SureStep™ STEPPING SYSTEMS NEW!

Introducing *Sure*Step™ Stepping Systems

High Performance Microstepping Drive with High Torque Stepping Motors

Open-loop stepping systems provide simple and accurate control of position and speed where lower power and cost are considerations. Pulses (or "step" and "direction" signals) from the *Direct*LOGIC family of PLCs or other indexers and motion controllers are "translated" by the microstepping drive into precise movement of the stepping motor shaft. The *Sure*Step™ 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 *Sure*Step microstepping drive uses advanced microstepping technology with selectable step sizes of 400 steps per revolution (÷ 2), 1,000 steps per revolution (÷ 5), 2,000 steps per revolution (÷ 10), and 10,000 steps per revolution (÷ 50). The equation below relates the PLC pulse output frequency to *Sure*Step motor speed and stepping angle:

Motion Control Made Easy!
One pulse from the PLC will cause the motor shaft to move precisely one step

Stepping Motor RPM = (A÷B) x (60 seconds/minute)

where A = PLC output frequency (steps of pulses per second
B = microstepping motor drive resolution selection (steps/revolution – *Sure*Step™ provides 400, 1,000, 2,000, and 10,000 steps/revolution as possible settings)

Maximum Potential Speed Chart

Direct LOGIC PLC Pulse Frequency	SureStep™ Drive Selection (Steps/Rev)			
	400 Steps/Rev	1000 Steps/Rev	2000 Steps/Rev	10,000 Steps/Rev
5,000Hz	750RPM	300RPM	150RPM	30RPM
7,000Hz	1050RPM	420RPM	210RPM	42RPM
10,000Hz	1500RPM	600RPM	300RPM	60RPM
25,000Hz	3750RPM	1500RPM	750RPM	150RPM

Formula	RPM		Steps/Sec A		Steps/Rev B		Sec/Min
Example 1:	1,500	=	10,000	÷	400	X	60
DL06 with 10kHz Built-in Pulse Output							
Example 2:	1,500	=	25,000	÷	1,000	X	60
Hx-CTRIO with 25kHz Pulse Output							
Example 3:	3,000	=	20,000	÷	400	X	60
Hx-CTRIO using 20kHz Pulse Output							

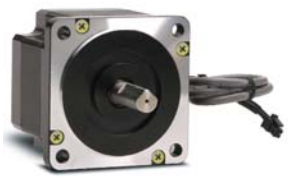
Microstepping Drive
STP-DRV-4035

NEMA 17 Stepper Motor
STP-MTR-17048

NEMA 23 Stepper Motor
STP-MTR-23055

NEMA 23 Stepper Motor
STP-MTR-23079

NEMA 34 Stepper Motor
STP-MTR-34066



Stepper Motor Extension Cable
STP-EXT-020

Stepper Motor Power Supply
STP-PWR-3204

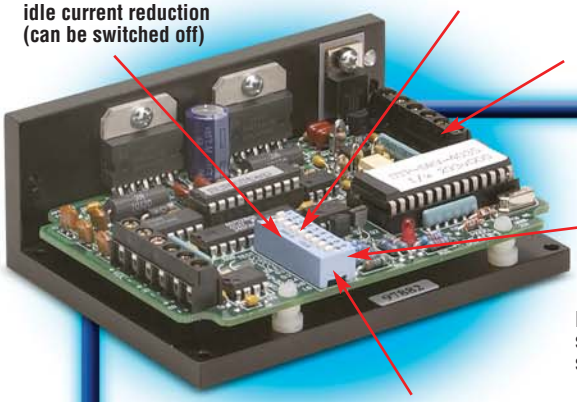
SureStep™ Stepping Systems

2-Phase Microstepping Drive
STP-DRV-4035

Automatic 50% idle current reduction (can be switched off)

Phase current from 0.4 to 3.5 Amps (switch selectable, 32 settings)

Optically isolated step, direction and enable inputs



Self test - slow 1/2 revolution rotation back and forth (switch selectable)

