CHAPTER 1

GETTING STARTED

In This Chapter...

Manual Overview

Overview of this Publication

Thank you for selecting the SureStep™ Stepping System components. This user manual describes the selection, installation, configuration, and methods of operation of the SureStep™ Stepping System. We hope our dedication to performance, quality and economy will make your motion control project successful.

Who Should Read this Manual

This manual contains important information for those who will install, maintain, and/or operate any of the SureStep™ Stepping System devices.

Technical Support

By Telephone: 770-844-4200
(Mon.-Fri., 9:00 am – 6:00 pm E.T.)

On the Web: www.automationdirect.com

Our technical support group is glad to work with you in answering your questions. If you cannot find the solution to your particular application, or, if for any reason you need additional technical assistance, please call technical support at **770-844-4200**. We are available weekdays from 9:00 am to 6:00 pm Eastern Time.

We also encourage you to visit our web site where you can find technical and non-technical information about our products and our company. Visit us at **www.automationdirect.com**.

Special Symbols

When you see the "notepad" icon in the left-hand margin, the paragraph to its immediate right will be a special note which presents information that may make your work quicker or more efficient.

When you see the "exclamation mark" icon in the left-hand margin, the paragraph to its immediate right will be a WARNING. This information could prevent injury, loss of property, or even death (in extreme cases).

SureStep™ System Introduction

SureStep open-loop and inclusive position verification (semi-closed loop) stepping systems provide simple and accurate control of position and speed where lower power and cost are considerations. The SureStep family of stepping components includes power supplies, drives, motors, and cables. The AutomationDirect family of PLCs or other indexers and motion controllers can be used to provide the signals that are "translated" by the microstepping drives into precise movement of the stepping motor shaft.

SureStep™ Part Number Explanation

Drives

STP-DRV-6575

Component Capacity
2-digit max nominal voltage followed by max current with 1 implied decimal place

- 4035: 40VDC, 3.5 A
- 4830: 48VDC, 3.0 A
- 4845: 48VDC, 4.5 A
- 4850: 48VDC, 5.0 A
- 6575: 65VDC, 7.5 A
- 80100: 80VDC, 10.0 A
- 24025: 120/240VAC, 2.5 A

Component Type

- DRV: DC powered stepper drive
- DRVAC: AC powered stepper drive
- DRVA: drive accessory

***Sure*Step Series Designation:** STP

Motors

STP-MTRx-23079x

Motor Shaft Type/Variant

- blank: single shaft
- D: dual shaft
- E: encoder pre-mounted
- W: IP65 (washdown)

Component Capacity
2-digit NEMA frame size followed by approximate stack* length in mm

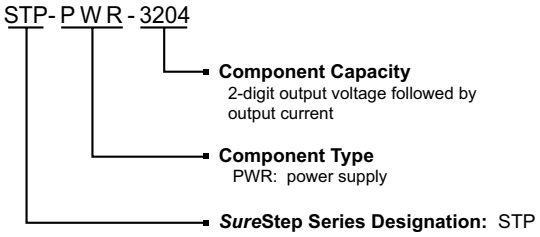
Component Type

- MTRL: low-power DC stepper motor
- MTR: high-power stepper motor
- MTRH: higher-power stepper motor
- MTRA: motor accessory
- MTRAC: high bus voltage stepper motor**

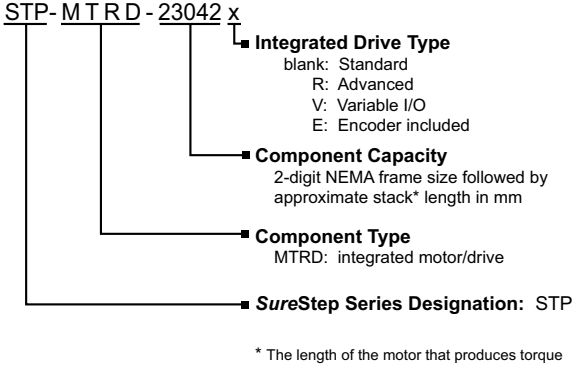
***Sure*Step Series Designation:** STP

* The length of the motor that produces torque (not including shaft)
** For use with DRVAC drives

