stripe Color	Number of Stripes
A1	1	AO	Orange	Black	1
B1	2	/AO	Orange	Red	1
A2	3	BO	Orange	Black	2
B2	4	/BO	Orange	Red	2
A3	5	ZO	Orange	Black	3
B3	6	/ZO	Orange	Red	3
A4	7	A-TLMT	Orange	Black	4
B4	8	AGND	Orange	Red	4
A5	9	A-OVR	Orange	Black	5
B5	10	AGND	Orange	Red	5
A6	11	+24V	Yellow	Black	1
B6	12	DI-1	Yellow	Red	1
A7	13	DI-2	Yellow	Black	2
B7	14	DI-3	Yellow	Red	2
A8	15	DI-4	Yellow	Black	3
B8	16	DI-5	Yellow	Red	3
A9	17	DI-6	Yellow	Black	4
B9	18	DI-7	Yellow	Red	4
A10	19	DI-8	Yellow	Black	5
B10	20	N/C	Yellow	Red	5
A11	21	+24v	Gray	Black	1
B11	22	DI-9	Gray	Red	1
A12	23	DI-10	Gray	Black	2
B12	24	DI-11	Gray	Red	2
A13	25	DI-12	Gray	Black	3
B13	26	DI-13	Gray	Red	3
A14	27	DI-14	Gray	Black	4
B14	28	DI-15	Gray	Red	4
A15	29	DI-16	Gray	Black	5
B15	30	PULCOM 24V pwr input	Gray	Red	5
A16	31	PF+	White	Black	1
B16	32	PF-	White	Red	1
A17	33	PR+	White	Black	2
B17	34	PR-	White	Red	2
A18	35	DO-1+	White	Black	3
B18	36	DO-1-	White	Red	3
A19	37	DO-2+	White	Black	4
B19	38	DO-2-	White	Red	4
A20	39	DO-3+	White	Black	5
B20	40	DO-3-	White	Red	5
A21	41	DO-4+	Pink	Black	1
B21	42	DO-4-	Pink	Red	1
A22	43	DO-5+	Pink	Black	2
B22	44	DO-5-	Pink	Red	2
A23	45	DO-6+	Pink	Black	3
B23	46	DO-6-	Pink	Red	3
A24	47	DO-7+	Pink	Black	4
B24	48	DO-7-	Pink	Red	4
A25	49	DO-8+	Pink	Black	5
B25	50	DO-8-	Pink	Red	5

LS *ELECTRIC*

iX7NH Series Accessories

Accessories

CN1 Accessories

For iX7NH series drives, two methods are available for creating I/O connections.

Option 1:
Terminal blocks + cables:

- APCS-L7NCN1T-AD
- APCS-L7NCN1T01-AD
- APCS-L7NCN1T015-AD
- APCS-L7NCN1T02-AD

APCS-L7NCN1T terminals ship with a universal labeling strip (A1-A10, B1-B10). A labeling template with designations specifically for the i7X drive can be downloaded from any of the drive pages or the terminal block page (www.automationdirect.com/pn/apcs-l7ncn1t-ad).
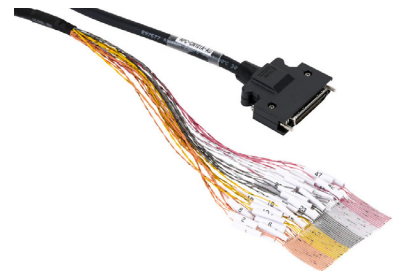
Option 2:
Flying lead cables:

- APCS-CN101A-AD
- APCS-CN102A-AD
- APCS-CN103A-AD

APCS-L7NCN1T-AD

APCS-CN101A-AD

Part Number	Price	Description	Cable Length	Drawing	Compatible Drives
APCS-L7NCN1T-AD	$64.00	LS Electric CN1 feedthrough terminal block, 20-pole, DIN rail mount. For use with all LS Electric iX7 series drives.	0.5 m [1.6 ft]	PDF	All iX7NH drives
APCS-L7NCN1T01-AD	$67.00		1.0 m [3.2 ft]	PDF	
APCS-L7NCN1T015-AD	$69.00		1.5 m [4.9 ft]	PDF	
APCS-L7NCN1T02-AD	$72.00		2.0 m [6.5 ft]	PDF	
APCS-CN101A-AD	$44.00	LS Electric CN1 control cable, 20-pin connector to pigtail.	1.0 m [3.2 ft]	PDF	
APCS-CN102A-AD	$49.00		2.0 m [6.5 ft]	PDF	
APCS-CN103A-AD	$51.00		3.0 m [9.8 ft]	PDF	

LS ELECTRIC

iX7NH Series Accessories

Accessories

iX7NH Terminal Assignment Table

CAUTION: This terminal assignment table is for use with iX7NH drives ONLY. Using this table with non-iX7NH series drives could damage your equipment as terminal assignments are different for each drive series.

APCS-L7NCN1Txxx-AD

You can download a printable terminal label at https://www.automationdirect.com/pn/APCS-L7NCN1T-AD
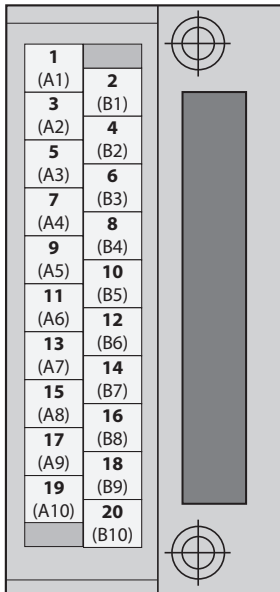
iX7NH Drive Terminal Assignments					
Terminal	Drive I/O Pin/Wire #	Description	Wire Color	Stripe Color	Number of Stripes
A1	1	DO1	Yellow	Black	1
B1	2	DOCOM	Yellow	Red	1
A2	3	DO2	Yellow	Black	2
B2	4	DO3	Yellow	Red	2
A3	5	AGND	Yellow	Black	3
B3	6	+24V	Yellow	Red	3
A4	7	DI3	Yellow	Black	4
B4	8	DI4	Yellow	Red	4
A5	9	AO	Yellow	Black	5
B5	10	/AO	Yellow	Red	5
A6	11	DI1	White	Black	1
B6	12	DI2	White	Red	1
A7	13	DI5	White	Black	2
B7	14	DI6	White	Red	2
A8	15	A-TLMT	White	Black	3
B8	16	GND	White	Red	3
A9	17	ZO	White	Black	4
B9	18	/ZO	White	Red	4
A10	19	BO	White	Black	5
B10	20	/BO	White	Red	5

LS *ELECTRIC*

iX7NH Series Accessories

Accessories, *continued*

NOTE: These parts available for sale to North American locations only

iX7NH System STO Cables

Use these pre-made factory cables to easily connect the drive STO connector to a safety relay.

Part Number	Price	Length	Description	Drawing	Compatible Motors
APCS-STO03A-AD	$45.00	0.3 m [1ft]	LS Electric STO cable, 6-pin connector to pigtail,	PDF	All iX7NH series drives
APCS-STO10A-AD	$48.00	1m [3.2 ft]		PDF	
APCS-STO30A-AD	$51.00	3m [9.8 ft]		PDF	

APCS-STO series cable

iX7NH STO Bypass Connector

Replacement STO bypass connector. Note that each drive ships with an APCS-CN6K bypass connector included - this is only needed as a replacement.

Part Number	Price	Description	Drawing	Compatible Motors
APCS-CN6K-AD	$33.50	LS Electric STO connector, replacement, 6-pin. For use with all LS Electric iX7 series drives.	PDF	All iX7NH series drives

APCS-CN6K-AD

LS Electric AC Servo Systems

Accessories, *continued*

NOTE: These parts available for sale to North American locations only

L7C/L7P/iX7NH System Motor Encoder Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Compatible Motors
APCS-EN03ES-AD	$54.00	N	3m [9.8 ft]	24AWG	PDF	APMC motors with 17-bit incremental encoders (AYK/AYK2 motors)
APCS-EN05ES-AD	$66.00		5m [16.4 ft]		PDF	
APCS-EN10ES-AD	$76.00		10m [32.8 ft]		PDF	
APCS-EN20ES-AD	$89.00		20m [65.6 ft]		PDF	
APCS-EF03ES-AD	$79.00	Y	3m [9.8 ft]		PDF	
APCS-EF05ES-AD	$94.00		5m [16.4 ft]		PDF	
APCS-EF10ES-AD	$131.00		10m [32.8 ft]		PDF	
APCS-EF20ES-AD	$213.00		20m [65.6 ft]		PDF	
APCS-EN03ES1-AD	$89.00	N	3m [9.8 ft]	24AWG	PDF	FBL/FCL series motors with 19-bit encoders
APCS-EN05ES1-AD	$94.00		5m [16.4 ft]		PDF	
APCS-EN10ES1-AD	$109.00		10m [32.8 ft]		PDF	
APCS-EN20ES1-AD	$136.00		20m [65.6 ft]		PDF	
APCS-EF03ES1-AD	$112.00	Y	3m [9.8 ft]		PDF	
APCS-EF05ES1-AD	$133.00		5m [16.4 ft]		PDF	
APCS-EF10ES1-AD	$180.00		10m [32.8 ft]		PDF	
APCS-EF20ES1-AD	$276.00		20m [65.6 ft]		PDF	
APCS-EN03DS1-AD	$94.00	N	3m [9.8 ft]		PDF	APM-FE/APM-FF series motors
APCS-EN05DS1-AD	$100.00		5m [16.4 ft]		PDF	
APCS-EN10DS1-AD	$112.00		10m [32.8 ft]		PDF	
APCS-EN20DS1-AD	$140.00		20m [65.6 ft]		PDF	
APCS-EF03DS1-AD	$118.00	Y	3m [9.8 ft]		PDF	
APCS-EF05DS1-AD	$136.00		5m [16.4 ft]		PDF	
APCS-EF10DS1-AD	$180.00		10m [32.8 ft]		PDF	
APCS-EF20DS1-AD	$278.00		20m [65.6 ft]		PDF	

APCS-EN series encoder cable

APCS-ENxxxES1 series encoder cable

L7P/iX7NH System Encoder Accessories

Part Number	Price	Description	Compatible Drives
APC-EF00BS-AD	$22.50	17-pin motor encoder connector.	APM-FE and APM-FF series motors
APCS-BATT36-AD	$40.50	Encoder battery. One (1) AA ER6V lithium battery with extended leads and an encoder cable connector.	All LS Electric motors with 19-bit encoders

APC-EF00BS-AD

APCS-BATT36-AD

LS ELECTRIC

LS Electric AC Servo Systems

Accessories, *continued*

NOTE: These parts available for sale to North American locations only

L7C/L7P/iX7NH System Motor Brake Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Compatible Motors
APCS-BN03QS-AD	$59.00	N	3m [9.8 ft]	18AWG	PDF	APMC FBL/FCL brake motors (100W – 1kW)
APCS-BN05QS-AD	$63.00		5m [16.4 ft]		PDF	
APCS-BN10QS-AD	$69.00		10m [32.8 ft]		PDF	
APCS-BN20QS-AD	$84.00		20m [65.6 ft]		PDF	
APCS-BF03QS-AD	$66.00	Y	3m [9.8 ft]		PDF	
APCS-BF05QS-AD	$72.00		5m [16.4 ft]		PDF	
APCS-BF10QS-AD	$89.00		10m [32.8 ft]		PDF	
APCS-BF20QS-AD	$122.00		20m [65.6 ft]		PDF	

APCS-BN series brake cable

LS ELECTRIC

iX7NH Series Accessories

iX7NH System Non-Brake Motor Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Compatible Motors
APCS-PN03LSX-AD	$54.00	N	3m [9.8 ft]		PDF	FBL/FCL series motors
APCS-PN05LSX-AD	$61.00		5m [16.4 ft]		PDF	
APCS-PN10LSX-AD	$74.00		10m [32.8 ft]		PDF	
APCS-PN20LSX-AD	$107.00		20m [65.6 ft]		PDF	
APCS-PF03LSX-AD	$63.00	Y	3m [9.8 ft]		PDF	
APCS-PF05LSX-AD	$74.00		5m [16.4 ft]		PDF	
APCS-PF10LSX-AD	$106.00		10m [32.8 ft]		PDF	
APCS-PF20LSX-AD	$165.00		20m [65.6 ft]		PDF	
APCS-PN03HSX1-AD	$54.00	N	3m [9.8 ft]		PDF	APM-FE15A series motors without brake
APCS-PN05HSX1-AD	$63.00		5m [16.4 ft]		PDF	
APCS-PN10HSX1-AD	$81.00		10m [32.8 ft]		PDF	
APCS-PN20HSX1-AD	$122.00		20m [65.6 ft]		PDF	
APCS-PF03HSX1-AD	$64.00	Y	3m [9.8 ft]		PDF	
APCS-PF05HSX1-AD	$77.00		5m [16.4 ft]		PDF	
APCS-PF10HSX1-AD	$113.00		10m [32.8 ft]		PDF	
APCS-PF20HSX1-AD	$179.00		20m [65.6 ft]		PDF	
APCS-PN03HSX-AD	$50.00	N	3m [9.8 ft]		PDF	APM-FE16D and APM-FE22D series motors without brake
APCS-PN05HSX-AD	$61.00		5m [16.4 ft]		PDF	
APCS-PN10HSX-AD	$84.00		10m [32.8 ft]		PDF	
APCS-PN20HSX-AD	$131.00		20m [65.6 ft]		PDF	
APCS-PF03HSX-AD	$65.00	Y	3m [9.8 ft]		PDF	
APCS-PF05HSX-AD	$84.00		5m [16.4 ft]		PDF	
APCS-PF10HSX-AD	$131.00		10m [32.8 ft]		PDF	
APCS-PF20HSX-AD	$227.00		20m [65.6 ft]		PDF	
APCS-PN03ISX-AD	$55.00	N	3m [9.8 ft]		PDF	APM-FF35D motors without brake
APCS-PN05ISX-AD	$65.00		5m [16.4 ft]		PDF	
APCS-PN10ISX-AD	$89.00		10m [32.8 ft]		PDF	
APCS-PN20ISX-AD	$136.00		20m [65.6 ft]		PDF	
APCS-PF03ISX-AD	$72.00	Y	3m [9.8 ft]		PDF	
APCS-PF05ISX-AD	$90.00		5m [16.4 ft]		PDF	
APCS-PF10ISX-AD	$141.00		10m [32.8 ft]		PDF	
APCS-PF20ISX-AD	$241.00		20m [65.6 ft]		PDF	

NOTE: These parts available for sale to North American locations only

APCS-PxxLSX series power cable

APCS-PxxHSX1 series power cable

APCS-PxxHSX series power cable

Accessories, _continued_

iX7NH System Brake Motor Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Compatible Motors
Note: For FBL/FCL 100W–1kW motors with brake, use the power cables on the previous page AND separate brake cable APCS-BxxxQS-AD from page page tMNC-259. This is for FBL/FCL motors only. FE and FF motors have brake wiring incorporated into the power cable (below).						
APCS-PN03NBX1-AD	$66.00	N	3m [9.8 ft]		PDF	APM-FE15A series motors with brakes
APCS-PN05NBX1-AD	$77.00		5m [16.4 ft]		PDF	
APCS-PN10NBX1-AD	$107.00		10m [32.8 ft]		PDF	
APCS-PN20NBX1-AD	$163.00		20m [65.6 ft]		PDF	
APCS-PF03NBX1-AD	$81.00	Y	3m [9.8 ft]		PDF	
APCS-PF05NBX1-AD	$103.00		5m [16.4 ft]		PDF	
APCS-PF10NBX1-AD	$157.00		10m [32.8 ft]		PDF	
APCS-PF20NBX1-AD	$268.00		20m [65.6 ft]		PDF	
APCS-PN03NBX-AD	$58.00	N	3m [9.8 ft]		PDF	APM-FE16D and APM-FE22D series motors with brakes
APCS-PN05NBX-AD	$69.00		5m [16.4 ft]		PDF	
APCS-PN10NBX-AD	$98.00		10m [32.8 ft]		PDF	
APCS-PN20NBX-AD	$155.00		20m [65.6 ft]		PDF	
APCS-PF03NBX-AD	$76.00	Y	3m [9.8 ft]		PDF	
APCS-PF05NBX-AD	$101.00		5m [16.4 ft]		PDF	
APCS-PF10NBX-AD	$155.00		10m [32.8 ft]		PDF	
APCS-PF20NBX-AD	$275.00		20m [65.6 ft]		PDF	
APCS-PN03PBX-AD	$79.00	Y	3m [9.8 ft]		PDF	APM-FF35D series motors with brakes
APCS-PN05PBX-AD	$92.00		5m [16.4 ft]		PDF	
APCS-PN10PBX-AD	$133.00		10m [32.8 ft]		PDF	
APCS-PN20PBX-AD	$209.00		20m [65.6 ft]		PDF	
APCS-PF03PBX-AD	$101.00	N	3m [9.8 ft]		PDF	
APCS-PF05PBX-AD	$133.00		5m [16.4 ft]		PDF	
APCS-PF10PBX-AD	$206.00		10m [32.8 ft]		PDF	
APCS-PF20PBX-AD	$356.00		20m [65.6 ft]		PDF	

APCS-PxxNBX1 series power cable

APCS-PxxNBX series power cable

APCS-PxxPBX series power cable

LS *ELECTRIC* L7C Series AC Servo Systems

Accessories, *continued*

NOTE: These parts available for sale to North American locations only

L7C System Motor Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Compatible Motors
APCS-PN03LSC-AD	$45.00	N	3m [9.8 ft]	18AWG	PDF	APMC FBL/FCL motors (100W – 1kW) used with L7C drives
APCS-PN05LSC-AD	$54.00		5m [16.4 ft]		PDF	
APCS-PN10LSC-AD	$70.00		10m [32.8 ft]		PDF	
APCS-PN20LSC-AD	$97.00		20m [65.6 ft]		PDF	
APCS-PF03LSC-AD	$59.00	Y	3m [9.8 ft]		PDF	
APCS-PF05LSC-AD	$77.00		5m [16.4 ft]		PDF	
APCS-PF10LSC-AD	$109.00		10m [32.8 ft]		PDF	
APCS-PF20LSC-AD	$172.00		20m [65.6 ft]		PDF	

APCS-PN series motor cable

LS ELECTRIC   L7P Series AC Servo Systems

L7P System Non-Brake Motor Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Compatible Motors
APCS-PN03LS-AD	$48.00	N	3m [9.8 ft]	18AWG	PDF	FBL/FCL series motors
APCS-PN05LS-AD	$52.00		5m [16.4 ft]		PDF	
APCS-PN10LS-AD	$65.00		10m [32.8 ft]		PDF	
APCS-PN20LS-AD	$90.00		20m [65.6 ft]		PDF	
APCS-PF03LS-AD	$61.00	Y	3m [9.8 ft]		PDF	
APCS-PF05LS-AD	$70.00		5m [16.4 ft]		PDF	
APCS-PF10LS-AD	$102.00		10m [32.8 ft]		PDF	
APCS-PF20LS-AD	$164.00		20m [65.6 ft]		PDF	
APCS-PN03HS-AD	$42.00	N	3m [9.8 ft]	14AWG	PDF	APM-FE series motors without brake
APCS-PN05HS-AD	$50.00		5m [16.4 ft]		PDF	
APCS-PN10HS-AD	$70.00		10m [32.8 ft]		PDF	
APCS-PN20HS-AD	$111.00		20m [65.6 ft]		PDF	
APCS-PF03HS-AD	$59.00	Y	3m [9.8 ft]		PDF	
APCS-PF05HS-AD	$75.00		5m [16.4 ft]		PDF	
APCS-PF10HS-AD	$120.00		10m [32.8 ft]		PDF	
APCS-PF20HS-AD	$209.00		20m [65.6 ft]		PDF	
APCS-PN03IS-AD	$57.00	N	3m [9.8 ft]		PDF	230VAC APM-FF35D and 460VAC APM-FFP35D motors without brakes
APCS-PN05IS-AD	$73.00		5m [16.4 ft]		PDF	
APCS-PN10IS-AD	$111.00		10m [32.8 ft]		PDF	
APCS-PN20IS-AD	$189.00		20m [65.6 ft]		PDF	
APCS-PF03IS-AD	$73.00	Y	3m [9.8 ft]		PDF	
APCS-PF05IS-AD	$97.00		5m [16.4 ft]		PDF	
APCS-PF10IS-AD	$158.00		10m [32.8 ft]		PDF	
APCS-PF20IS-AD	$286.00		20m [65.6 ft]		PDF	
APCS-PN03JS-AD	$66.00	N	3m [9.8 ft]	10AWG	PDF	230VAC APM-FF55D motors without brake
APCS-PN05JS-AD	$87.00		5m [16.4 ft]		PDF	
APCS-PN10JS-AD	$136.00		10m [32.8 ft]		PDF	
APCS-PN20JS-AD	$250.00		20m [65.6 ft]		PDF	
APCS-PF03JS-AD	$94.00	Y	3m [9.8 ft]		PDF	
APCS-PF05JS-AD	$131.00		5m [16.4 ft]		PDF	
APCS-PF10JS-AD	$230.00		10m [32.8 ft]		PDF	
APCS-PF20JS-AD	$426.00		20m [65.6 ft]		PDF	
APCS-PF03JS1-AD	$78.00	Y	3m [9.8 ft]	12AWG	PDF	460VAC APM-FFP55D and APM-FFP75D motors without brakes
APCS-PF05JS1-AD	$108.00		5m [16.4 ft]		PDF	
APCS-PF10JS1-AD	$180.00		10m [32.8 ft]		PDF	
APCS-PF20JS1-AD	$328.00		20m [65.6 ft]		PDF	
APCS-PN03JS2-AD	$112.00	N	3m [9.8 ft]	8AWG	PDF	230VAC APM-FF75D motors without brake
APCS-PN05JS2-AD	$157.00		5m [16.4 ft]		PDF	
APCS-PN10JS2-AD	$266.00		10m [32.8 ft]		PDF	
APCS-PN20JS2-AD	$484.00		20m [65.6 ft]		PDF	
APCS-PF03JS2-AD	$163.00	Y	3m [9.8 ft]		PDF	
APCS-PF05JS2-AD	$238.00		5m [16.4 ft]		PDF	
APCS-PF10JS2-AD	$424.00		10m [32.8 ft]		PDF	
APCS-PF20JS2-AD	$796.00		20m [65.6 ft]		PDF	

APCS-PxxLS series power cable

APCS-PxxHS series power cable

APCS-PxxIS series power cable

APCS-PxxJS series power cable

LS ELECTRIC L7P Series AC Servo Systems

Accessories, *continued*

L7P System Brake Motor Power Cables

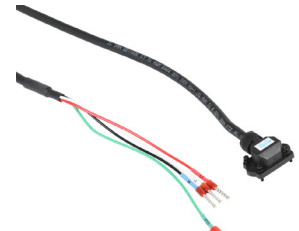| Part Number	Price	Flex Rated	Length	Gauge	Drawing	Compatible Motors
Note: For FBL/FCL 100W–1kW motors with brake, use the power cables on page tMNC-234 (APCS-PxxxLS-AD) AND spearate brake cable APCS-BxxxQS-AD from page tMNC-232. This is for FBL/FCL motors only. FE and FF motors have brake wiring incorporated into the power cable (below).						
APCS-PN03NB-AD	$55.00	N	3m [9.8 ft]	14AWG	PDF	230VAC and 460 VAC APM-FE series motors with brakes
APCS-PN05NB-AD	$66.00		5m [16.4 ft]		PDF	
APCS-PN10NB-AD	$96.00		10m [32.8 ft]		PDF	
APCS-PN20NB-AD	$155.00		20m [65.6 ft]		PDF	
APCS-PF03NB-AD	$80.00	Y	3m [9.8 ft]		PDF	
APCS-PF05NB-AD	$108.00		5m [16.4 ft]		PDF	
APCS-PF10NB-AD	$174.00		10m [32.8 ft]		PDF	
APCS-PF20NB-AD	$310.00		20m [65.6 ft]		PDF	
APCS-PN03PB-AD	$78.00	N	3m [9.8 ft]		PDF	230VAC APM-FF35D and 460VAC APM-FFP35D motors with brakes
APCS-PN05PB-AD	$99.00		5m [16.4 ft]		PDF	
APCS-PN10PB-AD	$151.00		10m [32.8 ft]		PDF	
APCS-PN20PB-AD	$260.00		20m [65.6 ft]		PDF	
APCS-PF03PB-AD	$100.00	Y	3m [9.8 ft]		PDF	
APCS-PF05PB-AD	$136.00		5m [16.4 ft]		PDF	
APCS-PF10PB-AD	$224.00		10m [32.8 ft]		PDF	
APCS-PF20PB-AD	$407.00		20m [65.6 ft]		PDF	
APCS-PN03LB-AD	$75.00	N	3m [9.8 ft]	8AWG	PDF	230VAC APM-FF55D motors with brake
APCS-PN05LB-AD	$96.00		5m [16.4 ft]		PDF	
APCS-PN10LB-AD	$149.00		10m [32.8 ft]		PDF	
APCS-PN20LB-AD	$256.00		20m [65.6 ft]		PDF	
APCS-PF03LB-AD	$109.00	Y	3m [9.8 ft]		PDF	
APCS-PF05LB-AD	$154.00		5m [16.4 ft]		PDF	
APCS-PF10LB-AD	$266.00		10m [32.8 ft]		PDF	
APCS-PF20LB-AD	$493.00		20m [65.6 ft]		PDF	
APCS-PF03LB1-AD	$91.00	Y	3m [9.8 ft]	12AWG	PDF	460VAC APM-FFP55D and APM-FFP75D motors with brakes
APCS-PF05LB1-AD	$124.00		5m [16.4 ft]		PDF	
APCS-PF10LB1-AD	$212.00		10m [32.8 ft]		PDF	
APCS-PF20LB1-AD	$386.00		20m [65.6 ft]		PDF	
APCS-PN03LB2-AD	$124.00	N	3m [9.8 ft]	8AWG	PDF	230VAC APM-FF75D motors with brake
APCS-PN05LB2-AD	$172.00		5m [16.4 ft]		PDF	
APCS-PN10LB2-AD	$289.00		10m [32.8 ft]		PDF	
APCS-PN20LB2-AD	$521.00		20m [65.6 ft]		PDF	
APCS-PF03LB2-AD	$180.00	Y	3m [9.8 ft]		PDF	
APCS-PF05LB2-AD	$263.00		5m [16.4 ft]		PDF	
APCS-PF10LB2-AD	$464.00		10m [32.8 ft]		PDF	
APCS-PF20LB2-AD	$875.00		20m [65.6 ft]		PDF	

APCS-PxxNB series power cable

APCS-PxxPB series power cable

APCS-PxxLB series power cable

LS ELECTRIC

LS Drive System Accessories

Accessories, *continued*

LS Drive System Replacement Connectors

Part Number	Price	Description	Compatible Drives	Image
5452573	$10.00	AutomationDirect replacement drive power connector.	All L7C drives	
APC-CN1NNA-AD	$35.50	LS solder-type CN1 50-pin Electric I/O connector.	All L7C and L7P series drives	
APC-CN2NNA-AD	$28.50	LS Electric I/O connector, replacement, 20-pin.	All iX7NH series drives	
APC-CN3NNA-AD	$35.50	LS Electric solder-type CN2 14-pin drive encoder connector.	All L7C, L7P, and iX7NH series drives	
APCS-CN6K-AD	$33.50	LS Electric STO connector, replacement, 6-pin. For use with all LS Electric iX7 series drives.	All iX7NH series drives	
IX7-CON-A	$21.00	AutomationDirect drive power connector, replacement, 11-pin.	iX7NH series drives, 400W, 750W, and 1kW	
IX7-CON-B	$21.00	AutomationDirect drive power connector for motor power, replacement, 4-pin.	iX7NH series drives, 400W, 750W, and 1kW	
IX7-CON-C	$10.00	AutomationDirect drive power connector release, replacement.	iX7NH series drives, 400W, 750W, and 1kW	
IX7-CON-D	$21.00	AutomationDirect drive power connector for motor power, replacement, 4-pin	iX7NH series drives, 2kW and 3.5 kW	
IX7-CON-E	$21.00	AutomationDirect drive control power connector, replacement, 5-pin.	iX7NH series drives, 2kW and 3.5 kW	
IX7-CON-F	$21.00	AutomationDirect drive main power connector, replacement, 6-pin.	iX7NH series drives, 2kW and 3.5 kW	
L7P-CON-A	$16.50	Replacement 11-pin drive power connector.	L7PA series 230VAC 400W and 1kW drives	
L7P-CON-B	$8.75	Replacement 3-pin drive power connector.	L7PA series 230VAC 400W and 1kW drives	
Continued on next page				

LS *ELECTRIC*

LS Drive System Accessories

Accessories, *continued*

LS Drive System Replacement Connectors, *continued*

Part Number	Price	Description	Compatible Drives	Image
L7P-CON-C	$22.00	Replacement 11-pin drive power connector.	L7PB series 460VAC 1kW drives, all L7P series 2kW and 3.5 kW drives	
L7P-CON-D	$8.25	Replacement 3-pin drive power connector.	L7PB series 460VAC 1kW drives, all L7P series 2kW and 3.5 kW drives	
L7P-CON-E	$0.75	Drive analog monitor crimp pins (24-48 AWG), package of 5.	All L7P and iX7NH drives. Requires L7P-CON-F	
L7P-CON-F	$2.25	Drive analog monitor 4-pin crimp connector.	All L7P and iX7NH drives. Requires L7P-CON-E	
L7P-CON-G	$2.25	Drive analog monitor 4-pin IDC connector (26AWG).	All L7P and iX7NH series drives	

LS *ELECTRIC*

LS Electric AC Servo Systems

Accessories, *continued*

L7C/L7P/iX7NH System Braking Resistors

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

Part Number	Price	Description	Drawing	Compatible Drives
APCS-140R50-AD	$21.00	LS Electric 140W 30Ω encapsulated braking resistor	PDF	All 400W LS drives
APCS-300R30-AD	$27.00	LS Electric 300W 30Ω encapsulated braking resistor	PDF	All 230VAC 750W and 1kW LS drives
APC-600R30-AD	$48.00	LS Electric 600W 30Ω encapsulated braking resistor.	PDF	All 230VAC 2.2 kW and 3.5 kW LS drives
APC-600R28-AD	$73.00	LS Electric 600W 28Ω encapsulated braking resistor.	PDF	All 230VAC 5.5 kW and 7.5 kW LS drives
APCS-300R82-AD	$18.00	LS Electric 300W 82Ω encapsulated braking resistor.	PDF	All 460VAC 1kW LS drives
APCS-600R140-AD	$48.00	LS Electric 600W 140Ω encapsulated braking resistor.	PDF	All 460VAC 2.2 kW and 3.5 kW LS drives
APCS-600R75-AD	$48.00	LS Electric 600W 75Ω encapsulated braking resistor.	PDF	All 460VAC 5.5 kW and 7.5 kW LS drives

APCS-140R50-AD

NOTE: 600W resistors require customer-supplied M5-.8 bolts and cable lugs for connection.

