

# SureStep™ ACCESSORIES

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# APPENDIX A

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## Braking Accessories

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

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

To solve this problem, AutomationDirect offers a regeneration clamp STP-DRVA-RC-050A. The regeneration clamp has a built-in 50W braking resistor. The STP-DRVA-RC-050A does not have an external resistor.

*STP-DRVA-RC-050 and the optional 100W braking resistor are no longer available, but are included here for reference purposes.*

You can test whether regen is needed by installing a single unit in the first installation. If the regen LED (red) never flashes, then you may not need the clamp.

Further information about braking accessories and regeneration clamping can be found in the REGENERATION CLAMP datasheet.

### Regeneration Clamp Features

- Built-in 50W power resistor
- 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.

### STP-DRVA-RC-050 Features:

- External 100W resistor available
- Multiple drives in parallel up to 20A total output current
- Non-removable terminal blocks
- Uses 12-18 AWG wire for connections

### STP-DRVA-RC-050A Features:

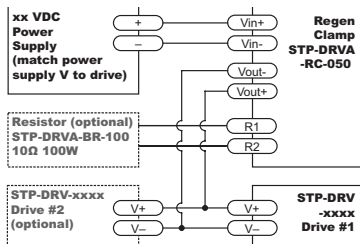
- Three drive connections, 7A max per channel, 15A total output current
- Removable terminal blocks (replacement kit STP-CON-4)
- Uses 18-20 AWG wire for connections

#### SureStep™ Stepping Systems – Braking Accessories

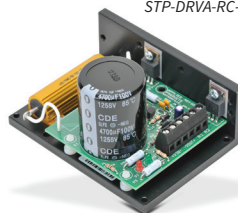
Part Number	Description
STP-DRVA-RC-050*	Regeneration Clamp: use with DC-powered stepper & servo drives; 50W, 24–80 VDC
STP-DRVA-RC050A*	Regeneration Clamp: 50W, for DC input stepper and servo drives
STP-DRVA-BR-100	Braking Resistor: use with STP-DRVA-RC-050 regen clamp; 100W, 10 ohms
* Do not use the regeneration clamp in an atmosphere containing corrosive gases.	

## Block Diagram – STP-DRV-xxxx

### STP-DRVA-RC-050 & STP-DRVA-BR-100

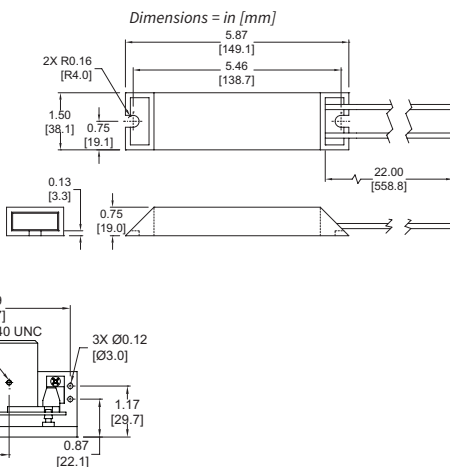
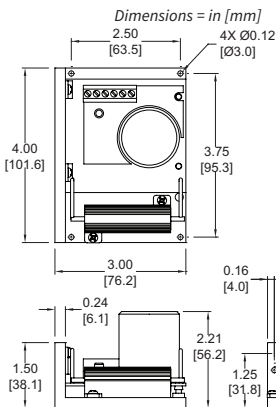


STP-DRVA-RC-050

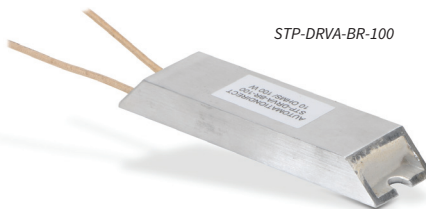


## Dimensions – STP-DRVA-BR-100

### Dimensions – STP-DRVA-RC-050



STP-DRVA-BR-100

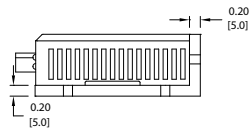
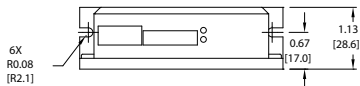
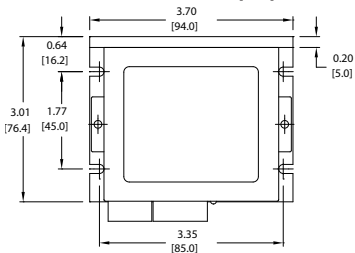




STP-DRVA-RC-050A

## Dimensions - STP-DRVA-RC-050A

Dimensions = in [mm]



## Cables and Accessories

Replacement cables and connector kits are available for use with SureStep motors, drives, and integrated motors/drives. See the table below for available accessories and the parts they are compatible with. Encoder cables are located in the Encoder Options section.