Power Supplies



Integrated Motors/Drives



* The length of the motor that produces torque

Cables and Accessories

*Sure*Step Cables & Accessories	
Part Number	**Description**
STP-EXTx-xx	Motor extension cable, xx = cable length in feet, x=H for high power, L for low power, W for IP65
STP-DRVA-xx	Drive accessory, xx= accessory descriptor
STP-MTRA-xx	Motor accessory, xx = accessory descriptor
Note: See Appendix A for the full range of SureStep accessories	

SureStep™ System Recommended Component Compatibility

*Sure*Step Power Supply / DC Powered Drive Compatibility				
Drive (1)(2)(4)	Recommended Linear Power Supply (1)(2)(4)			
Model Number	STP-PWR -3024	STP-PWR -4805	STP-PWR -4810	STP-PWR -7005(3)
STP-DRV-4035 12-32 VDC input (40V max)	√	No	No	No
STP-DRV-4830 12-48 VDC Input (48V max)	√	√	√	No
STP-DRV-4845 24-48 VDC Input (48V max)	√	√	√	No
STP-DRV-4850 24-48 VDC input (48V max)	√	√	√	No
STP-DRV-6575 24-75 VDC input (85V max)	√	√	√	No
STP-DRV-80100 24-80 VDC input (80V max)	√	√	√	√
STP-MTRD-17 12-48 VDC input	√	√	√	No
STP-MTRD-23, -24 12-70 VDC input	√	√	√	√

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

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

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) STP-DRV**AC**-x drives are AC powered and cannot be powered by DC power supplies. Please see Chapter 5 for use of AC power drives and motors.*

*Sure*Step Power Supply / Drive Compatibility			
Drive (1)(2)(3)	Recommended Switching Power Supply (1)(2)(3)		
Model Number	PSB12-xxxS	PSB24-xxxS	PSB48-xxxS
STP-DRV-4035 12-32 VDC input (40V max)	√	√	No
STP-DRV-4830 12-48 VDC Input (48V max)	√	√	√
STP-DRV-4845 24-48 VDC Input (48V max)	No	√	√
STP-DRV-4850 24-48 VDC input (48V max)	No	√	√
STP-DRV-6575 24-75 VDC input (85V max)	No	√	√
STP-DRV-80100 24-80 VDC input (80V max)	No	√	√
STP-MTRD-17 12-48 VDC input	√	√	√
STP-MTRD-23, -24 12-70 VDC input	√	√	√

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) STP-DRV**AC**-x drives are AC powered and cannot be powered by DC power supplies. Please see Chapter 5 for use of AC power drives and motors.*

*Sure*Step DC Drive / Motor Compatibility[3]									
Motor [1][2]			Recommended Drive [1]						
Model Number [1][2]	Rated Amps (RMS)	Extension Cable	STP-DRV-4035[1] (3.5 A max output)	STP-DRV-4830 (3.0 A max output)	STP-DRV-4845 (4.5 A max output)	STP-DRV-4850[1] (5.0 A max output)	STP-DRV-6575[1] (7.5 A max output)	STP-DRV-80100[1] (10.0 A max output)
STP-MTR*L*-14026x	0.35	STP-EXT***L***-0xx	√	√		√	–	–
STP-MTR*L*-14034x	0.8		√	√	√	√	–	–
STP-MTR-17040x	1.7	STP-EXTx-0xx	√	√	√	√	√	√
STP-MTR-17048x	2.0		√	√	√	√	√	√
STP-MTR-17060x	2.0		√	√	√	√	√	√
STP-MTR-23055x	2.8		√	√	√	√	√	√
STP-MTR-23079x	2.8		√	√	√	√	√	√
STP-MTR-34066x	2.8		√	√	√	√	√	√
STP-MTR*H*-23079x	5.6	STP-EXT***H***x-0xx	–				√	√
STP-MTR*H*-34066x	6.3						√	√
STP-MTR*H*-34097x	6.3						√	√
STP-MTR*H*-34127x	6.3						√	√

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

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

*Sure*Step AC Motor/Drive Compatibility		
Model Number	STP-DRVAC-24025	
	Series Wired Motor	Parallel Wired Motor
STP-MTRAC-23044	Yes	No
STP-MTRAC-23055	Yes	No
STP-MTRAC-23078	Yes	No
STP-MTRAC-34075	Yes	No
STP-MTRAC-34115	Yes	No
STP-MTRAC-34156	Yes	No

Note: Always use series motor wiring with STP-DRVAC-24025. The drive has an internal voltage doubler circuit, so it will output a very high bus voltage if fed with 120VAC or 240VAC.

