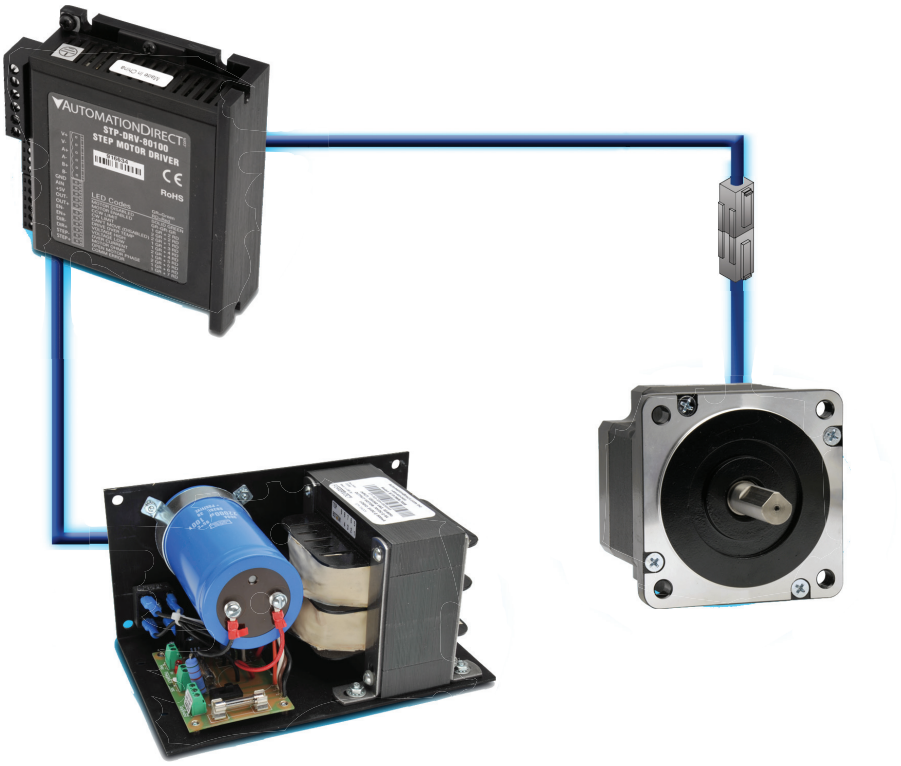
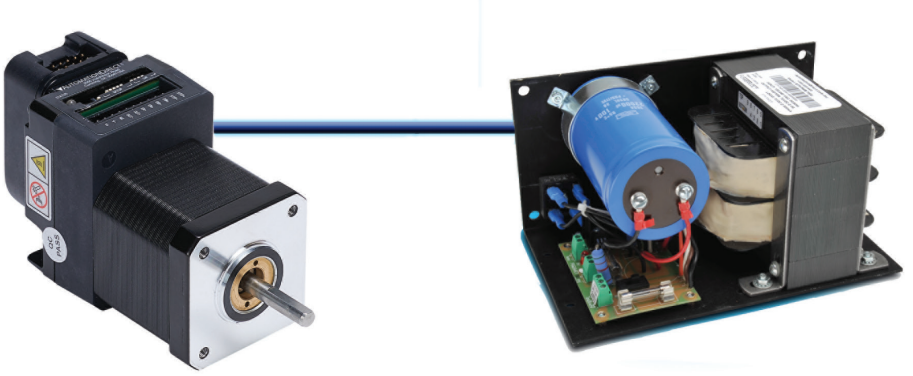
SureStep® Stepper Systems

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.



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 standard stepper drives (STP-DRV-4035, STP-DRV6575, DIP-switch-enabled integrated motor/drives) have several selectable microstep resolutions from 400 steps per revolution (half-step) to 20,000 steps per revolution (each full step / 50). See the spec pages of each drive to determine all the available steps/revolution for each drive.

The SureStep advanced drives (STP-DRV-4805, STP-DRV-80100, integrated motor/drives with "R" in the part number) have software-selectable resolutions ranging from 200 (full step) to 51,200 (÷256) steps per revolution.

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

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:

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

Standards and Agency Approvals CE

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	250	>2,500***			1,500

** 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						

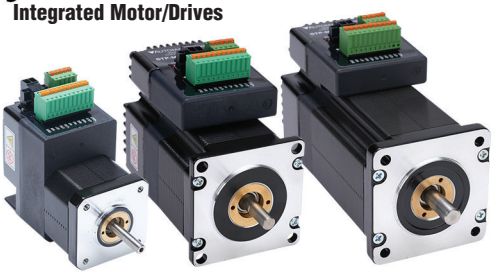
SureStep® Stepping System Overview

Two or Four components to make a complete system

Choose an integrated motor/drive and power supply

Integrated Motor/Drives

Integrated Motor/Drives

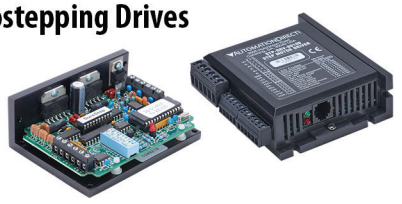


Step Motor Power Supplies

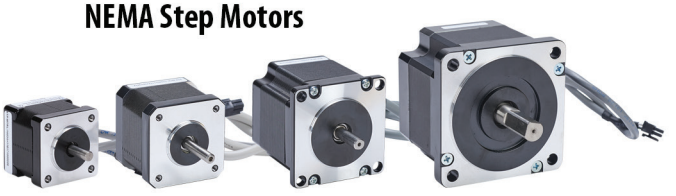
OR . . .