SureStep Cables & Accessories		
Part Number	Description	Use With
STP-CON-1	SureStep replacement connector kit.	STP-DRV-4845 & -6575
STP-CON-2	SureStep replacement connector kit.	STP-DRV-4850 STP-DRV-80100
STP-CON-3	SureStep replacement connector kit.	All STP-MTRD except STP-MTRD-17038 and 17048E
STP-CON-4	SureStep replacement connector kit.	STP-DRVA-RC-050A
STP-CON-5	SureStep replacement connector kit.	STP-DRV-4830
STP-CON-6	SureStep replacement connector kit.	STP-DRVAC-24025
STP-485DB9-CBL-2	Integrated motor/drive programming cable	STP-MTRD-xxxxxR(E)
STP-USB485-4W	USB to RS-485 adapter, 4-wire	STP-MTRD-xxxxxR(E)
STP-EXT-0xx	Motor to drive extension cable, xx = length in feet	STP-MTR-xxxxx(x)
STP-EXTL-0xx	Motor to drive extension cable, xx = length in feet	STP-MTRL-xxxxx(x)
STP-EXTH-0xx	Motor to drive extension cable, xx = length in feet	STP-MTRH-xxxxx(x)
STP-EXTW-0xx	IP65 rated motor to drive extension cable, xx = length in feet	STP-MTR-xxxxxW
STP-EXTHW-0xx	IP65 rated motor to drive extension cable, xx = length in feet	STP-MTRH-xxxxxW
STP-LA-EXT17-0xx	SureStep extension cable, 6-pin connector to pigtail (4 wires used), 6, 10, or 20ft cable length.	STP-LE17-xxxxxx
STP-LA-EXT23-0xx	SureStep extension cable, 6-pin connector to pigtail (4 wires used), 6, 10, or 20ft cable length.	STP-LE23-xxxxxx
STP-CBL-CAxx	Control cable for 17038 series integrated motor/drives, xx = length in feet	STP-MTRD-17038/17038E
STP-MTRA-17DMP	Metal body SureStep damper. For use with NEMA 17 stepper motors with 5mm shafts.	STP-MTR-17xxx(x)
STP-MTRA-23DMP	Metal body SureStep damper. For use with NEMA 23 stepper motors with 1/4 in. shafts.	STP-MTR-23xxx(x) STP-MTRAC-23xxxD
STP-MTRA-SCRWKT-1	SureStep encoder mounting screw kit.	All stepper encoders <sup>1</sup>
STP-MTRA-42ENC	NEMA 42 Encoder adapter plate for Same Sky AMT31/AMT33 encoders	STP-MTRAC(H)-42xxxD
CUI-KIT-1	Same Sky encoder accessory kit, replacement. Includes (1) AMT102 base, (1) AMT102 wide base, and (1) AMT10 sleeve kit (9 sleeves sized 2-8mm).	Same Sky AMT102 encoders
CUI-KIT-2	Same Sky encoder accessory kit, replacement. Includes (1) AMT standard base, (1) AMT standard wide base, and (1) AMT10 sleeve kit (9 sleeves sized 2-8mm).	Same Sky AMT103 encoders
<sup>1</sup> - For NEMA42 motors, screws are not included in this kit. Screws are included with the STP-MTRA-42ENC adapter plate.		
Continued on next page		

SureStep Cables & Accessories (continued)		
Part Number	Description	Use With
CUI-KIT-3	Same Sky encoder accessory kit, replacement. Includes (1) AMT standard base, (1) AMT standard wide base, and (1) AMT standard sleeve kit (9 sleeves sized from 2-8mm).	Same Sky AMT11 and AMT31 encoders
CUI-KIT-4	Same Sky encoder sleeve kit, replacement. Includes (8) sleeves sized from 9-14mm.	Same Sky AMT13 and AMT33 encoders
STP-LA-NTFA	SureStep lead screw flange nut, replacement, triangular, 0.25in/rev, 0.25in lead screw diameter.	SureStep STP-LE series screw code A
STP-LA-NTFB	SureStep lead screw flange nut, replacement, triangular, 0.5in/rev, 0.25in lead screw diameter.	SureStep STP-LE series screw code B
STP-LA-NTFC	SureStep lead screw flange nut, replacement, triangular, 3mm/rev, 6.5mm lead screw diameter.	SureStep STP-LE series screw code C
STP-LA-NTFD	SureStep lead screw flange nut, replacement, triangular, 1.25mm/rev, 8mm lead screw diameter.	SureStep STP-LE series screw code D
STP-LA-NTFE	SureStep lead screw flange nut, replacement, triangular, 8mm/rev, 8mm lead screw diameter.	SureStep STP-LE series screw code E
STP-LA-NTFF	SureStep lead screw flange nut, replacement, triangular, 10.5mm/rev, 10mm lead screw diameter.	SureStep STP-LE series screw code F
STP-LA-NTFG	SureStep lead screw flange nut, replacement, triangular, 2mm/rev, 12mm lead screw diameter.	SureStep STP-LE series screw code G
STP-LA-NTFH	SureStep lead screw flange nut, replacement, triangular, 6mm/rev, 12mm lead screw diameter.	SureStep STP-LE series screw code H
STP-LA-NTFK	SureStep lead screw flange nut, replacement, triangular, 1in/rev, 0.5in lead screw diameter.	SureStep STP-LE series screw code K
STP-LA-NRFA	SureStep lead screw flange nut, round, 0.25in/rev, 0.25in lead screw diameter.	SureStep STP-LE series screw code A
STP-LA-NRFB	SureStep lead screw flange nut, round, 0.5in/rev, 0.25in lead screw diameter.	SureStep STP-LE series screw code B
STP-LA-NRFC	SureStep lead screw flange nut, round, 3mm/rev, 6.5mm lead screw diameter.	SureStep STP-LE series screw code C
STP-LA-NRFD	SureStep lead screw flange nut, round, 1.25mm/rev, 8mm lead screw diameter.	SureStep STP-LE series screw code D
STP-LA-NRFE	SureStep lead screw flange nut, round, 8mm/rev, 8mm lead screw diameter.	SureStep STP-LE series screw code E
STP-LA-NRFF	SureStep lead screw flange nut, round, 10.5mm/rev, 10mm lead screw diameter.	SureStep STP-LE series screw code F
STP-LA-NRFG	SureStep lead screw flange nut, round, 2mm/rev, 12mm lead screw diameter.	SureStep STP-LE series screw code G
STP-LA-NRFH	SureStep lead screw flange nut, round, 6mm/rev, 12mm lead screw diameter.	SureStep STP-LE series screw code H
STP-LA-NRFK	SureStep lead screw flange nut, round, 1in/rev, 0.5in lead screw diameter.	SureStep STP-LE series screw code K