Microstepping Drives Introduction

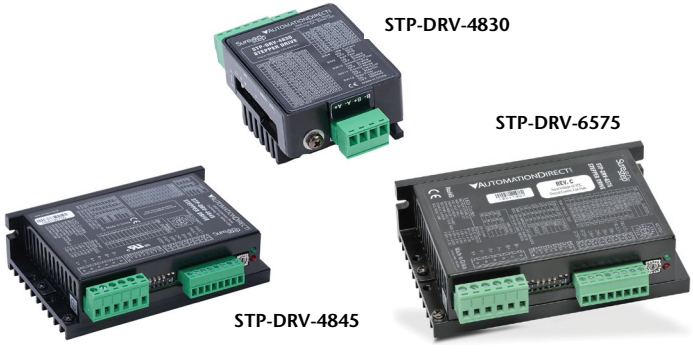
There are two different basic types of microstepping drives offered in the SureStep™ series. DIP-switch configurable models with pulse inputs are available, as well as two software configurable advanced models with multiple operating modes. Descriptions of integrated motor/drives (a drive integrally attached to the motor) follow the drive-only section.

Standard Microstepping Drives

STP-DRV-4830, -4845, -6575

These SureStep™ standard microstepping drives use pulse input signals, and are configured with DIP switches on the drive. These are fully enclosed drives, not open frame. To use these drives in a step motor control system, you will need the following:

- A 24–48 VDC power supply for the STP-DRV-4830/4845 or a 24–75 VDC power supply for the STP-DRV-6575. SureStep STP-PWR-x linear power supplies or PSBx Rhino regulated power supplies from AutomationDirect are good choices. If you decide not to use one of these recommended power supplies, then please read the section entitled "Choosing a Power Supply" in Chapter 8, "SureStep System Power Supplies."
- A source of step pulses. Signal may be sinking (NPN), sourcing (PNP), or differential.
- The step inputs can be CW/CCW or Step & Direction. CW and CCW are viewed from the end opposite the drive end of the motor (looking out of the shaft).
- A compatible step motor, such as an AutomationDirect SureStep STP-MTRx. (Motor extension cables STP-EXTx are also available.)
- A small flat blade screwdriver for tightening the connectors.



Refer to the "SureStep STP-DRV-4830/4845/6575 Microstepping Drive" chapter of this user manual for complete details on the installation, configuration, and wiring of this drive.

Standard Microstepping Drives (continued)

STP-DRV-4035

The SureStep™ STP-DRV-4035 standard microstepping drive uses pulse input signals, and is configured with DIP switches on the drive. To use this drive in a step motor control system, you will need the following:

- 12-42 volt DC power supply for the motor drive. The SureStep STP-PWR-3204 linear power supply from AutomationDirect is the best choice. If you decide not to use the STP-PWR-3204, please read the section entitled "Choosing a Power Supply" in Chapter 7, "SureStep System Power Supplies."
- A source of step pulses. Signal may be sinking (NPN), sourcing (PNP), or differential.
- The step inputs can be CW/CCW, step and direction, or quadrature.
- A compatible step motor, such as an AutomationDirect SureStep STP-MTRx. (Motor extension cables STP-EXTx are also available.)
- A small flat blade or phillips screwdriver for tightening the connectors.

The STP-DRV-4035 standard microstepping drive is an open frame design.

STP-DRV-4035

Refer to the "SureStep STP-DRV-4035 Microstepping Drive" chapter of this user manual for complete details on the installation, configuration, and wiring of this drive.

High Bus Voltage Microstepping Drives

STP-DRVAC24025

These SureStep™ high bus voltage drives use pulse input signals, and are configured with DIP switches on the drive. These are fully enclosed drives, not open frame. To use these drives in a step motor control system, you will need the following:

- A 90-240 VAC single phase power source (there is a 115/230V voltage selector switch on the drive.
- A source of step pulses. Signal may be sinking (NPN), sourcing (PNP), or differential.
- The step inputs can be CW/CCW or Step & Direction. CW and CCW are viewed from the end opposite the drive end of the motor (looking out of the shaft).
- A compatible step motor, such as an AutomationDirect SureStep STP-MTRAC-x.