Drives NEMA sizes 17 thru 34 step motors

Half, 1/5, 1/10, 1/50 step (switch selectable)

PWM, MOSFET 3-state switching amplifiers

STEPPER MOTOR POWER CABLE

20 foot extension cable with locking connector (STP-EXT-020)

12" long integrated connectorized pigtail

NEMA 17, 23 and 34 mounting flanges

Holding torque ranges from 83 to 434 oz-in

Four standard step motors to cover a wide range of applications

NEMA Stepper Motor
STP-MTR-23055

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

Stepper Motor Power Supply
STP-PWR-3204

32 VDC at 4 Amp unregulated step motor power

Screw terminal AC Input and DC output connections

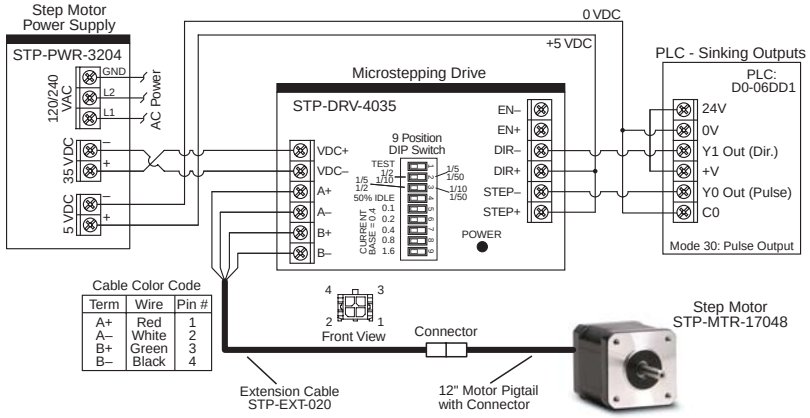
120 or 240 VAC, 50/60 Hz power input (switch selectable)

Power ON LEDs

5 VDC ±5% at 500 mA regulated logic power

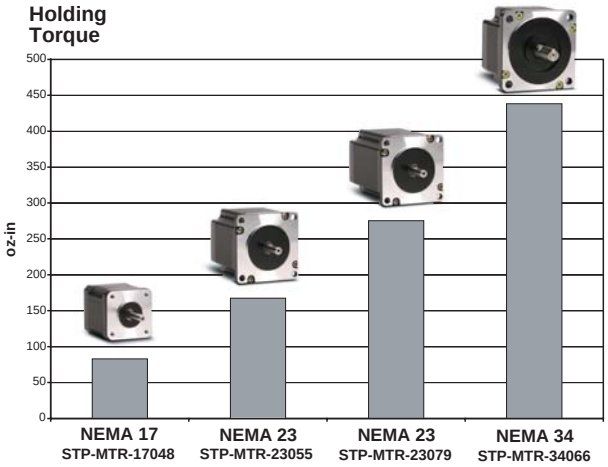
SureStep™ STEPPING SYSTEMS

*Sure*Step™ stepping systems…four standard systems simplify your choice



Power Supply Sizing:
$I_{PS} \leq 2/3 \times (I_{drive1} + I_{drive2} + I_{drive3})$
I = current in Amps

Low-cost stepping systems from AUTOMATIONDIRECT...plug and play...it's that easy



Four standard motors with connectorized pigtail

The *Sure*Step™ stepping family has four standard motors to handle a wide range of automation applications such as woodworking, assembly, and test machines. Our square frame or "high torque" style stepping motors are the latest technology, resulting in the best torque to volume. We have NEMA 17, 23, and 34 mounting flanges and holding torque ranges from 83 oz-in to 434 oz-in. A 20 foot extension cable with locking connector is a standard option to interface any of the four stepping motors to the microstepping drive. The extension cable can be easily cut to length if desired.