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

Microstepping Drives

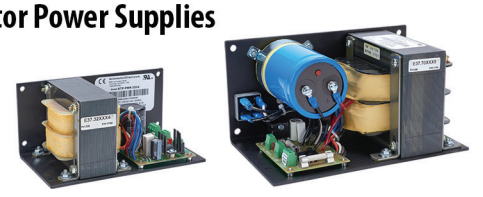


NEMA Step Motors



Step Motor Extension Cables

Step Motor Power Supplies



Stepping System : Head to Head

AutomationDirect VS. Competition

Hey - I can do the math! - AutomationDirect

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

***Sure*Step™ NEMA 23 System**

Complete 2 Axis System

Ours includes:

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

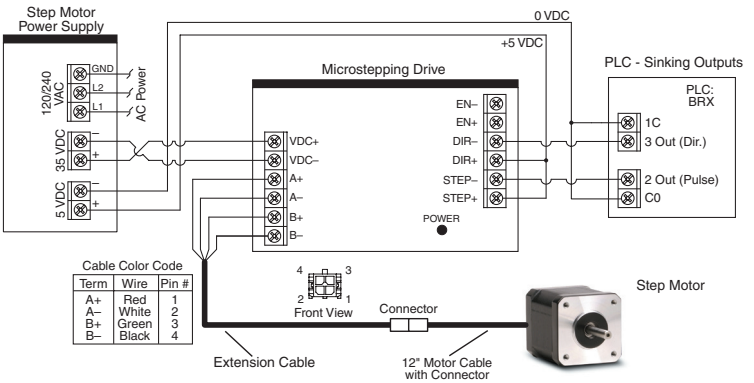
VS. Parker

E-DC

$798

for 2 drives

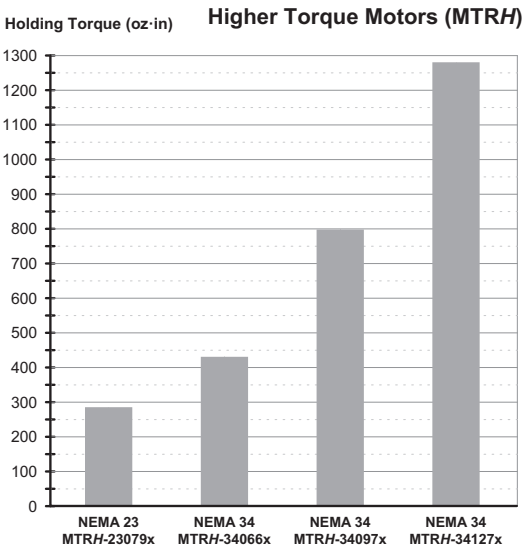
All prices are U.S. published prices. AutomationDirect prices as of August 2018 Price List. Parker prices are from http://buy.compumotor.com 8/13/2018.

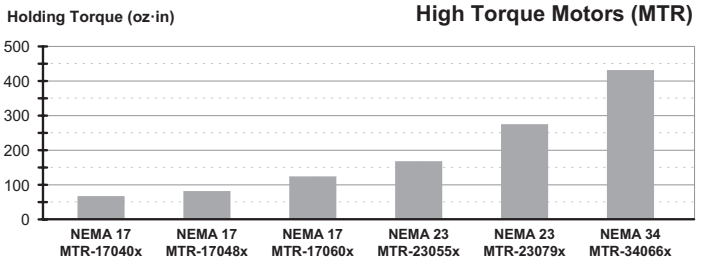


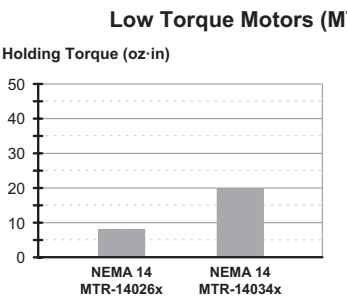
SureStep® Stepping System Overview

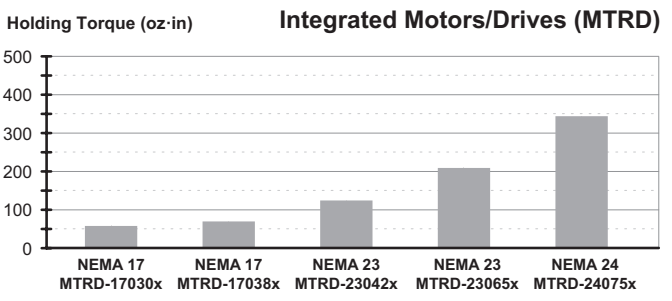
NEMA frame stepping motors with 1-ft. cable and locking connector

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, and 34 size motors with holding torque ranging from 8 to 1288 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. 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.