Motion Control

LS ELECTRIC AC Servo Systems Accessories

Servo System EMI 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.

Part Number	Price	Rating	Description	Drawing	Compatible Drives
TB1-10A0D0	$76.00	10A	LS Electric EMI input filter, 250 VAC, 1-phase, 10A, panel mount, EMI/RFI filtering, 2-stage, drive rated, standard performance, screw terminals. For use with 1-phase AC drives.	PDF	All L7C series drives
TB6-B010LBEI	$98.00	10A	LS Electric EMI input filter, 550VAC, 3-phase, panel mount, EMI/RFI filtering, drive rated, standard performance, screw terminals.	PDF	L7P and iX7NH 230V 400W through 1kW drives
TB6-B020NBDC	$124.00	20A		PDF	L7P 460V 2kW and 3.5 kW drives
TB6-B030NBDC	$118.00	30A		PDF	L7P and iX7NH 230V: 2kW, 3.5 kW and L7P 460V: 5kW
TB6-B040AS	$204.00	40A		PDF	L7P 230V: 5kW 460V: 7.5 kW
TB6-B060LAS	$354.00	50A		PDF	L7P 230V: 7.5 kW drives

TB1-10A0D0

TB6-B010LBEI

LS ELECTRIC

LS Electric AC Servo Systems

Accessories, *continued*

NOTE: *These parts available for sale to North American locations only*

L7C/L7P/iX7NH System Planetary Gearboxes

Precision planetary gearboxes can increase the torque output of servo systems while reducing the reflected load inertia for higher response. Gearboxes offer high stiffness, high efficiency, and very quiet operation. Input motor shaft clamp, oversized output shaft key, and mounting hardware are included for mating to LS Electric motors.

Features:
• Maintenance free (no need to replace lubrication)
• IP65
• Operating temperature range of -10°C to +90°C [14°F to 194°F]
• Uses VIGO Grease RE #0

MSS Series Planetary Gearbox

MSS Series Planetary Gearbox Specfications										
Model	*96200004*	*96200005*	*96200103*	*96200007*	*96200008*	*96200257*	*96200373*	*96200378*	*96200393*	*96200459*
Manufacturer Part Number	MSS0601A-005KS-B3110103C14	MSS0601A-010KS-B3110103C14	MSS0902B-020KS-B3110103C14	MSS0901A-005KS-C3110103C19	MSS0901A-010KS-C3110103C19	MSS1152B-020KS-C3110103C19	MSS0901A-005KS-C4120103C19	MSS0901A-010KS-C4120103C19	MSS1152B-020KS-C4120103C19	MSS1151A-005KS-D3110103C22
Compatible Motors	APMC-FBL series 100, 200, and 400 W motors			APMC FCL series 750W and 1kW motors			APM-FE series 900W and 1.5 kW motors			APM-FE series 1.6 kW motors
Price	$327.00	$336.00	$598.00	$426.00	$439.00	$864.00	$385.00	$396.00	$792.00	$549.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Ratio	5:1	10:1	20:1	5:1	10:1	20:1	5:1	10:1	20:1	5:1
Nominal Output Torque	54 N·m	42 N·m	143 N·m	160 N·m	121 N·m	295 N·m	160 N·m	121 N·m	295 N·m	332 N·m
Inertia	0.13 kg/cm^2	0.13 kg/cm^2	0.13 kg/cm^2	0.48 kg/cm^2	0.44 kg/cm^2	0.48 kg/cm^2	0.48 kg/cm^2	0.44 kg/cm^2	0.48 kg/cm^2	2.81 kg/cm^2
Output Shaft Diameter	16mm	16mm	22mm	22mm	22mm	32mm	22mm	22mm	32mm	32mm
Stage	1	1	2	1	1	2	1	1	2	1
Frame	60mm	60mm	90mm	90mm	90mm	115mm	90mm	90mm	115mm	115mm
Nominal Input Speed (rpm)	5,000	5,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000	4,000
Max Input Speed (rpm)	10,000	10,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000	8,000
Emergency Stop Torque	3 times nominal output torque									
Noise (dB)	≤54	≤54	≤56	≤56	≤56	≤59	≤56	≤56	≤59	≤59
Efficiency (%)	≥97	≥97	≥94	≥97	≥97	≥94	≥97	≥97	≥94	≥97
Backlash (Arcmin)	≤7	≤7	≤9	≤7	≤7	≤9	≤7	≤7	≤9	≤7
Max Radial Load (N)	1,280	1,280	3,200	3,200	3,200	6,800	3,200	3,200	6,800	6,800
Max Axial Load (N)	690	690	1,600	1,600	1,600	3,400	1,600	1,600	3,400	3,400
Service Life (Hours)	20,000 (10,000 under continuous operation)									
Continued on next page										

LS Electric AC Servo Systems

LS *ELECTRIC*

Accessories, *continued*

MSS Series Planetary Gearbox Specfications										
Model	*96200464*	*96200479*	*96200010*	*96200011*	*96200445*	*96200013*	*96200014*	*96200701*	*96200016*	*96200017*	*96200862*
Manufacturer Part Number	MSS1151A-010KS-D3110103C22	MSS1422B-020KS-D3110103C22	MSS1151A-005KS-D3110103C24	MSS1151A-010KS-D3110103C24	MSS1422B-020KS-D3110103C24	MSS1421A-005KS-E3110103C35	MSS1421A-010KS-E3110103C35	MSS1802B-020KS-E3110103C35	MSS1801A-005KS-F3110103C42	MSS1801A-010KS-F3110103C42	MSS1802A-015KS-F3110103C42
Compatible Motors	APM-FE series 1.6 kW motors		APM-FE series 2.2 kW motors			APM-FF series 3.5 kW and 5.5 kW motors			APM-FF series 7.5 kW motors		
Price	$565.00	$1,167.00	$549.00	$565.00	$1,167.00	$847.00	$872.00	$2,035.00	$1,628.00	$1,676.00	$2,096.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Ratio	10:1	20:1	5:1	10:1	20:1	5:1	10:1	20:1	5:1	10:1	15:1
Nominal Output Torque	262 N·m	295 N·m	332 N·m	262 N·m	295 N·m	634 N·m	500 N·m	1060 N·m	1195 N·m	960 N·m	897 N·m
Inertia	2.59 kg/cm^2	2.81 kg/cm^2	2.81 kg/cm^2	2.59 kg/cm^2	2.81 kg/cm^2	7.52 kg/cm^2	7.05 kg/cm^2	7.52 kg/cm^2	24.29 kg/cm^2	23.51 kg/cm^2	24.29 kg/cm^2
Output Shaft Diameter	32mm	40mm	32mm	32mm	40mm	40mm	40mm	55mm	55mm	55mm	55mm
Stage	1	2	1	1	2	1	1	2	1	1	2
Frame	115mm	142mm	115mm	115mm	142mm	142mm	142mm	180mm	180mm	180mm	180mm
Nominal Input Speed (rpm)	4,000	3,000	4,000	4,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
Max Input Speed (rpm)	8,000	6,000	8,000	8,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Emergency Stop Torque	3 times nominal output torque										
Noise (dB)	≤59	≤62	≤59	≤59	≤62	≤62	≤62	≤64	≤64	≤64	≤64
Efficiency (%)	≥97	≥94	≥97	≥97	≥94	≥97	≥97	≥94	≥97	≥97	≥94
Backlash (Arcmin)	≤7	≤9	≤7	≤7	≤9	≤7	≤7	≤9	≤7	≤7	≤9
Max Radial Load (N)	6,800	9,300	6,800	6,800	9,300	9,300	9,300	15,100	15,100	15,100	15,100
Max Axial Load (N)	3,400	4,500	3,400	3,400	4,500	4,500	4,500	7,500	7,500	7,500	7,500
Service Life (Hours)	20,000 (10,000 under continuous operation)										

SureServo2

AC Servo Systems

Drive features

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

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

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

Motor features

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

SureServo2 tuning technology

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

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

The drive has several tuning methods available:

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

SureServo2 Built-in motion controller

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

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

SureServo2 Optional Holding Brake

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

SureGear® Precision Gearboxes for Servo motors

Inertia balancing issue in your design?

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

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

AC Servo Systems

How to select and apply *Sure*Servo2 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 SureServo2 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. SureServo2 Pro has the ability to measure the load (reflected) inertia and accurately measure the motor torque output.

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.automationdirect.com on the store page for your drive.

Motion Profile

Desired Load Velocity

Required Motor Torque

time

Servo System → Mechanical Transmission → Load

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. SureServo2 systems may be tuned manually, fully Automatically, or via a hybrid mode where the software tunes the system with input for system responsiveness from the user.

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 or torque). If you have a SureServo2 system, these values are easily captured and recorded with the Scope feature built into SureServo2 Pro. If you are designing the system, use VisualSizer to define the system and calculate expected inertia and required power.

Peak Torque Limited by Current Limit

Peak Torque Limited by Voltage Limit

300%

Torque

200%

Intermittent Operating Region

100%

Continuous Operating Region

1000 2000 3000 4000 5000

Speed (r.p.m.)

Motion Control   tMNC-272
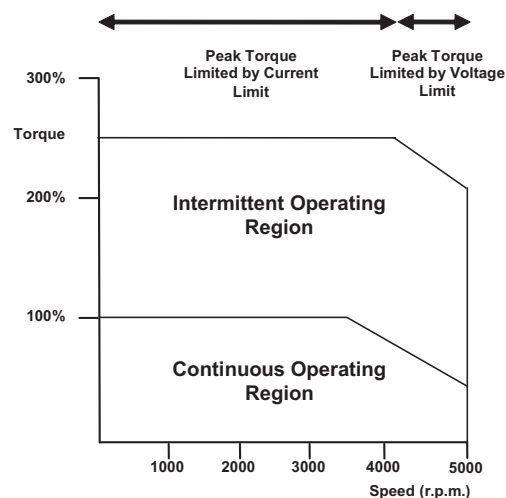
AC Servo Systems

Application tip - coupling considerations

The SureServo2 motors have keyed shafts that can be used with keyed couplings or with clamp-on or compression style couplings. "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 SureServo2 **peak** torque requirement of your application.

Available Couplings

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. SureServo2 systems can go up to 6,000 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

SureServo2 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.

Mechanical Transmission: Timing Belts and Pulleys
Precision Gearboxes

Ordering guide instructions

The following four pages are your ordering guide for SureServo2 systems. Each system has a torque-speed curve included for reference. This is the fundamental information that you need to select the servo motor and matching drive for your application.

Each system needs:
- Motor
- Drive
- Motor Power Cable
- Motor Encoder Cable
- I/O connections (either CN1 cable + RTB breakout board, or an LTB20 breakout board that mounts on the drive)
- For brakemotors 4.5 kW and below, the brake wiring is included in the power cable. For brakemotors 5.5 kw and above, a separate brake cable is required.

A wide variety of optional accessories are also available, such as Ethernet cards, RS485 splitters/terminators, toroids, etc.

You can also use the SureServo2 selector tool on the AutomationDirect.com website to help you configure your system.

Sure~~2 servo2

AC Servo System Configuration

*Sure*Servo2 series drives and motors part numbering system
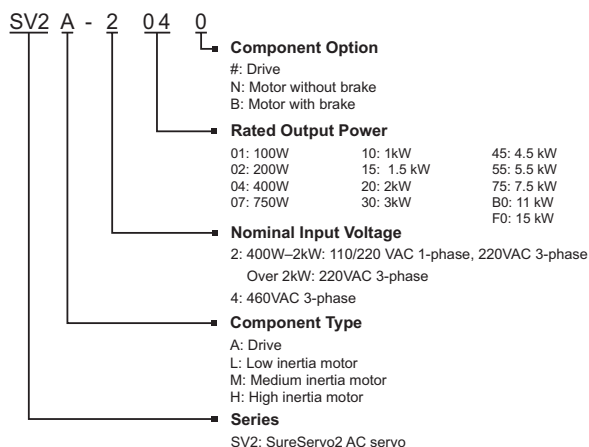
SV2 A - 2 04 0

Component Option
#: Drive
N: Motor without brake
B: Motor with brake

Rated Output Power

01: 100W	10: 1kW	45: 4.5 kW
02: 200W	15: 1.5 kW	55: 5.5 kW
04: 400W	20: 2kW	75: 7.5 kW
07: 750W	30: 3kW	B0: 11 kW
		F0: 15 kW

Nominal Input Voltage
2: 400W–2kW: 110/220 VAC 1-phase, 220VAC 3-phase
    Over 2kW: 220VAC 3-phase
4: 460VAC 3-phase

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

Series
SV2: SureServo2 AC servo

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. I/O Interface

+

or

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
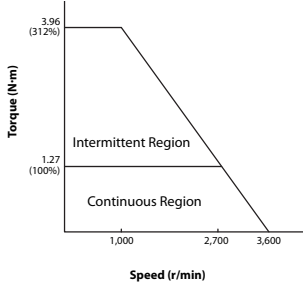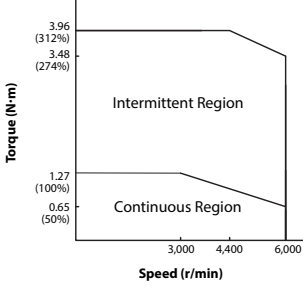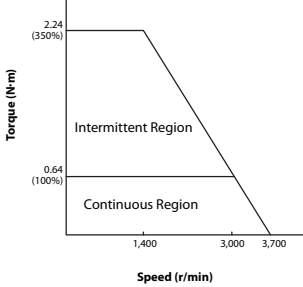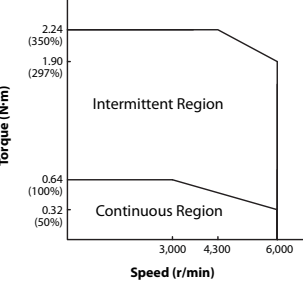
SureServo2

AC Servo System Configuration

Torque to SureServo2 System Quick Reference

230V System Torque			
System Rated Torque (N·m)	**System Maximum Torque (N·m)**	**Suggested Servo Motor**	**Required Servo Drive**
0.32	1.12	SV2L-201N or SV2L-201B	SV2A-2040
0.64	2.24	SV2L-202N or SV2L-202B	SV2A-2040
1.27	3.96	SV2L-204N or SV2L-204B	SV2A-2040
2.39	7.86	SV2L-207N or SV2L-207B	SV2A-2075
3.18	8.12	SV2L-210N or SV2L-210B	SV2A-2150
4.77	14.32	SV2M-210N or SV2M-210B	SV2A-2150
7.16	14.88	SV2M-215N or SV2M-215B	SV2A-2150
9.55	24.54	SV2M-220N or SV2M-220B	SV2A-2200
17.55	48.29	SV2M-230N or SV2M-230B	SV2A-2300
28.65	71.62	SV2H-245N or SV2H-245B	SV2A-2550
35.01	87.53	SV2H-255N or SV2H-255B	SV2A-2550
47.74	119.36	SV2H-275N or SV2H-275B	SV2A-2750
70	175	SV2H-2B0N or SV2H-2B0B	SV2A-2F00
95.4	224.0	SV2H-2F0N or SV2H-2F0B	SV2A-2F00

460V System Torque			
System Rated Torque (N·m)	**System Maximum Torque (N·m)**	**Suggested Servo Motor**	**Required Servo Drive**
1.27	4.45	SV2L-404N or SV2L-404B	SV2A-4040
2.24	7.58	SV2L-407N or SV2L-407B	SV2A-4075
3.18	9.54	SV2L-410N or SV2L-410B	SV2A-4150
4.77	14.32	SV2M-410N or SV2M-410B	SV2A-4150
7.16	18.1	SV2L-415N or SV2L-415B	SV2A-4150
9.55	28.65	SV2L-420N or SV2L-420B	SV2A-4200
19.1	49.38	SV2H-430N or SV2H-430B	SV2A-4300
28.65	64.61	SV2H-445N or SV2H-445B	SV2A-4550
35.01	73.48	SV2H-455N or SV2H-455B	SV2A-4550
47.74	93.71	SV2H-475N or SV2H-475B	SV2A-4750
70	175	SV2H-4B0N or SV2H-4B0B	SV2A-4F00
95.4	224.0	SV2H-4F0N or SV2H-4F0B	SV2A-4F00

AC Servo System Configuration

*Sure*Servo2

*Sure*Servo2 AC servo drive, motor, and cable combinations

	Input Voltage	Torque Chart	SureServo2 Motor	SureServo2 Drive	Power Cable*	Encoder Cable*
100W Low Inertia System	120V		SV2L-204N	SV2A-2040	SV2C-PA18-xxNN	SV2C-E122-xxNN
					SV2C-PA18-xxFN	SV2C-E122-xxFN
			SV2L-204B		SV2C-PB18-xxNB	SV2C-E122-xxNN
					SV2C-PB18-xxFB	SV2C-E122-xxFN
	230V		SV2L-204N	SV2A-2040	SV2C-PA18-xxNN	SV2C-E122-xxNN
					SV2C-PA18-xxFN	SV2C-E122-xxFN
			SV2L-204B		SV2C-PB18-xxNB	SV2C-E122-xxNN
					SV2C-PB18-xxFB	SV2C-E122-xxFN
200W Low Inertia System	120V		SV2L-202N	SV2A-2040	SV2C-PA18-xxNN	SV2C-E122-xxNN
					SV2C-PA18-xxFN	SV2C-E122-xxFN
			SV2L-202B		SV2C-PB18-xxNB	SV2C-E122-xxNN
					SV2C-PB18-xxFB	SV2C-E122-xxFN
	230V		SV2L-202N	SV2A-2040	SV2C-PA18-xxNN	SV2C-E122-xxNN
					SV2C-PA18-xxFN	SV2C-E122-xxFN
			SV2L-202B		SV2C-PB18-xxNB	SV2C-E122-xxNN
					SV2C-PB18-xxFB	SV2C-E122-xxFN

Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
SV2C-xxxx-xxNN is a non-flex, non-brake motor cable   SV2C-xxxx-xxFN is a flex-rated, non-brake cable
SV2C-xxxx-xxNB is a non-flex, brake motor cable   SV2C-xxxx-xxFB is a flex-rated, brake motor cable

All Systems I/O

SV2-CN1-CBL50xxx + SV2-CN1-RTB50   **SV2-CN1-LTB20**

OR

SureServo2 System Selector Online

SureServo2

AC Servo System Configuration

SureServo2 AC servo drive, motor, and cable combinations, *continued*

Input Voltage	Torque Chart	SureServo2 Motor	SureServo2 Drive	Power Cable*	Encoder Cable*
120V		SV2L-204N	SV2A-2040	SV2C-PA18-xxNN	SV2C-E122-xxNN
				SV2C-PA18-xxFN	SV2C-E122-xxFN
		SV2L-204B		SV2C-PB18-xxNB	SV2C-E122-xxNN
				SV2C-PB18-xxFB	SV2C-E122-xxFN
230V		SV2L-204N	SV2A-2040	SV2C-PA18-xxNN	SV2C-E122-xxNN
				SV2C-PA18-xxFN	SV2C-E122-xxFN
		SV2L-204B		SV2C-PB18-xxNB	SV2C-E122-xxNN
				SV2C-PB18-xxFB	SV2C-E122-xxFN
460V		SV2L-404N	SV2A-4040	SV2C-PA18-xxNN	SV2C-E122-xxNN
				SV2C-PA18-xxFN	SV2C-E122-xxFN
		SV2L-404B		SV2C-PB18-xxNB	SV2C-E122-xxNN
				SV2C-PB18-xxFB	SV2C-E122-xxFN

400W Low Inertia System

Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
SV2C-xxxx-xxNN is a non-flex, non-brake motor cable   SV2C-xxxx-xxFN is a flex-rated, non-brake cable
SV2C-xxxx-xxNB is a non-flex, brake motor cable   SV2C-xxxx-xxFB is a flex-rated, brake motor cable

All Systems I/O

SV2-CN1-CBL50xxx + SV2-CN1-RTB50   **SV2-CN1-LTB20**

OR

SureServo2 System Selector Online

AC Servo System Configuration

SureServo2 AC servo drive, motor, and cable combinations, *continued*

<table>
<tr><th></th><th>Input Voltage</th><th>Torque Chart</th><th>SureServo2 Motor</th><th>SureServo2 Drive</th><th>Power Cable*</th><th>Encoder Cable*</th></tr>
<tr><td rowspan="12">750W Low Inertia System</td><td rowspan="4">120V</td><td rowspan="4"></td><td rowspan="2">SV2L-207N</td><td rowspan="4">SV2A-2075</td><td>SV2C-PA18-xxNN</td><td>SV2C-E122-xxNN</td></tr>
<tr><td>SV2C-PA18-xxFN</td><td>SV2C-E122-xxFN</td></tr>
<tr><td rowspan="2">SV2L-207B</td><td>SV2C-PB18-xxNB</td><td>SV2C-E122-xxNN</td></tr>
<tr><td>SV2C-PB18-xxFB</td><td>SV2C-E122-xxFN</td></tr>
<tr><td rowspan="4">230V</td><td rowspan="4"></td><td rowspan="2">SV2L-207N</td><td rowspan="4">SV2A-2075</td><td>SV2C-PA18-xxNN</td><td>SV2C-E122-xxNN</td></tr>
<tr><td>SV2C-PA18-xxFN</td><td>SV2C-E122-xxFN</td></tr>
<tr><td rowspan="2">SV2L-207B</td><td>SV2C-PB18-xxNB</td><td>SV2C-E122-xxNN</td></tr>
<tr><td>SV2C-PB18-xxFB</td><td>SV2C-E122-xxFN</td></tr>
<tr><td rowspan="4">460V</td><td rowspan="4"></td><td rowspan="2">SV2L-407N</td><td rowspan="4">SV2A-4075</td><td>SV2C-PA18-xxNN</td><td>SV2C-E122-xxNN</td></tr>
<tr><td>SV2C-PA18-xxFN</td><td>SV2C-E122-xxFN</td></tr>
<tr><td rowspan="2">SV2L-407B</td><td>SV2C-PB18-xxNB</td><td>SV2C-E122-xxNN</td></tr>
<tr><td>SV2C-PB18-xxFB</td><td>SV2C-E122-xxFN</td></tr>
</table>

Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
SV2C-xxxx-xxNN is a non-flex, non-brake motor cable   SV2C-xxxx-xxFN is a flex-rated, non-brake cable
SV2C-xxxx-xxNB is a non-flex, brake motor cable   SV2C-xxxx-xxFB is a flex-rated, brake motor cable

All Systems I/O

SV2-CN1-CBL50xxx + SV2-CN1-RTB50   SV2-CN1-LTB20

OR

SureServo2 System Selector Online

For the latest prices, please check AutomationDirect.com.

Sureservo**2**

AC Servo System Configuration

SureServo2 AC servo drive, motor, and cable combinations, *continued*

Input Voltage	Torque Chart	SureServo2 Motor	SureServo2 Drive	Power Cable*	Encoder Cable*
120V		SV2L-210N	SV2A-2150	SV2C-PC16-xxNN	SV2C-E222-xxNN
				SV2C-PC16-xxFN	SV2C-E222-xxFN
		SV2L-210B		SV2C-PC16-xxNB	SV2C-E222-xxNN
				SV2C-PC16-xxFB	SV2C-E222-xxFN
230V		SV2L-210N	SV2A-2150	SV2C-PC16-xxNN	SV2C-E222-xxNN
				SV2C-PC16-xxFN	SV2C-E222-xxFN
		SV2L-210B		SV2C-PC16-xxNB	SV2C-E222-xxNN
				SV2C-PC16-xxFB	SV2C-E222-xxFN
460V		SV2L-410N	SV2A-4150	SV2C-PC16-xxNN	SV2C-E222-xxNN
				SV2C-PC16-xxFN	SV2C-E222-xxFN
		SV2L-410B		SV2C-PC16-xxNB	SV2C-E222-xxNN
				SV2C-PC16-xxFB	SV2C-E222-xxFN

Vertical label: 1.0 kW Low Inertia System

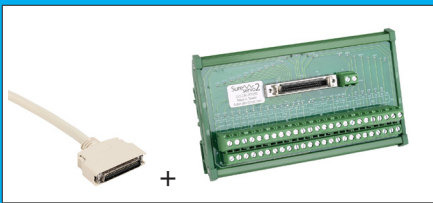Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
SV2C-xxxx-xxNN is a non-flex, non-brake motor cable   SV2C-xxxx-xxFN is a flex-rated, non-brake cable
SV2C-xxxx-xxNB is a non-flex, brake motor cable   SV2C-xxxx-xxFB is a flex-rated, brake motor cable
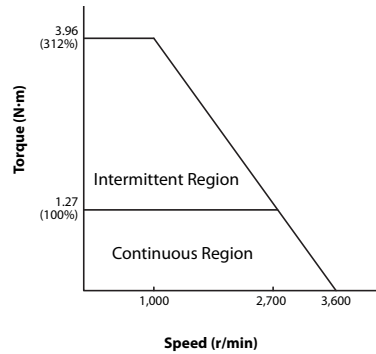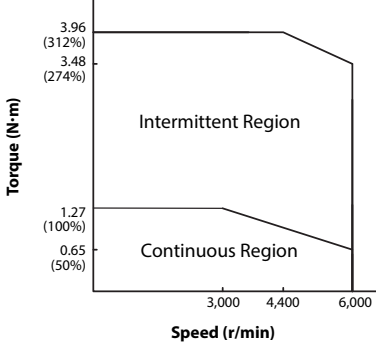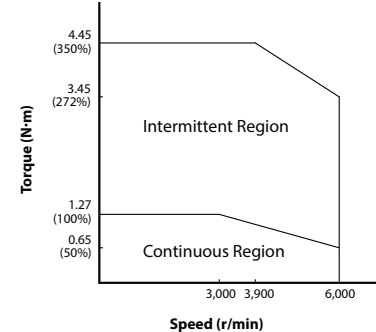
All Systems I/O

SV2-CN1-CBL50xxx + SV2-CN1-RTB50

OR

SV2-CN1-LTB20

SureServo2 System Selector Online

Motion Control   tMNC-279

AC Servo System Configuration

SureServo2 AC servo drive, motor, and cable combinations, *continued*

Input Voltage	Torque Chart	SureServo2 Motor	SureServo2 Drive	Power Cable*	Encoder Cable*
120V	14.32 (300%), 4.77 (100%), Intermittent Region, Continuous Region, Speed (r/min) 700, 1,550, 2,000	SV2M-210N	SV2A-2150	SV2C-PC12-xxNN	SV2C-E222-xxNN
				SV2C-PC12-xxFN	SV2C-E222-xxFN
		SV2M-210B		SV2C-PC12-xxNB	SV2C-E222-xxNN
				SV2C-PC12-xxFB	SV2C-E222-xxFN
230V	14,32 (300%), 4.77 (100%), 3.20 (67%), Intermittent Region, Continuous Region, Speed (r/min) 2,000, 3,000	SV2M-210N	SV2A-2150	SV2C-PC12-xxNN	SV2C-E222-xxNN
				SV2C-PC12-xxFN	SV2C-E222-xxFN
		SV2M-210B		SV2C-PC12-xxNB	SV2C-E222-xxNN
				SV2C-PC12-xxFB	SV2C-E222-xxFN
460V	14.32 (300%), 4.77 (100%), 3.20 (67%), Intermittent Region, Continuous Region, Speed (r/min) 2,000, 3,000	SV2M-410N	SV2A-4150	SV2C-PC16-xxNN	SV2C-E222-xxNN
				SV2C-PC16-xxFN	SV2C-E222-xxFN
		SV2M-410B		SV2C-PC16-xxNB	SV2C-E222-xxNN
				SV2C-PC16-xxFB	SV2C-E222-xxFN

1.0 kW Medium Inertia System

Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
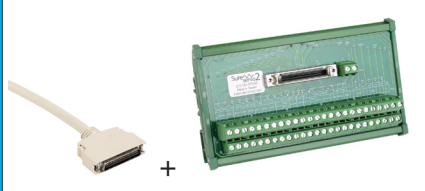**SV2C-xxxx-xxNN is a non-flex, non-brake motor cable**   **SV2C-xxxx-xxFN is a flex-rated, non-brake cable**
SV2C-xxxx-xxNB is a non-flex, brake motor cable   **SV2C-xxxx-xxFB is a flex-rated, brake motor cable**
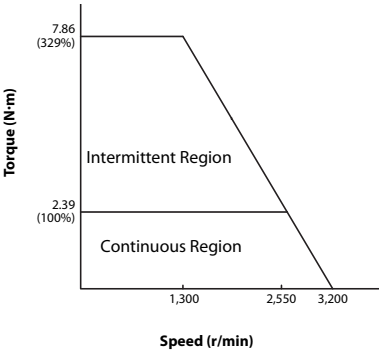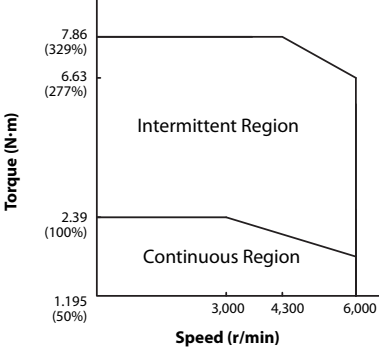
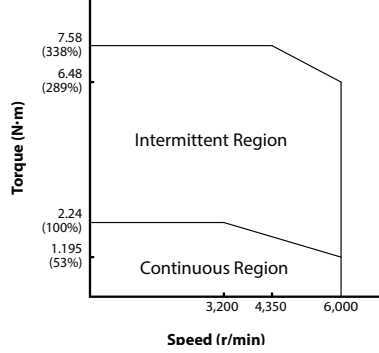**All Systems I/O**