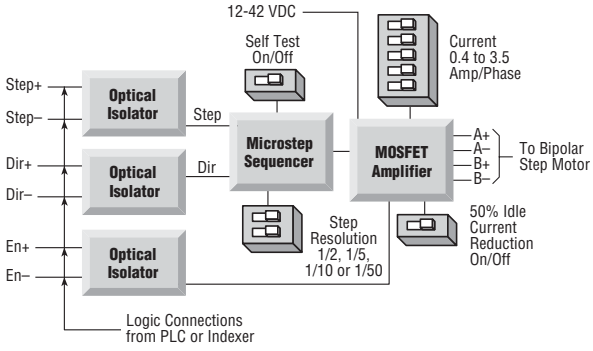
Drive

STD-DRV-4035

One-size-fits-all microstepping drive

- Ultimate in simplicity
- One standard microstepping drive to operate any of four standard motors
- Onboard screw terminals for easy hook-up
- Optically-isolated inputs ready for +5 VDC logic from *Direct*LOGIC PLCs
- No software or add-on resistors required for drive configuration - 9-position dipswitch set-up
- Dipswitch used for built-in self-test, step angle selection, current level selection, and optional idle current reduction.
- Standard power supply available to operate at least two stepping systems of any size with an auxiliary +5 VDC supply to facilitate *Direct*LOGIC PLCs and stepping motor drive interfaces.

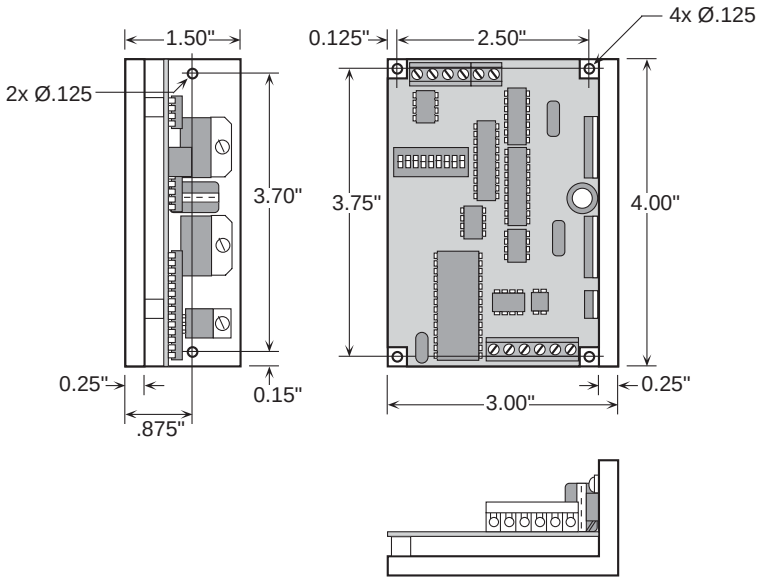
Drive Block Diagram



SureStep™ STEPPING SYSTEMS

*Sure*Step™ Series Specifications – Microstepping Drive		
Microstepping Drive		**STP-DRV-4035** 
Input Power (with power on red LED)		12-42 VDC (including ripple voltage)
Output Power		Output current selectable from 0.4 to 3.5 Amps/phase motor current (maximum output power is 140 W)
Current Controller		Dual H-bridge Bipolar Chopper (3-state 20 kHz PWM with MOSFET switches)
Input Signals	***Input Signal Circuit***	Opto-coupler input with 440 Ohm resistance (5 to 15 mA input current), Logic Low is input pulled to 0.8 VDC or less, Logic High is input 4 VDC or higher
	Pulse Signal	Motor steps on falling edge of pulse and minimum pulse width is 0.5 microseconds
	Direction Signal	Needs to change at least 2 microseconds before a step pulse is sent
	Enable Signal	Logic 0 will disable current to the motor (current is enabled with no hook-up or logic 1)
DIP Switch Selectable Functions	***Self Test***	Off or On (uses half-step to rotate 1/2 revolution in each direction at 100 steps/second)
	Microstepping	400 (200x2), 1,000 (200x5), 2,000 (200x10), or 10,000 (200x50) steps/rev
	Idle Current Reduction	0% or 50% reduction (idle current setting is active if motor is at rest for 1 second or more)
	Phase Current Setting	0.4 to 3.5 Amps/phase with 32 selectable levels
Drive Cooling Method		Natural convection (mount drive to metal surface if possible)
Dimensions		3 x 4 x 1.5 inches
Mounting		Use #4 screws to mount on wide side (4 screws) or narrow side (2 screws)
Connectors		Screw terminal blocks with AWG 18 maximum wire size
Weight		9.3 oz. (264 g)
Chassis Operating Temperature		0 °C to 55 °C recommended, 70 °C maximum (use fan cooling if necessary)
Agency Approvals		CE (complies with EN55011A and EN50082-1 (1992))