NOTE: The drive always outputs a high bus voltage (~340V) that is compatible with our STP-MTRAC-x motors. This drive is not to be used with low-voltage STP-MTR-x motors. Always wire motors in series configuration with this drive. When supplied 115VAC, the drive has an internal voltage doubler, so the output voltage could be near 340V peak (whether supplied 115VAC or 230VAC).

Refer to "Chapter 5: SureStep STP-DRVAC-24025 Microstepping Drive" of this user manual for complete details on the installation, configuration, and wiring of this drive.

STP-DRVAC-24025

Advanced Microstepping Drive

The SureStep™ advanced microstepping drives (STP-DRV-4850 & -80100) are capable of accepting several different forms of input signals for control: pulse, analog, serial communication, or internal indexing. These drives are configured by computer with software which is included with the drive. To use one of these drives in a step motor control system, you will need the following:

- A DC power supply for the motor drive. A compatible SureStep STP-PWR-xxxx linear power supply from AutomationDirect is the best choice.
- A source of input control signals, such as a PLC from AutomationDirect.
- A compatible step motor, such as an AutomationDirect SureStep STP-MTRx. (Motor extension cables STP-EXTx are also available.)
- A small flat blade screwdriver for tightening the connectors.

The SureStep advanced microstepping drives are enclosed with removable wiring terminal blocks.

STP-DRV-80100

Refer to the "SureStep™ Advanced Microstepping Drives" chapter of this user manual for complete details on the installation, configuration, and wiring of this drive.

Standard Integrated Motors/Drives

The SureStep™ STP-MTRD standard series integrated motors/drives (STP-MTRD-17 and -23) use pulse input signals, and are configured with DIP switches on the drive. To use this motor/drive in a step motor control system, you will need the following:

- 12-48 volt (for 17 series) or 12-70 volt (for 23 series) DC power supply for the motor/drive. The SureStep linear power supplies from AutomationDirect are the best choice. If you decide not to use a STP-PWR-xxxx, please read the section entitled "Choosing a Power Supply" in Chapter 7, "SureStep System Power Supplies."
- A source of step pulses. Signal may be sinking (NPN), sourcing (PNP), or differential.
- The step inputs can be CW/CCW, step and direction, or quadrature.
- A small flat blade screwdriver (3/32") for tightening the connectors.

The SureStep standard integrated motors/drives are enclosed with removable wiring terminal blocks. Models with external encoders (for position feedback to a PLC, motion controller, etc.) are available.

STP-MTRD-17038RE

Refer to Chapter 5: "SureStep Integrated Motors/Drives" for complete details on the installation, configuration, and wiring of this motor/drive.

Advanced Integrated Motors/Drives

The SureStep™ STP-MTRD advanced series integrated motors/drives (STP-MTRD-17R, -23R, and -24R) are capable of accepting several different forms of input signals for control: pulse, analog, serial communication, or internal indexing (via serial communications). These motors/drives are configured with software which is included with the drive. To use one of these motors/drives in a step motor control system, you will need the following:

- A DC power supply for the motor drive (12-48 volt for 17 series, 12-70 volt for 23 and 24 series). A compatible SureStep STP-PWR-xxxx linear power supply from AutomationDirect is the best choice.
- A source of input control signals, such as a PLC from AutomationDirect.
- A small flat blade screwdriver for tightening the connectors.

The SureStep advanced integrated motors/drives are enclosed with removable wiring terminal blocks. Models with internal encoders (for position verification and stall prevention inside the motor/drive) are available.

STP-MTRD-23042

Refer to Chapter 5: "SureStep Integrated Motors/Drives" for complete details on the installation, configuration, and wiring of this motor/drive.