SV2-CN1-CBL50xxx + SV2-CN1-RTB50   SV2-CN1-LTB20

OR

SureServo2 System Selector Online

AC Servo System Configuration

SureServo2 AC servo drive, motor, and cable combinations, *continued*

	Input Voltage	Torque Chart	SureServo2 Motor	SureServo2 Drive	Power Cable*	Encoder Cable*
1.5 kW Medium Inertia System	120V	Torque (N·m): 14.88 (208%), 7.16 (100%). Intermittent Region, Continuous Region. Speed (r/min): 1,000 1,400 1,800	SV2M-215N	SV2A-2150	SV2C-PC12-xxNN	SV2C-E222-xxNN
					SV2C-PC12-xxFN	SV2C-E222-xxFN
			SV2M-215B		SV2C-PC12-xxNB	SV2C-E222-xxNN
					SV2C-PC12-xxFB	SV2C-E222-xxFN
	230V	Torque (N·m): 14.88 (208%), 7.16 (100%), 4.60 (67%). Intermittent Region, Continuous Region. Speed (r/min): 2,000 2,400 3,000	SV2M-215N	SV2A-2150	SV2C-PC12-xxNN	SV2C-E222-xxNN
					SV2C-PC12-xxFN	SV2C-E222-xxFN
			SV2M-215B		SV2C-PC12-xxNB	SV2C-E222-xxNN
					SV2C-PC12-xxFB	SV2C-E222-xxFN
1.5 kW Low Inertia System	460V	Torque (N·m): 18.1 (253%), 7.16 (100%), 4.77 (67%). Intermittent Region, Continuous Region. Speed (r/min): 2,000 3,000	SV2L-415N	SV2A-4150	SV2C-PC16-xxNN	SV2C-E222-xxNN
					SV2C-PC16-xxFN	SV2C-E222-xxFN
			SV2L-415B		SV2C-PC16-xxNB	SV2C-E222-xxNN
					SV2C-PC16-xxFB	SV2C-E222-xxFN

Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
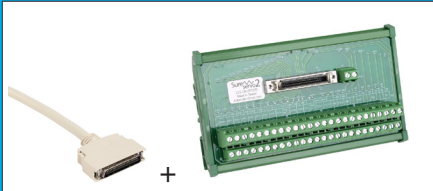SV2C-xxxx-xxNN is a non-flex, non-brake motor cable   SV2C-xxxx-xxFN is a flex-rated, non-brake cable
SV2C-xxxx-xxNB is a non-flex, brake motor cable   SV2C-xxxx-xxFB is a flex-rated, brake motor cable

All Systems I/O

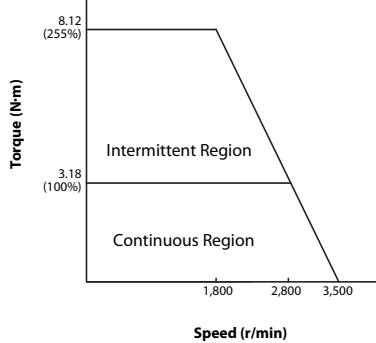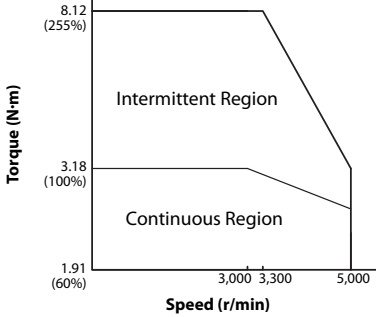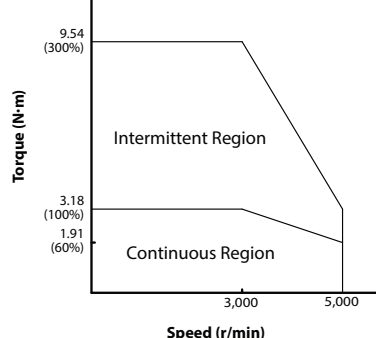**SV2-CN1-CBL50xxx + SV2-CN1-RTB50**   **SV2-CN1-LTB20**

OR

SureServo2 System Selector Online

Motion Control

AC Servo System Configuration

*Sure*Servo2 AC servo drive, motor, and cable combinations, *continued*

Input Voltage	Torque Chart	SureServo2 Motor	SureServo2 Drive	Power Cable*	Encoder Cable*
2.0 kW Medium Inertia System — 120V		SV2M-220N	SV2A-2200	SV2C-PD12-xxNN	SV2C-E222-xxNN
				SV2C-PD12-xxFN	SV2C-E222-xxFN
		SV2M-220B		SV2C-PD12-xxNB	SV2C-E222-xxNN
				SV2C-PD12-xxFB	SV2C-E222-xxFN
2.0 kW Medium Inertia System — 230V		SV2M-220N	SV2A-2200	SV2C-PD12-xxNN	SV2C-E222-xxNN
				SV2C-PD12-xxFN	SV2C-E222-xxFN
		SV2M-220B		SV2C-PD12-xxNB	SV2C-E222-xxNN
				SV2C-PD12-xxFB	SV2C-E222-xxFN
2.0 kW Low Inertia System — 460V		SV2L-420N	SV2A-4200	SV2C-PC16-xxNN	SV2C-E222-xxNN
				SV2C-PC16-xxFN	SV2C-E222-xxFN
		SV2L-420B		SV2C-PC16-xxNB	SV2C-E222-xxNN
				SV2C-PC16-xxFB	SV2C-E222-xxFN

Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
SV2C-xxxx-xxNN is a non-flex, non-brake motor cable   SV2C-xxxx-xxFN is a flex-rated, non-brake cable
SV2C-xxxx-xxNB is a non-flex, brake motor cable   SV2C-xxxx-xxFB is a flex-rated, brake motor cable

All Systems I/O

SV2-CN1-CBL50xxx + SV2-CN1-RTB50

OR

SV2-CN1-LTB20

SureServo2 System Selector Online

For the latest prices, please check AutomationDirect.com.

SureServo2

AC Servo System Configuration

SureServo2 AC servo drive, motor, and cable combinations, *continued*

	Input Voltage	Torque Chart	SureServo2 Motor	SureServo2 Drive	Power Cable*	Encoder Cable*
3.0 kW Medium Inertia System	230V	Torque (N·m) — 48.29 (275%); 17.55 (100%); 10.00 (57%); 9.55 (54%); Intermittent Region; Continuous Region; Speed (r/min) 1,700 1,800 3,000	SV2M-230N	SV2A-2300	SV2C-PD12-xxNN	SV2C-E222-xxNN
					SV2C-PD12-xxFN	SV2C-E222-xxFN
			SV2M-230B		SV2C-PD12-xxNB	SV2C-E222-xxNN
					SV2C-PD12-xxFB	SV2C-E222-xxFN
3.0 kW High Inertia System	460V	Torque (N·m) — 49.38 (259%); 19.1 (100%); 9.00 (47%); Intermittent Region; Continuous Region; Speed (r/min) 1,500 1,800 3,000	SV2H-430N	SV2A-4300	SV2C-PD12-xxNN	SV2C-E222-xxNN
					SV2C-PD12-xxFN	SV2C-E222-xxFN
			SV2H-430B		SV2C-PD12-xxNB	SV2C-E222-xxNN
					SV2C-PD12-xxFB	SV2C-E222-xxFN

Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
SV2C-xxxx-xxNN is a non-flex, non-brake motor cable   **SV2C-xxxx-xxFN is a flex-rated, non-brake cable**
SV2C-xxxx-xxNB is a non-flex, brake motor cable   **SV2C-xxxx-xxFB is a flex-rated, brake motor cable**

All Systems I/O

SV2-CN1-CBL50xxx + SV2-CN1-RTB50

SV2-CN1-LTB20

OR

SureServo2 System Selector Online

AC Servo System Configuration

*Sure*Servo2 AC servo drive, motor, and cable combinations, *continued*

Input Voltage	Torque Chart	SureServo2 Motor	SureServo2 Drive	Power Cable*	Encoder Cable*
4.5 kW High Inertia System 230V	71.62 (250%); 28.65 (100%); 14.33 (50%); Intermittent Region; Continuous Region; 1,500; 3,000; Torque (N·m); Speed (r/min)	SV2H-245N	SV2A-2550	SV2C-PD08-xxNN	SV2C-E222-xxNN
				SV2C-PD08-xxFN	SV2C-E222-xxFN
		SV2H-245B		SV2C-PD08-xxNB	SV2C-E222-xxNN
				SV2C-PD08-xxFB	SV2C-E222-xxFN
460V	64.61 (226%); 28.65 (100%); 14.33 (50%); Intermittent Region; Continuous Region; 1,500; 1,700; 3,000; Torque (N·m); Speed (r/min)	SV2H-445N	SV2A-4550	SV2C-PD08-xxNN	SV2C-E222-xxNN
				SV2C-PD08-xxFN	SV2C-E222-xxFN
		SV2H-445B		SV2C-PD08-xxNB	SV2C-E222-xxNN
				SV2C-PD08-xxFB	SV2C-E222-xxFN

Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
SV2C-xxxx-xxNN is a non-flex, non-brake motor cable   SV2C-xxxx-xxFN is a flex-rated, non-brake cable
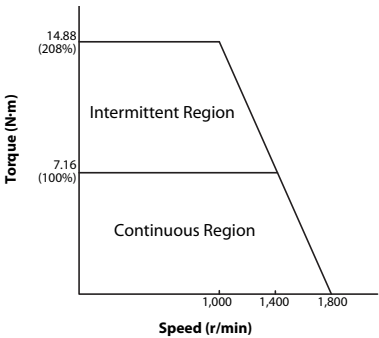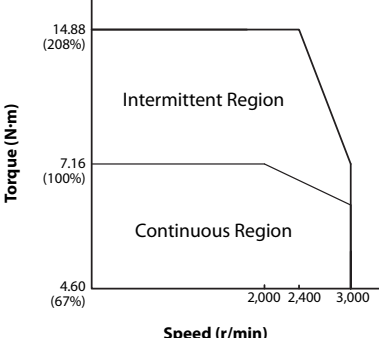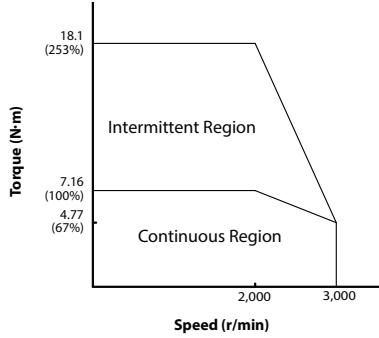SV2C-xxxx-xxNB is a non-flex, brake motor cable   SV2C-xxxx-xxFB is a flex-rated, brake motor cable

All Systems I/O

SV2-CN1-CBL50xxx + SV2-CN1-RTB50

+

OR

SV2-CN1-LTB20

SureServo2 System Selector Online

AC Servo System Configuration

SureServo2 AC servo drive, motor, and cable combinations, *continued*

	Input Voltage	Torque Chart	SureServo2 Motor	SureServo2 Drive	Power Cable*	Encoder Cable*
5.5 kW High Inertia System	230V	Torque (N·m): 87.53 (250%), 35.01 (100%), 17.51 (50%); Intermittent Region; Continuous Region; Speed (r/min): 1,500 / 3,000	SV2H-255N	SV2A-2550	SV2C-PF06-xxNN	SV2C-E222-xxNN
					SV2C-PF06-xxFN	SV2C-E222-xxFN
			SV2H-255B		SV2C-PF06-xxNN and SV2C-B120-xxxx	SV2C-E222-xxNN
					SV2C-PF06-xxFN and SV2C-B120-xxxx	SV2C-E222-xxFN
	460V	Torque (N·m): 73.48 (210%), 35.01 (100%), 19.1 (55%), 17.51 (50%); Intermittent Region; Continuous Region; Speed (r/min): 1,500 / 1,900 / 3,000	SV2H-455N	SV2A-4550	SV2C-PD08-xxNN	SV2C-E222-xxNN
					SV2C-PD08-xxFN	SV2C-E222-xxFN
			SV2H-455B		SV2C-PD08-xxNN	SV2C-E222-xxNN
					SV2C-PD08-xxFN	SV2C-E222-xxFN

Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
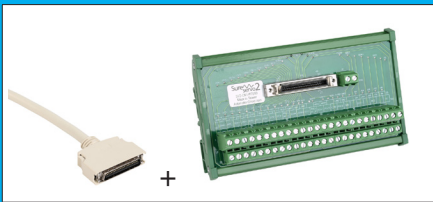SV2C-xxxx-xxNN is a non-flex, non-brake motor cable   SV2C-xxxx-xxFN is a flex-rated, non-brake cable
SV2C-xxxx-xxNB is a non-flex, brake motor cable   SV2C-xxxx-xxFB is a flex-rated, brake motor cable
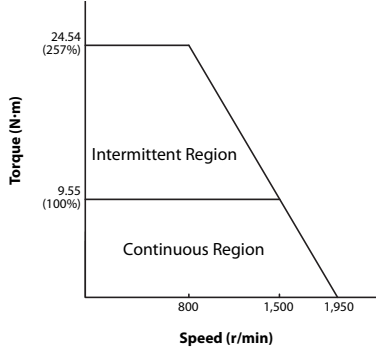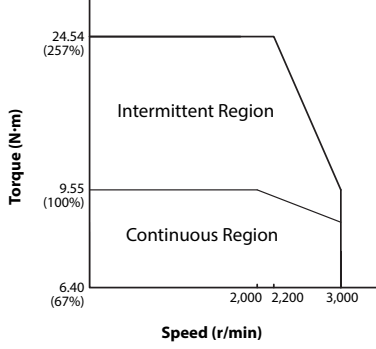
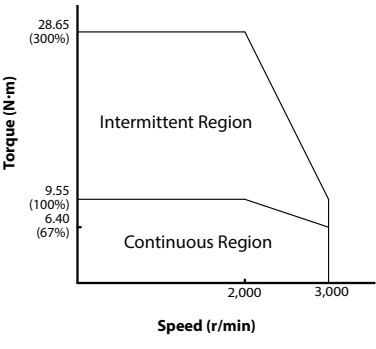**All Systems I/O**

SV2-CN1-CBL50xxx + SV2-CN1-RTB50   SV2-CN1-LTB20

OR

SureServo2 System Selector Online

AC Servo System Configuration

SureServo2 AC servo drive, motor, and cable combinations, *continued*

Input Voltage	Torque Chart	SureServo2 Motor	SureServo2 Drive	Power Cable*	Encoder Cable*
230V (7.5 kW High Inertia System)	*Torque (N·m)* — 119.36 (250%), 47.74 (100%), 23.87 (50%); Intermittent Region; Continuous Region; Speed (r/min) 1,500 – 3,000	SV2H-275N	SV2A-2750	SV2C-PF06-xxNN	SV2C-E222-xxNN
				SV2C-PF06-xxFN	SV2C-E222-xxFN
		SV2H-275B		SV2C-PF06-xxNN and SV2C-B120-xxxx	SV2C-E222-xxNN
				SV2C-PF06-xxFN and SV2C-B120-xxxx	SV2C-E222-xxFN
460V (7.5 kW High Inertia System)	*Torque (N·m)* — 93.71 (196%), 47.74 (100%), 20.0 (42%); Intermittent Region; Continuous Region; Speed (r/min) 1,500 2,000 – 3,000	SV2H-475N	SV2A-4750	SV2C-PD08-xxNN	SV2C-E222-xxNN
				SV2C-PD08-xxFN	SV2C-E222-xxFN
		SV2H-475B		SV2C-PD08-xxNN	SV2C-E222-xxNN
				SV2C-PD08-xxFN	SV2C-E222-xxFN

7.5 kW High Inertia System

Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
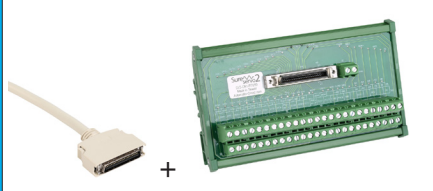SV2C-xxxx-xxNN is a non-flex, non-brake motor cable   SV2C-xxxx-xxFN is a flex-rated, non-brake cable
SV2C-xxxx-xxNB is a non-flex, brake motor cable   SV2C-xxxx-xxFB is a flex-rated, brake motor cable

All Systems I/O

SV2-CN1-CBL50xxx + SV2-CN1-RTB50   **SV2-CN1-LTB20**

OR

SureServo2 System Selector Online

AC Servo System Configuration

SureServo2 AC servo drive, motor, and cable combinations, *continued*

Input Voltage	Torque Chart	SureServo2 Motor	SureServo2 Drive	Power Cable*	Encoder Cable*
11.0 kW High Inertia System 230V	Torque (N·m) 175.0 (250%) Intermittent Region 70.0 (100%) 52.5 (75%) Continuous Region 1,500 2,000 Speed (r/min)	SV2H-2B0N	SV2A-2F00	SV2C-PF06-xxNN	SV2C-E222-xxNN
				SV2C-PF06-xxFN	SV2C-E222-xxFN
		SV2H-2B0B		SV2C-PF06-xxNN and SV2C-B120-xxNB	SV2C-E222-xxNN
				SV2C-PF06-xxFN and SV2C-B120-xxFB	SV2C-E222-xxFN
460V	Torque (N·m) 175.0 (250%) Intermittent Region 70.0 (100%) 52.5 (75%) Continuous Region 1,500 2,000 Speed (r/min)	SV2H-4B0N	SV2A-4F00	SV2C-PF08-xxNN	SV2C-E222-xxNN
				SV2C-PF08-xxFN	SV2C-E222-xxFN
		SV2H-4B0B		SV2C-PF08-xxNN and SV2C-B120-xxNB	SV2C-E222-xxNN
				SV2C-PF08-xxFN and SV2C-B120-xxFB	SV2C-E222-xxFN

Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
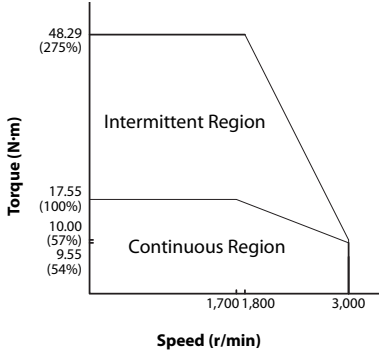SV2C-xxxx-xxNN is a non-flex, non-brake motor cable   SV2C-xxxx-xxFN is a flex-rated, non-brake cable
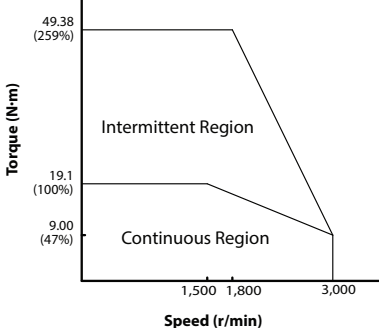SV2C-xxxx-xxNB is a non-flex, brake motor cable   SV2C-xxxx-xxFB is a flex-rated, brake motor cable

All Systems I/O

SV2-CN1-CBL50xxx + SV2-CN1-RTB50   **SV2-CN1-LTB20**

OR

SureServo2 System Selector Online

AC Servo System Configuration

*Sure*Servo2 AC servo drive, motor, and cable combinations, *continued*

	Input Voltage	Torque Chart	SureServo2 Motor	SureServo2 Drive	Power Cable*	Encoder Cable*
15.0 kW High Inertia System	230V		SV2H-2F0N	SV2A-2F00	SV2C-PF04-xxNN	SV2C-E222-xxNN
					SV2C-PF04-xxFN	SV2C-E222-xxFN
			SV2H-2F0B		SV2C-PF04-xxNN and SV2C-B120-xxNB	SV2C-E222-xxNN
					SV2C-PF04-xxFB and SV2C-B120-xxFB	SV2C-E222-xxFN
	460V		SV2H-4F0N	SV2A-4F00	SV2C-PF08-xxNN	SV2C-E222-xxNN
					SV2C-PF08-xxFN	SV2C-E222-xxFN
			SV2H-4F0B		SV2C-PF08-xxNN and SV2C-B120-xxNB	SV2C-E222-xxNN
					SV2C-PF08-xxFN and SV2C-B120-xxFB	SV2C-E222-xxFN

Note: "xx" in the cable part numbers represents cable length: SV2C-xxxx-10xx is a 10m cable.
The final two digits indicate flex rating and motor brake compatibility:
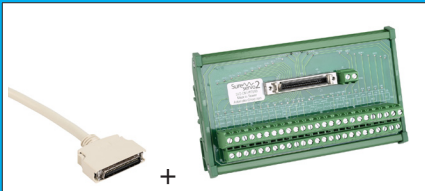SV2C-xxxx-xxNN is a non-flex, non-brake motor cable   SV2C-xxxx-xxFN is a flex-rated, non-brake cable
SV2C-xxxx-xxNB is a non-flex, brake motor cable   SV2C-xxxx-xxFB is a flex-rated, brake motor cable

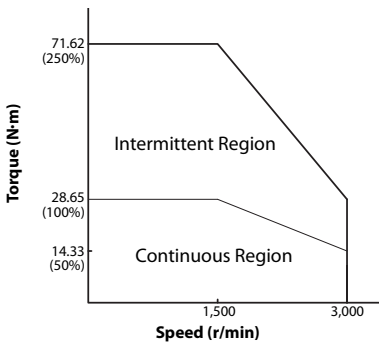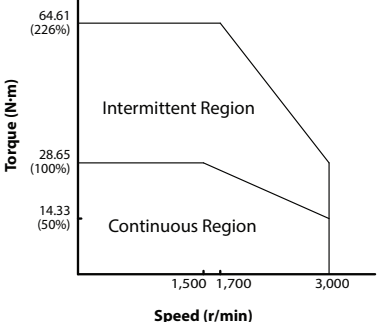**All Systems I/O**
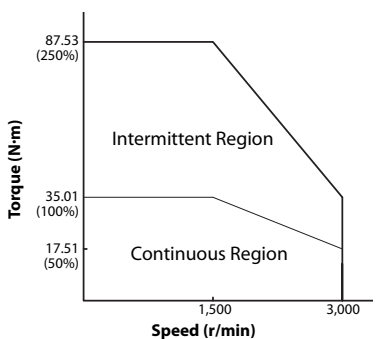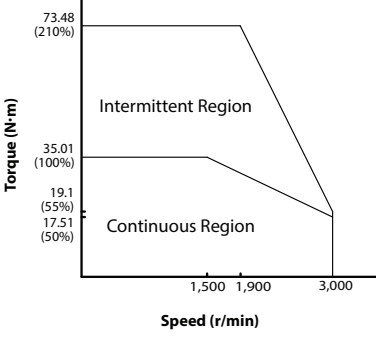
SV2-CN1-CBL50xxx + SV2-CN1-RTB50		SV2-CN1-LTB20
	OR	

SureServo2 System Selector Online

AC Servo System Software

*Sure*Servo2 Pro configuration software

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

Features

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

Parameter editor

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

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

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

Parameter Editor Example Screen
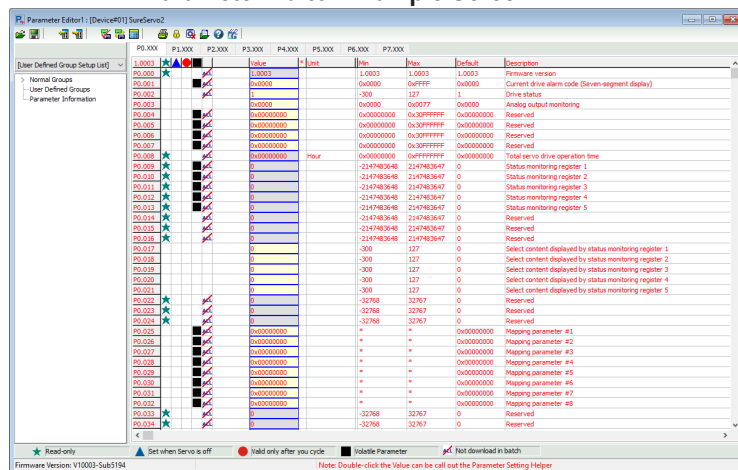
USB Programming Cables

Part Number	Price	Description	Length	Drawing	Compatible Drives
SV2-PGM-USB15	$46.00	Programming cable, USB A to miniB-USB	1.5 m	PDF	All SureServo2 drives
SV2-PGM-USB30	$50.00		3m	PDF	

SV2-PGM-USB15

Motion Control

AC Servo System Software

*Sure*Servo2 Pro configuration software - (continued)

General Setting Example Screen
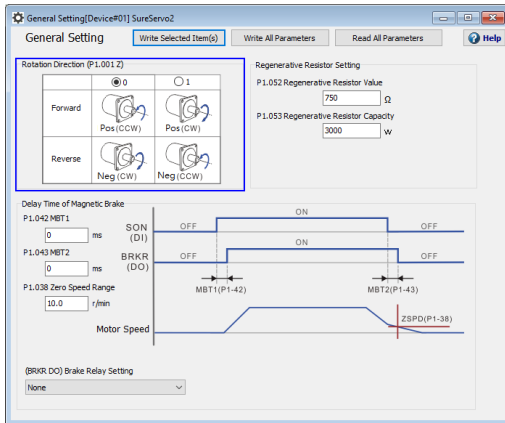
Digital IO/Jog Control screen

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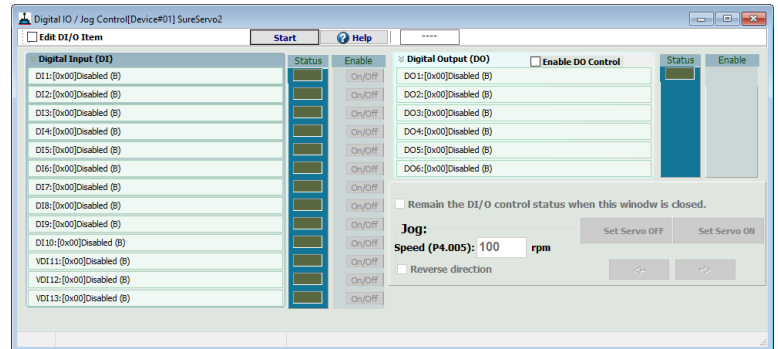
Alarm Information Example Screen
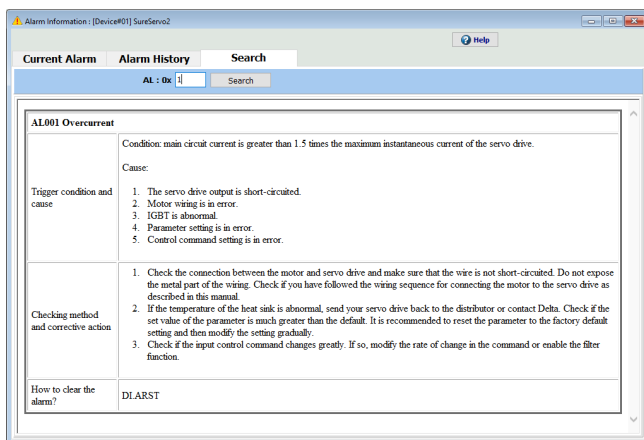
Scope

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

PR Mode Setting Example Screen

*Sure*servo**2**
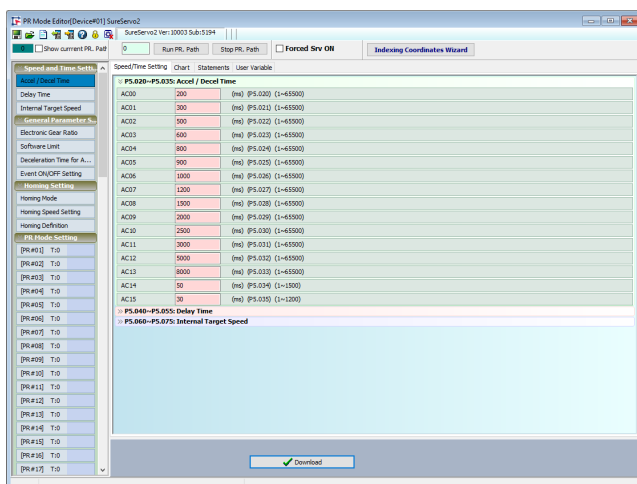
AC Servo Drive Specifications

Servo drive overview

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

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

Safe Torque Off (STO) Connector Port

Keypad
Five Function keys:
• MODE: Press to change mode
• SHIFT: Press to change parameter group or move cursor left
• UP: Press to increase values
• DOWN: Press to decrease values
• SET: Press to enter value

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

460VAC drives: control power = 24VDC

USB Connector
Used to connect a PC for configuration with SureServo2 Pro software

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

Main Power Terminal
• 1 phase 110VAC: 100W-2kW
• 1 phase 220VAC: 100W-2kW
• 3 phase 220VAC: 100W-15kW
• 3 phase 460VAC: 400W-15kW

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

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

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

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

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

Ground Terminals

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High Density DB15 Connector
CN5: Auxiliary/Secondary Encoder input. Used for applications requiring Full Closed Loop, Linear Measurement, etc.

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

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*Sure*Servo2 systems run "out-of-the-box"... but may be reconfigured for many applications!