High-performance microstepping drive

SureStep microstepping drives

(STP-DRV-4035, STP-DRV-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

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)

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 four-piece systems with our NEMA MTRH (higher torque) motors.

SureStep advanced microstepping drives

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

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

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

SureStep® Choose your SureStep System

1. Choose a motor

Determine the torque and speed required by your application. Then look at the motor speed-torque curves in the Motors and Standard Integrated and Advanced Integrated sections of this catalog chapter. Choose a standalone or integrated motor that can run your application with plenty of speed and torque reserve (most stepper systems should have a 100% safety margin for torque). If encoder feedback is desired, be sure to choose an "E" model motor. If an IP65 rating is desired, choose a "W" motor. *[If you chose an Integrated motor/drive, you can skip to "Choose a Power Supply".]*

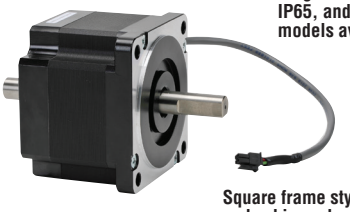
NEMA 17, 23 and 24 integrated motor/drives

NEMA 14, 17, 23 and 34 mounting flanges

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

Holding torque ranges from 8 to 1288 oz-in

Single-shaft, Dual-shaft, IP65, and encoder-mounted models available



1-ft cable with locking connector on the end

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

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.

If you chose an STP-MTR-xxxx motor, select an STP-EXT-0xx cable.

If you chose an STP-MTR**L**-xxxx motor, select an STP-EXT**L**-0xx cable.

If you chose an STP-MTR**H**-xxxx motor, select an STP-EXT**H**-0xx cable (The "**H**" motors and cable can handle higher motor current).

If you chose an STP-MTR-xxxx**W** motor, select an STP-EXT**W**-0xx cable.

If you chose an STP-MTR**H**-xxxx**W** motor, select an STP-EXT**HW**-0xx cable.

20-foot extension cable with locking connector

SureStep® Choose your SureStep System

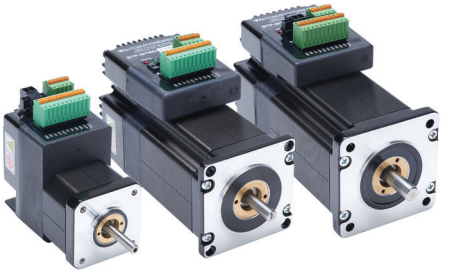
3. Choose a drive

[If you chose an Integrated motor/drive in Step 1, skip to "Choose a Power Supply" . . . you have already chosen your drive.]

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.

- Standard and Advanced Drives and Integrated Motor/Drives can accept high speed pulse input control.
- Advanced Drives and Integrated Motor/Drives can also accept serial communication control.

STP-DRV Series



STP-MTRD Series

What you need	STP-DRV-4035	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 phase ("H" motors)	–	–	√	√	–	–	–	–	–
Supply voltage	12-42	24-48	24-65	24-80	12-48	12-70	12-48	12-70	12-70
Digital Input Voltage	5V (12V*, 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.***

SureStep® Choose your SureStep System

4. Choose a power supply

Since all 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. 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.

Permissible Drive/Power Supply Combinations

Recommended Linear Power Supply

Drive	Linear Power Supply			
	STP-PWR-3204	STP-PWR-4805	STP-PWR-4810	STP-PWR-7005
STP-DRV-4035 12-32 VDC input (40V max)	√	–	–	–
STP-DRV-4850 24-48 VDC input (48V max)	√	√	√	–
STP-DRV-6575 24-65 VDC input (65V max)	√	√	√	–
STP-DRV-80100 24-80 VDC input (80V max)	√	√	√	√
STP-MTRD-17 12-48 VDC input	√	√	√	–
STP-MTRD-23, -24 12-70 VDC input	√	√	√	√

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) ≥ 2/3 x (I_motor1 + I_motor2 + I_motor 3 + . . .)

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

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.

Recommended Switching Power Supply

Drive	Switching Power Supply		
	PSB12-xxxS	PSB24-xxxS	PSB48-xxxS
STP-DRV-4035 12-32 VDC input (40V max)	√	√	–
STP-DRV-4850 24-48 VDC input (48V max)	–	√	√
STP-DRV-6575 24-65 VDC input (65V max)	–	√	√
STP-DRV-80100 24-80 VDC input (80V max)	–	√	√
STP-MTRD-17 12-48 VDC input	√	√	√
STP-MTRD-23, -24 12-70 VDC input	√	√	√

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) ≥ 0.66 x (I_motor1 + I_motor2 + I_motor 3 + . . .)