Bipolar Step Motor Introduction

AutomationDirect offers many different models of bipolar step motors with mounting flanges in two different shaft configurations (single and dual-shaft), and in four different NEMA frame sizes (14, 17, 23, and 34). There are a variety of motor types available: low torque (STP-MTRL), high torque (STP-MTR), and higher torque (STP-MTRH). Models that have a "D", "E", or "W" variant represent a dual shaft option (D), an encoder pre-mounted to the motor (E), or IP65 washdown rated (W) respectively. The "D" variants except for the NEMA 34 motors are encoder ready with pre-drilled and tapped holes on the rear face for encoder mounting. All low-voltage motors have a 12 inch connectorized pigtail cable, and optional matching 6, 10, or 20 foot connectorized extension cables (STP-EXTx) are also available. The IP65 motors (W models) have IP65 rated connectors. The high bus voltage MTRAC motors have 8-lead 10-foot cables.

Refer to Chapter 6: "SureStep™ Stepping Motors" in this user manual for complete details on the specifications, installation, mounting, dimensions, and wiring of the SureStep step motors.

STP-MTRx
NEMA 14, 17, 23, 34
Frame Sizes

STP-MTRx Motors available in Single-shaft, Dual-shaft (encoder ready), Encoder Mounted, and IP65 (washdown) Models. STP-MTRAC-x Motors available in Single-shaft or Dual-shaft (encoder ready) models.

Stepping System Power Supply Introduction

The SureStep stepping system power supplies are designed to work with SureStep microstepping drives and motors. The different power supply models can provide unregulated DC power at the applicable voltage and current levels for various SureStep drives and motors. The power supplies also provide a regulated 5VDC, 500 mA logic supply output for indexer and PLC logic outputs to control the SureStep drives. Automation Direct switching power supplies PSB12-xxxS, PSB24-xxxS, and PSB48-xxxS are good non-linear supplies. A regen clamp may be needed if using these supplies. For more information on using the power supplies please see Chapter 8: "SureStep System Power Supplies".

Linear Power Supplies

Switching Power Supplies

The stepping system power supplies can supply power for multiple SureStep STP-DRV-xxxx microstepping motor drives, depending on step motor size and application requirements.

Refer to the Power Supply chapter of this user manual for complete details on the specifications, installation, mounting, dimensions, and wiring of the SureStep stepping system power supplies.

Further information about braking accessories and regeneration clamping can be found in Appendix A: "SureStep Accessories" and the STP-DRVA-RC-050 or STP-DRVA-RC-50A REGENERATION CLAMP datasheet.

Selecting the Stepping System

Refer to Appendix C: Selecting the SureStep™ Stepping System for detailed information on how to calculate requirements for various applications using stepping motors for motion control.

Use with AutomationDirect PLCs

Refer to Appendix B: Using SureStep™ with AutomationDirect PLCs for detailed information on wiring the SureStep Stepping System components to AutomationDirect PLCs and high-speed counter modules.

The following is a summary of the AutomationDirect PLCs and module part numbers that are suitable to work with the SureStep Stepping Systems:

High-Speed Pulse Output Control (Standard Drives)

Any AutomationDirect PLC with high speed pulse output can control the SureStep Standard and Advanced stepper drives and integrated motor/drives. Certain high-speed PLC outputs are 24VDC and may require dropping resistors to work with 5VDC stepper inputs. See Appendix B in this manual and the appropriate PLC User Manual for more detailed information.

AutomationDirect PLCs that can use pulse train outputs with SureStep drives:

BRX Series (all models with DC outputs on the CPU module)

Productivity Series (all P2 and P3 CPUs - with the P2-HSO/P3-HSO modules)

Do-More Series (all models that can use the H2-CTRIO2)

DirectLogic Series

- All CPU models that can use the H2-CTRIO2 (and other CTRIO models)
- Models with built-in high speed outputs (DL05, DL06)

Serial Communication Control (Advanced Drives)

AutomationDirect PLCs with an RS-232 port can control an Advanced stepper drive (STP-DRV-4850, STP-DRV-80100) with serial communication (one drive per PLC communication port). A PLC with an RS-485 port can control multiple Advanced integrated stepper motor/drives.

The **Click Series**, **BRX Series**, **Productivity Series**, and **Do-More Series** of PLCs allow for simple ASCII control of the Advanced drives and motor/drives. Of the DirectLogic Series of PLCs, we recommend only using the DL06 and D2-260 CPUs due to their advanced ASCII instruction set which includes PRINTV and VPRINT commands.

See Appendix B and the appropriate PLC User Manual for more detailed information.