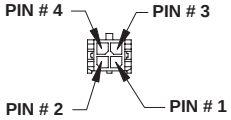
Dimensions



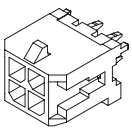
SureStep™ STEPPING SYSTEMS

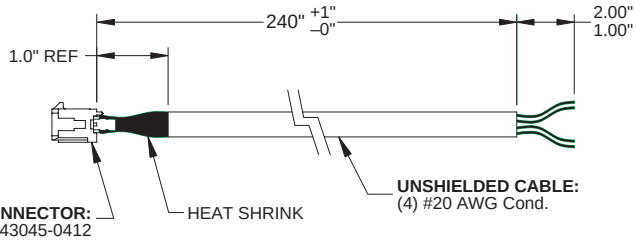
*Sure*Step™ Series Specifications – High Torque Bipolar Stepping Motors				
Bipolar Stepping Motors	 **STP-MTR-17048**	 **STP-MTR-23055**	 **STP-MTR-23079**	 **STP-MTR-34066**
Stepping Motor Face Plate	NEMA 17	NEMA 23	NEMA 23	NEMA 34
Maximum Holding Torque	5.2 lb-in	11.4 lb-in	18.4 lb-in	27.1 lb-in
	83 oz-in	166 oz-in	276 oz-in	434 oz-in
	0.59 Nm	1.29 Nm	2.08 Nm	3.06 Nm
Rotor Inertia	0.00006 lb-in-s^2	0.00024 lb-in-s^2	0.00042 lb-in-s^2	0.0012 lb-in-s^2
	0.45 oz-in^2	1.483 oz-in^2	2.596 oz-in^2	7.66 oz-in^2
	0.0000068 kg-m^2	0.000027 kg-m^2	0.000047 kg-m^2	0.00014 kg-m^2
Rated Current	2.0 A/phase	2.8 A/phase	2.8 A/phase	2.8 A/phase
Basic Step Angle	1.8° (2-phase motors with connectorized pigtail)			
Weight	0.7 lbs	1.50 lbs	2.2 lbs	3.85 lbs
Shaft Runout	0.002 in			
Shaft Radial Play @ 1 lb load	0.001 in max			
Perpendicularity	0.003 in			
Concentricity	0.002 in			
Operating Temperature Range	-20 °C to 50 °C (motor case temperature should be kept below 100 °C (212 °F))			
Maximum Radial Load	6.0 in/lb	15.0 in/lb	15.0 in/lb	39.0 in/lb
Maximum Thrust Load	6.0 in/lb	13.0 in/lb	13.0 in/lb	25.0 in/lb
Agency Approvals	130 °C Class B			
Agency Approvals	CE (complies with EN55014-1 (1993) and EN60034-1.5.11)			
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 thrust loading on bearings from minor mis-alignment.			
Extension Cable - 20 Foot (motor to drive)	**Part Number STP-EXT-020** 			