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

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

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

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

AC Servo Drive Specifications

230V Servo drive specifications

SureServo2 230V Drive Specifications									
Model		SV2A-2040	SV2A-2075	SV2A-2150	SV2A-2200	SV2A-2300	SV2A-2550	SV2A-2750	SV2A-2F00
Price		$421.00	$525.00	$560.00	$658.00	$726.00	$920.00	$1,075.00	$1,405.00
Drawing		PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Power	**Power Rating**	400W	750W	1.5 kW	2kW	3kW	5.5 kW	7.5 kW	15kW
	Input Voltage	Single-phase 100–120 VAC, -15% to +10% Single-phase 200–230 VAC, -15% to +10% Three-phase 200–230 VAC, -15% to +10%				Three-phase 200–230 VAC, -15% to +10%			
	Input Current 200–230 VAC 3-phase [Amps] rms	2.76	5.09	8.09	11.36	14.52	27.06	37.33	69.95
	Input Current 100–120 VAC 1-phase [Amps] rms	3.98	7.73	12.56	18.03	–	–	–	–
	Input Current 200–230 VAC 1-phase [Amps] rms	4.69	8.71	14.82	20.83	–	–	–	–
	Continuous Output Current [Amps] rms	2.60	5.10	8.33	13.40	17.92	41.33	49.04	78
	Max. Instantaneous Output Current [Amps] rms	8.56	15.43	20.16	40.57	55.93	91.44	127.46	162.04
	Main Circuit Inrush Current [Amps]	1.44	1.40	1.44	4.64	4.42	9.55	28.68	32.0
	Control Circuit Inrush Current [Amps]	37.0	37.40	39.80	32.40	36.40	32.80	40.0	37.0
	Cooling Method	Air Conv. Cooling	Fan Cooling						
	Encoder Resolution	24-bit (16777216 p/rev)							
	Main Circuit Control	SVPWM control							
	Control Mode	Manual / Auto							
	Regenerative Resistor	Built-in (external options also available)					External (optional)		
Position Control Mode	**Pulse Type**	Pulse + Direction, CCW pulse + CW pulse, AB Quadrature							
	Max. Input Pulse Frequency	Pulse + Direction: 4 Mpps; CCW pulse + CW pulse: 4 Mpps; AB Quadrature: single-phase 4 Mpps; Open collector: 200 Kpps							
	Command Source	External pulse / Internal registers							
	Smoothing Method	Low-pass and P-curve filter							
	Torque Limit	Parameter settings							
	Feed Forward Compensation	Parameter settings							

AC Servo Drive Specifications

230V Servo drive specifications (continued)

SureServo2 230V Drive Specifications Continued								
Model	SV2A-2040	SV2A-2075	SV2A-2150	SV2A-2200	SV2A-2300	SV2A-2550	SV2A-2750	SV2A-2F00
Speed Control Mode — Analog Command Input — Voltage Range	±10VDC							
Resolution	15-bit							
Input Impedance	1MΩ							
Time Constant	25µs							
Speed Control Range1	1 : 6000							
Command Source	External analog command / Internal registers							
Smoothing Method	Low-pass and S-curve filter							
Torque Limit	Parameter settings / Analog input							
Bandwidth	Maximum 3.1 kHz (closed-loop)							
Speed Calibration Ratio2	±0.01% at 0% to 100% load fluctuation							
	±0.01% at ±10% power fluctuation							
	±0.01% at 0˚C to 50˚C ambient temperature fluctuation							
Torque Control Mode — Analog Command Input — Voltage Range	±10VDC							
Input Impedance	1MΩ							
Time Constant	25µs							
Command Source	External analog command / Internal registers							
Smoothing Method	Low-pass filter							
Speed Limit	Parameter settings / Analog input							
Analog Monitor Output	Monitor signal can be set by parameters (voltage output range: ±8V); resolution:10-bit							
Digital Input/Output — Input	Servo on, Fault reset, Gain switch, Pulse clear, Zero speed clamping, Command input reverse control, Internal position command trigger, Torque limit, Speed limit, Internal position command selection, Motor stop, Speed command selection, Speed / position mode switching, Speed / torque mode switching, Torque / position mode switching, PT / PR command switching, motor override, Forward / reverse limit, Original point, Forward / reverse operation torque limit, Homing activated, E-Cam engage, Forward / reverse JOG input, Event trigger, E-Gear N selection, Pulse input prohibition							
Output	A, B, Z line driver output							
	Servo ready, Servo on, Zero speed detection, Target speed reached, Target position reached, Torque limiting, Servo alarm, Magnetic brake control, Homing completed, Early warning for overload, Servo warning, Position command overflows, Software limit (reverse direction), Software limit (forward direction), Internal position command completed, Capture procedure completed, Servo procedure completed, Master position area of E-Cam.							

1 - Within the rated load, the speed ratio is: the minimum speed (smooth operation) / rated speed.
2 - Within the rated speed, the speed calibration ratio is: (rotational speed with no load - rotational speed with full load) / rated speed.

AC Servo Drive Specifications

230V Servo drive specifications (continued)

SureServo2 230V Drive Specifications Continued								
Model	SV2A-2040	SV2A-2075	SV2A-2150	SV2A-2200	SV2A-2300	SV2A-2550	SV2A-2750	SV2A-2F00
Protection Function	STO (Category 3 / SIL 2), Overcurrent, Overvoltage, Undervoltage, Overheat, Regeneration error, Overload, Excessive speed deviation, Excessive position deviation, Encoder error, Adjustment error, Emergency stop, Forward / reverse limit error, Excessive deviation of full-closed loop control, Serial communication error, RST leak phase, Serial communication timeout, Short-circuit protection for terminals U, V, W and CN1, CN2, CN3							
Communication Interface	RS-485 / Modbus RTU / USB / Optional EtherNet/IP or Modbus TCP							
Weight [kg (lb)]	0.92 (2.03)	1.3 (2.87)	1.3 (2.87)	2.7 (5.95)	2.7 (5.95)	4.9 (10.8)	7.2 (15.9)	13 (29)
Environment Installation Site	Indoors (avoid direct sunlight), no corrosive vapor (avoid fumes, flammable gases, and dust)							
Altitude	Altitude 1000m or lower above sea level							
Atmospheric Pressure	86kPa - 106kPa							
Operating Temperature	0˚C to 55˚C (If operating temperature is above 45˚C, forced cooling is required)							
Storage Temperature	-20˚C to 65˚C							
Humidity	Under 0 - 90% RH (non-condensing)							
Vibration	9.80665 m/s2 (1 G) less than 20 Hz, 5.88 m/s2 (0.6 G) 20 to 50 Hz							
IP Rating	IP20							
Power System	TN system3,4							
Approvals	IEC/EN 61800-5-1, UL 508C, TUV (for STO), CE							

3 - TN system: the neutral point of the power system connects directly to the ground. The exposed metal components connect to the ground through the protective ground conductor.
4 - Use a single-phase three-wire power system for the single-phase power model.

AC Servo Drive Specifications

460V Servo drive specifications

SureServo2 460V Drive Specifications								
Model	SV2A-4040	SV2A-4075	SV2A-4150	SV2A-4200	SV2A-4300	SV2A-4550	SV2A-4750	SV2A-4F00
Price	$506.00	$534.00	$732.00	$713.00	$803.00	$920.00	$1,155.00	$1,499.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Power / Power Rating	400W	750W	1.5 kW	2kW	3kW	5.5 kW	7.5 kW	15kW
Input Voltage	Three-phase 380–480 VAC, ±10%							
Input Current 380–480 VAC 3-phase [Amps] rms	1.49	2.31	4.98	6.29	9.92	16.83	23.06	36.65
Continuous Output Current [Amps] rms	1.6	2.91	6.05	6.7	12.6	23.6	28.7	40.5
Max. Instantaneous Output Current [Amps] rms	5.4	9.7	13.94	21.35	30.46	47.5	57.69	95.3
Control Power Input Current	1.17	1.17	1.17	1.35	1.63	1.91	1.91	4.26
Main Circuit Inrush Current [Amps]	5.6	5.6	5.6	12.5	12.5	12.5	12.5	12.5
Control Circuit Inrush Current [Amps]	5	5	5	4.8	4.8	5.5	5.5	6
Control Circuit Voltage	24VDC							
Cooling Method	Fan cooling							
Encoder Resolution	24-bit (16777216 p/rev)							
Main Circuit Control	SVPWM control							
Control Mode	Manual/Auto							
Regenerative Resistor	Built-in (external options also available)				External (optional)			
Position Control Mode / Pulse Type	Pulse + Direction, CCW pulse + CW pulse, A phase + B phase							
Max. Input Pulse Frequency	Pulse + Direction: 4 Mpps; CCW pulse + CW pulse: 4 Mpps; A phase + B phase: single-phase 4 Mpps; Open collector: 200 Kpps							
Command Source	External pulse / Internal registers							
Smoothing Method	Low-pass, moving-averaging, and S-curve filter							
E-Gear Ratio	N/M times, limited to (1/4 < N/M < 262144) N: 1–536870911 / M: 1–2147483647							
Torque Limit	Parameter settings							
Feed Forward Compensation	Parameter settings							

AC Servo Drive Specifications

460V Servo drive specifications (continued)

SureServo2 460V Drive Specifications Continued								
Model	SV2A-4040	SV2A-4075	SV2A-4150	SV2A-4200	SV2A-4300	SV2A-4550	SV2A-4750	SV2A-4F00
Speed Control Mode — *Analog Command Input* — **Voltage Range**	±10VDC							
Analog Command Input — **Resolution**	12-bit							
Analog Command Input — **Input Impedance**	1MΩ							
Analog Command Input — **Time Constant**	25µs							
Speed Control Range1	1 : 6000							
Command Source	External analog command / Internal registers							
Smoothing Method	Low-pass and S-curve filter							
Torque Limit	Parameter settings / Analog input							
Bandwidth	Maximum 3.1 kHz (closed-loop)							
Speed Calibration Ratio2	±0.01% at 0% to 100% load fluctuation ±0.01% at ±10% power fluctuation ±0.01% at 0˚C to 50˚C ambient temperature fluctuation							
Torque Control Mode — *Analog Command Input* — **Voltage Range**	±10VDC							
Analog Command Input — **Input Impedance**	1MΩ							
Analog Command Input — **Time Constant**	25µs							
Command Source	External analog command / Internal registers							
Smoothing Method	Low-pass filter							
Speed Limit	Parameter settings / Analog input							
Analog Monitor Output	Monitor signal can be set by parameters (voltage output range: ±8V); resolution:10-bit							
Digital Input/Output — **Input**	Servo on, Fault reset, Gain switch, Pulse clear, Zero speed clamping, Command input reverse control, Internal position command trigger, Torque limit, Speed limit, Internal position command selection, Motor stop, Speed command selection, Speed / position mode switching, Speed / torque mode switching, Torque / position mode switching, PT / PR command switching, Emergency Stop, Forward / reverse limit, Original point, Forward / reverse operation torque limit, Homing activated, E-Cam engage, Forward / reverse JOG input, Event trigger, E-Gear N selection, Pulse input prohibition							
Output	A, B, Z line driver output							
Output	Servo ready, Servo on, Zero speed detection, Target speed reached, Target position reached, Torque limiting, Servo alarm, Magnetic brake control, Homing completed, Early warning for overload, Servo warning, Position command overflows, Software limit (reverse direction), Software limit (forward direction), Internal position command completed, Capture procedure completed, Servo procedure completed, Master position area of E-Cam.							

1 - Within the rated load, the speed ratio is: the minimum speed (smooth operation) / rated speed.
2 - Within the rated speed, the speed calibration ratio is: (rotational speed with no load - rotational speed with full load) / rated speed.

AC Servo Drive Specifications

460V Servo drive specifications (continued)

SureServo2 460V Drive Specifications Continued								
Model	**SV2A-4040**	**SV2A-4075**	**SV2A-4150**	**SV2A-4200**	**SV2A-4300**	**SV2A-4550**	**SV2A-4750**	**SV2A-4F00**
Protection Function	Overcurrent, Overvoltage, Undervoltage, Overheat, Regeneration error, Overload, Excessive speed deviation, Excessive position deviation, Encoder error, Adjustment error, Emergency stop, Forward / reverse limit error, Excessive deviation of full-closed loop control, Serial communication error, RST leak phase, Serial communication timeout, Short-circuit protection for terminals U, V, W and CN1, CN2, CN3							
Communication Interface	RS-485 / USB							
Weight [kg (lb)]	5.96 [13.1]	5.96 [13.1]	5.96 [13.1]	9.71 [21.4]	9.71 [21.4]	12.14 [26.8]	12.14 [26.8]	15.01 [33.1]
Environment / **Installation Site**	Indoors (avoid direct sunlight), no corrosive vapor (avoid fumes, flammable gases, and dust)							
Altitude	1000m or lower above sea level							
Atmospheric Pressure	86kPa – 106kPa							
Operating Temperature	0˚C to 55˚C [32˚F to 131˚F] (If operating temperature is above 45˚C, forced cooling is required)							
Storage Temperature	-20˚C to 65˚C [-4˚F to 149˚F]							
Humidity	Under 90% RH (non-condensing)							
Vibration	9.80665 m/s2 (1 G) less than 20 Hz, 5.88 m/s2 (0.6 G) 20 to 50 Hz							
IP Rating	IP20							
Power System	TN system[3,4]							
Approvals	IEC/EN 61800-5-1, UL 508C, TUV (for STO), CE							

3 - TN system: the neutral point of the power system connects directly to the ground. The exposed metal components connect to the ground through the protective ground conductor.
4 - Use a single-phase three-wire power system for the single-phase power model.

Sure~~2
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AC Servo Motor Specifications

Servo motor overview

24-bit Encoder Connector
1-foot cable with 9-position connector

(Motor-mounted connector is IP67, end-of-cable connector is not liquid tight)

IP67 Housing

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

750W and below

Motor Power and Brake Connector
1-foot cable with 6-position connector

(Motor-mounted connector is IP67, end-of-cable connector is not liquid tight)

Keyed Shafts
• 100W 8 mm diameter
• 200W 14 mm diameter
• 400W 14 mm diameter
• 750W 19 mm diameter

With Shaft Seal (liquid tight)

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

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

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

IP67 Housing
(IP65 connectors)

1 kW and above

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

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

With Shaft Seal (liquid tight)

AC Servo Motor Specifications

230V Low Inertia Motor Specifications

230V SureServo2 Low Inertia Motor Specifications										
Model	SV2L-201N	SV2L-201B	SV2L-202N	SV2L-202B	SV2L-204N	SV2L-204B	SV2L-207N	SV2L-207B	SV2L-210N	SV2L-210B
Price	$315.00	$461.00	$347.00	$512.00	$374.00	$527.00	$400.00	$561.00	$525.00	$772.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Rated Power [kW]	0.1	0.1	0.2	0.2	0.4	0.4	0.75	0.75	1.0	1.0
Rated Torque [N·m]Note 1	0.32	0.32	0.64	0.64	1.27	1.27	2.39	2.39	3.18	3.18
Max. Torque [N·m]	1.12	1.12	2.24	2.24	3.96	3.96	7.86	7.86	8.12	8.12
Rated Speed [rpm]	3000									
Max. Speed [rpm]	6000								5000	
Rated current [Amps] rms	0.9	0.9	1.45	1.45	2.60	2.60	4.5	4.5	8.04	8.04
Max. Instantaneous Current [Amps] rms	3.3	3.3	5.4	5.4	8.56	8.56	15.41	15.41	20.16	20.16
Change of Rated Power [W/s]	16.3	14.90	16.4	14.60	35.8	33.60	37.8	34.40	38.2	30.40
Rotor Inertia [x10-4 kg m2]	0.0627	0.0689	0.25	0.28	0.45	0.48	1.51	1.66	2.65	3.33
Mechanical Time Constant [ms]	1.13	1.24	1.38	1.54	0.94	1.01	0.91	1.00	0.83	1.05
Torque Constant-KT [N-m/A]	0.356	0.356	0.441	0.441	0.488	0.488	0.531	0.531	0.396	0.396
Voltage Constant-KE [mV/rpm]	13.66	13.66	16.4	16.4	17.2	17.2	18.7	18.7	16.8	16.8
Armature Resistance [Ohm]	8,34	8,34	3,8	3,8	1.68	1.68	0.57	0.57	0.20	0.20
Armature Inductance [mH]	9.85	9.85	8.15	8.15	4.03	4.03	2.2	2.2	1.81	1.81
Electrical Time Constant [ms]	1.18	1.18	2.14	2.14	2.40	2.40	3.86	3.86	9.05	9.05
Insulation Class	Class A (UL), Class B (CE)									
Insulation Resistance	> 100MΩ, 500VDC									
Insulation Strength	1.8 kVAC, 1 second									
Weight [kg]	0.5	0.8	1.1	1.6	1.4	1.9	2.8	3.6	4.3	4.7
Max. Radial Loading [N]	78	78	245	245	245	245	392	392	490	490
Max. Axial Loading [N]	54	54	74	74	74	74	147	147	98	98
Brake Holding Torque [N·m (min)]Note 2	n/a	0.32	n/a	1.3	n/a	1.3	n/a	2.5	n/a	8
Brake Power Consumption (at 20°C) [W]		6.1		7.2		7.2		8		18.7
Brake Release Time [ms (max)]		20		20		20		20		10
Brake Pull-in Time [ms (max)]		35		50		50		60		70
Vibration Grade [μm]	V15									
Operating Temperature [°C]	0–40 °C (32–104 °F)									
Storage Temperature [°C]	-10°C to 80°C (-14°F to 176°F)									
Operating Humidity	20–90% relative humidity (non-condensing)									
Storage Humidity	20–90% relative humidity (non-condensing)									
Vibration Capacity	2.5 G									
IP Rating	IP67 (when using waterproof connectors and when an oil seal is fitted to the rotating shaft (for an oil seal model))								IP65 (when using waterproof connectors)	
Encoder Resolution	24-bit (16777216 p/rev)									
Agency Approvals	$_c$UR$_{US}$, CE									

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating termperature which is suitable for a servo motor mounted with the following heat sink dimensions: 250mm x 250mm x 6mm made from aluminum (or mounted to equipment with an equivalent heat sinking capability).
Note 2–The built-in servo motor brake is only for holding the load in a stopped state. Do not use for deceleration or as a dynamic brake.

AC Servo Motor Specifications

SureServo2

230V Medium Inertia Motor Specifications

230V SureServo2 Medium Inertia Motor Specifications								
Model	SV2M-210N	SV2M-210B	SV2M-215N	SV2M-215B	SV2M-220N	SV2M-220B	SV2M-230N	SV2M-230B
Price	$547.00	$782.00	$591.00	$875.00	$716.00	$949.00	$809.00	$1,042.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Rated Power [kW]	1.0	1.0	1.5	1.5	2.0	2.0	3.0	3.0
Rated Torque [N·m]Note 1	4.77	4.77	7.16	7.16	9.55	9.55	17.55	17.55
Max. Torque [N·m]	14.32	14.32	14.88	14.88	24.54	24.54	48.29	48.29
Rated Speed [rpm]	2000						1700	
Max. Speed [rpm]	3000							
Rated current [Amps] rms	5.66	5.66	8.33	8.33	12.1	12.1	17.9	17.9
Max. Instantaneous Current [Amps] rms	19.73	19.73	20.16	20.16	33.66	33.66	55.93	55.93
Change of Rated Power [W/s]	27.1	24.90	45.8	43.10	26.3	24.10	56.0	53.90
Rotor Inertia [x10-4 kg m2]	8.41	9.14	11.2	11.9	34.7	37.8	55	57.1
Mechanical Time Constant [ms]	1.54	1.67	1.12	1.18	1.75	1.90	1.29	1.34
Torque Constant-KT [N-m/A]	0.843	0.843	0.860	0.860	0.789	0.789	0.980	0.980
Voltage Constant-KE [mV/rpm]	31.9	31.9	31.8	31.8	31.4	31.4	35	35
Armature Resistance [Ohm]	0.47	0.47	0.26	0.26	0.119	0.119	0.077	0.077
Armature Inductance [mH]	5.99	5.99	4.01	4.01	2.84	2.84	1.27	1.27
Electrical Time Constant [ms]	12.74	12.74	15.42	15.42	23.87	23.87	16.49	16.49
Insulation Class	Class A (UL), Class B (CE)							
Insulation Resistance	> 100MΩ, 500VDC							
Insulation Strength	1.8 kVAC, 1 second							
Weight [kg]	7.0	8.4	7.5	8.9	13.5	17.5	18.5	22.5
Max. Radial Loading [N]	490				1176		1470	
Max. Axial Loading [N]	98				490			
Brake Holding Torque [N·m (min)]Note 2	n/a	10	n/a	10	n/a	25	n/a	25
Brake Power Consumption (at 20°C) [W]		19		19		20.4		20.4
Brake Release Time [ms (max)]		10		10		10		10
Brake Pull-in Time [ms (max)]		70		70		70		70
Vibration Grade [µm]	V15							
Operating Temperature [°C]	0–40 °C (32–104 °F)							
Storage Temperature [°C]	-10°C to 80°C (-14°F to 176°F)							
Operating Humidity	20–90% relative humidity (non-condensing)							
Storage Humidity	20–90% relative humidity (non-condensing)							
Vibration Capacity	2.5 G							
IP Rating	IP65 (when using waterproof connectors)							
Encoder Resolution	24-bit (16777216 p/rev)							
Agency Approvals	$_C UR_{US}$, CE							

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions: 250mm x 250mm x 6mm made from aluminum (or mounted to equipment with an equivalent heat sinking capability).
Note 2–The built-in servo motor brake is only for holding the load in a stopped state. Do not use for deceleration or as a dynamic brake.

AC Servo Motor Specifications

230V High Inertia Motor Specifications

230V SureServo2 High Inertia Motor Specifications										
Model	SV2H-245N	SV2H-245B	SV2H-255N	SV2H-255B	SV2H-275N	SV2H-275B	SV2H-2B0N	SV2H-2B0B	SV2H-2F0N	SV2H-2F0B
Price	$1,002.00	$1,557.00	$1,155.00	$1,725.00	$1,400.00	$2,188.00	$2,152.00	$2,950.00	$2,483.00	$3,400.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Rated Power [kW]	4.5	4.5	5.5	5.5	7.5	7.5	11	11	15	15
Rated Torque [N·m]Note 1	28.65	28.65	35.01	35.01	47.74	47.74	70	70	95.4	95.4
Max. Torque [N·m]	71.62	71.62	87.53	87.53	119.36	119.36	175	175	224.0	224.0
Rated Speed [rpm]	1500									
Max. Speed [rpm]	3000						2000			
Rated current [Amps] rms	32.5	32.5	40.12	40.12	47.5	47.5	51.1	51.1	67	67
Max. Instantaneous Current [Amps] rms	91.4	91.4	108.0	108.0	127.46	127.46	129.5	129.5	162	162
Change of Rated Power [W/s]	105.6	101.8	122.8	119.3	159.7	156.6	145.0	141.4	201.8	197.1
Rotor Inertia [x10-4 kg m2]	77.75	80.65	99.78	102.70	142.7	145.55	338	346.5	451	461.8
Mechanical Time Constant [ms]	0.93	0.96	0.97	0.99	0.84	0.85	1.38	1.41	1.22	1.25
Torque Constant-KT [N·m/A]	0.878	0.878	0.873	0.873	1.005	1.005	1.370	1.370	1.424	1.424
Voltage Constant-KE [mV/rpm]	32.0	32.0	31.0	31.0	35.5	35.5	49	49	50	50
Armature Resistance [Ohm]	0.032	0.032	0.025	0.025	0.02	0.02	0.0261	0.0261	0.0184	0.0184
Armature Inductance [mH]	0.89	0.89	0.71	0.71	0.6	0.6	0.65	0.65	0.48	0.48
Electrical Time Constant [ms]	27.81	27.81	28.4	28.4	30.0	30.0	24.9	24.9	26.09	26.09
Insulation Class	Class A (UL), Class B (CE)						Class F (UL), Class F (CE)			
Insulation Resistance	> 100MΩ, 500VDC									
Insulation Strength	1.8 kVAC, 1 second									
Weight [kg]	23.5	29	30.5	36	40.5	46	56.4	68.4	75	87
Max. Radial Loading [N]	1470		1764				3300			
Max. Axial Loading [N]	490		588				1100			
Brake Holding Torque [N·m (min)]Note 2	n/a	55.0	n/a	55.0	n/a	55.0	n/a	115	n/a	115
Brake Power Consumption (at 20°C) [W]		19.9		19.9		19.9		28.8		28.8
Brake Release Time [ms (max)]		10		10		10		10		10
Brake Pull-in Time [ms (max)]		70		70		70		70		70
Vibration Grade [μm]	V15									
Operating Temperature [°C]	0–40 °C (32–104 °F)									
Storage Temperature [°C]	-10°C to 80°C (-14°F to 176°F)									
Operating Humidity	20–90% relative humidity (non-condensing)									
Storage Humidity	20–90% relative humidity (non-condensing)									
Vibration Capacity	2.5 G									
IP Rating	IP65 (when using waterproof connectors and when an oil seal is fitted to the rotating shaft (for an oil seal model))									
Encoder Resolution	24-bit (16777216 p/rev)									
Agency Approvals	cUR$_{US}$, CE									

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions:
300mm x 300mm x 12mm
400mm x 400mm x 20mm
550mm x 550mm x 30mm
All made from aluminum (or mounted to equipment with an equivalent heat sinking capability)
Note 2–The built-in servo motor brake is only for holding the load in a stopped state. Do not use it for deceleration or as a dynamic brake.

AC Servo Motor Specifications

460V Low Inertia Motor Specifications

460V SureServo2 Low Inertia Motor Specifications										
Model	SV2L-404N	SV2L-404B	SV2L-407N	SV2L-407B	SV2L-410N	SV2L-410B	SV2L-415N	SV2L-415B	SV2L-420N	SV2L-420B
Price	$396.00	$567.00	$427.00	$611.00	$556.00	$820.00	$638.00	$941.00	$756.00	$989.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF	PDF
Rated Power [kW]	0.4	0.4	0.75	0.75	1.0	1.0	1.5	1.5	2.0	2.0
Rated Torque [N·m]Note 1	1.27	1.27	2.24	2.24	3.18	3.18	7.16	7.16	9.55	9.55
Max. Torque [N·m]	4.45	4.45	7.58	7.58	9.54	9.54	18.1	18.1	28.65	28.65
Rated Speed [rpm]	3000		3200		3000		2000			
Max. Speed [rpm]	6000		6000		5000		3000			
Rated current [Amps] rms	1.43	1.43	2.90	2.90	4.36	4.36	5.1	5.1	6.7	6.7
Max. Instantaneous Current [Amps] rms	5.25	5.25	9.70	9.70	13.74	13.74	13.28	13.28	21.35	21.35
Change of Rated Power [W/s]	35.8	33.6	33.2	30.2	38.2	30.40	45.9	43.10	62.5	57.4
Rotor Inertia [x10-4 kg m2]	0.45	0.48	1.51	1.66	2.65	3.33	11.18	11.9	14.59	15.88
Mechanical Time Constant [ms]	1.05	1.12	1.02	1.12	0.81	1.02	1.26	1.34	1.11	1.21
Torque Constant-KT [N-m/A]	0.888	0.888	0.772	0.772	0.729	0.729	1.404	1.404	1.425	1.425
Voltage Constant-KE [mV/rpm]	31.83	31.83	27.83	27.83	29.00	29.00	55.00	55.00	55.00	55.00
Armature Resistance [Ohm]	6.28	6.28	1.38	1.38	0.617	0.617	0.83	0.83	0.57	0.57
Armature Inductance [mH]	13.34	13.34	4.78	4.78	6.03	6.03	11.67	11.67	8.29	8.29
Electrical Time Constant [ms]	2.12	2.12	3.46	3.46	9.77	9.77	14.06	14.06	14.54	14.54
Insulation Class	Class A (UL), Class B (CE)									
Insulation Resistance	> 100 MΩ, 500VDC									
Insulation Strength	2.3 kVAC, 1 sec									
Weight [kg]	1.4	1.9	2.8	3.6	4.3	4.7	7.5	8.9	7.8	9.2
Max. Radial Loading [N]	245	245	392	392	490	490	490	490	490	490
Max. Axial Loading [N]	74	74	147	147	98	98	98	98	98	98
Brake Holding Torque [N·m (min)]Note 2	n/a	1.3	n/a	2.5	n/a	8	n/a	10	n/a	10
Brake Power Consumption (at 20°C) [W]		7.2		8		18.7		19		19
Brake Release Time [ms (max)]		20		20		10		10		10
Brake Pull-in Time [ms (max)]		50		60		70		70		70
Vibration Grade [µm]	V15									
Operating Temperature [°C]	0–40 °C (32–104 °F)									
Storage Temperature [°C]	-10°C to 80°C (-14°F to 176°F)									
Operating Humidity	20–90% relative humidity (non-condensing)									
Storage Humidity	20–90% relative humidity (non-condensing)									
Vibration Capacity	2.5 G									
IP Rating	IP67 (when using waterproof connectors and when an oil seal is fitted to the rotating shaft (for an oil seal model))				IP65 (when using waterproof connectors and when an oil seal is fitted to the rotating shaft (for an oil seal model))					
Encoder Resolution	24-bit (16777216 p/rev)									
Agency Approvals	cURus, CE									

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions: 250mm x 250mm x 6mm made from aluminum (or mounted to equipment with an equivalent heat sinking capability).

Note 2–The built-in servo motor brake is only for holding the load in a stopped state. Do not use for deceleration or as a dynamic brake.

460V Medium Inertia Motor Specifications

460V SureServo2 Medium Inertia Motor Specifications		
Model	SV2M-410N	SV2M-410B
Price	$583.00	$842.00
Drawing	PDF	PDF
Rated Power [kW]	1.0	1.0
Rated Torque [N·m]Note 1	4.77	4.77
Max. Torque [N·m]	14.32	14.32
Rated Speed [rpm]	2000	
Max. Speed [rpm]	3000	
Rated current [Amps] rms	3.6	3.6
Max. Instantaneous Current [Amps] rms	11.41	11.41
Change of Rated Power [W/s]	27.1	24.90
Rotor Inertia [x10-4 kg m2]	8.41	9.14
Mechanical Time Constant [ms]	1.85	2.01
Torque Constant-KT [N-m/A]	1.325	1.325
Voltage Constant-KE [mV/rpm]	53.20	53.20
Armature Resistance [Ohm]	1.477	1.477
Armature Inductance [mH]	17.79	17.79
Electrical Time Constant [ms]	12.04	12.04
Insulation Class	Class A (UL), Class B (CE)	
Insulation Resistance	> 100 MΩ, 500VDC	
Insulation Strength	2.3 kVAC, 1 sec	
Weight [kg]	7.0	8.4
Max. Radial Loading [N]	490	
Max. Axial Loading [N]	98	
Brake Holding Torque [N·m (min)]Note 2	n/a	10
Brake Power Consumption (at 20°C) [W]		19
Brake Release Time [ms (max)]		10
Brake Pull-in Time [ms (max)]		70
Vibration Grade [µm]	V15	
Operating Temperature [°C]	0–40 °C (32–104 °F)	
Storage Temperature [°C]	-10°C to 80°C (-14°F to 176°F)	
Operating Humidity	20–90% relative humidity (non-condensing)	
Storage Humidity	20–90% relative humidity (non-condensing)	
Vibration Capacity	2.5 G	
IP Rating	IP65 (when using waterproof connectors and when an oil seal is fitted to the rotating shaft (for an oil seal model))	
Encoder Resolution	24-bit (16777216 p/rev)	
Agency Approvals	$_C$UR$_{US}$, CE	

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions: 250mm x 250mm x 6mm made from aluminum (or mounted to equipment with an equivalent heat sinking capability).
Note 2–The built-in servo motor brake is only for holding the load in a stopped state. Do not use for deceleration or as a dynamic brake.