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

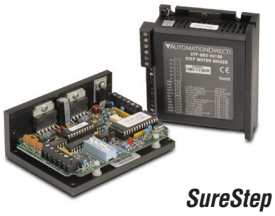
Note: For detailed information on the switching power supplies, please see:
https://cdn.automationdirect.com/static/specs/rhinopsbbuffer.pdf

SureStep® Stepping System Components

SureStep® System

Step Motor Power Supply

+



SureStep Microstepping Drive

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SureStep Extension Cable

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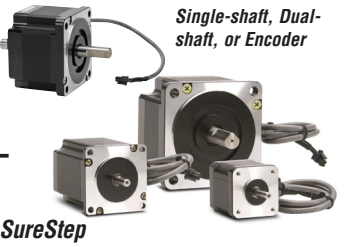

Single-shaft, Dual-shaft, or Encoder

SureStep Connectorized Step Motor

or

Step Motor Power Supply

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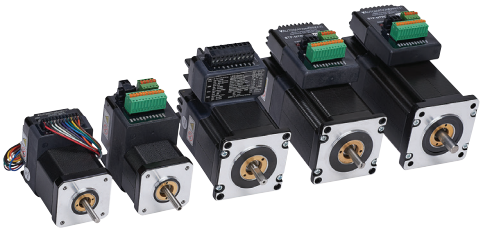


SureStep Integrated Motor/Drive

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, and 34 frame size step motors in single shaft, dual-shaft, IP65, or encoder mounted configurations
- NEMA 17, 23, and 24 frame size integrated motor/drives
- 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

- High torque, 2-phase, bipolar, 1.8° per step, 4-lead
- Available in single-shaft and dual-shaft models
- Connectorized
- Optional encoder feedback
- IP65 versions available
- 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, STP-DRV-6575, STP-MTRD-x)

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

Advanced stepper drive features

(STP-DRV-4850, STP-DRV-80100, 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

SureStep® Stepping System Components

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

SureStep Power Supply / Drive Compatibility			
Drive(1)(2)	Recommended Switching Power Supply(1)(2)		
Model #	PSB12-xxxS	PSB24-xxxS	PSB48-xxxS
STP-DRV-4035	√	√	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.

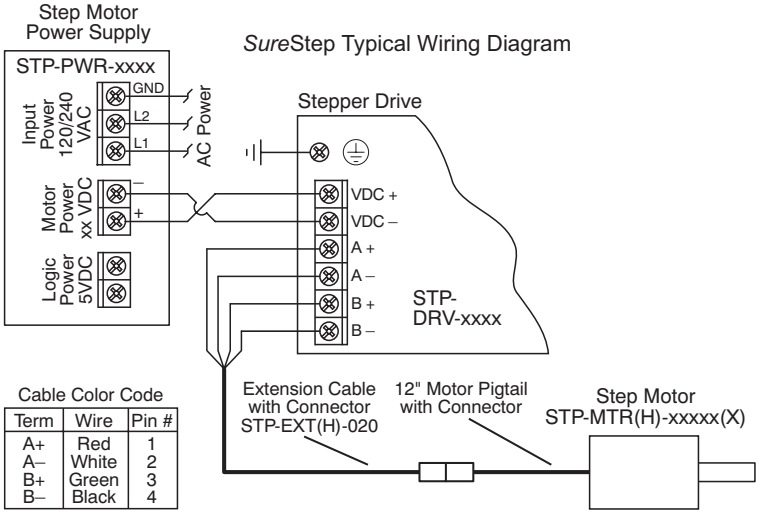
SureStep Drive / Motor Compatibility(3)						
Motor(1)(2)			Recommended Drive(1)			
Model # (1)(2)	Rated Amps	Extension Cable(2)	STP-DRV -4035(1)	STP-DRV -4850(1)	STP-DRV -6575(1)	STP-DRV -80100(1)
STP-MTRL-14026(x)	0.35	STP-EXTL-0xx	√	√	–	–
STP-MTRL-14034(x)	0.8		√	√		
STP-MTR-17040(x)	1.7	STP-EXT-0xx	√	√	√	√
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-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				√	√

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

2) MTR motors have connectors compatible with the EXT extension cables. MTRL motors have connectors compatible with the EXTL extension cables. MTRH motors have connectors compatible with the EXTH extension cables. W-series motors have connectors compatible with the EXTW and EXTHW extension cables.

3) Not applicable to integrated motor/drives as drives and motors are already paired.