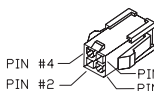
## STP-EXTx-0xx Extension Cable Wiring Diagram

## EXT &amp; EXTH CABLES

PIN#	COLOR
1	RED
2	WHITE
3	GREEN
4	BLACK

## EXTL CABLES

PIN#	COLOR
1	RED
2	WHITE
3	GREEN
4	BLACK

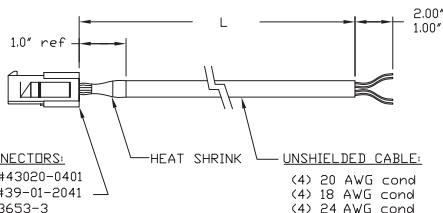


## CONNECTORS:

EXT: Molex #43020-0401

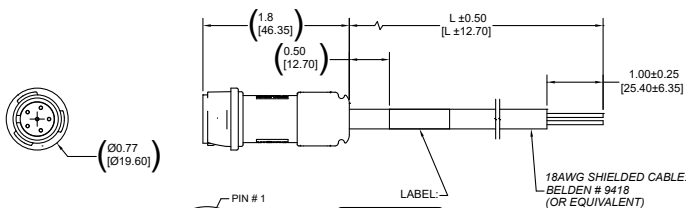
EXTH: Molex #39-01-2041

EXTL: TE #103653-3

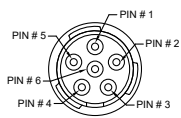


UNSHIELDED CABLE:  
 (4) 20 AWG cond  
 (4) 18 AWG cond  
 (4) 24 AWG cond

## STP-EXTW-0xx and STP-EXTHW-0xx Extension Cable Wiring Diagram



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

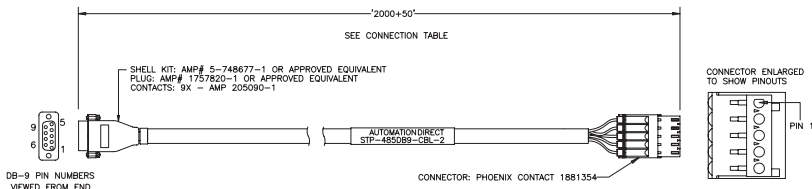


VIEW FROM PIN CONNECTION

Connector: Bulgin # PXP4011/06P/6065

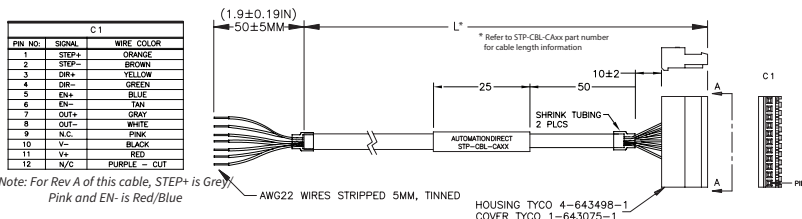
## STP-485DB9-CBL-2 Wiring Diagram

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

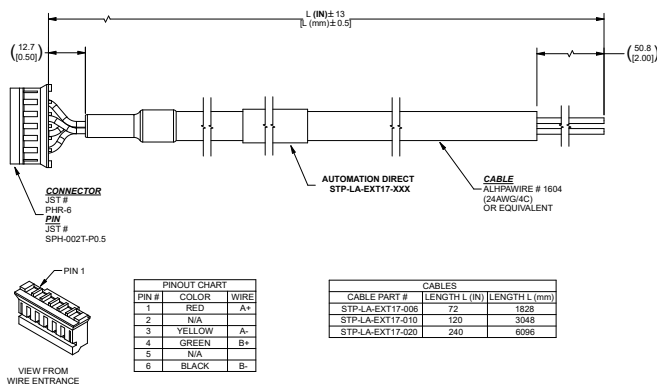


DB-9 PIN NUMBERS VIEWED FROM END

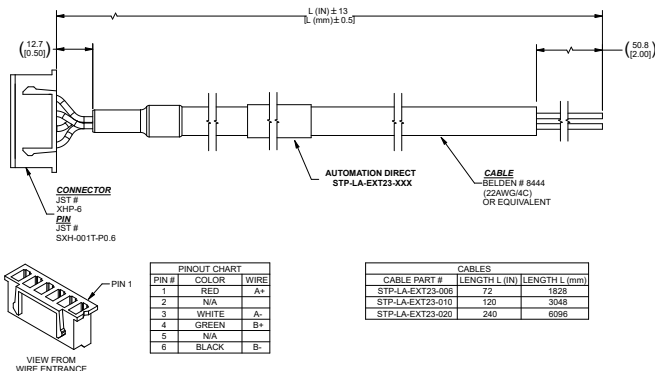
## STP-CBL-CApp Control Cable Wiring Diagram