AC Servo Motor Specifications

460V High Inertia Motor Specifications

460V SureServo2 High Inertia Motor Specifications						
Model	SV2H-430N	SV2H-430B	SV2H-445N	SV2H-445B	SV2H-455N	SV2H-455B
Price	$905.00	$1,101.00	$1,033.00	$1,602.00	$1,190.00	$1,775.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF
Rated Power [kW]	3.0	3.0	4.5	4.5	5.5	5.5
Rated Torque [N·m]Note 1	19.1	19.1	28.65	28.65	35	35
Max. Torque [N·m]	49.38	49.38	64.61	64.61	73.48	73.48
Rated Speed [rpm]	1500					
Max. Speed [rpm]	3000					
Rated current [Amps] rms	12.2	12.2	21.9	21.9	23.6	23.6
Max. Instantaneous Current [Amps] rms	30.46	30.46	47.5	47.5	47.5	47.5
Change of Rated Power [W/s]	66.4	63.9	105.6	101.8	122.8	119.3
Rotor Inertia [x10-4 kg m2]	54.95	57.1	77.75	80.65	99.78	80.65
Mechanical Time Constant [ms]	1.20	1.24	1.06	1.10	0.84	0.86
Torque Constant-KT [N·m/A]	1.566	1.566	1.308	1.308	1.483	1.483
Voltage Constant-KE [mV/rpm]	64.4	64.4	53.00	53.00	58.9	58.9
Armature Resistance [Ohm]	0.21	0.21	0.09	0.09	0.07	0.07
Armature Inductance [mH]	4.94	4.94	2.36	2.36	2.20	2.20
Electrical Time Constant [ms]	23.52	23.52	26.22	26.22	31.43	31.43
Insulation Class	Class A (UL), Class B (CE)					
Insulation Resistance	> 100 MΩ, 500VDC					
Insulation Strength	2.3 kVAC, 1 sec					
Weight [kg]	18.5	22.5	23.5	29	30.5	36
Max. Radial Loading [N]	1470				1764	
Max. Axial Loading [N]	490				588	
Brake Holding Torque [N·m (min)]Note 2	n/a	25	n/a	55	n/a	55
Brake Power Consumption (at 20°C) [W]		20.4		19.9		19.9
Brake Release Time [ms (max)]		10		10		10
Brake Pull-in Time [ms (max)]		70		70		70
Vibration Grade [µm]	V15					
Operating Temperature [°C]	0–40 °C (32–104 °F)					
Storage Temperature [°C]	-10°C to 80°C (-14°F to 176°F)					
Operating Humidity	20–90% relative humidity (non-condensing)					
Storage Humidity	20–90% relative humidity (non-condensing)					
Vibration Capacity	2.5 G					
IP Rating	IP65 (when using waterproof connectors and when an oil seal is fitted to the rotating shaft (for an oil seal model))					
Encoder Resolution	24-bit (16777216 p/rev)					
Agency Approvals	$_{C}UR_{US}$, CE					
Continued on next page						

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions:
300mm x 300mm x 12mm
400mm x 400mm x 20mm
550mm x 550mm x 30mm
All made from aluminum (or mounted to equipment with an equivalent heat sinking capability)
Note 2–The built-in servo motor brake is only for holding the load in a stopped state. Do not use it for deceleration or as a dynamic brake.

AC Servo Motor Specifications

460V High Inertia Motor Specifications, *continued*

460V SureServo2 High Inertia Motor Specifications						
Model	SV2H-475N	SV2H-475B	SV2H-4B0N	SV2H-4B0B	SV2H-4F0N	SV2H-4F0B
Price	$1,442.00	$2,252.00	$2,215.00	$3,036.00	$2,556.00	$3,500.00
Drawing	PDF	PDF	PDF	PDF	PDF	PDF
Rated Power [kW]	7.5	7.5	11	11	15	15
Rated Torque [N·m]Note 1	47.74	47.74	70	70	95.4	95.4
Max. Torque [N·m]	93.71	93.71	175	175	224.0	224.0
Rated Speed [rpm]	1500		1500			
Max. Speed [rpm]	3000		2000			
Rated current [Amps] rms	28.7	28.7	26.8	26.8	37.5	37.5
Max. Instantaneous Current [Amps] rms	57.69	57.69	67.7	67.7	95.3	95.3
Change of Rated Power [W/s]	159.7	156.6	145.0	141.4	201.8	197.1
Rotor Inertia [x10-4 kg m2]	142.7	145.5	338	346.5	451	461.8
Mechanical Time Constant [ms]	0.81	0.83	1.40	1.44	1.21	1.23
Torque Constant-KT [N·m/A]	1.663	1.663	2.612	2.612	2.544	2.544
Voltage Constant-KE [mV/rpm]	66.40	66.40	96.00	96.00	83.90	83.90
Armature Resistance [Ohm]	0.06	0.06	0.0994	0.0994	0.0545	0.0545
Armature Inductance [mH]	1.70	1.70	2.51	2.51	1.43	1.43
Electrical Time Constant [ms]	28.33	28.33	25.25	25.25	26.24	26.24
Insulation Class	Class A (UL), Class B (CE)		Class F (UL), Class F (CE)			
Insulation Resistance	> 100 MΩ, 500VDC					
Insulation Strength	2.3 kVAC, 1 sec					
Weight [kg]	40.5	46	56.4	68.4	75	87
Max. Radial Loading [N]	1764		3300			
Max. Axial Loading [N]	588		1100			
Brake Holding Torque [N·m (min)]Note 2	n/a	55	n/a	115	n/a	115
Brake Power Consumption (at 20°C) [W]		19.9		28.8		28.8
Brake Release Time [ms (max)]		10		10		10
Brake Pull-in Time [ms (max)]		70		70		70
Vibration Grade [μm]	V15					
Operating Temperature [°C]	0–40 °C (32–104 °F)					
Storage Temperature [°C]	-10°C to 80°C (-14°F to 176°F)					
Operating Humidity	20–90% relative humidity (non-condensing)					
Storage Humidity	20–90% relative humidity (non-condensing)					
Vibration Capacity	2.5 G					
IP Rating	IP65 (when using waterproof connectors and when an oil seal is fitted to the rotating shaft (for an oil seal model))					
Encoder Resolution	24-bit (16777216 p/rev)					
Agency Approvals	$_c$UR$_{US}$, CE					

Note 1–The rated torque is the continuous permissible torque between the 0°C and 40°C operating temperature which is suitable for a servo motor mounted with the following heat sink dimensions:
300mm x 300mm x 12mm
400mm x 400mm x 20mm
550mm x 550mm x 30mm
All made from aluminum (or mounted to equipment with an equivalent heat sinking capability)
Note 2–The built-in servo motor brake is only for holding the load in a stopped state. Do not use it for deceleration or as a dynamic brake.

AC Servo System Wiring

SureServo2

Standard wiring example, 230V Systems

24V Open-collector pulse command input

NPN (SINK) type equipment

PULL HI_S	35
/SIGN	37
PULL HI_P	39
/PULSE	41

PNP (SOURCE) type equipment

PULL HI_S	35
/SIGN	37
PULL HI_P	39
/PULSE	41

Inputs SIGN (36) and PULSE (43) are designed for Line Driver (differential) signals. Do not use with 24V. For 5V open collector applications, see section 3.5 in the User Manual.

T S R MCCB
Noise filter
Motor Power ON
Motor Power OFF
MC ALRM_RY_B
MC
SPD

*1 R / S / T / L1C / L2C / P1 / P2 / ⊖

CN1

/SIGN	37
SIGN	36
/PULSE	41
PULSE	43
V-REF	42
GND	44
T-REF	18
GND	19
MON1	16
GND	13
MON2	15
COM+	11

Pulse input (Line Driver)
±10V 10KΩ
1.2KΩ 12KΩ
Twisted-pair or twisted-shielded cable
10KΩ

Digital Input Rating:
ON: 15 - 24VDC, 8mA
OFF: <5VDC, <0.5 mA

SON	DI1	9
CCLR	DI2	10
TCM0	DI3	34
TCM1	DI4	8
ARST	DI5	33
NL	DI6	32
PL	DI7	31
OVRD	DI8	30
	DI9	29
	DI10	38

4.7KΩ *2

Digital Output Rating:
Max 30VDC, Max 40mA

24V

For inductive loads, use a diode
Make sure the polarity of diode is correct, or it may damage the servo drive.
Servo drive
24Vdc
DOX+
DOX-

SRDY	DO1+	7
	DO1-	6
ZSPD	DO2+	5
	DO2-	4
HOME	DO3+	3
	DO3-	2
TPOS	DO4+	1
	DO4-	26
ALRM	DO5+	28
	DO5-	27
	DO6+	46
	DO6-	40

1.5KΩ

A phase pulse	OA	21
	/OA	22
B phase pulse	OB	25
	/OB	23
Z phase pulse	OZ	50
	/OZ	24

Encoder pulse output

| Z phase open collector | OCZ | 48 |
| | GND | 44 |

Use a current limiting resistor if necessary
Max. output current: 50mA
Max. voltage: 30V

STO   CN10

-	1
-	2
STO_A	3
/STO_A	4
STO_B	5
/STO_B	6
FDBK+	7
FDBK-	8

ESTOP
24Vdc
Safety relay (LG5925)
S11 S12 S21 S22 13 23
S34 S33 14 24
Current flow

NOTE: Polarity between terminals S33/S34 and FDBK+/- must be correct. If polarity is reversed, enough leakage current will flow through the drive transistor to satisfy the reset circuit of the safety relay.

BRKR and OVRD are Digital Output functions that can be used to control the holding brake. Many applications release the holding brake with the safety circuit.

P3 *2 / D / C / U / V / W / ⊕
Regenerative resistor
Red / White / Black / Green
Motor supply
24V BRKR OVRD *3
Brake
Encoder

CN2

1	+5V
2	GND
5	T+
6	T-
Case	Shielding

Twisted-pair or twisted-shielded cable

CN3

6,8	-
5	RS485+
4	RS485-
3,7	GND_ISO
2	-
1	-

CN4

| Mini USB |

CN5

8	+5V
4	Opt A
5	Opt /A
3	Opt B
2	Opt /B
9	Opt Z
1	Opt /Z
6	GND
7	GND
10	-
11	-
12	-
13	-
14	-
15	-

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.

SureServo2

AC Servo System Wiring

Standard wiring example, 460V Systems

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.

24V Open-collector pulse command input

NPN (SINK) type equipment

PULL HI_S	35
/SIGN	37
PULL HI_P	39
/PULSE	41

PNP (SOURCE) type equipment

PULL HI_S	35
/SIGN	37
PULL HI_P	39
/PULSE	41

Inputs SIGN (36) and PULSE (43) are designed for Line Driver (differential) signals. Do not use with 24V. For 5V open collector applications, see section 3.5 in the User Manual.

Pulse input (Line Driver)

BRKR and OVRD are Digital Output functions that can be used to control the holding brake. Many applications release the holding brake with the safety circuit.

Motor Power ON / Motor Power OFF / MC / ALRM_RY_A / SPD

R
S
T
24VDC
0V
P1
P2
⊖

P3
D
C
U
V
W

Regenerative resistor

Red
White
Black
Green

Motor supply
Brake
Encoder

24V BRKR OVRD

CN1

/SIGN	37
SIGN	36
/PULSE	41
PULSE	43
V-REF	42
GND	44
T-REF	18
GND	19
MON1	16
GND	13
MON2	15
COM+	11

±10V 10KΩ
±10V 10KΩ

1.2KΩ 12KΩ
1.2KΩ 12KΩ

Twisted-pair or twisted-shielded cable
10KΩ
10KΩ

CN2

1	+5V
2	GND
5	T+
6	T-
Case	Shielding

Twisted-pair or twisted-shielded cable

Digital Input Rating:
ON: 15 - 24V_DC, 8mA
OFF: <5V_DC, <0.5 mA

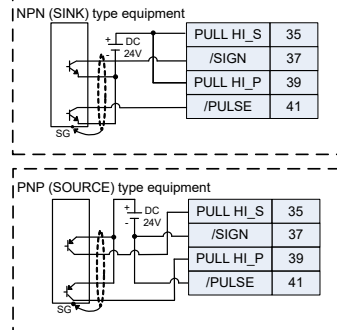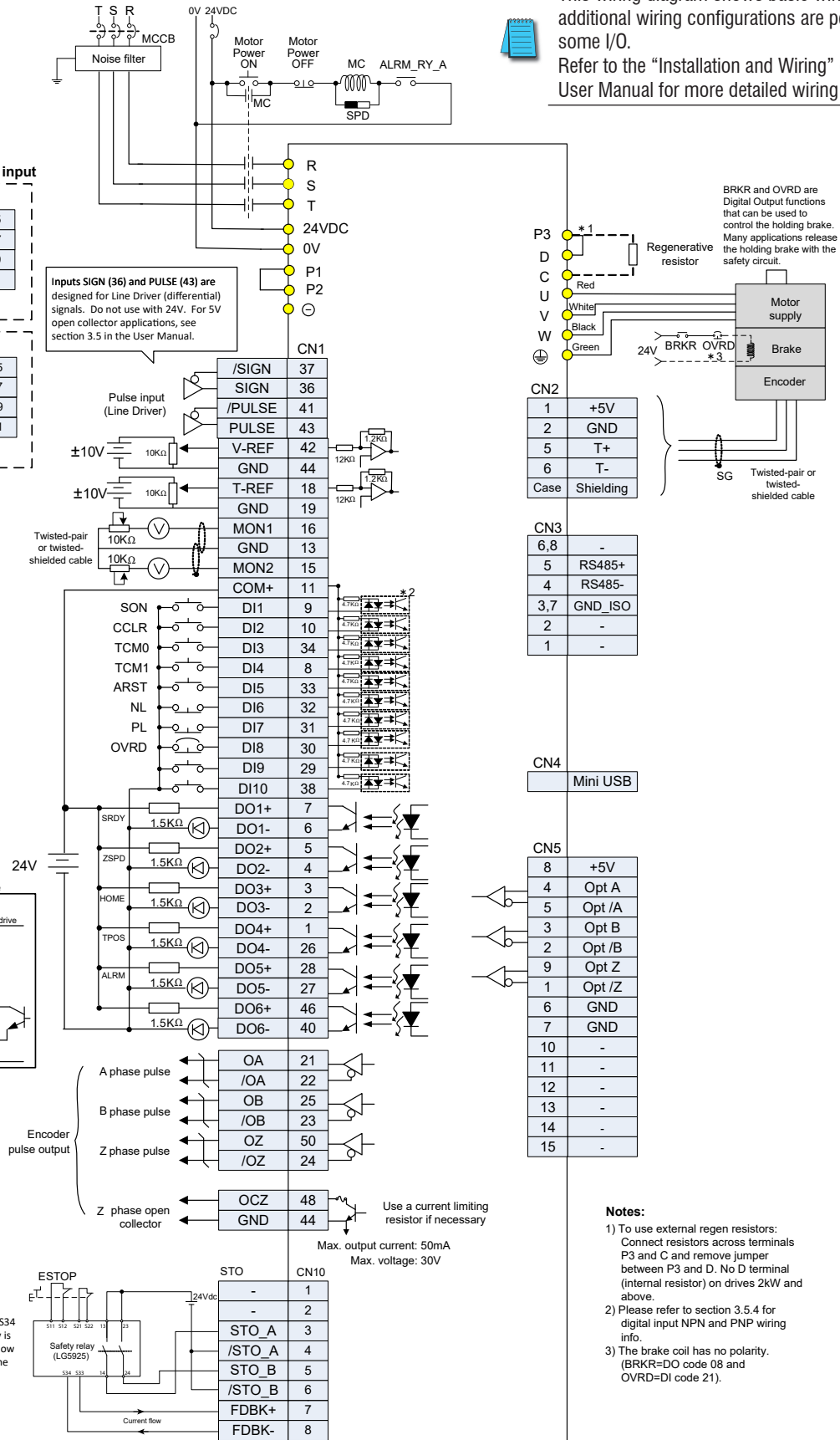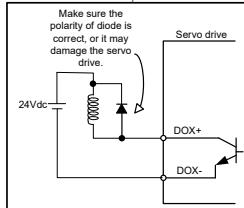| | DI | |
SON	DI1	9
CCLR	DI2	10
TCM0	DI3	34
TCM1	DI4	8
ARST	DI5	33
NL	DI6	32
PL	DI7	31
OVRD	DI8	30
	DI9	29
	DI10	38

4.7KΩ

CN3

6,8	-
5	RS485+
4	RS485-
3,7	GND_ISO
2	-
1	-

Digital Output Rating:
Max 30V_DC, Max 40mA

CN4

| Mini USB |

24V

For inductive loads, use a diode

Make sure the polarity of diode is correct, or it may damage the servo drive.

Servo drive
24Vdc
DOX+
DOX-

SRDY	DO1+	7
	DO1-	6
ZSPD	DO2+	5
	DO2-	4
HOME	DO3+	3
	DO3-	2
TPOS	DO4+	1
	DO4-	26
ALRM	DO5+	28
	DO5-	27
	DO6+	46
	DO6-	40

1.5KΩ

CN5

8	+5V
4	Opt A
5	Opt /A
3	Opt B
2	Opt /B
9	Opt Z
1	Opt /Z
6	GND
7	GND
10	-
11	-
12	-
13	-
14	-
15	-

A phase pulse
| OA | 21 |
| /OA | 22 |
B phase pulse
| OB | 25 |
| /OB | 23 |
Z phase pulse
| OZ | 50 |
| /OZ | 24 |

Encoder pulse output

Z phase open collector
| OCZ | 48 |
| GND | 44 |

Use a current limiting resistor if necessary

Max. output current: 50mA
Max. voltage: 30V

ESTOP

NOTE: Polarity between terminals S33/S34 and FDBK+/- must be correct. If polarity is reversed, enough leakage current will flow through the drive transistor to satisfy the reset circuit of the safety relay.

Safety relay (LG5925)

STO   CN10
-	1
-	2
STO_A	3
/STO_A	4
STO_B	5
/STO_B	6
FDBK+	7
FDBK-	8

24Vdc

Current flow

Notes:
1) To use external regen resistors: Connect resistors across terminals P3 and C and remove jumper between P3 and D. No D terminal (internal resistor) on drives 2kW and above.
2) Please refer to section 3.5.4 for digital input NPN and PNP wiring info.
3) The brake coil has no polarity. (BRKR=DO code 08 and OVRD=DI code 21).

Motion Control   tMNC-307

AC Servo System Dimensions

Servo drive dimensions

SureServo2 Drive Dimensions				
Model	Drawing Link	W mm [inches]	D mm [inches]	H mm [inches]
SV2A-2040	PDF	35 [1.38]	170 [6.69]	170 [6.69]
SV2A-2075	PDF	50 [1.97]	180 [7.09]	180 [7.09]
SV2A-2150	PDF	50 [1.97]	180 [7.09]	180 [7.09]
SV2A-2200	PDF	95 [3.74]	200 [7.87]	180 [7.09]
SV2A-2300	PDF	95 [3.74]	200 [7.87]	180 [7.09]
SV2A-2550	PDF	120 [4.72]	206 [8.12]	273 [10.75]
SV2A-2750	PDF	141 [5.56]	226 [8.90]	312 [12.28]
SV2A-2F00	PDF	186 [7.32]	281 [11.08]	390 [15.35]
SV2A-4040	PDF	65 [2.55]	204 [8.03]	180 [7.09]
SV2A-4075	PDF	65 [2.55]	204 [8.03]	180 [7.09]
SV2A-4150	PDF	65 [2.55]	204 [8.03]	180 [7.09]
SV2A-4200	PDF	110 [4.33]	200.8 [7.9]	260 [10.24]
SV2A-4300	PDF	110 [4.33]	200.8 [7.9]	260 [10.24]
SV2A-4550	PDF	110 [4.33]	200.8 [7.9]	260 [10.24]
SV2A-4750	PDF	120 [4.72]	206.3 [8.12]	273 [10.75]
SV2A-4F00	PDF	141 [5.55]	225.5 [8.88]	312 [12.28]

For additional dimensions, see the AutomationDirect website or click on the drawing links.

Requires 2" above and below the drive for air flow. For proper air flow clearance, please see section 2.3.1 of the SureServo2 User Manual.

For cabinet depth, add approximately 100mm (4 inches) for CN1 (I/O) and CN2 (encoder) cable bend radius.

AC Servo System Dimensions

230V Servo motor dimensions
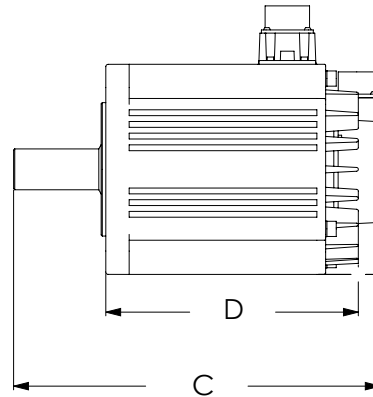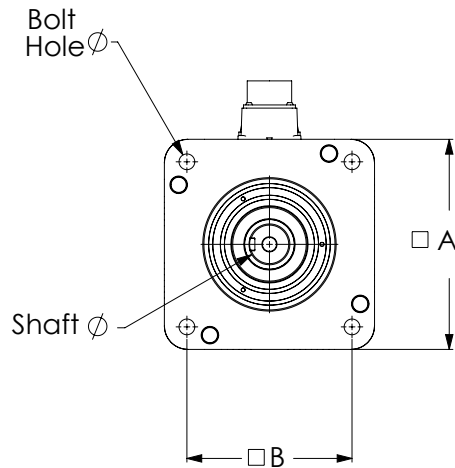
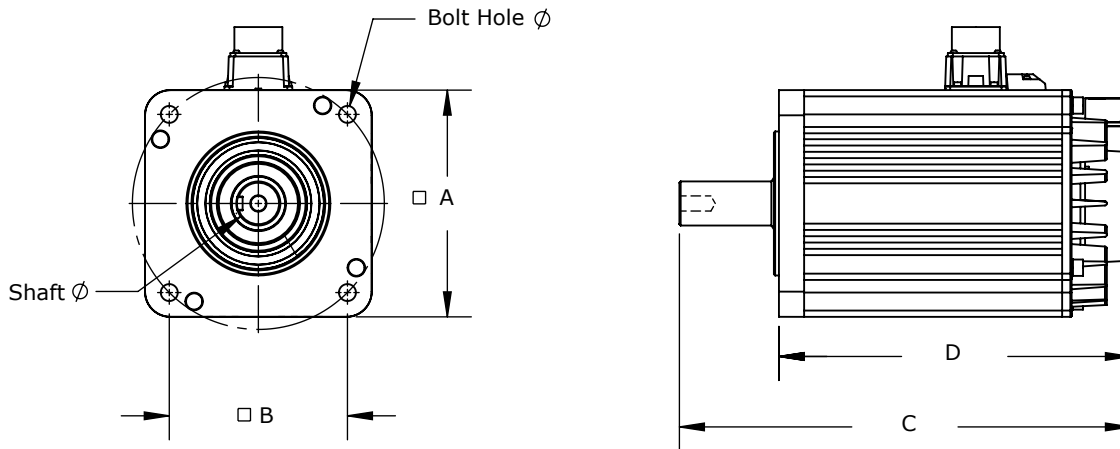| SureServo2 230V Motor Dimensions							
Model	Drawing Link	A mm [inches]	B mm [inches]	C mm [inches]	D mm [inches]	Bolt Hole Ø mm [inches]	Shaft Ø mm [inches]
SV2L-201N	PDF	40.0 [1.57]	32.2 [1.27]	110.3 [4.34]	85.3 [3.36]	4.5 [0.18]	8.0 [0.31]
SV2L-201B	PDF	40.0 [1.57]	32.2 [1.27]	145.1 [5.71]	120.1 [4.73]	4.5 [0.18]	8.0 [0.31]
SV2L-202N	PDF	60.0 [2.36]	49.5 [1.95]	113.9 [4.49]	84.0 [3.31]	5.5 [0.22]	14.0 [0.55]
SV2L-202B	PDF	60.0 [2.36]	49.5 [1.95]	147.6 [5.81]	117.1 [4.61]	5.5 [0.22]	14.0 [0.55]
SV2L-204N	PDF	60.0 [2.36]	49.5 [1.95]	136.0 [5.35]	106.0 [4.17]	5.5 [0.22]	14.0 [0.55]
SV2L-204B	PDF	60.0 [2.36]	49.5 [1.95]	169.7 [6.68]	139.7 [5.50]	5.5 [0.22]	14.0 [0.55]
SV2L-207N	PDF	80.0 [3.15]	63.6 [2.51]	155.8 [6.13]	115.8 [4.56]	6.6 [2.51]	19.0 [0.75]
SV2L-207B	PDF	80.0 [3.15]	63.6 [2.51]	193.2 [7.61]	153.2 [6.03]	6.6 [2.51]	19.0 [0.75]
SV2L-210N	PDF	100.0 [3.94]	81.3 [3.20]	198.3 [7.81]	110.2 [4.34]	9.0 [0.35]	22.0 [0.87]
SV2L-210B	PDF	100.0 [3.94]	81.3 [3.20]	237.5 [9.35]	149.5 [5.89]	9.0 [0.35]	22.0 [0.87]
SV2M-210N	PDF	130.0 [5.12]	102.5 [4.04]	202.5 [7.97]	104.5 [4.11]	9.0 [0.35]	22.0 [0.87]
SV2M-210B	PDF	130.0 [5.12]	102.5 [4.04]	238.5 [9.39]	140.5 [5.53]	9.0 [0.35]	22.0 [0.87]
SV2M-215N	PDF	130.0 [5.12]	102.5 [4.04]	222.5 [8.76]	120.5 [4.74]	9.0 [0.35]	22.0 [0.87]
SV2M-215B	PDF	130.0 [5.12]	102.5 [4.04]	257.0 [10.12]	155.0 [6.10]	9.0 [0.35]	22.0 [0.87]
SV2M-220N	PDF	180.0 [7.09]	141.4 [5.57]	247.7 [9.75]	150.0 [5.91]	13.5 [0.53]	35.0 [1.38]
SV2M-220B	PDF	180.0 [7.09]	141.4 [5.57]	281.8 [11.09]	184.1 [7.25]	13.5 [0.53]	35.0 [1.38]
SV2M-230N	PDF	180.0 [7.09]	141.4 [5.57]	280.8 [11.06]	183.1 [7.21]	13.5 [0.53]	35.0 [1.38]
SV2M-230B	PDF	180.0 [7.09]	141.4 [5.57]	314.0 [12.36]	216.3 [8.52]	13.5 [0.53]	35.0 [1.38]
SV2H-245N	PDF	180.0 [7.09]	141.4 [5.57]	314.0 [12.36]	216.3 [8.52]	13.5 [0.53]	35.0 [1.38]
SV2H-245B	PDF	180.0 [7.09]	141.4 [5.57]	358.0 [14.09]	260.3 [10.25]	13.5 [0.53]	35.0 [1.38]
SV2H-255N	PDF	180.0 [7.09]	141.4 [5.57]	392.4 [15.45]	260.7 [10.26]	13.5 [0.53]	42.0 [1.63]
SV2H-255B	PDF	180.0 [7.09]	141.4 [5.57]	424.4 [16.71]	292.7 [11.52]	13.5 [0.53]	42.0 [1.63]
SV2H-275N	PDF	180.0 [7.09]	141.4 [5.57]	454.70 [17.9]	323.0 [12.72]	13.5 [0.53]	42.0 [1.63]
SV2H-275B	PDF	180.0 [7.09]	141.4 [5.57]	488.8 [19.24]	357.1 [14.06]	13.5 [0.53]	42.0 [1.63]
SV2H-2B0N	PDF	219.9 [8.66]	166.2 [6.54]	487.4 [19.19]	319.0 [12.56]	13.5 [0.53]	42.0 [1.63]
SV2H-2B0B	PDF	219.9 [8.66]	166.2 [6.54]	550.4 [21.67]	382.0 [15.04]	13.5 [0.53]	42.0 [1.63]
SV2H-2F0N	PDF	219.9 [8.66]	166.2 [6.54]	566.4 [22.30]	398.0 [15.67]	13.5 [0.53]	55.0 [2.17]
SV2H-2F0B	PDF	219.9 [8.66]	166.2 [6.54]	629.4 [24.78]	461.0 [18.15]	13.5 [0.53]	55.0 [2.17]

NOTE: Motor cables are approximately 304mm (12") in length.

For additional dimensions, see the AutomationDirect website or click on the drawing links.

AC Servo System Dimensions

460V Servo motor dimensions

SureServo2 460V Motor Dimensions							
Model	*Drawing Link*	*A* mm [inches]	*B* mm [inches]	*C* mm [inches]	*D* mm [inches]	*Bolt Hole Ø* mm [inches]	*Shaft Ø* mm [inches]
SV2L-404N	PDF	60.0 [2.36]	49.5 [1.95]	136.0 [5.35]	106.0 [4.17]	5.5 [0.22]	14.0 [0.55]
SV2L-404B	PDF	60.0 [2.36]	49.5 [1.95]	169.7 [6.68]	139.7 [5.50]	5.5 [0.22]	14.0 [0.55]
SV2L-407N	PDF	80.0 [3.15]	63.6 [2.51]	155.8 [6.13]	115.8 [4.56]	6.6 [0.26]	19.0 [0.75]
SV2L-407B	PDF	80.0 [3.15]	63.6 [2.51]	193.2 [7.61]	153.2 [6.03]	6.6 [0.26]	19.0 [0.75]
SV2L-410N	PDF	100.0 [3.94]	81.3 [3.20]	198.2 [7.81]	153.2 [6.03]	9.0 [0.35]	22.0 [0.87]
SV2L-410B	PDF	100.0 [3.94]	81.3 [3.20]	237.5 [9.35]	192.5 [7.58]	9.0 [0.35]	22.0 [0.87]
SV2L-415N	PDF	130.0 [5.12]	102.5 [4.04]	222.5 [8.76]	167.5 [6.59]	9.0 [0.35]	22.0 [0.87]
SV2L-415B	PDF	130.0 [5.12]	102.5 [4.04]	257.0 [10.12]	202.0 [7.95]	9.0 [0.35]	22.0 [0.87]
SV2L-420N	PDF	130.0 [5.12]	102.5 [4.04]	242.5 [9.55]	187.5 [7.38]	9.0 [0.35]	22.0 [0.87]
SV2L-420B	PDF	130.0 [5.12]	102.5 [4.04]	271.0 [10.67]	216.0 [8.50]	9.0 [0.35]	22.0 [0.87]
SV2M-410N	PDF	130.0 [5.12]	102.5 [4.04]	202.5 [7.97]	147.5 [5.81]	9.0 [0.35]	22.0 [0.87]
SV2M-410B	PDF	130.0 [5.12]	102.5 [4.04]	238.5 [9.39]	183.5 [7.22]	9.0 [0.35]	22.0 [0.87]
SV2H-430N	PDF	180.0 [7.09]	141.4 [5.57]	280.8 [11.06]	201.8 [7.94]	13.5 [0.53]	35.0 [1.38]
SV2H-430B	PDF	180.0 [7.09]	141.4 [5.57]	314.0 [12.36]	235.0 [9.25]	13.5 [0.53]	35.0 [1.38]
SV2H-445N	PDF	180.0 [7.09]	141.4 [5.57]	314.0 [12.36]	235.0 [9.25]	13.5 [0.53]	35.0 [1.38]
SV2H-445B	PDF	180.0 [7.09]	141.4 [5.57]	358.0 [14.09]	279.0 [10.98]	13.5 [0.53]	35.0 [1.38]
SV2H-455N	PDF	180.0 [7.09]	141.4 [5.57]	392.4 [15.45]	279.4 [11.00]	13.5 [0.53]	42.0 [1.65]
SV2H-455B	PDF	180.0 [7.09]	141.4 [5.57]	424.4 [16.71]	311.4 [12.26]	13.5 [0.53]	42.0 [1.65]
SV2H-475N	PDF	180.0 [7.09]	141.4 [5.57]	454.7 [17.90]	341.7 [13.45]	13.5 [0.53]	42.0 [1.65]
SV2H-475B	PDF	180.0 [7.09]	141.4 [5.57]	488.8 [19.24]	375.8 [14.80]	13.5 [0.53]	42.0 [1.65]
SV2H-4B0N	PDF	220.0 [8.66]	166.2 [6.54]	487.4 [19.19]	371.4 [14.62]	13.5 [0.53]	42.0 [1.65]
SV2H-4B0B	PDF	220.0 [8.66]	166.2 [6.54]	550.4 [21.67]	434.4 [17.10]	13.5 [0.53]	42.0 [1.65]
SV2H-4F0N	PDF	220.0 [8.66]	166.2 [6.54]	566.4 [22.30]	450.4 [17.73]	13.5 [0.53]	55.0 [2.17]
SV2H-4F0B	PDF	220.0 [8.66]	166.2 [6.54]	629.4 [24.78]	513.4 [20.21]	13.5 [0.53]	55.0 [2.17]

NOTE: Motor cables are approximately 304mm (12") in length.