Typical Wiring Diagram



SureStep® Stepping System Drives

SureStep® Microstepping Drives Overview

SureStep Series – Microstepping Drives Features Comparison							
Drive Model		**Standard Microstepping Drives**			**Advanced Microstepping Drives**		
		STP-DRV-6575	**STP-DRV-4035**	**STP-MTRD-x**	**STP-DRV-4850**	**STP-DRV-80100**	**STP-MTRD-xR**
Price				See Integrated Motor/ Drives section			See Integrated Motor/Drives section
Drive Type		Microstepping drive with pulse input		Integrated stepper motor/drive	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	open-frame	enclosed	enclosed		enclosed
Output Current		1.0–7.5 A/phase	0.4–3.5 A/phase	–	0.1–5 A/phase	0.1–10 A/phase	–
Input Voltage		nominal: 24–65 VDC range: 20–75 VDC	nominal: 12–32 VDC range: 12–42 VDC	nominal: 12-48 VDC (NEMA 17) 12-70 VDC (NEMA 23) range: 10-55 VDC (NEMA 17) 11-74 VDC (NEMA 23)	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	MOSFET, dual H-bridge, bipolar chopper	Dual H-bridge, 4 quadrant	MOSFET, dual H-bridge, 4-quadrant		Dual H-bridge, 4 quadrant
Current Control		4-state PWM @ 20 kHz	4-state PWM @ 20 kHz	4-state PWM @ 16 kHz	4-state PWM @ 20 kHz	4-state PWM @ 20 kHz	4-state PWM @ 20kHz
Microstep Resolution		dipswitch selectable			software selectable		
		200 to 20,000 steps/rev	400 to 10,000 steps/rev	200 to 25,600 steps/rev	200 to 51200 steps/rev		
Modes of Operation	**Step & Dir**	YES	YES	YES	YES	YES	YES
	CW/CCW	YES	n/a	YES	YES	YES	YES
	A/B Quad	n/a	n/a	n/a	YES	YES	YES
	Oscillator	n/a	n/a	n/a	YES	YES	YES
	Serial Indexing	n/a	n/a	n/a	YES	YES	YES
Digital Input Signals	**Step/Pulse**	step & direction, CW/ CCW step	step & direction	step & direction, CW/ CCW step	step & direction, CW/CCW step, A/B quadrature, run/stop & direction, jog CW/CCW, CW/CCW limits		
	Direction						
	Enable	motor disable	motor disable	motor enable	motor enable, alarm reset, speed select (oscillator mode)		
Analog Input		n/a	n/a	n/a	speed control		signal range, offset, dead band, and filtering
Output Signal		fault	n/a	fault	fault, motion, tach		brake, fault, motion, tach
Communication Interface		n/a	n/a	n/a	YES (programming/communication cable included)		
Non-volatile Memory Storage		n/a	n/a	n/a	YES		
Idle Current Reduction		YES					
Self Test		YES					
Additional Features		Load inertia (anti-resonance & damping feature to improve motor performance) Step pulse noise filter	n/a	Load inertia (anti-resonance & damping feature to improve motor performance) Step pulse noise filter	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.							

SureStep® Stepping System Motors

SureStep® Stepping Motors

SureStep Series Part Numbers – Connectorized Bipolar Stepping Motors*				
Bipolar Stepping Motors	Price	Shaft Type	Torque Level	Encoder Mounting
STP-MTRL-14026		single	low	not available
STP-MTRL-14026D		dual		optional
*STP-MTRL-14026E***		dual		pre-installed
STP-MTRL-14034		single		not available
STP-MTRL-14034D		dual		optional
*STP-MTRL-14034E***		dual		pre-installed
STP-MTR-17040		single	high	not available
STP-MTR-17040D		dual		optional
*STP-MTR-17040E***		dual		pre-installed
*STP-MTR-17040W****		single		not available
STP-MTR-17048		single		not available
STP-MTR-17048D		dual		optional
*STP-MTR-17048E***		dual		pre-installed
*STP-MTR-17048W****		single		not available
STP-MTR-17060		single		not available
STP-MTR-17060D		dual		optional
*STP-MTR-17060E***		dual		pre-installed
*STP-MTR-17060W****		single		not available
STP-MTR-23055		single		not available
STP-MTR-23055D		dual		optional
*STP-MTR-23055E***		dual		pre-installed
*STP-MTR-23055W****		single		not available
STP-MTR-23079		single		not available
STP-MTR-23079D		dual		optional
*STP-MTR-23079E***		dual		pre-installed
*STP-MTR-23079W****		single		not available
STP-MTR-34066		single		not available
STP-MTR-34066D		dual		optional
*STP-MTR-34066W****		single		not available
STP-MTRH-23079		single	higher	not available
STP-MTRH-23079D		dual		optional
*STP-MTRH-23079E***		dual		pre-installed
*STP-MTRH-23079W****		single		not available
STP-MTRH-34066		single		not available
STP-MTRH-34066D		dual		optional
*STP-MTRH-34066W****		single		not available
STP-MTRH-34097		single		not available
STP-MTRH-34097D		dual		optional
*STP-MTRH-34097W****		single		not available
STP-MTRH-34127		single		not available
STP-MTRH-34127D		dual		optional
*STP-MTRH-34127W****		single		not available