Extension Cable Wiring Diagram



PIN #	COLOR
1	RED
2	WHITE
3	GREEN
4	BLACK

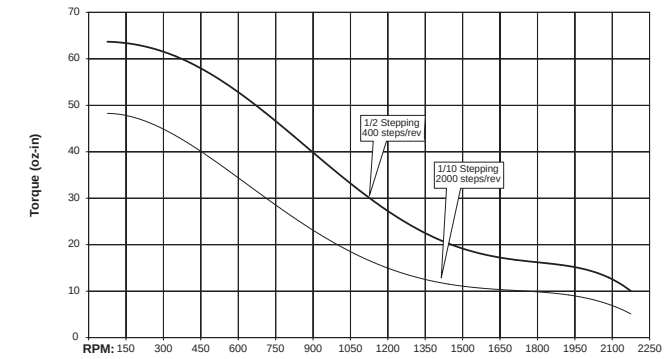




SureStep™ Stepping Systems

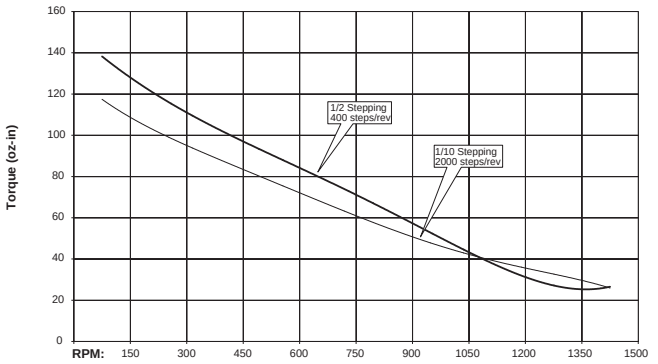
Torque vs. Speed Chart

STP-MTR-17048



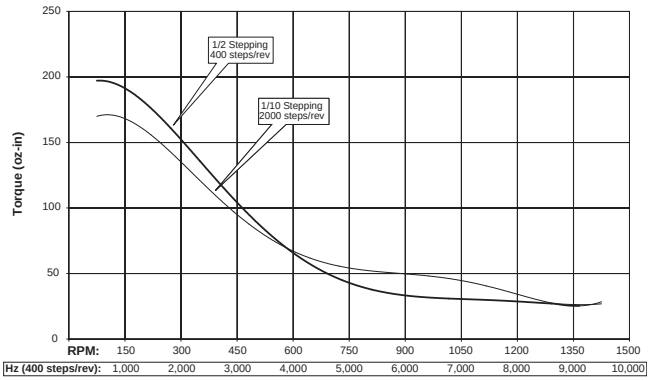
RPM:	150	300	450	600	750	900	1050	1200	1350	1500	1650	1800	1950	2100	2250
Hz (400 steps/rev):	1k	2k	3k	4k	5k	6k	7k	8k	9k	10k	11k	12k	13k	14k	15k
Hz (2000 steps/rev):	5k	10k	15k	20k	25k	30k	35k	40k	45k	50k	55k	60k	65k	70k	75k

STP-MTR-23055



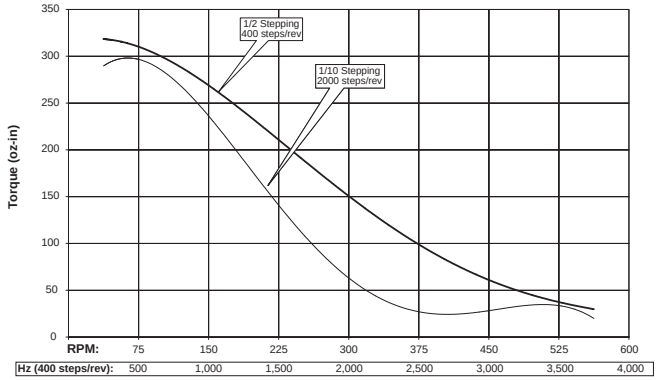
RPM:	150	300	450	600	750	900	1050	1200	1350	1500
Hz (400 steps/rev):	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
Hz (2000 steps/rev):	5,000	10,000	15,000	20,000	25,000	30,000	35,000	40,000	45,000	50,000