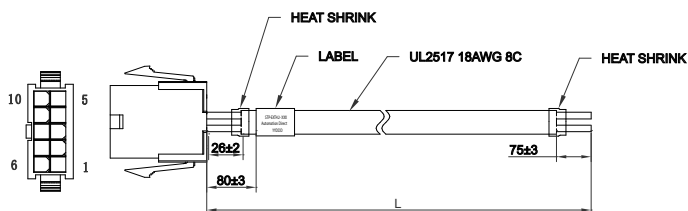
## STP-LE17-xxxxxx Cable Wiring Diagram



## STP-LE23-xxxxxx Cable Wiring Diagram



## STP-EXT42(H)-xxx Cable Wiring Diagram



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

## Encoder Options

The standard integrated motors and dual-shaft stepper motors have options for mounting an external encoder. The NEMA 14, 17, 23/24, and 34 dual-shaft motors come with pre-tapped holes on the rear end cap for mounting the STP-MTRA-ENCx encoders. The NEMA 42 dual-shaft motors require an STP-MTRA-42ENC adapter plate for encoder mounting. All high bus voltage dual-shaft motors also come with pre-tapped holes. The “E” stepper motors and integrated models come with an encoder installed. This encoder can be replaced with other options. All STP-MTRA-ENCx encoders are incremental A/B quadrature type. Please see the compatibility table below. For these encoders, the hardware in STP-MTRA-SCRWKT-1 is used to attach the encoder to the compatible motor.



*NOTE: Using the CLICK or BRX PLC requires the use of an FC-ISO-C signal conditioner.*

SureStep Brand Encoder Compatibility							
Encoder Part Number	PPR	Bore Diameter	Output Type	PLC Compatibility	Motor Compatibility	Matching Cable	
STP-MTRA-ENC1	1000	5mm	Line Driver	P2-HSI, P3-HSI, BRX <sup>2</sup> , CLICK C0-1xDxE-D <sup>2</sup>	STP-MTRx-14xxxD STP-MTRx-14xxxE STP-MTRx-17xxxD STP-MTRx-17xxxE	STP-CBL-EAxx	
STP-MTRA-ENC3	400				Standard STP-MTRD-xxxxxE	STP-CBL-EDxx	
STP-MTRA-ENC2	1000		Push-pull (totem)	BRX <sup>2</sup> , CLICK C0-1xDxE-D <sup>2</sup>			
STP-MTRA-ENC4	400						
STP-MTRA-ENC5	1000	0.25 inch	Line Driver	P2-HSI, P3-HSI, BRX <sup>2</sup> , CLICK C0-1xDxE-D <sup>2</sup>	STP-MTRx-23xxxD STP-MTRx-23xxxE STP-MTRAC-23xxxD	STP-CBL-EAxx	
STP-MTRA-ENC7	400				STP-CBL-EDxx		
STP-MTRA-ENC6	1000		Push-pull (totem)				
STP-MTRA-ENC8	400						
STP-MTRA-ENC9 (AMT-112Q-V)	48 to 4096 <sup>1</sup>	2mm - 8mm	Line Driver	P2-HSI, P3-HSI, BRX <sup>2</sup> , CLICK C0-1xDxE-D <sup>2</sup>	STP-MTRx-14xxxD STP-MTRx-14xxxE STP-MTRx-17xxxD STP-MTRx-17xxxE STP-MTRx-23xxxD STP-MTRx-23xxxE STP-MTRAC-23xxxD Std STP-MTRD-xxxxE STP-LE17-xxxADJ STP-LE23-xxxADJ	STP-CBL-EBxx AMT-PGRM-17C	
STP-MTRA-ENC10 (AMT-112S-V)			Push-pull (totem)	BRX <sup>2</sup> , CLICK C0-1xDxE-D <sup>2</sup>			
STP-MTRA-ENC11	1000	0.375 inch	Line Driver	P2-HSI, P3-HSI, BRX <sup>2</sup> , CLICK C0-1xDxE-D	STP-MTRAC-34xxxD	STP-CBL-EAxx	
STP-MTRA-ENC13	400					STP-CBL-EDxx	
STP-MTRA-ENC12	1000		Push-pull (totem)				
STP-MTRA-ENC14	400						

1 - Configurable (default=400). Requires configuration cable AMT-PGRM-17C.

2 - Requires FC-ISO-C (see wiring diagrams below for DIP switch settings).

For all encoders listed below, please use the hardware contained in STP-MTRA-SCRWKT-1 to attach the encoder to the compatible motor.

Same Sky Brand Encoder Compatibility						
Encoder Part Number	PPR	Bore Diameter	Output Type	PLC Compatibility	Motor Compatibility	Matching Cable
AMT102-V	48 to 2048 <sup>1</sup>	2mm - 8mm	push-pull (totem)	BRX <sup>2</sup> , CLICK C0-1xDxE-D <sup>2</sup>	STP-MTRx-14xxxD STP-MTRx-14xxxE STP-MTRx-17xxxD STP-MTRx-17xxxE STP-MTRx-23xxxD STP-MTRx-23xxxE Standard STP-MTRD-xxxxxE STP-MTRAC-23xxxD STP-LE17-xxxADJ STP-LE23-xxxADJ	CUI-313x-xxx
AMT103-V <sup>3</sup>						CUI-435-xxx or CUI-3934-6FT
AMT112S-V	48 to 4096 <sup>1</sup>		line driver (differential)	P2-HSI, P3-HSI, BRX <sup>2</sup> , CLICK C0-1xDxE-D <sup>2</sup>		AMT-17C-1-xxx
AMT112Q-V						
AMT312D-V	48 to 4096 <sup>1</sup>		line driver (differential)	P2-HSI, P3-HSI, BRX <sup>2</sup> , CLICK C0-1xDxE-D <sup>2</sup>	STP-LE17-xxxADJ STP-LE23-xxxADJ	AMT-17C-1-xxx
AMT312S-V			push-pull (totem)	BRX <sup>2</sup> , CLICK C0-1xDxE-D <sup>2</sup>		
AMT132S-V						
AMT132Q-V	48 to 4096 <sup>1</sup>	9mm - 5/8"	line driver (differential)	P2-HSI, P3-HSI, BRX <sup>2</sup> , CLICK C0-1xDxE-D <sup>2</sup>	STP-MTRx-34xxxD STP-MTRAC(H)-42xxxD <sup>4</sup> (Does not fit STP-MTRAC-34 motors)	AMT-18C-3-xx
AMT332S-V			push-pull (totem)	BRX <sup>2</sup> , CLICK C0-1xDxE-D <sup>2</sup>		
AMT332D-V			line driver (differential)	P2-HSI, P3-HSI, BRX <sup>2</sup> , CLICK C0-1xDxE-D <sup>2</sup>		