For additional dimensions, see the AutomationDirect website or click on the drawing links.

AC Servo System Accessories

Accessories

CN1 Accessories

The terminal block module and direct mount feedthrough module allow for I/O connections to a SureServo2 drive.

Option 1:
Select an SV2-CN1-CBL50 cable (3 lengths available) and the DIN rail mount SV2-CN1-RTB50 Remote Terminal Block for access to all 50 of the drive's digital and analog I/O signals.

Option 2:
Select the SV2-CN1-LTB20 Local Terminal Block. The LTB20 can be used in many applications and allows connection to the most frequently-used I/O: High speed line driver pulse inputs (Pulse and Direction, AB Quad, etc.), (5) Digital Inputs, (4) Digital Outputs, and the Z-pulse open collector output.
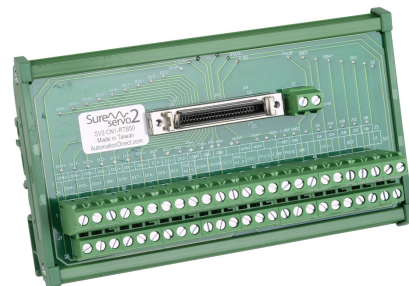
SV2-CN1-RTB50

Part Number	Price	Description	Cable Length	Drawing	Compatible Drives
SV2-CN1-RTB50	$78.00	SureServo2 feedthrough module, 50-pole, DIN rail mount	–	PDF	
SV2-CN1-CBL50	$102.00	SureServo2 CN1 I/O control cable with mating connectors	0.5 m	–	All
SV2-CN1-CBL50-1	$108.00		1m		
SV2-CN1-CBL50-2	$114.00		2m		
SV2-CN1-LTB20	$59.00	SureServo2 feedthrough module, 20-pole, direct mount	–	PDF	

SV2-CN1-LTB20

Communication Modules

SureServo2 drives can also make use of optional communication cards. Both EtherNet/IP and Modbus TCP cards are available. Field upgradeable firmware ensures that the cards can always be kept current.

ModBus TCP
The SV2-CM-MODTCP Modbus TCP card allows the same access to all the drive parameters as the native serial Modbus (RS485).

EtherNet/IP
The SV2-CM-ENETIP Ethernet/IP card allows both Explicit and Implicit (I/O) Messaging. The SureServo2 Pro software allows you to easily generate (with pull-down menus) an EDS file for import into your PLC that contains exactly what you want in your Implicit Message.

SV2-CM-ENETIP
or
SV2-CM-MODTCP

Part Number	Price	Description	Drawing	Compatible Drives
SV2-CM-ENETIP	$143.00	SureServo2 communication module, EtherNet/IP, 1 port, (1) Ethernet (RJ45) port.	PDF	All SureServo2 drives
SV2-CM-MODTCP	$134.00	SureServo2 communication module, Modbus TCP, 1 port, (1) Ethernet (RJ45) port.	PDF	

AC Servo System Accessories

Accessories, *continued*

Motor Cables

Use the table to the right to select the correct SV2 motor cables (power, encoder, and brake) for your SureServo2 motor. Note that the largest frame brakemotors require a separate brake cable: 230V motors 5.5–15 kW and 460V motors 11kW–15kW. For smaller brakemotors, the brake wiring is incorporated into the motor power cable.

First find the motor part number in the left column, then reference the required cable part series under the Power, Encoder, and Brake columns. The first two "x" digits in the part numbers below are placeholders to represent length in meters while the 3rd "x" denotes flex (F) or non-flex (N) cabling. Brake vs non-brake cables are represented by a "B" or "N" at the end of the part number. For example, a 20m non-flex non-brake cable would end in 20NN, while a 3m flex-rated brake motor cable would end in 03FB. Note that SV2H series motors (5.5 kW and greater) use a separate cable to power the brake, so use an "N" cable for motor power. Also, if you use a flex-rated power cable (F series) you should use flex-rated encoder and brake power cables. The flex cables may not feel more flexible when compared side-by-side with the non-flex versions, but they are constructed with finer strands of wire and are designed to withstand millions of flex cycles (continuous flexing) without suffering from "cable corkscrew".

Specs and prices for the various cable options in each series can be found in the tables on the following pages.

Example:
You are purchasing an SV2L-201B brake motor and want 10m flex-rated cabling. What cables do you need? The abbreviated motor chart below shows that the SV2L-201B brake motor needs a PB18 series power cable and an E122 series encoder cable. Brake power is supplied through the power cable. The cable charts on subsequent pages enumerate all the various options and show that a 10m, flex, E122 series encoder cable is SV2C-E122-10FN and that a 10m, flex, PB series power cable is SV2C-PB18-10FB.

SureServo2® Motor		Power Cable	Encoder Cable	Brake Cable
230V	**460V**			
SV2L-201N SV2L-202N SV2L-204N SV2L-207N	SV2L-404N SV2L-407N	SV2C-PA18-xxxN	SV2C-E122-xxxN	n/a
SV2L-201B SV2L-202B SV2L-204B SV2L-207B	SV2L-404B SV2L-407B	SV2C-PB18-xxxB		
SV2L-210N	SV2L-410N SV2M-410N SV2L-415N SV2L-420N	SV2C-PC16-xxxN	SV2C-E222-xxxN	
SV2L-210B	SV2L-410B SV2M-410B SV2L-415B SV2L-420B	SV2C-PC16-xxxB		
SV2M-210N SV2M-215N	–	SV2C-PC12-xxxN		
SV2M-210B SV2M-215B	–	SV2C-PC12-xxxB		
SV2M-220N SV2M-230N	SV2H-430N	SV2C-PD12-xxxN		
SV2M-220B SV2M-230B	SV2H-430B	SV2C-PD12-xxxB		
SV2H-245N	SV2H-445N SV2H-455N SV2H-475N	SV2C-PD08-xxxN		
SV2H-245B	SV2H-445B SV2H-455B SV2H-475B	SV2C-PD08-xxxB		
SV2H-255N SV2H-275N SV2H-2B0N	–	SV2C-PF06-xxxN		
SV2H-255B SV2H-275B SV2H-2B0B	–	SV2C-PF06-xxxN		SV2C-B120-xxxB
SV2H-2F0N	–	SV2C-PF04-xxxN		n/a
SV2H-2F0B	–	SV2C-PF04-xxxN		SV2C-B120-xxxB
–	SV2H-4B0N SV2H-4F0N	SV2C-PF08-xxxN		n/a
–	SV2H-4B0B SV2H-4F0B	SV2C-PF08-xxxN		SV2C-B120-xxxB

Power Cables
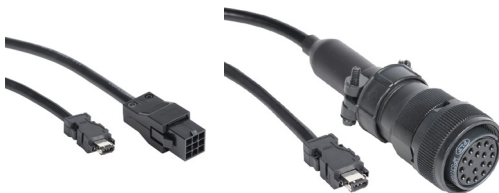
Encoder Cables

Separate Brake Cable
(for large frame motors (see table))

AC Servo System Accessories

Accessories, *continued*

SV2C-E122 Series Encoder Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Connector	Compatible Motors
SV2C-E122-03NN	$86.00		3m		PDF		
SV2C-E122-05NN	$118.00	N	5m		PDF		SV2L-201x
SV2C-E122-10NN	$187.00		10m		PDF		SV2L-202x
SV2C-E122-20NN	$307.00		20m	22	PDF	SV2C-E1-CON	SV2L-204x
SV2C-E122-03FN	$110.00		3m		PDF		SV2L-207x
SV2C-E122-05FN	$157.00	Y	5m		PDF		SV2L-404x
SV2C-E122-10FN	$262.00		10m		PDF		SV2L-407x
SV2C-E122-20FN	$455.00		20m		PDF		

SV2C-E222 Series Encoder Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Connector	Compatible Motors	
SV2C-E222-03NN	$187.00		3m		PDF		SV2L-210x	SV2L-410x
SV2C-E222-05NN	$307.00	N	5m		PDF		SV2M-210x	SV2M-410x
SV2C-E222-10NN	$382.00		10m		PDF		SV2M-215x	SV2L-415x
SV2C-E222-20NN	$504.00		20m	22	PDF	SV2C-E2-CON	SV2M-220x	SV2L-420x
SV2C-E222-03FN	$242.00		3m		PDF		SV2M-230x	SV2H-430x
SV2C-E222-05FN	$296.00	Y	5m		PDF		SV2H-245x	SV2H-445x
SV2C-E222-10FN	$456.00		10m		PDF		SV2H-255x	SV2H-455x
SV2C-E222-20FN	$653.00		20m		PDF		SV2H-275X	SV2H-475X
							SV2H-2B0x	SV2H-4B0x
							SV2H-2F0x	SV2H-4F0x

SV2C-PA18 Series Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Connector	Compatible Motors
SV2C-PA18-03NN	$59.00		3m		PDF		
SV2C-PA18-05NN	$78.00	N	5m		PDF		SV2L-201N
SV2C-PA18-10NN	$115.00		10m		PDF		SV2L-202N
SV2C-PA18-20NN	$185.00		20m	18	PDF	SV2C-PA-CON	SV2L-204N
SV2C-PA18-03FN	$82.00		3m		PDF		SV2L-207N
SV2C-PA18-05FN	$110.00	Y	5m		PDF		SV2L-404N
SV2C-PA18-10FN	$179.00		10m		PDF		SV2L-407N
SV2C-PA18-20FN	$305.00		20m		PDF		

AC Servo System Accessories

Accessories, *continued*

SV2C-PB18 Series Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Connector	Compatible Motors
SV2C-PB18-03NB	$70.00	N	3m	18	PDF	SV2C-PB-CON	SV2L-201B SV2L-202B SV2L-204B SV2L-207B SV2L-404B SV2L-407B
SV2C-PB18-05NB	$91.00		5m		PDF		
SV2C-PB18-10NB	$144.00		10m		PDF		
SV2C-PB18-20NB	$235.00		20m		PDF		
SV2C-PB18-03FB	$103.00	Y	3m		PDF		
SV2C-PB18-05FB	$151.00		5m		PDF		
SV2C-PB18-10FB	$253.00		10m		PDF		
SV2C-PB18-20FB	$451.00		20m		PDF		

SV2C-PC16 Series Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Connector	Compatible Motors
SV2C-PC16-03NN	$202.00	N	3m	16	PDF	SV2C-PC-CON	SV2L-210N SV2L-410N SV2M-410N SV2L-415N SV2L-420N
SV2C-PC16-05NN	$239.00		5m		PDF		
SV2C-PC16-10NN	$316.00		10m		PDF		
SV2C-PC16-20NN	$458.00		20m		PDF		
SV2C-PC16-03FN	$222.00	Y	3m		PDF		
SV2C-PC16-05FN	$268.00		5m		PDF		
SV2C-PC16-10FN	$376.00		10m		PDF		
SV2C-PC16-20FN	$577.00		20m		PDF		
SV2C-PC16-03NB	$236.00	N	3m	16	PDF		SV2L-210B SV2L-410B SV2M-410B SV2L-415B SV2L-420B
SV2C-PC16-05NB	$286.00		5m		PDF		
SV2C-PC16-10NB	$395.00		10m		PDF		
SV2C-PC16-20NB	$598.00		20m		PDF		
SV2C-PC16-03FB	$265.00	Y	3m		PDF		
SV2C-PC16-05FB	$331.00		5m		PDF		
SV2C-PC16-10FB	$482.00		10m		PDF		
SV2C-PC16-20FB	$773.00		20m		PDF		

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AC Servo System Accessories

Accessories, *continued*

SV2C-PC12 Series Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Connector	Compatible Motors
SV2C-PC12-03NN	$276.00	N	3m	12	PDF	SV2C-PC-CON	SV2M-210N SV2M-215N
SV2C-PC12-05NN	$361.00		5m		PDF		
SV2C-PC12-10NN	$540.00		10m		PDF		
SV2C-PC12-20NN	$924.00		20m		PDF		
SV2C-PC12-03FN	$302.00	Y	3m		PDF		
SV2C-PC12-05FN	$402.00		5m		PDF		
SV2C-PC12-10FN	$624.00		10m		PDF		
SV2C-PC12-20FN	$1,068.00		20m		PDF		
SV2C-PC12-03NB	$307.00	N	3m	12	PDF		SV2M-210B SV2M-215B
SV2C-PC12-05NB	$403.00		5m		PDF		
SV2C-PC12-10NB	$624.00		10m		PDF		
SV2C-PC12-20NB	$1,056.00		20m		PDF		
SV2C-PC12-03FB	$338.00	Y	3m		PDF		
SV2C-PC12-05FB	$455.00		5m		PDF		
SV2C-PC12-10FB	$708.00		10m		PDF		
SV2C-PC12-20FB	$1,188.00		20m		PDF		

SV2C-PD12 Series Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Connector	Compatible Motors
SV2C-PD12-03NN	$210.00	N	3m	12	PDF	SV2C-PD-CON	SV2M-220N SV2M-230N SV2H-430N
SV2C-PD12-05NN	$268.00		5m		PDF		
SV2C-PD12-10NN	$410.00		10m		PDF		
SV2C-PD12-20NN	$684.00		20m		PDF		
SV2C-PD12-03FN	$226.00	Y	3m		PDF		
SV2C-PD12-05FN	$295.00		5m		PDF		
SV2C-PD12-10FN	$463.00		10m		PDF		
SV2C-PD12-20FN	$786.00		20m		PDF		
SV2C-PD12-03NB	$233.00	N	3m	12	PDF		SV2M-220B SV2M-230B SV2H-430B
SV2C-PD12-05NB	$301.00		5m		PDF		
SV2C-PD12-10NB	$463.00		10m		PDF		
SV2C-PD12-20NB	$779.00		20m		PDF		
SV2C-PD12-03FB	$254.00	Y	3m		PDF		
SV2C-PD12-05FB	$337.00		5m		PDF		
SV2C-PD12-10FB	$536.00		10m		PDF		
SV2C-PD12-20FB	$922.00		20m		PDF		

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AC Servo System Accessories

Accessories, *continued*

SV2C-PD08 Series Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Connector	Compatible Motors
SV2C-PD08-03NN	$286.00	N	3m	8	PDF	SV2C-PD-CON	SV2H-245N SV2H-445N SV2H-455N SV2H-475N
SV2C-PD08-05NN	$390.00		5m		PDF		
SV2C-PD08-10NN	$653.00		10m		PDF		
SV2C-PD08-20NN	$1,164.00		20m		PDF		
SV2C-PD08-03FN	$310.00	Y	3m		PDF		
SV2C-PD08-05FN	$432.00		5m		PDF		
SV2C-PD08-10FN	$734.00		10m		PDF		
SV2C-PD08-20FN	$1,330.00		20m		PDF		
SV2C-PD08-03NB	$277.00	N	3m	8	PDF		SV2H-245B SV2H-445B SV2H-455B SV2H-475B
SV2C-PD08-05NB	$391.00		5m		PDF		
SV2C-PD08-10NB	$671.00		10m		PDF		
SV2C-PD08-20NB	$1,211.00		20m		PDF		
SV2C-PD08-03FB	$326.00	Y	3m		PDF		
SV2C-PD08-05FB	$460.00		5m		PDF		
SV2C-PD08-10FB	$791.00		10m		PDF		
SV2C-PD08-20FB	$1,430.00		20m		PDF		

SV2C-PF08 Series Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Connector	Compatible Motors
SV2C-PF08-03NN	$289.00	N	3m	8	PDF	SV2C-PF-CON	SV2H-4B0N SV2H-4B0B SV2H-4F0N SV2H-4F0B
SV2C-PF08-05NN	$356.00		5m		PDF		
SV2C-PF08-10NN	$520.00		10m		PDF		
SV2C-PF08-20NN	$900.00		20m		PDF		
SV2C-PF08-03FN	$366.00	Y	3m		PDF		
SV2C-PF08-05FN	$481.00		5m		PDF		
SV2C-PF08-10FN	$760.00		10m		PDF		
SV2C-PF08-20FN	$1,378.00		20m		PDF		

SV2C-PF06 Series Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Connector	Compatible Motors
SV2C-PF06-03NN	$388.00	N	3m	6	PDF	SV2C-PF-CON	SV2H-255N SV2H-255B SV2H-275N SV2H-275B SV2H-2B0N SV2H-2B0B
SV2C-PF06-05NN	$574.00		5m		PDF		
SV2C-PF06-10NN	$1,000.00		10m		PDF		
SV2C-PF06-20NN	$1,808.00		20m		PDF		
SV2C-PF06-03FN	$451.00	Y	3m		PDF		
SV2C-PF06-05FN	$634.00		5m		PDF		
SV2C-PF06-10FN	$1,096.00		10m		PDF		
SV2C-PF06-20FN	$1,992.00		20m		PDF		

AC Servo System Accessories

Accessories, *continued*

SV2C-PF04 Series Power Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Connector	Compatible Motors
SV2C-PF04-03NN	$458.00	N	3m	4	PDF	SV2C-PF-CON	SV2H-2F0N SV2H-2F0B
SV2C-PF04-05NN	$647.00		5m		PDF		
SV2C-PF04-10NN	$1,091.00		10m		PDF		
SV2C-PF04-20NN	$1,982.00		20m		PDF		
SV2C-PF04-03FN	$521.00	Y	3m		PDF		
SV2C-PF04-05FN	$734.00		5m		PDF		
SV2C-PF04-10FN	$1,277.00		10m		PDF		
SV2C-PF04-20FN	$2,333.00		20m		PDF		

SV2C-B120 Series Brake Cables

Part Number	Price	Flex Rated	Length	Gauge	Drawing	Connector	Compatible Motors
SV2C-B120-03NB	$127.00	N	3m	20	PDF	SV2C-B1-CON	SV2H-255B SV2H-275B SV2H-2B0B SV2H-2F0B SV2H-4B0B SV2H-4F0B
SV2C-B120-05NB	$146.00		5m		PDF		
SV2C-B120-10NB	$185.00		10m		PDF		
SV2C-B120-20NB	$247.00		20m		PDF		
SV2C-B120-03FB	$137.00	Y	3m		PDF		
SV2C-B120-05FB	$161.00		5m		PDF		
SV2C-B120-10FB	$215.00		10m		PDF		
SV2C-B120-20FB	$308.00		20m		PDF		

AC Servo System Accessories

Accessories, *continued*

External Encoder CN5 Cables

CN5 secondary encoder cables can be used to connect an external secondary encoder to a SureServo2 drive. The CN5 uses a wire not present in standard VGA cables - you must use one of these cables, standard HD15 VGA cables will not work.

Part Number	Price	Description	Length	Drawing	Compatible Drives
ZL-HD15M-CBL-2P	$25.00	ZIPLink communication cable, 15-pin D-sub HD15 male to pigtail, shielded, twisted pair.	2m	PDF	All SV2 drives
*ZL-HD15M-CBL-DB15F**	$27.50	ZIPLink communication cable, 15-pin female D-sub to 15-pin D-sub HD15 male, shielded, twisted pair.	2m	PDF	

* ZL-RTB-DB15 is required to use the ZL-HD15M-CBL-DB15F cable

Pin Number	Color	Signal	Function
1	Black/White	Opt_/Z	/Z phase input
2	Blue/White	Opt_/B	/B phase input
3	Blue	Opt_B	B phase input
4	Green	Opt_A	A phase input
5	Green/White	Opt_/A	/A phase input
6	Yellow Yellow/Black	GND	Encoder grounding
7	Red/White	GND	Encoder grounding
8	Red	+5V	Encoder power
9	Black	Opt_Z	Z phase input
10	Orange	Reserved	Reserved
11	Orange/White	Reserved	Reserved
12	Brown	Reserved	Reserved
13	Brown/White	Reserved	Reserved
14	Purple	Reserved	Reserved
15	Purple/White	Reserved	Reserved

ZL-HD15M-CBL-2P

ZL-HD15M-CBL-DB15F

ZL-RTB-DB15

SV2-BBOX-CBL

Battery Box

An optional external battery can be used to power SureServo2 encoders. The battery allows the use of Absolute Encoder Mode. This mode will keep track of the motor actual position (regardless of number of turns) even if control power is removed from the drive.

SV2-BBOX-1 attaches to the encoder cable. There is a small connector protruding from each encoder cable several inches from the drive-end connector. This connector plugs into the SV2-BBOX-1.

SV2-BBOX-CBL is not required for most applications. Use this cable to extend the length from the encoder cable's connector to the BBOX. This is used if you do not want the BBOX clamped onto the encoder cable right under the drive.

Part Number	Price	Description	Length	Drawing	Compatible Drives
SV2-BBOX-1	$32.50	SureServo2 encoder single battery box, for use with all SureServo2 drives. (1) AA ER14505 lithium battery included.	–	PDF	All SV2 drives
SV2-BBOX-CBL	$4.25	SureServo2 battery box cable, mating connectors, 7.8 in/200mm cable length. For use with SureServo2 encoder battery box.	200mm	PDF	

SV2-BBOX-1
Motion Control

AC Servo System Accessories

Accessories, *continued*

Serial Comms Connectors
Available serial comms connectors consist of an RS-485 splitter and an RS-485 terminating resistor. These connectors (and the drive's CN3) all use RJ45 connectors.

With these two connectors, you can easily create a multi-drop RS485 connection with minimal manual wiring. For multi-drop systems, use one SV2-CN3-CON-2 per drive. Connect each drive with a standard RJ45 (Ethernet patch) cable. On the last drive in the daisy-chain, plug in an SV2-CN3-TR2 to terminate the network. On the first drive, either strip one end of a patch cable to wire into your controller/PLC or plug into a ZL-RTB-RJ45 breakout board for easy wiring to your controller/PLC.

SV2-CN3-CON-2

Part Number	Price	Description	Drawing	Compatible Drives
SV2-CN3-CON-2	$17.00	SureServo2 splitter, (2) RS-485 (RJ45) to (1) RS-485 (RJ45)	PDF	All SureServo2 Drives
SV2-CN3-TR2	$7.50	Terminating resistor, 120 ohm, RJ45 8P8C male.	PDF	
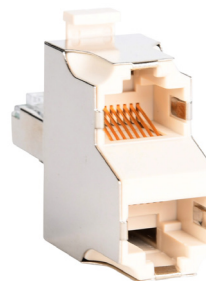
SV2-CN3-TR2

Toroid
A toroid (ferrite ring) is available for use with all SureServo2 drives to reduce radiated noise. See the user manual for application information for the SV2-TOR1.

| Part Number	Price	Description	Drawing	Compatible Drives
SV2-TOR1	$19.00	Toroid ring for EMI/RFI filtering (2 per pack)	PDF	All SureServo2 Drives

SV2-TOR1

Cable Connectors
Use the cable connectors below to build your own motor power, brake, or encoder cable.

Part Number	Price	Description	Drawing	Compatible With
SV2C-PA-CON	$14.50	SureServo2 motor power connector	PDF	750W or smaller SureServo2 motors w/o brake
SV2C-PB-CON	$17.00		PDF	750W or smaller SureServo2 motors w/brake
SV2C-PC-CON	$54.00		PDF	1 to 1.5 kW SureServo2 motors
SV2C-PD-CON	$64.00		PDF	2 to 4.5 kW SureServo2 motors
SV2C-PF-CON	$95.00		PDF	5.5 to 15 kW SureServo2 motors
SV2C-E1-CON	$14.50	SureServo2 motor encoder connector	PDF	750W or smaller SureServo2 motors
SV2C-E2-CON	$47.00		PDF	1kW and larger SureServo2 motors
SV2C-E3-CON	$11.00	CN2 encoder cable (connection to drive)	PDF	All SureServo2 drives
SV2C-B1-CON	$42.00	SureServo2 motor brake connector	PDF	5.5 to 15 kW SureServo2 motors with brake
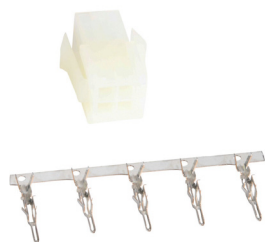
SV2C-PA-CON

SV2C-PF-CON

SV2C-E1-CON

SureServo2

AC Servo System Accessories

Accessories, *continued*

Replacement Connectors

The following replacement connectors can be purchased for use with SureServo2 drives. SV2-CN1-CON and SV2-CN10-STO are standalone connectors, while SV2-CON-KIT is a set of connectors.

Part Number	Price	Description	Drawing	Compatible With
SV2-CN1-CON	$25.00	Optional 50-pin CN1 I/O connector (solder)	–	All SureServo2 drives
SV2-CON-KIT	$31.00	SureServo2 replacement connector kit, contains: (1) SV2-CN10-STO connector (2) AC power connectors (1) Power resistor connector (1) Motor power connector (2) Wire insert tools	–	Up to 1.5 kW 230V SureServo2 drives (460V drives use integrated terminals)
SV2-CN10-STO	$14.50	Replacement SureServo2 STO connector	PDF	All SureServo2 drives

SV2-CON-KIT

SV2-CN10-STO

SV2-CN1-CON

Replacement Drive Fans

The following replacement fans can be purchased for use with SureServo2 drives. Each fan can be used to replace the fan on a specific 230 and 460 V drive. Please see the table below to find the correct part.

| Part Number	Price	Description	Drawing
SV2-FAN-1	$21.50	SureServo2 main cooling fan, replacement, 40 x 40 x 15mm, 12 VDC. For use with SureServo2 SV2A-2075 and SV2A-2150 drives. Electrical connector included.	PDF
SV2-FAN-2	$15.50	SureServo2 main cooling fan, replacement, 50 x 50 x 20mm, 12 VDC. For use with SureServo2 SV2A-2200 and SV2A-2300 drives. Electrical connector included.	PDF
SV2-FAN-3	$33.00	SureServo2 main cooling fan, replacement, 50 x 50 x 20mm, 12 VDC. For use with SureServo2 SV2A-4040, SV2A-4075 and SV2A-4150 drives. Electrical connector included.	PDF
SV2-FAN-4	$35.00	SureServo2 main cooling fan, replacement, 60 x 60 x 25mm, 12 VDC. For use with SureServo2 SV2A-2550, SV2A-4300 and SV2A-4550 drives. Electrical connector included.	PDF
SV2-FAN-5	$27.50	SureServo2 main cooling fan, replacement, 60 x 60 x 20mm, 12 VDC. For use with SureServo2 SV2A-2550, SV2A-4200 and SV2A-4550 drives. Electrical connector included.	PDF
SV2-FAN-6	$39.00	SureServo2 main cooling fan, replacement, 70 x 70 x 25mm, 12 VDC. For use with SureServo2 SV2A-2750 and SV2A-4750 drives. Electrical connector included.	PDF
SV2-FAN-7	$66.00	SureServo2 main cooling fan, replacement, 92 x 92 x 38mm, 24 VDC. For use with SureServo2 SV2A-2F00 drive. Electrical connector included.	PDF
SV2-FAN-8	$55.00	SureServo2 main cooling fan, replacement, 92 x 92 x 38mm, 12 VDC. For use with SureServo2 SV2A-4F00 drive. Electrical connector included.	PDF

SV2-FAN-1

SV2-FAN-8

AC Servo Systems

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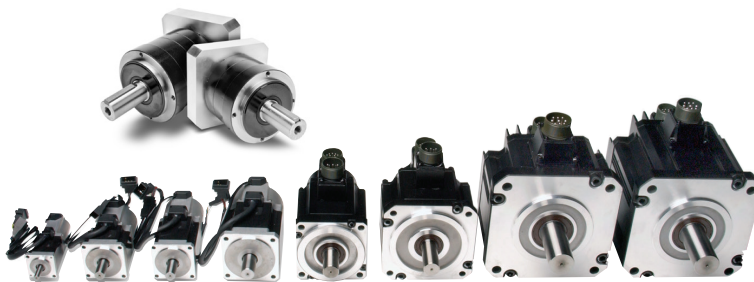
Drive features

- 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
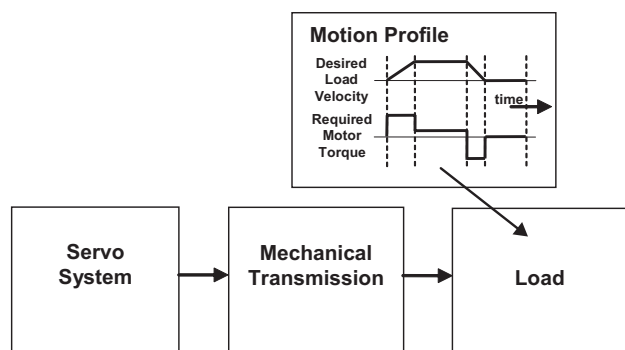
AC Servo Systems

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

Motion Profile

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).
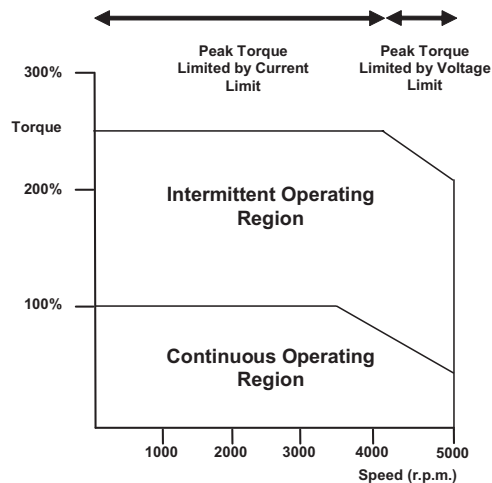
AC Servo Systems

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.
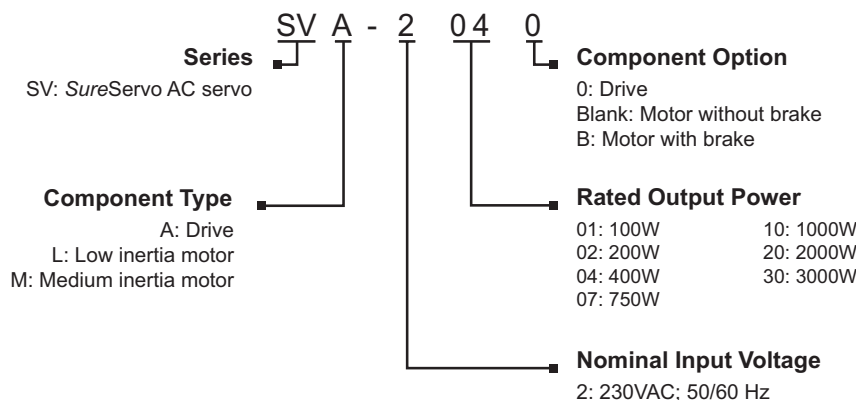
Don't forget the cables and ZIPLink break-out board kit!