** For integrated motor/drives part numbers and pricing, see the integrated motor/drives section.*

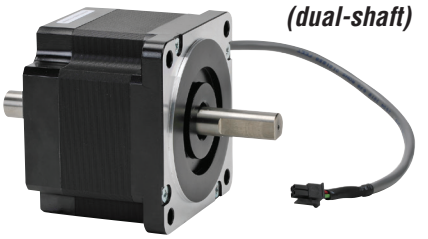
*** E model motors come with a STP-MTRA-ENC9 encoder pre-installed. Requires STP-CBL-EBxx for encoder wiring. To change from the default 400ppr, use STP-USBENC-CBL-1. See the SureStep Stepping System Encoders section for more details.*

**** W models are IP65 washdown rated. All others are IP40.*

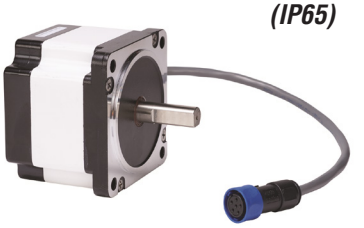
STP-MTR-xxxxx
(single-shaft)

STP-MTR-xxxxxE
(encoder mount)

STP-MTR-xxxxxD
(dual-shaft)



STP-MTR-xxxxxW
(IP65)



SureStep® Stepping Motors Mounting Accessory

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

SureStep® Stepping System Motors

SureStep® Stepping Motors

SureStep Series Specifications – Connectorized Bipolar Stepping Motors												
		Low Torque Motors		High Torque Motors						Higher Torque Motors			
Bipolar Stepping 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-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	($oz·in^2$)	0.06	0.08	0.28	0.37	0.56	1.46	2.60	7.66	2.60	7.66	14.80	21.90
	($kg·cm^2$)	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-EXT***L***-0xx		STP-EXT-0xx STP-EXT***W***-0xx (for "W" motors)						STP-EXT***H***-0xx STP-EXT***HW***-0xx (for "W" motors)			

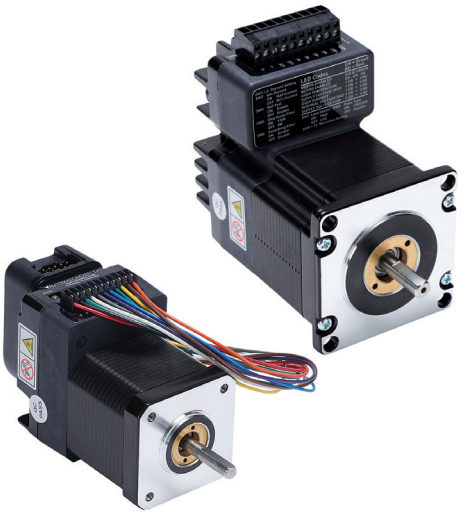
**** For dual-shaft motors (STP-MTR-xxxxxD):***
The sum of the front and rear Torque Loads, Radial Loads, and Thrust Loads must not exceed the applicable Torque, Radial, and Thrust load ratings of the motor.

SureStep® Integrated Microstepping Motors and Drives

SureStep® Integrated Motors System

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

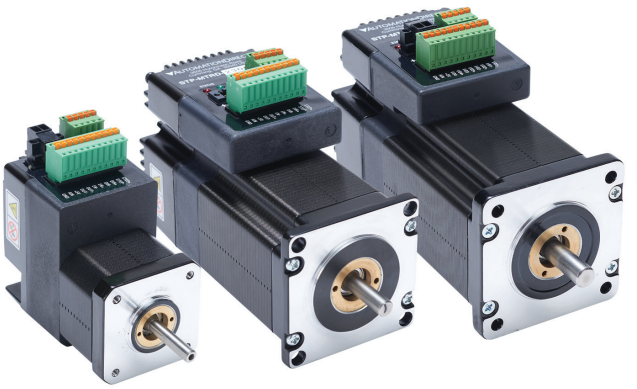
(STP-MTRD-x)

- "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
STP-MTRD-17038	17	
STP-MTRD-17038E	17	
STP-MTRD-23042	23	
STP-MTRD-23042E	23	
STP-MTRD-23065	23	
STP-MTRD-23065E	23	

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
STP-MTRD-17030R	17	
STP-MTRD-17030RE	17	
STP-MTRD-17038R	17	
STP-MTRD-17038RE	17	
STP-MTRD-23042R	23	
STP-MTRD-23042RE	23	
STP-MTRD-23065R	23	
STP-MTRD-23065RE	23	
STP-MTRD-24075RV	24	
STP-MTRD-24075RVE	24	

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® 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 STP-MTRA-ENC9 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.

STP-MTRA-ENC2

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. 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.