1 - Configurable (default=400). AMT103-V is dip switch configurable. All others require configuration cable, see below.

2 - Requires FC-ISO-C (see wiring diagrams below for DIP switch settings).

3 - For AMT103-V to maintain NEMA23 compatibility, CUI-KIT-2 must be purchased to use the standard wide base for mounting.

4 - STP-MTRA-42ENC adapter plate required for STP-MTRAC(H)-42xxxD compatibility.

1 - Configurable (default=400). AMT103-V is dip switch configurable. All others require configuration cable, see below.

2 - Requires FC-ISO-C (see wiring diagrams below for DIP switch settings).

3 - For AMT103-V to maintain NEMA23 compatibility, CUI-KIT-2 must be purchased to use the standard wide base for mounting.

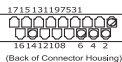
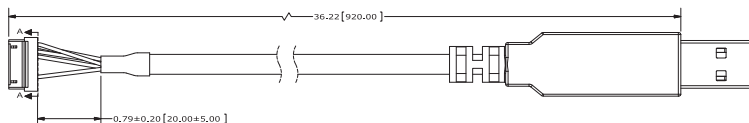
4 - STP-MTRA-42ENC adapter plate required for STP-MTRAC(H)-42xxxD compatibility.

AMT102 and AMT103 encoders can be configured with on-board DIP switches.

All other Same Sky encoders come preset at 400ppr as factory default. For other resolutions, a USB configuration cable is required (separate from the signal cables above).

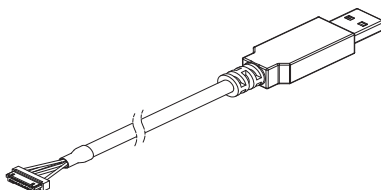
- AMT11 and AMT31 encoders are configured with AMT-PGRM-17C.
- AMT13 and AMT33 encoders are configured with AMT-PGRM-18C.

## STP-USBENC-CBL-1 Wiring Diagram

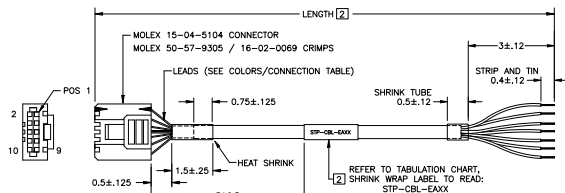


(Back of Connector Housing)

Connector Pinout		
#FunctionColor	Pin	
TX_ENC+Yellow	1	
RX_ENC+Orange	2	
GNDBlack	4	
+5VRed	6	
MCLRGreen	14	



## STP-CBL-EAxx Encoder Cable Wiring Diagram



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

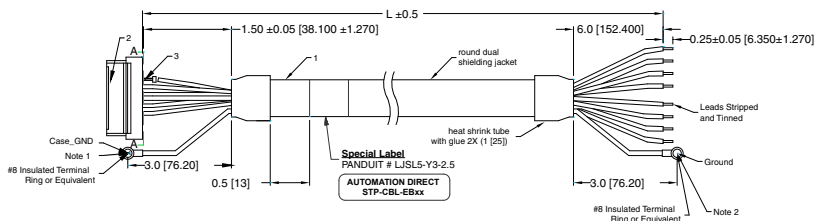
WIRE: 24AWG, CABLE: UL2464.

## STP-CBL-EBxx Encoder Cable Wiring Diagram

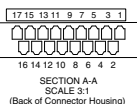
### NOTE:

- Case\_GND is connected internally to GND (BLACK/RED)
- Ground connected internally to cable shielding/customer ref. only
- Tolerance: ± 0.2" (5) unless otherwise specified
- All materials must be RoHS compliant

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



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



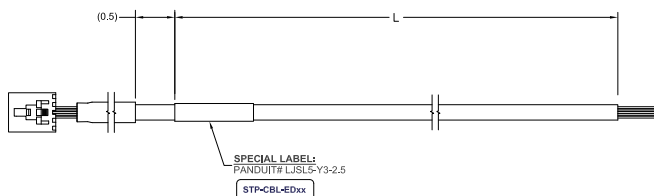
SECTION A-A  
SCALE 3:1  
(Back of Connector Housing)

## 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



Connector part number:

- US Digital Part Number: CON-FC5
- Molex Part Number: 14600052



*NOTE: Stepper motors can vibrate and resonate more than most motors. If this is an issue for your application use thread locking adhesive on the mounting screws.*