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	10: 1000W
02: 200W	20: 2000W
04: 400W	30: 3000W
07: 750W	

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

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		SVL-207	SVL-207B										
	1000W	SVA-2100	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.
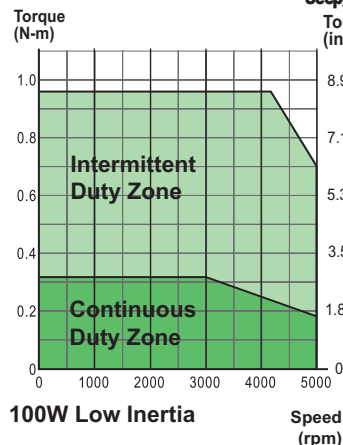The motor power cable includes brake power wires for the optional motor brake.

Sure servo®

AC Servo System Configuration

For all systems:

Order programming software & programming cable if needed. See pgs. page tMNC-328 & page tMNC-340.
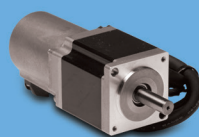
100W Low Inertia System

1.

Torque (N·m) / Torque (in·lb)


```
1.0    8.9
0.8    7.1
0.6    5.3
0.4    3.5
0.2    1.8
0      0
   0 1000 2000 3000 4000 5000
```

Intermittent Duty Zone
Continuous Duty Zone

100W Low Inertia   Speed (rpm)

=

Servo Drive
SVA-2040 Retired

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

_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.

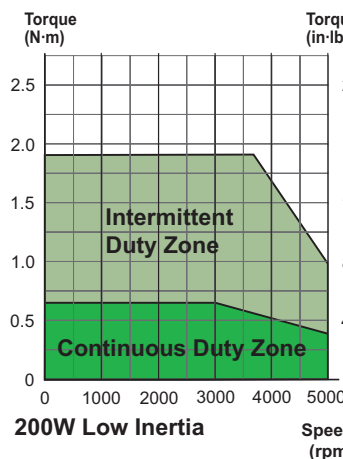|	
SVC-EFL-010 (10')	Retired
SVC-EFL-020 (20')	Retired
SVC-EFL-030 (30')	$165.00
SVC-EFL-060 (60')	$209.00

_ZIP_Link I/O Interface

5.

ZL-RTB50 $80.00
and one cable below:
ZL-SVC-CBL50 (0.5m) $57.00
ZL-SVC-CBL50-1 (1m) $55.00
ZL-SVC-CBL50-2 (2m) $63.00
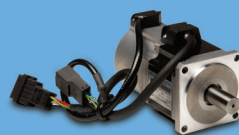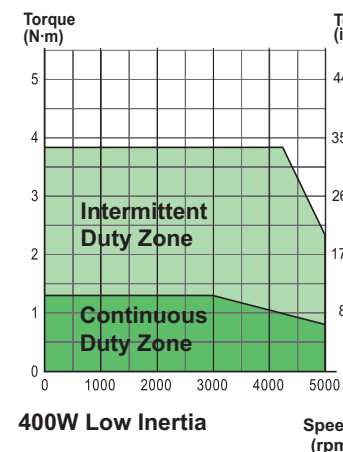

200W Low Inertia System

1.

Torque (N·m) / Torque (in·lb)

```
2.5    22.1
2.0    17.7
1.5    13.3
1.0    8.9
0.5    4.4
0      0
   0 1000 2000 3000 4000 5000
```

Intermittent Duty Zone
Continuous Duty Zone

200W Low Inertia   Speed (rpm)

=

Servo Drive
SVA-2040 Retired

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

_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')	Retired
SVC-EFL-030 (30')	$165.00
SVC-EFL-060 (60')	$209.00

_ZIP_Link I/O Interface

5.

ZL-RTB50 $80.00
and one cable below:
ZL-SVC-CBL50 (0.5m) $57.00
ZL-SVC-CBL50-1 (1m) $55.00
ZL-SVC-CBL50-2 (2m) $63.00

400W Low Inertia System

1.

Torque (N·m) / Torque (in·lb)

```
5    44.3
4    35.4
3    26.6
2    17.7
1    8.9
0    0
   0 1000 2000 3000 4000 5000
```

Intermittent Duty Zone
Continuous Duty Zone

400W Low Inertia   Speed (rpm)

=

Servo Drive
SVA-2040 Retired

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

_Sure_Servo Motor

2.
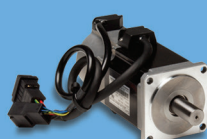
SVL-204   Retired
SVL-204B (w/brake)   Retired

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')	Retired
SVC-EFL-030 (30')	$165.00
SVC-EFL-060 (60')	$209.00

_ZIP_Link I/O Interface
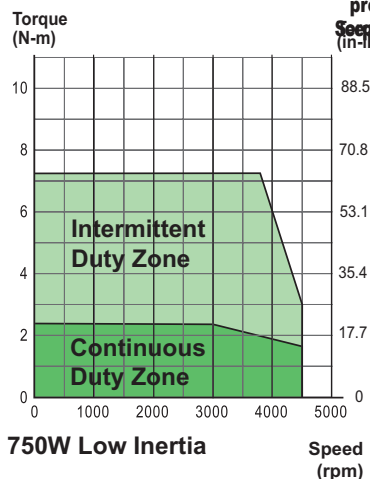
5.

ZL-RTB50 $80.00
and one cable below:
ZL-SVC-CBL50 (0.5m) $57.00
ZL-SVC-CBL50-1 (1m) $55.00
ZL-SVC-CBL50-2 (2m) $63.00

AC Servo System Configuration

Sure servo®

750W Low Inertia System

750W Low Inertia

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

For all systems:

Order programming software & programming cable if needed. See pg. tMNC-328 & pg. tMNC-340.

1.

*Sure*Servo Motor

2.

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

Servo Drive
SVA-2100 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')   Retired
SVC-EFL-030 (30') $165.00
SVC-EFL-060 (60') $209.00

*ZIP*Link I/O Interface

5.

ZL-RTB50
and one cable below:
ZL-SVC-CBL50 (0.5m) $57.00
ZL-SVC-CBL50-1 (1m) $55.00
ZL-SVC-CBL50-2 (2m) $63.00

$80.00

1 kW Low Inertia System

1 kW Low Inertia

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

1.

*Sure*Servo Motor

2.

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

Servo Drive
SVA-2100 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
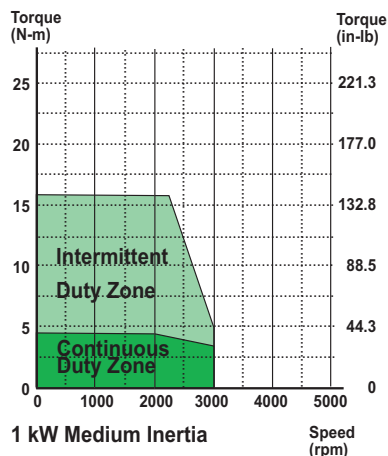SVC-EHH-030 (30')   Retired
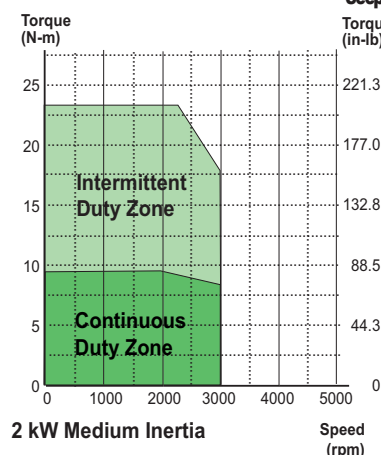SVC-EHH-060 (60') $250.00

*ZIP*Link I/O Interface

5.

ZL-RTB50
and one cable below:
ZL-SVC-CBL50 (0.5m) $57.00
ZL-SVC-CBL50-1 (1m) $55.00
ZL-SVC-CBL50-2 (2m) $63.00

$80.00

1 kW Medium Inertia System

1 kW Medium Inertia

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

1.

*Sure*Servo Motor

2.

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

Servo Drive
SVA-2100 Retired

Motor Power Cable (1)

3.

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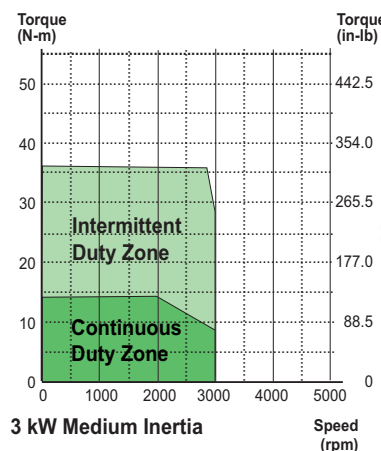SVC-PHM-060 (60') $343.00

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
and one cable below:
ZL-SVC-CBL50 (0.5m) $57.00
ZL-SVC-CBL50-1 (1m) $55.00
ZL-SVC-CBL50-2 (2m) $63.00

$80.00

SureServo®

AC Servo System Configuration

For all systems:

2 kW Medium Inertia System

1. Order programming software & programming cable if needed.
See pgs. page tMNC-328 & page tMNC-340.

Torque (N-m) / Torque (in-lb)

- 25 / 221.3
- 20 / 177.0
- 15 / 132.8
- 10 / 88.5
- 5 / 44.3
- 0 / 0

Intermittent Duty Zone

Continuous Duty Zone

0 1000 2000 3000 4000 5000

2 kW Medium Inertia   Speed (rpm)

Servo Drive
SVA-2300 Retired

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

2. *Sure*Servo Motor
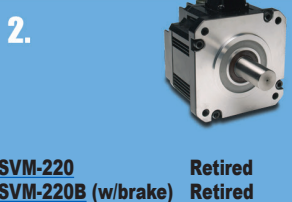
SVM-220	Retired
SVM-220B (w/brake)	Retired

3. Motor Power Cable (1)

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

4. Motor Encoder Cable (1)

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

5. *ZIP*Link I/O Interface

ZL-RTB50 $80.00
and one cable below:

ZL-SVC-CBL50 (0.5m)	$57.00
ZL-SVC-CBL50-1 (1m)	$55.00
ZL-SVC-CBL50-2 (2m)	$63.00

---

3 kW Medium Inertia System

1.

Torque (N-m) / Torque (in-lb)

- 50 / 442.5
- 40 / 354.0
- 30 / 265.5
- 20 / 177.0
- 10 / 88.5
- 0 / 0

Intermittent Duty Zone

Continuous Duty Zone

0 1000 2000 3000 4000 5000

3 kW Medium Inertia   Speed (rpm)

Servo Drive
SVA-2300 Retired

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

2. *Sure*Servo Motor

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

3. Motor Power Cable (1)

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

4. Motor Encoder Cable (1)

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

5. *ZIP*Link I/O Interface

ZL-RTB50 $80.00
and one cable below:

ZL-SVC-CBL50 (0.5m)	$57.00
ZL-SVC-CBL50-1 (1m)	$55.00
ZL-SVC-CBL50-2 (2m)	$63.00

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	$47.50	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 *	$17.00	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.

SureServo

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, $41.50) 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
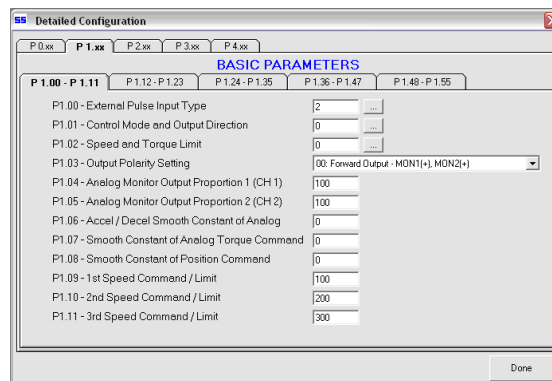
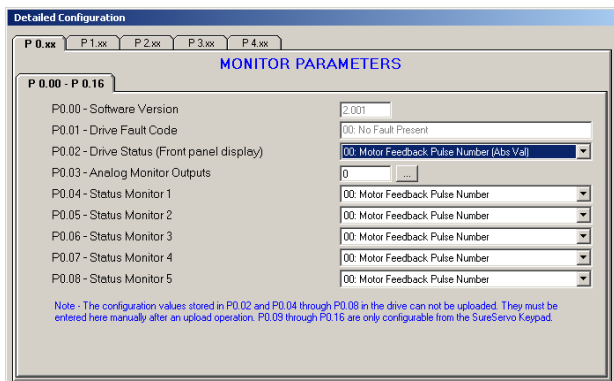## SureServo Software and Configuration Cables

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	$41.50	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	$20.00	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.
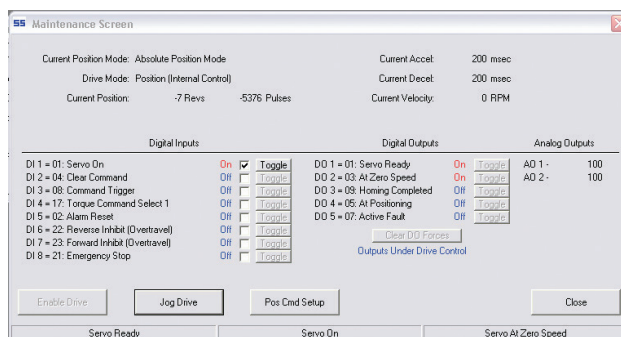
AC Servo System Software

SureServo Pro configuration software - Parameter views (continued)

Parameter View Example Screen - Monitor Parameters

Parameter View Example Screen - Extended Parameters

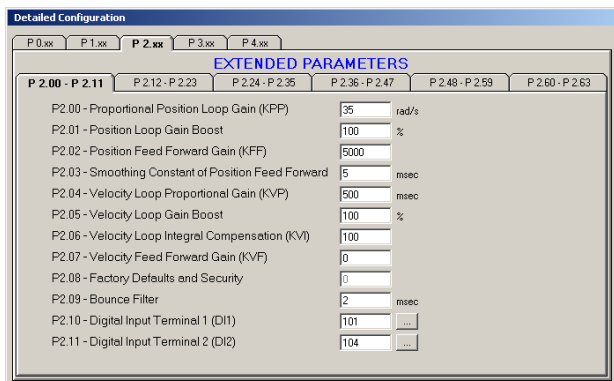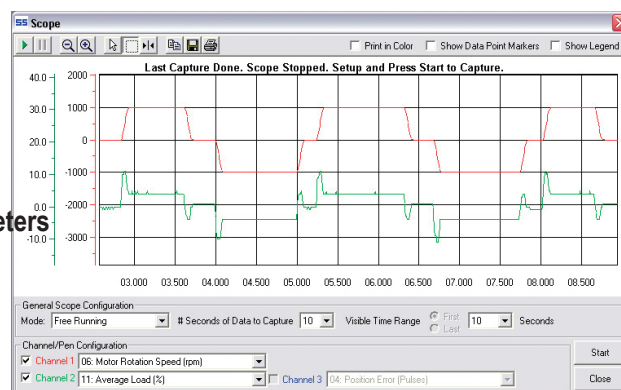**Parameter View Example Screen - Communication Parameters**

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.

Sure servo®

AC Servo Drive Specifications

Servo drive overview

Power On LED
Main power is ON

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

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

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

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

Use our ZIPLink 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 SureServo 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.

SureServo 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.

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 SureServo 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/s2 (1G) less than 20Hz, 5.88 m/s2 (0.6G) 20 to 50 Hz
Protection	IP 20
Agency Approvals	CE; UL Certified (U.S. and Canada)

Sure servo®

AC Servo Drive Specifications

Servo drive specifications (continued)

Model and Mode Specific Drive Specifications								
AC Servo Model		SVA-2040			SVA-2100		SVA-2300	
Price		Retired			Retired		Retired	
Voltage Phase		Single-phase or Three-phase					Three-phase	
Voltage and Frequency Range		3-phase: 170~255 VAC @ 50/60 Hz ±5%; 1-phase: 200~255 VAC @ 50/60 Hz ±5%					170~255 VAC @ 50/60 Hz ±5%	
Main Circuit Input Current	**Single Phase**	3.4A @ 400W			8.0A @ 1kW		–	
	Three Phase	2.6A @ 400W			6.2A @ 1kW		13.6A @ 3kW	
Main Circuit Inrush Current		44A			77A		87A	
Main Circuit Power Cycling		Maximum 1 power cycle per minute						
Control Circuit Current and Voltage		43 mA @ 200~255 VAC, 1 phase						
Control Circuit Inrush Current		32A maximum						
Cooling System		Natural Air Circulation			Internal Cooling Fan			
Drive Heat Loss *	**Motor driven ***	SVL-201(B)	SVL-202(B)	SVL-204(B)	SVL-207(B)	SVL-210(B)	SVM-210(B)	SVM-220(B)	SVM-230(B)
	Heat Loss	12W	15W	20W	35W	45W	50W	75W	80W
Weight		1.5 kg [3.3 lb]			2kg [4lb]		3kg [7lb]	

(Note: Motor driven/Heat Loss row has 8 motor columns: SVL-201(B), SVL-202(B), SVL-204(B), SVL-207(B), SVL-210(B), SVM-210(B), SVM-220(B), SVM-230(B))

Position Control Mode

Max. Input Pulse Frequency	Max. 500 kpps (Line driver); Max. 200 kpps (Open collector)
Pulse Type	Pulse + Direction, A phase + B phase Quadrature, CCW pulse + CW pulse
Command Source	External pulse train / Onboard indexer
Smoothing Strategy	Low-pass and P-curve filter
Electronic Gear	Electronic gear N/M multiple; N: 1~32767, M: 1~32767(1/50<N/M<200)
Torque Limit Operation	Set by parameters or by analog input
Feed Forward Compensation	Set by parameters

Velocity Control Mode

Analog Input Command	**Voltage Range**	Bipolar ±10 VDC
	Input Resistance	10 k
	Time Constant	2.2 µs
	Resolution	(Varies with input voltage) 13 bits @ 0V~1V; 13~10 bits @ 1V~2V; 10 bits @ 2V~10V
Speed Control Range		1:5000
Command Source		External analog signal / Onboard indexer
Smoothing Strategy		Low-pass and S-curve filter
Torque Limit Operation		Set by parameters or via analog input
Frequency Response Characteristic		Maximum 450 Hz
Speed Accuracy (at rated rotation speed)		0.01% or less at 0 to 100% load fluctuation
		0.01% or less at ±10% power fluctuation
		0.01% or less at 0 to 50°C ambient temperature fluctuation

Torque Control Mode

Analog Input Command	**Voltage Range**	Bipolar ±10 VDC
	Input Resistance	10 kΩ
	Time Constant	2.2 µs
	Resolution	10 bits
Permissible Time for Overload		8 sec. under 200% rated output
Command Source		External analog signal / Onboard indexer
Smoothing Strategy		Low-pass filter
Speed Limit Operation		Set by parameters or via analog input

* Drive heat loss varies depending upon which motor is connected to the drive.

Sure~servo ®

AC Servo Motor Specifications

Servo motor overview

Motor Power and Brake Connector

1-foot cable with 6-position connector (Not liquid tight)

750W and below

Encoder Connector

1-foot cable with 9-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

Without Shaft Seal

(not liquid tight)

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

Motor Power and Brake Connector

(Liquid tight when using AutomationDirect cables)

Encoder Connector

(Liquid tight when using AutomationDirect cables)

IP65 Housing

1 kW and above

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)

For the latest prices, please check AutomationDirect.com.

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		Retired	Retired	Retired	Retired	Retired	Retired	Retired	Retired
Model with brake: Sxx-xxxB		SVL-201B	SVL-202B	SVL-204B	SVL-207B	SVL-210B	SVM-210B	SVM-220B	SVM-230B
Price		Retired	Retired	Retired	Retired	Retired	Retired	Retired	$1,741.00
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							
	Current ADC	0.21	0.38		0.4	0.75	0.83	1.45	1.67
	Holding Torque N·m	0.32	1.27		2.55	9.3	7.5	32.0	50.0
	Holding Torque 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 Mechanical time constant	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
	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 SureServo 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
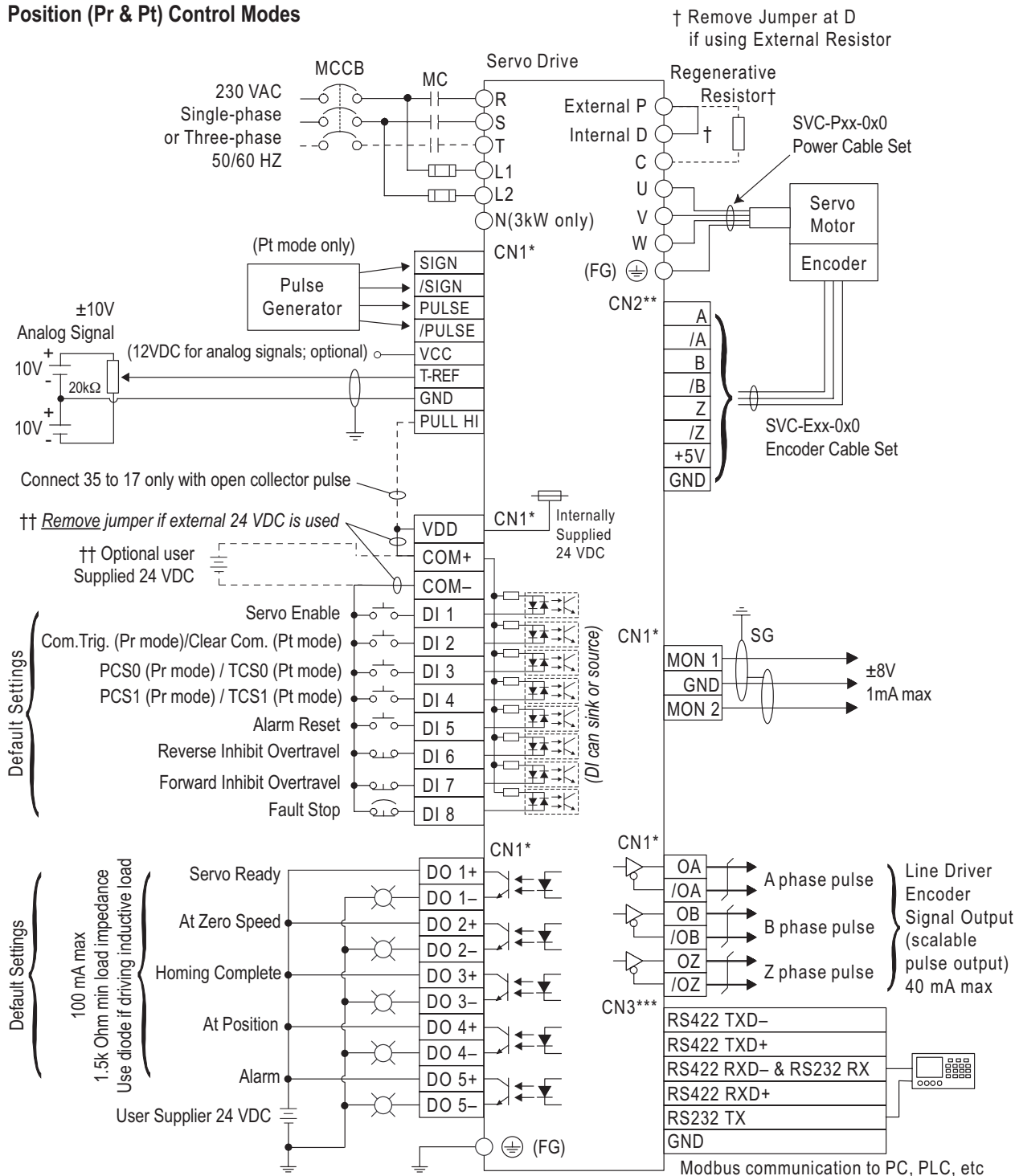
* Use connection kit part #s ZL-RTB50 & ZL-SVC-CBL-50(-x) for CN1 terminal connections.
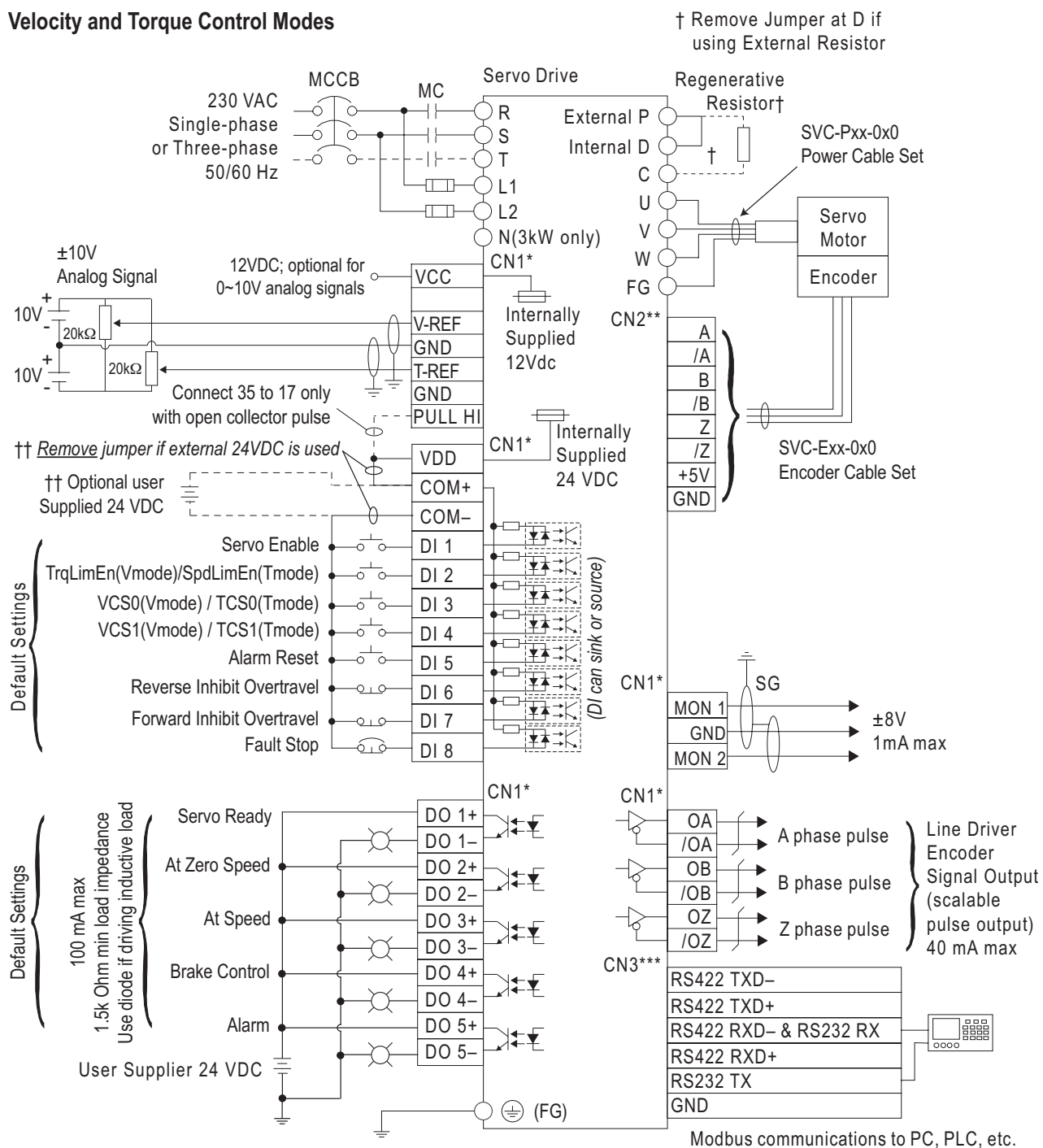** Use cable part # SVC-Exx-0x0 for CN2 terminal connections.
*** Use cable part # SVC-MDCOM-CBL for CN3 terminal Modbus network connections.

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

† Remove Jumper at D if using External Resistor

* 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.

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.)

75 (2.95)
69 (2.72)
64 (2.52)

Ø6 (0.24)

70 (2.76)   140 (5.51)

162 (6.38)
159 (6.26)
150 (5.90)

L1 L2 R S T U V W P D C

CN1 CN2 CN3

LABEL

LABEL

PE Terminal
69 (2.72)

SVA-2040

PE Screw: M4x0.7

⊕

Mounting Screw: M6; quantity (2)
Mounting Screw Torque: 14 kgf·cm (1.37 N·m)

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.)