STP-MTRA-ENC9

Features:

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

Sure Step Series Specifications – Encoders		
Part Number	***Price***	***Description***
STP-MTRA-ENC1		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.
STP-MTRA-ENC2		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.
STP-MTRA-ENC3		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.
STP-MTRA-ENC4		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.
STP-MTRA-ENC5		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.
STP-MTRA-ENC6		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.
STP-MTRA-ENC7		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.
STP-MTRA-ENC8		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.
STP-MTRA-ENC9*		SureStep incremental (quadrature) modular encoder, 5VDC, line driver (differential) output, configurable up to 4096 ppr. For use with NEMA 14, 17, and 23 SureStep dual-shaft motors. Installation tool and mounting hardware included.
STP-MTRA-ENC10*		SureStep incremental (quadrature) modular encoder, 5VDC, Push-pull (totem) output, configurable up to 4096 ppr. For use with NEMA 14, 17, and 23 SureStep dual-shaft motors. Installation tool and mounting hardware included.
**** ENC9 and ENC10 encoders come with multiple adapter sleeves to accomodate different motor shaft diameters. See the dimensional drawing for details.***		

Stepping System Accessories

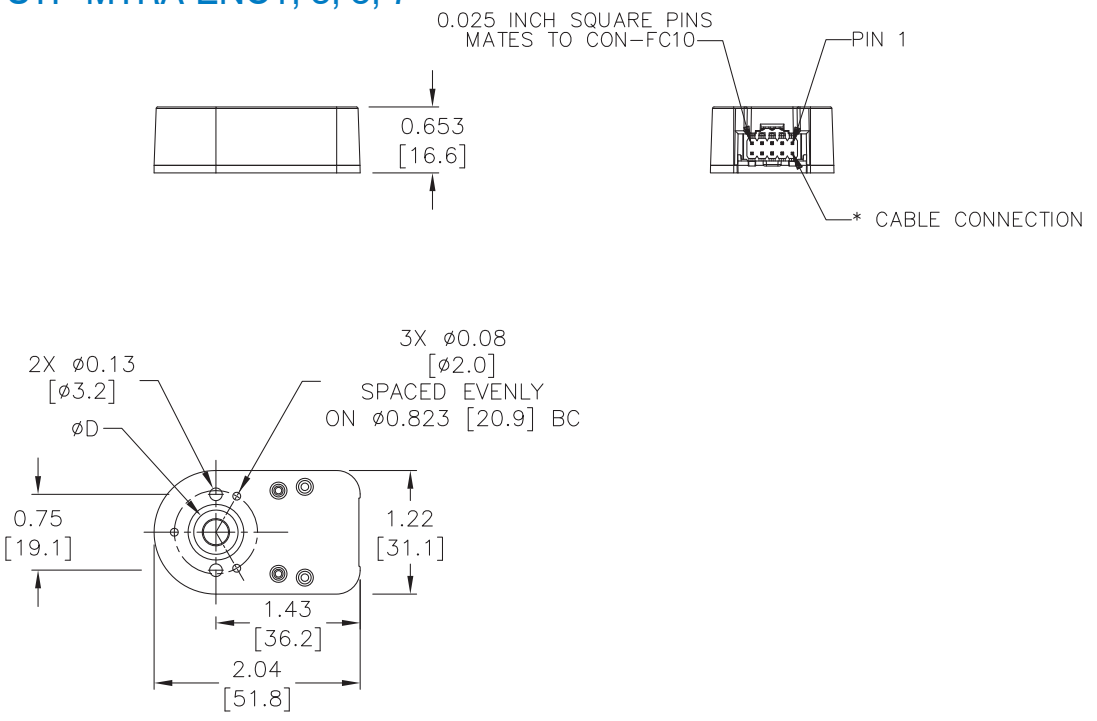
SureStep® Stepping System Encoders

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-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-ENC9	48 to 4096 configurable** (default = 400)	2mm - 8mm	Line Driver	STP-CBL-EBxx (signal) STP-USBENC-CBL-1 (configuration)	P2-HSI, P3-HSI, BRX*, CLICK C0-1xDxE-D*	STP-MTRx-14xxxD STP-MTRx-14xxxE STP-MTRx-17xxxD STP-MTRx-17xxxE STP-MTRx-23xxxD STP-MTRx-23xxxE Standard STP-MTRD-xxxxxE
STP-MTRA-ENC10			Push-pull (totem)		BRX*, CLICK C0-1xDxE-D*	
**** Requires FC-ISO-C***						
***** Cable STP-USBENC-CBL-1 required for configuration***						