Required Encoder Mounting Screws <sup>1 2</sup>				
Step Motor	Qty	Screw Description	Part Number	Image
STP-LE17-xxxADJ	2	M2.5 X 0.45 mm thread, 4mm long SS Slotted Screws, Narrow Cheese Head	McMaster Carr PN#: 91613A060	
STP-MTRL-14xxxD or E STP-MTR-17040D or E STP-MTR-17048D or E STP-LE23-xxxADJ	2	M2.5 X 0.45 mm, 5mm long, 8-18 SS Button Head Hex Drive Screw	McMaster Carr PN#: 92095A457	
STP-MTR-17060D or E	3	M2 X 0.4 mm, 5mm long 18-8 SS Pan Head Phillips Screws	McMaster Carr PN#: 92000A012	
STP-MTR-23xxxD or E STP-MTRH-23xxxD or E STP-MTRAC-34xxxD	2	4-40, 0.25 in long, 18-8 SS Pan Head Phillips Screw with captive washer	Olander.com PN#: 4C25PPIS	
STP-MTR-34xxxD STP-MTRH-34xxxD	2	M3 X 0.5 mm, 15mm long 18-8 SS Button Head Hex Drive Screws	McMaster Carr PN#: 992095A119	
STP-MTRAC-23xxxD	2	2-56, 0.25 in long, Zinc plated Steel Pan Head Phillips Screw with captive washer	McMaster Carr PN#: 90403A079	
STP-MTRD-xxxxxE	2	M3 X 0.5 mm, 8mm long 18-8 SS Pan Head Phillips Screws	McMaster Carr PN#: 94102A103	

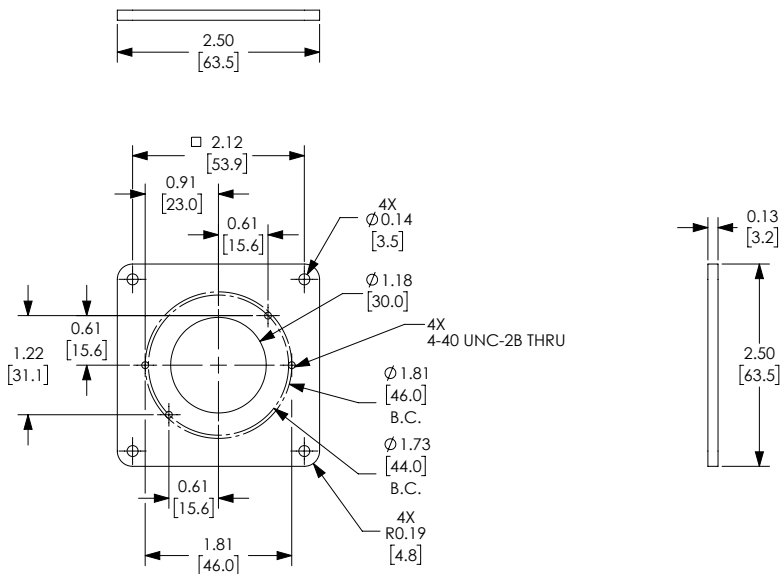
<sup>1</sup> - STP-MTRA-SCRWKT-1 contains all these screws.

<sup>2</sup> - Encoder mounting screws for STP-MTRAC(H)-42xxxD motors are included in STP-MTRA-42ENC, not STP-MTRA-SCRWKT-1.

## Encoder Mounting Accessories

## STP-MTRA-42ENC

The STP-MTRA-42ENC mounting kit is required to mount an AMT13 or AMT33 encoder on the STP-MTRAC(H)-42xxx series step motors.



## Encoder Specifications

Encoder General Specifications				
Encoder	STP-MTRA-ENC1, 3, 5, 7, 11, 13	STP-MTRA-ENC2, 4, 6, 8, 12, 14	STP-MTRA-ENC9	STP-MTRA-ENC10
Operating Temperature, CPR < 2000	-40 to 100°C (-40 to 212°F)		See AMT112Q-V datasheet	See AMT112S-V datasheet
Operating Temperature, CPR ≥ 2000	-25 to 100°C (-13 to 212°F)			
Vibration	20G (5Hz to 20kHz)			
Electrostatic Discharge	±2kV	±4kV		
Max. Shaft Axial Play	±0.010 inches [0.254 mm]			
Max Shaft Eccentricity plus Radial Play	0.004 inches			
Max Acceleration	250000 rad/sec <sup>2</sup>			
Typical Product Weight	0.91 oz. [25.8 g]	0.82 oz [23.2 g]		
Hub Set Screw	#4-48			
Hex Wrench Size	0.050 inches			
Phase Relationship	A leads B for clockwise shaft rotation, and B leads A for counterclockwise rotation as viewed from the cover side of the encoder.			

For Same Sky encoder specifications, please refer to the specific datasheet found on the encoder Item Page on [www.automationdirect.com](http://www.automationdirect.com).

SureStep Brand Bolt Circle Mounting Specifications (mm [inches])			
<div>Bolt Hole Circle</div>	Two Holes	Three Holes	Four Holes
Encoder			
STP-MTRA-ENC1	19.05 [0.75]	20.9 [0.823]	-
STP-MTRA-ENC3			
STP-MTRA-ENC2			
STP-MTRA-ENC4			
STP-MTRA-ENC5			
STP-MTRA-ENC7			
STP-MTRA-ENC6			
STP-MTRA-ENC8			
STP-MTRA-ENC9 (AMT-112Q-V)	16 [0.63] 19.05 [0.75]	20.9 [0.823] 21.55 [0.85]	25.4 [1])
STP-MTRA-ENC10 (AMT-112S-V)	32.44 [1.28] 46.02 [1.81]	22 [0.87]	
STP-MTRA-ENC11	19.05 [0.75] 46.02 [1.812]	20.9 [0.823]	
STP-MTRA-ENC13			
STP-MTRA-ENC12			
STP-MTRA-ENC14			