93 (3.66)
83 (3.27)
64 (2.52)

Ø6 (0.24)

70 (2.76)   191 (7.52)

162 (6.38)
149 (5.87)

L1 L2 R S T U V W P D C

CN1 CN2 CN3

LABEL

LABEL

73 (2.87)

SVA-2100

PE Terminal

PE Screw: M4x0.7

⊕

Mounting Screw: M6; quantity (2)
Mounting Screw Torque: 14 kgf·cm (1.37 N·m)
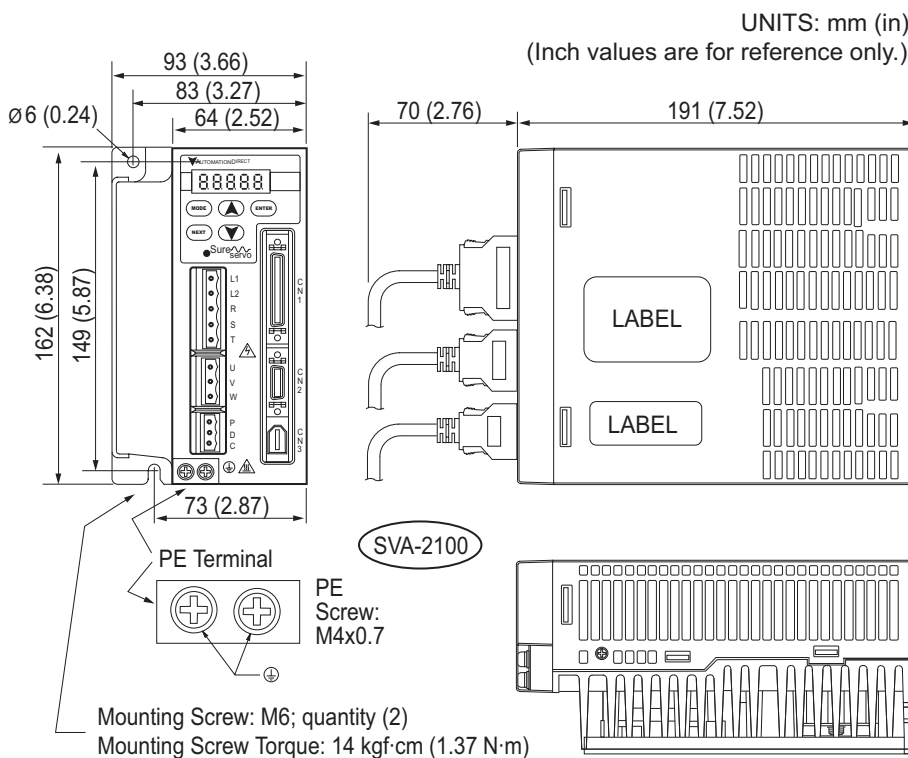
AC Servo System Dimensions

Servo drive dimensions (continued)

SVA-2300

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.)

110.0 (4.33)
91.2 (3.59)
Ø6 (0.24)
229.5 (9.04)
70 (2.76)
206 (8.11)
245

LABEL

LABEL

PE Terminal
PE Screw: M4x0.7

SVA-2300

Mounting Screw: M6; quantity (3)
Mounting Screw Torque: 14 kgf·cm (1.37 N·m)
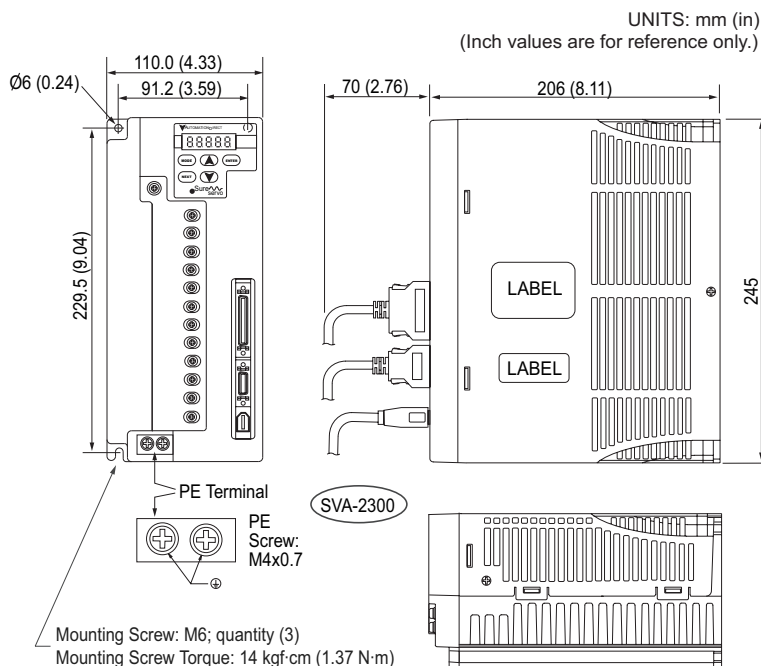
Servo motor dimensions

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

BRAKE
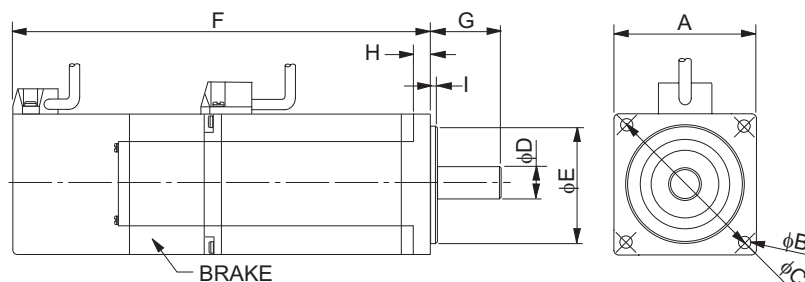
SureServo® Motor Dimensions – 100W-750W Low Inertia			
Dimension	SVL-201(B)	SVL-202(B)	SVL-204(B)	SVL-207(B)
A	40 [1.575]	60 [2.362]		80 [3.15]
B	4.5 [0.1772]	5.5 [0.2165]		6.6 [0.2598]
C	46 [1.811]	70 [2.756]		90 [3.543]
D	8 +0.0/-0.009 (8h6)	14 +0.0/-0.011 (14h6)		19 +0.0 -0.013 (19h6)
E	30 +0.0/-0.021 (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.)

AC Servo System Dimensions

Servo motor dimensions (continued)

Low inertia models SVL-210(B)
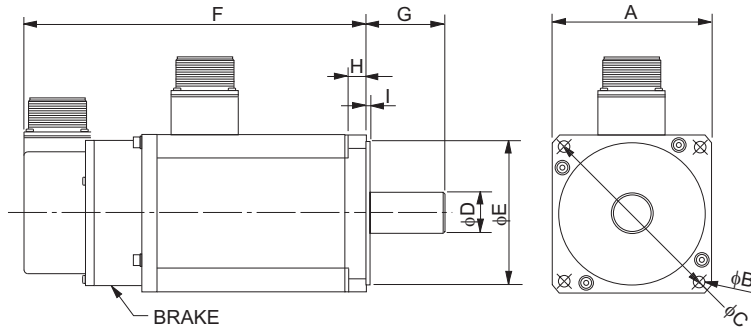
BRAKE

SureServo® 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)
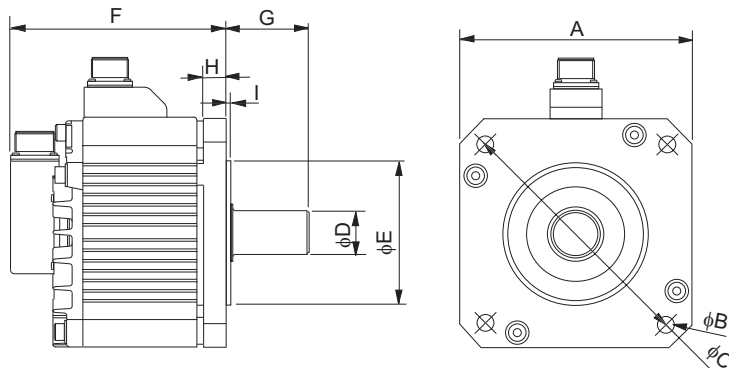
SureServo® Motor Dimensions -1000W-3000W Medium Inertia		
Dimension	**SVM-210(B)**	**SVM-220(B)**	**SVM-230(B)**
A	130 [5.118]	180 [7.087]	
B	9 [0.3543]	13.5 [0.5315]	
C	145 +0.2/-0.2 [5.709]	200 +0.2/-0.2 [7.874]	
D	22 +0.0/-0.013 (22h6)	35 +0.0/-0.016 (35h6)	
E	110 +0.0/-0.035 (110h7)	114.3 +0/-0.035 (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	Retired
GS-2010-BR-ENC	20Ω	SVA-2100, SVA-2300	$358.00

Resistor GS-25PO-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	Retired
	Three-Phase	250V, 3-phase, 10A	10TDT1W4C	Retired
SVA-2100	Single-Phase	250V, 1-phase, 20A	20DRT1W3S	Retired
	Three-Phase	250V, 3-phase, 10A	10TDT1W4C	Retired
SVA-2300	Three-Phase	250V, 3-phase, 26A	26TDT1W4C	Retired

AC Line Filter 10TD1W4C

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.

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	$182.00	SC-E02-xxx	varies
SVA-2100			HCTR7-5	$203.00	SC-E03-xxx	varies
SVA-2300			HCTR15	$172.00	SC-E04-xxx	varies
SVA-2040		230V 1-phase	HCTR4	$182.00	SC-E02-xxx	varies
SVA-2100			HCTR10	$182.00	SC-E03-xxx	varies
SVA-2040 SVA-2100 SVA-2300	Control Input Power	230V 1-phase	HCTR2-5	$187.00		

* Fuses are sold in packages of 10.
** Note: For contactors, xxx = coil voltage (for example, SC-E02P-220VAC).

Fuji Contactor SC-E02-xxx

Edison Fuse HCTRx

SureServo Connector Kit (replacement)
This kit contains replacement input, output, and brake connectors for SureServo drives.

Part Number	Description	SureServo Drives	Price
SVA-CON-1	SureServo connector kit, replacement, inclues (1) input power connector, (1) output power connector and (1) brake resistor connector.	SVA-2040 SVA-2100	$30.00

SVA-CON-1

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.

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.

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
PGA Gearbox**

SureGear PGB Gearbox

**SureGear
Hub Style PGD Gearbox**

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

**SureGear
2-Stage Cutaway View**

Applications

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

Precision Servo Gearboxes

SureGear® Servo Gearbox Selection

SureServoMotor (SV and SV2)	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)	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							489.83	0.433
		PGB090-15A2	90			16.76	147.84			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

Sure 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

SureGear® Servo Gearbox Selection

* 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.
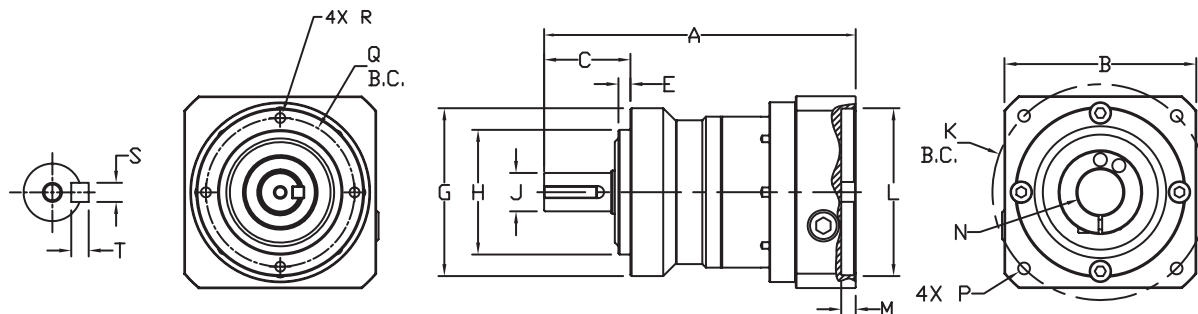
Precision Servo Gearboxes

SureGear® Servo Gearbox Selection

Sure Servo Motor	Gear Ratio	SureGear Gearbox	Frame Size (mm)	Motor Nominal Output Torque N·m	lb·in	Combo Nominal Output Torque N·m	lb·in	Nominal Output Speed (rpm)	Max Output Speed (rpm)	Available Load Inertia @ 5:1 Mismatch * kg·cm2	lb·in·s2
SV2M-215(x)	5:1	PGA090-05A5	90	7.16	63.37	34.01	301.01	400.00	600.00	1390.00	1.230
		PGD090-05A5	90							1388.00	1.228
		PGB120-05A5	120			33.29	294.68			1274.50	1.128
	10:1	PGA090-10A5	90			68.02	602.03	200.00	300.00	5571.00	4.930
		PGD110-10A5	110							5567.00	4.927
		PGB120-10A5	120			66.59	589.35			5154.00	4.561
	15:1	PGA120-15A5	120			96.66	855.51	133.33	200.00	12503.25	11.065
		PGB120-15A5	120			94.51	836.50			12093.75	10.703
	25:1	PGD110-25A5	110			161.10	1425.86	80.00	120.00	34562.50	30.588
		PGA120-25A5	120							34762.50	30.765
		PGB120-25A5	120			157.52	1394.17			33637.50	29.769
	35:1	PGD110-35A5	110			225.54	1996.20	57.14	85.71	67742.50	59.952
SV2M-220(x)	5:1	PGD110-05A6	110	9.55	84.52	45.36	401.49	400.00	600.00	4280.00	3.788
		PGA120-05A6	120							4297.50	3.803
		PGB120-05A6	120			44.41	393.04			4212.00	3.728
		PGB155-05A6	155							3914.75	3.465
	10:1	PGD110-10A6	110			90.73	802.98	200.00	300.00	17240.00	15.257
		PGA120-10A6	120							17255.00	15.271
		PGB120-10A6	120			88.82	786.08			16904.00	14.960
		PGB155-10A6	155							15884.00	14.057
	15:1	PGA155-15A6	155			128.93	1141.08	133.33	200.00	38745.00	34.289
		PGB155-15A6	155			126.06	1115.73			37597.50	33.274
	25:1	PGA155-25A6	155			214.88	1901.80	80.00	120.00	107750.00	95.359
		PGB155-25A6	155			210.10	1859.54			104593.75	92.565
SV2M-230(x)	5:1	PGD110-05A6	110	17.55	155.33	83.36	737.80	340.00	600.00	6817.50	6.033
		PGA120-05A6	120							6835.00	6.049
		PGB120-05A6	120			81.61	722.31			6749.50	5.973
		PGB155-05A6	155							6452.25	5.710
	10:1	PGD110-10A6	110			166.73	1475.68	170.00	300.00	27390.00	24.240
		PGA120-10A6	120							27405.00	24.253
		PGB120-10A6	120			163.22	1444.62			27054.00	23.943
		PGB155-10A6	155							26034.00	23.040
	15:1	PGA155-15A6	155			236.93	2097.01	113.33	200.00	61582.50	54.501
		PGB155-15A6	155			231.66	2050.36			60435.00	53.485
	25:1	PGA155-25A6	155			394.88	3494.98	68.00	120.00	171187.50	151.501
		PGB155-25A6	155			386.10	3417.27			168031.25	148.708

* 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

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	$432.00	50	5:1	single	9 [80]	18 [159]	35 [310]	5	4000	8000	290 [65]	330 [74]	0.036	95		0.7 [1.5]		SV(2)L-201(B)
PGA050-10A1	$456.00		10:1	single	6 [53]	12 [106]	30 [266]				360 [81]	450 [101]	0.030					
PGA050-15A1	$609.00		15:1	double	6 [53]	12 [106]	30 [266]	7			410 [92]	540 [121]	0.035	90		0.8 [1.8]		
PGA050-25A1	$609.00		25:1	double	9 [80]	18 [159]	35 [310]				490 [110]	640 [144]	0.034					
PGA070-05A1	$501.00	70	5:1	single	27 [239]	50 [443]	100 [885]				510 [115]	390 [88]	0.077	95		1.5 [3.3]		
PGA070-10A1	$528.00		10:1	single	18 [159]	35 [310]	80 [708]				640 [144]	530 [119]	0.056					
PGA070-15A1	$723.00		15:1	double	18 [159]	35 [310]	80 [708]				740 [166]	630 [142]	0.055	90		1.7 [3.7]		
PGA070-25A1	$723.00		25:1	double	27 [239]	50 [443]	100 [885]				870 [196]	790 [178]	0.053					
PGA070-05A2	$547.00		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	$547.00		10:1	single	18 [159]	35 [310]	80 [708]				640 [144]	530 [119]	0.140					
PGA070-15A2	$749.00		15:1	double	18 [159]	35 [310]	80 [708]				740 [166]	630 [142]	0.140	90		1.7 [3.7]		
PGA070-25A2	$749.00		25:1	double	27 [239]	50 [443]	100 [885]				870 [196]	790 [178]	0.130					
PGA070-05A3	$547.00		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	$646.00		10:1	single	50 [443]	80 [708]	200 [1770]				1200 [270]	1600 [360]	0.750			3.5 [7.7]		
PGA090-15A3	$856.00		15:1	double	50 [443]	80 [708]	200 [1770]				1400 [315]	1900 [427]	0.720	90		4.0 [8.8]		
PGA090-25A3	$856.00		25:1	double	75 [664]	125 [1106]	250 [2213]				1600 [360]	2200 [495]	0.710					
PGA090-05A4	$647.00	90	5:1	single	75 [664]	125 [1106]	250 [2213]	5	3000	6000	960 [216]	1200 [270]	2.900	95	90 °C [194 °F]	3.5 [7.7]	IP55	SV(2)L-210(B)
PGA090-10A4	$647.00		10:1	single	50 [443]	80 [708]	200 [1770]				1200 [270]	1600 [360]	2.800					
PGA090-05A5	$647.00		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	$647.00		10:1	single	50 [443]	80 [708]	200 [1770]				1200 [270]	1600 [360]	2.800					
PGA120-15A4	$1,073.00	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	$1,073.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				2700 [607]	3700 [832]	2.800					
PGA120-15A5	$1,073.00		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	$1,073.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				2700 [607]	3700 [832]	2.800					
PGA120-05A6	$856.00		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	$856.00		10:1	single	120 [1062]	225 [1991]	500 [4425]				2000 [450]	2500 [562]	11.000					
PGA155-10A6	$1,058.00	155	10:1	single	240 [2124]	470 [4160]	1000 [8851]		2000	4000	4700 [1057]	4100 [922]	11.000	95		16 [35.3]		
PGA155-15A6	$1,439.00		15:1	double	240 [2124]	470 [4160]	1000 [8851]				5400 [1214]	4900 [1102]	11.000	90		18 [40.0]		
PGA155-25A6	$1,439.00		25:1	double	360 [3186]	700 [6196]	1250 [11063]				6400 [1439]	6100 [1371]	11.000					

![Suregear logo]

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 [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

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			510 [115]	390 [88]	0.250	93		1.9 [4.2]		SV(2)L-201(B)
PGB070-10A1	$940.00		10:1	double	16 [142]	32 [283]	65 [575]				640 [144]	530 [119]	0.230	93		1.9 [4.2]		SV(2)L-201(B)
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]		SV(2)L-201(B)
PGB070-25A1	$1,227.00		25:1	triple	24 [212]	45 [398]	90 [797]				870 [196]	790 [178]	0.071	88		1.7 [3.7]		SV(2)L-201(B)
PGB070-05A2	$940.00		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	$940.00		10:1	double	16 [142]	32 [283]	65 [575]				640 [144]	530 [119]	0.300	93		1.9 [4.2]		SV(2)L-202(B) SV(2)L-204(B)
PGB070-15A2	$1,227.00		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	$1,227.00		25:1	triple	24 [212]	45 [398]	90 [797]				870 [196]	790 [178]	0.115	88		1.7 [3.7]		SV(2)L-202(B)
PGB090-15A2	$1,217.00	90	15:1	triple	45 [398]	65 [575]	170 [1505]	9	3000	6000	1400 [314]	1900 [427]	0.410	88	90 °C [194 °F]	4.3 [9.5]	IP55	SV(2)L-202(B) SV(2)L-204(B)
PGB090-25A2	$1,354.00		25:1	triple	65 [575]	110 [974]	220 [1947]				1600 [360]	2200 [495]	0.400	88		4.3 [9.5]		SV(2)L-202(B) SV(2)L-204(B)
PGB090-05A3	$1,007.00		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	$1,007.00		10:1	double	45 [398]	65 [575]	170 [1505]				1200 [270]	1600 [360]	2.020	93		4.9 [10.8]		SV(2)L-207(B)
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]		SV(2)L-207(B)
PGB090-25A3	$1,354.00		25:1	triple	65 [575]	110 [974]	220 [1947]				1600 [360]	2200 [495]	0.590	88		4.3 [9.5]		SV(2)L-207(B)
PGB090-05A4	$1,007.00		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	$1,007.00		10:1	double	45 [398]	65 [575]	170 [1505]				1200 [270]	1600 [360]	4.150	93		4.9 [10.8]		SV(2)L-210(B)
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]		SV(2)L-210(B)
PGB120-25A4	$1,682.00		25:1	triple	150 [1328]	300 [2655]	550 [4868]				2700 [607]	3700 [832]	4.640	88		10 [22]		SV(2)L-210(B)
PGB120-05A5	$1,354.00		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	$1,354.00		10:1	double	110 [974]	200 [1770]	450 [3983]				2000 [450]	2500 [562]	6.050	93		10.2 [22.5]		SV(2) M-210(B)
PGB120-15A5	$1,682.00		15:1	triple	110 [974]	200 [1770]	450 [3983]	9			2300 [517]	3000 [674]	4.700	88		10 [22]		SV(2) M-210(B)
PGB120-25A5	$1,682.00		25:1	triple	150 [1328]	300 [2655]	550 [4868]				2700 [607]	3700 [832]	4.640	88		10 [22]		SV(2) M-210(B)
PGB120-05A6	$1,354.00		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	$1,354.00		10:1	double	110 [974]	200 [1770]	450 [3983]				2000 [450]	2500 [562]	13.120	93		10.2 [22.5]		SV(2)M-220(B) SV(2)M-230(B)
PGB155-15A6	$1,951.00	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	$1,951.00		25:1	triple	300 [2655]	600 [5310]	1100 [9736]				6400 [1439]	6100 [1371]	14.820	88		20.4 [45.0]		SV(2)M-220(B)
PGB155-05A6	$1,560.00		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	$1,560.00		10:1	double	200 [1770]	400 [3540]	750 [6638]				4700 [1057]	4100 [922]	19.030	93		19.8 [43.7]		SV(2)M-220(B) SV(2)M-230(B)

Precision Servo Gearboxes

Suregear®

Dimensions – Right-Angle Shaft PGB Series
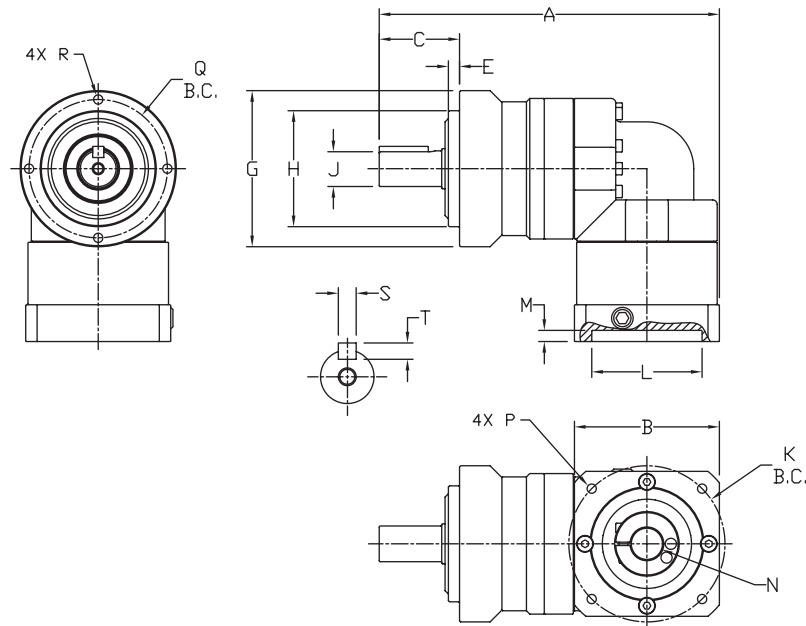
SureGear PGB Series Right-Angle Shaft Gearboxes Dimension Drawing

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]															
PGB090-05A3 PGB090-10A3	205.5 [8.09]	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]
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]										Ø22.0 * [Ø0.87]	M8- 1.25x17				
PGB120-05A5 PGB120-10A5	266.0 [10.47]	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]			Ø108.0 [Ø4.25]	M8- 1.25x16	10.0 [0.39]	8.0 [0.31]
PGB120-15A5 PGB120-25A5	272.0 [10.71]															
PGB120-05A6 PGB120-10A6	268.5 [10.57]	180.0 [7.09]														
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]	Ø200.0 [Ø7.87]	Ø114.0 [Ø4.50]		Ø35.0 * [Ø1.38]	M12- 1.75x25	Ø140.0 [Ø5.51]	M10- 1.5x20	12.0 [0.47]	
PGB155-15A6 PGB155-25A6	364.0 [14.33]															

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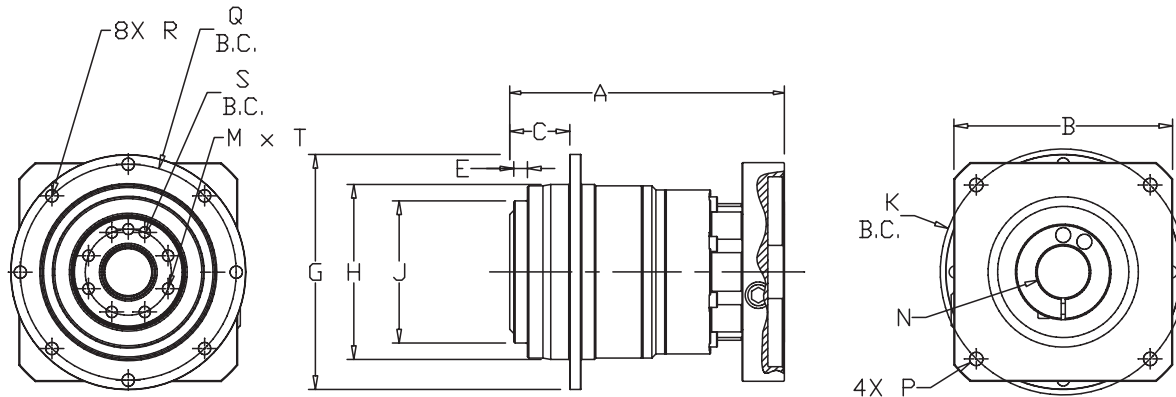**NOTE: See our website: www.AutomationDirect.com for complete engineering drawings.**

Precision Servo Gearboxes

Pricing & Specifications – Hub Style In-Line PGD Series

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	$907.00	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	$907.00		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	$1,374.00	64	50:1	double	27 [239]	50 [443]	100 [885]				850 [191]	750 [169]	0.049	90		1.6 [3.5]		
PGD064-05A2	$1,174.00		5:1	single	27 [239]	50 [443]	100 [885]				400 [90]	390 [88]	0.1	95		1.4 [3.1]		SV(2)L-202(B) SV(2)L-204(B)
PGD064-10A2	$1,174.00		10:1	single	18 [159]	35 [310]	80 [708]				500 [112]	530 [119]	0.062	95		1.4 [3.1]		
PGD064-25A2	$1,374.00		25:1	double	27 [239]	50 [443]	100 [885]				680 [153]	750 [169]	0.054	90		1.6 [3.5]		
PGD090-25A2	$1,577.00	90	25:1	double	75 [664]	125 [1106]	250 [2213]				1300 [292]	1400 [315]	0.130	90		4 [8.8]		
PGD090-50A2	$1,577.00		50:1	double	75 [664]	125 [1106]	250 [2213]				1700 [382]	1700 [382]	0.099	90		4 [8.8]		
PGD090-05A3	$1,376.00		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	$1,376.00		10:1	single	50 [443]	80 [708]	200 [1770]				980 [220]	920 [207]	0.330	95		3.6 [7.9]		
PGD090-05A4	$1,376.00		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]	≤ 3	3000	6000	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	$2,013.00		50:1	double	180 [1593]	330 [2921]	625 [5532]				10000 [2248]	6800 [1529]	0.400	90		8.6 [19]		
PGD110-25A4	$2,013.00		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	$2,013.00		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	$2,013.00		25:1	double	180 [1593]	330 [2921]	625 [5532]				8200 [1843]	5500 [1236]	0.700	90		8.6 [19]		
PGD110-35A5	$2,013.00		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	$1,712.00		10:1	single	120 [1062]	225 [1991]	500 [4425]				6200 [1394]	4200 [944]	1.100	95		7.8 [17.2]		

For the latest prices, please check AutomationDirect.com.

Precision Servo Gearboxes

Dimensions – Hub Style In-Line PGD Series

SureGear PGD Series Hub Style In-Line Gearboxes Dimension Drawing

	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]									Ø14.0 [Ø0.55]					M5-0.8x4
2	PGD064-25A2	103.0 [4.055]	65.0 [2.56]						Ø70.0 [Ø2.756]		Ø14.0 [Ø0.55]	M5-0.8x11				M5-0.8x10
2	PGD090-25A2 PGD090-50A2	122.0 [4.803]									Ø14.0 [Ø0.55]					
1	PGD090-05A3 PGD090-10A3	110.0 [4.33]	80.0 [3.15]	30.0 [1.1811]		Ø118.0 [Ø4.65]	Ø90.0 [Ø3.54]	Ø63.0 [Ø2.48]	Ø90.0 [Ø3.543]	8	Ø19.0 [Ø0.75]	M6-1.0x13	Ø109.0 [Ø4.30]		Ø50.0 [Ø1.9685]	
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]		6.0 [0.236]				Ø70.0 [Ø2.756]		Ø14.0 [Ø0.55]	M5-0.8x11		5.5 [0.22]		M6-1.0x12
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]	29.0 [1.142]		Ø145.0 [Ø5.70]	Ø110.0 [Ø4.33]	Ø80.0 [Ø3.15]	Ø115.0 ±0.2 [Ø4.528]	15	Ø28.0 [Ø1.102]	M8-1.25x17	Ø135.0 [Ø5.315]		Ø63.0 [Ø2.48]	
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				

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

* 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	$4.75	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	$33.00	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.