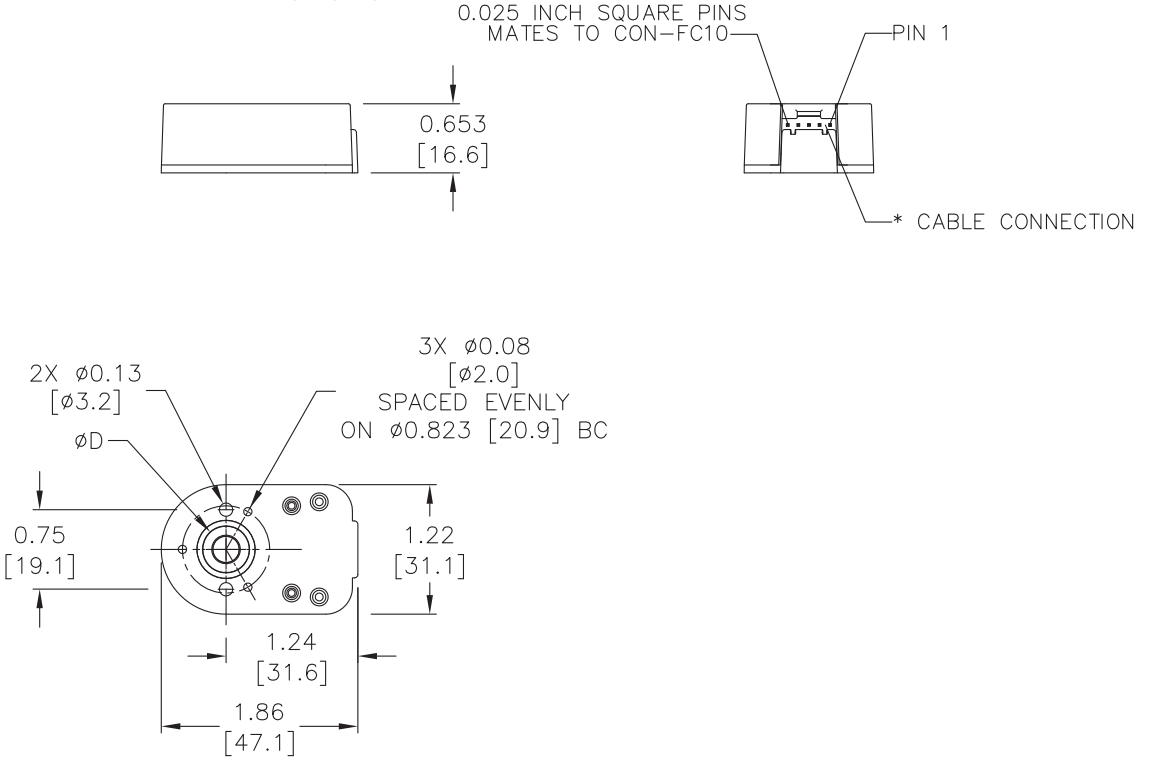
SureStep® Stepping System Encoders

Dimensions = in [mm]

STP-MTRA-ENC1, 3, 5, 7



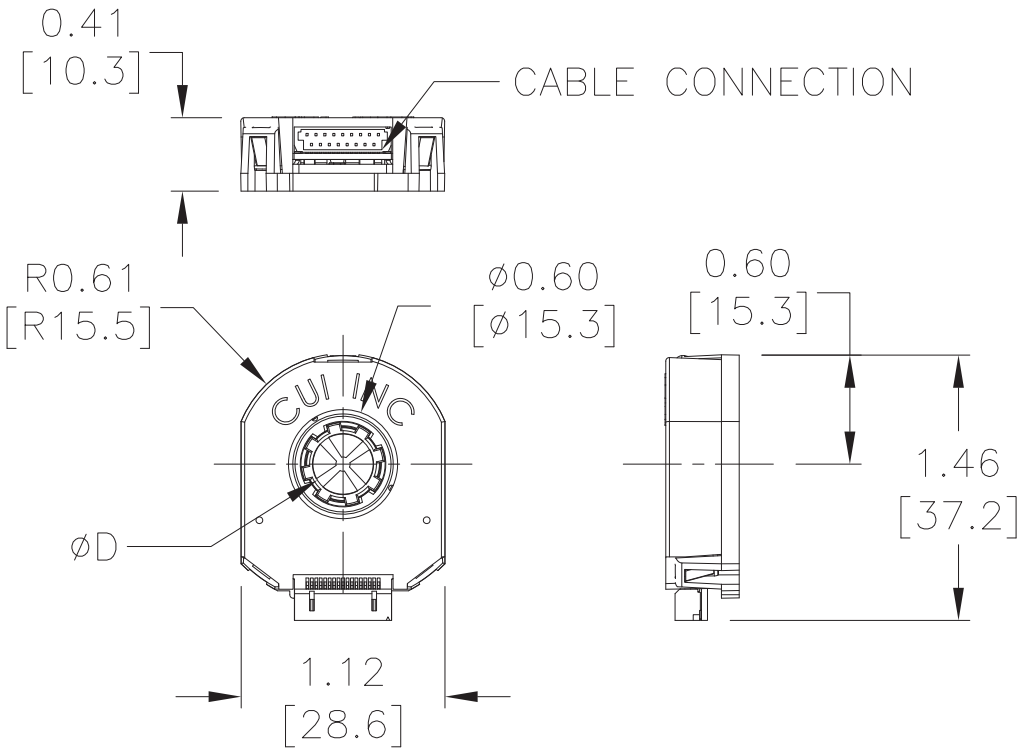
STP-MTRA-ENC2, 4, 6, 8



SureStep® Stepping System Encoders

Dimensions = in [mm]

STP-MTRA-ENC9, 10



STP-MTRA-ENC9, 10 Additional Dimensions	
Location	**Dimensions**
D*	2mm, 3mm, 1/8 inch, 4mm, 3/16 inch, 5mm, 6mm, 1/4 inch, 8mm

** The dimension of D varies based on which sleeve is used. Values listed represent the different sleeves available for this encoder.*