Same Sky Brand Bolt Circle Mounting Specifications (mm [inches])			
Encoder \ Bolt Hole Circle	Two Holes	Three Holes	Four Holes
AMT102-V	16.00 [0.630] 19.05 [0.750] 32.430 [1.277] 46.025 [1.812]	22.00 [0.866]	25.40 [1.000]
AMT103-V			
AMT112S-V		22.00 [0.866]	
AMT112Q-V		21.55 [0.848]	
AMT312D-V		20.90 [0.823]	
AMT312S-V	43.84 [1.726]	-	-
AMT132S-V			
AMT132Q-V			
AMT332S-V			
AMT332D-V			

## Differential Electrical Specifications

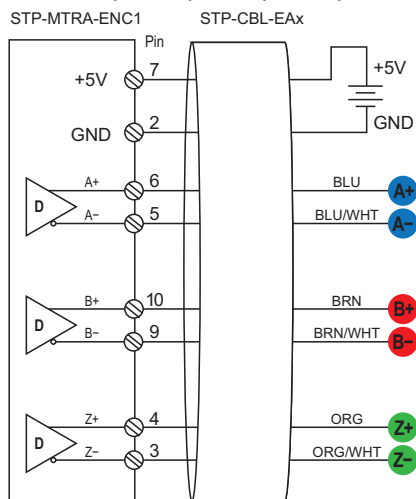
The following specifications apply over the entire operating temperature range.  
Typical values are specified at  $V_{CC} = 5.0\text{VDC}$  and  $25^{\circ}\text{C}$ .

Encoder Electrical Specifications							
Encoder		STP-MTRA-ENC1, 3, 5, 7, 11, 13	STP-MTRA-ENC2, 4, 6, 8, 12, 14	STP-MTRA-ENC9	STP-MTRA-ENC10		
Supply Voltage (V)	Min.	4.5		See AMT112Q-V datasheet	See AMT112S-V datasheet		
	Typical	5					
	Max	5.5					
Supply Current (mA) <sup>1</sup>	Typical	29 (CPR < 500) 56 (CPR ≥ 500)	27 (CPR < 500) 54 (CPR ≥ 500)				
	Max	36 (CPR < 500) 65 (CPR ≥ 500)	33 (CPR < 500) 62 (CPR ≥ 500)				
Low-level Output <sup>2</sup> (V)	Typical	0.2	n/a				
	Max	0.4	0.5				
High-level Output <sup>3</sup> (V)	Min	2.4	2.0				
	Typical	3.4	n/a				
Rise/Fall Time (nS)		15	110/100				
1: No load							
2: IOL (Amps at Output Low) = 20mA max. (for all -ENC1 through -ENC14, except -ENC9 and 10)							
3: IOH (Amps at Output High) = 20mA max. (for all -ENC1 through -ENC14, except -ENC9 and 10)							

## Wiring Examples

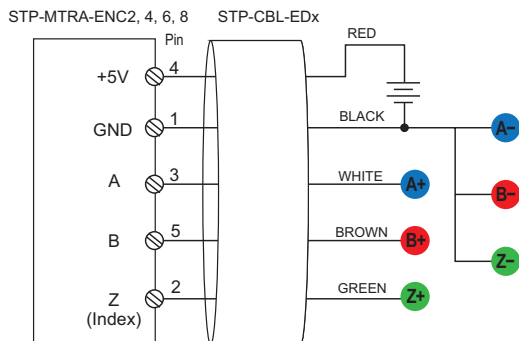
Please see the pages below for wiring examples:

### For STP-MTRA-ENC1, -ENC3, -ENC5, -ENC7, -ENC11, -ENC13



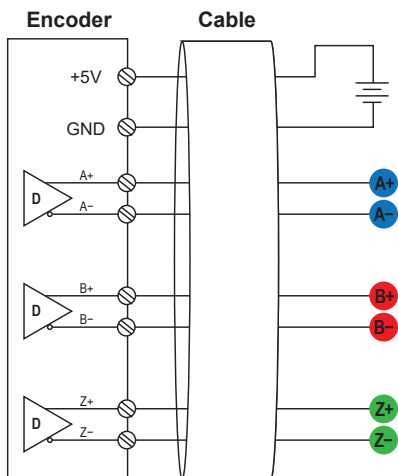
Optical Encoder Line Driver Wiring Diagram

### For STP-MTRA-ENC2, -ENC4, -ENC6, -ENC8, -ENC12, -ENC14



Optical Encoder Single Ended (Push-pull/Totem) Wiring Diagram

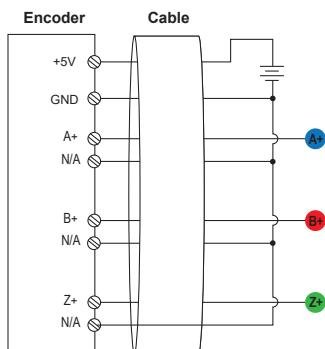
# For STP-MTRA-ENC9 and Same Sky Encoders



Configurable Encoder Line Driver Wiring Diagram

Line Driver Encoder Wiring Colors				
Encoder	AMT112Q-V AMT312D-V STP-MTRA-ENC9		AMT132Q-V AMT332D-V	
	Pin #	STP-CBL-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
A-	11	BLK/WHT	9	WHT/BRN
B+	8	GRN/BLK	10	GRN/WHT
B-	9	BLK/GRN	11	WHT/GRN
Z+	12	BLU/BLK	12	BLU/WHT
Z-	13	BLK/BLU	13	WHT/BLU

## For STP-MTRA-ENC10 and Same Sky Encoders



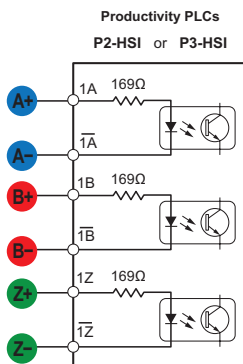
Configurable Encoder Single Ended (Push-pull/Totem) Wiring Diagram

## Single Ended (Push-pull/Totem) Encoder Wiring Colors

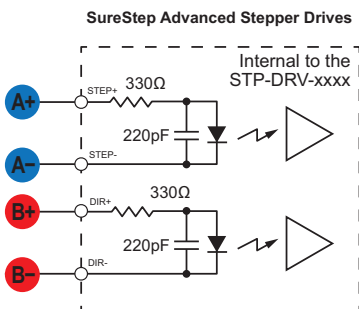
Single Ended (Push-pull/Totem) Encoder Wiring Colors										
Encoder	AMT112S-V AMT312S-V STP-MTRA-ENC10			AMT132S-V AMT332S-V		AMT102-V		AMT103-V		
Pin Function	Pin #	STP-CBL-EBx AMT-17C-1-xxx Wire Color	Pin #	AMT-18C-3-xxx Wire Color	Pin #	CUI-3131-xxx Wire Color	CUI-3132-1FT Wire Color	Pin #	CUI-435-xxx 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
N/A	11	BLK/WHT	9	WHT/BRN	-	-	-	-	-	-
B+	8	GRN/BLK	10	GRN/WHT	B	BRN	YEL	B	YEL	BRN
N/A	9	BLK/GRN	11	WHT/GRN	-	-	-	-	-	-
Z+	12	BLU/BLK	12	BLU/WHT	X	GRN	PUR	X	PUR	GRN
N/A	13	BLK/BLU	13	WHT/BLU	-	-	-	-	-	-

## Single Ended (Push-pull/Totem) Commutation Wiring Colors

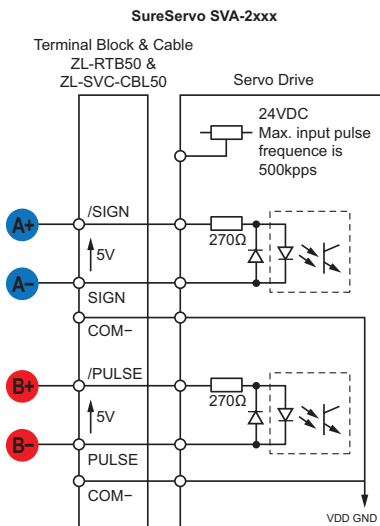
Encoder	AMT312S-V		AMT332S-V	
Pin Function	Pin #	AMT-17C-1-xxx Wire Color	Pin #	AMT-18C-3-xxx Wire Color
+5V	6	RED/BLK	6	RED/GRN
GND	4	BLK/RED	4	GRN/RED
U+	3	BRN/BLK	3	BRN/RED
W+	5	ORG/BLK	5	ORG/RED
V+	7	RED/WHT	7	BLU/RED



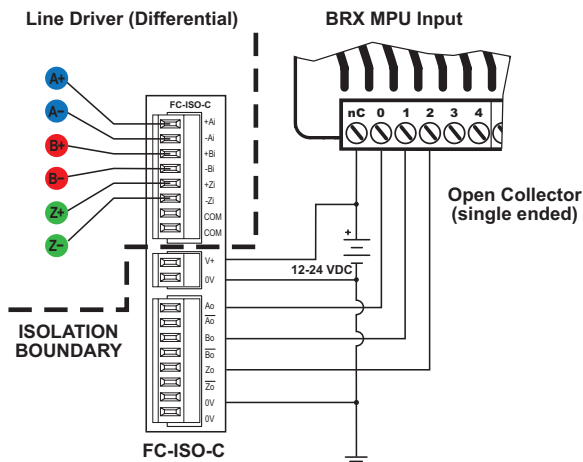
**Productivity PLC Wiring Diagram**



**SureStep Advanced Stepper Drive Wiring Diagram**



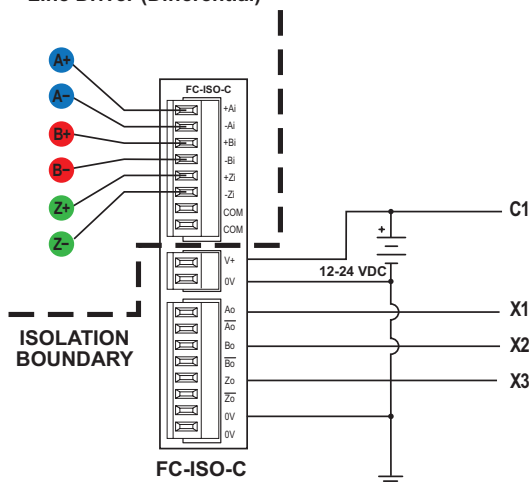
**SureServo Wiring Diagram**



BRX PLC Wiring Diagram

## CLICK High Speed Inputs

**Line Driver (Differential)**



CLICK PLC Wiring Diagram

## Line Filters

Line Filters	
Drive	Line Filter
STP-DRV-4035	RES10F06
STP-DRV-4830	RES10F03
STP-DRV-4845	RES10F06
STP-DRV-6575	RES10F10
STP-DRV-4850	RES10F06
STP-DRV-80100	RES10F10
STP-MTRD-17x	RES10F03
STP-MTRD-23x	RES10F06
STP-MTRD-24x	RES10F06
STP-DRVAC-24025	RES10F03