STP-MTR-23079



RPM:	150	300	450	600	750	900	1050	1200	1350	1500
Hz (400 steps/rev):	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
Hz (2000 steps/rev):	5,000	10,000	15,000	20,000	25,000	30,000	35,000	40,000	45,000	50,000

STP-MTR-34066



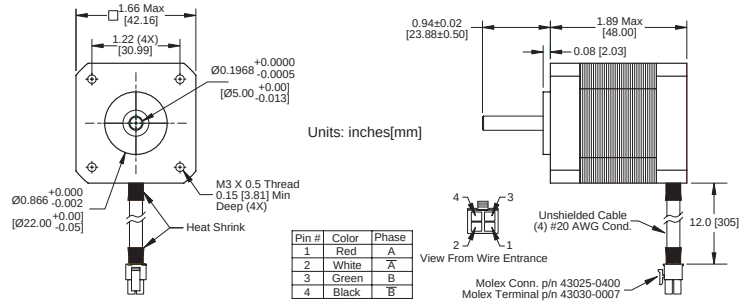
RPM:	75	150	225	300	375	450	525	600
Hz (400 steps/rev):	500	1,000	1,500	2,000	2,500	3,000	3,500	4,000
Hz (2000 steps/rev):	2,500	5,000	7,500	10,000	12,500	15,000	17,500	20,000

NOTE: THE TORQUE VS. SPEED CURVE VALUES SHOWN ABOVE WERE OBTAINED AT NOMINAL AC INPUT VOLTAGE USING SURESTEP™ STEP MOTORS DESCRIBED IN THIS DATA SHEET, THE STP-PWR-3204 STEP MOTOR POWER SUPPLY AND FULL LENGTH STP-EXT-020 EXTENSION CABLE.

SureStep™ STEPPING SYSTEMS

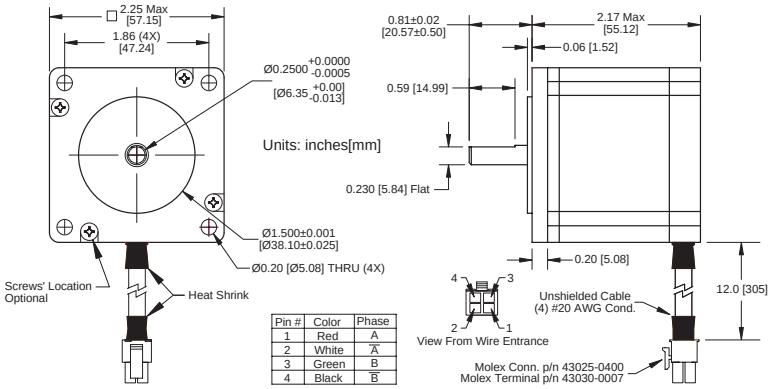
Dimensions

STP-MTR-17048



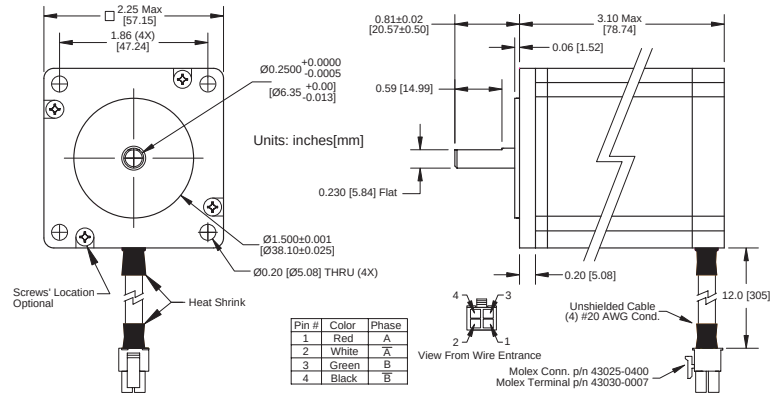
Pin #	Color	Phase
1	Red	A
2	White	$\overline{A}$
3	Green	B
4	Black	$\overline{B}$

STP-MTR-23055



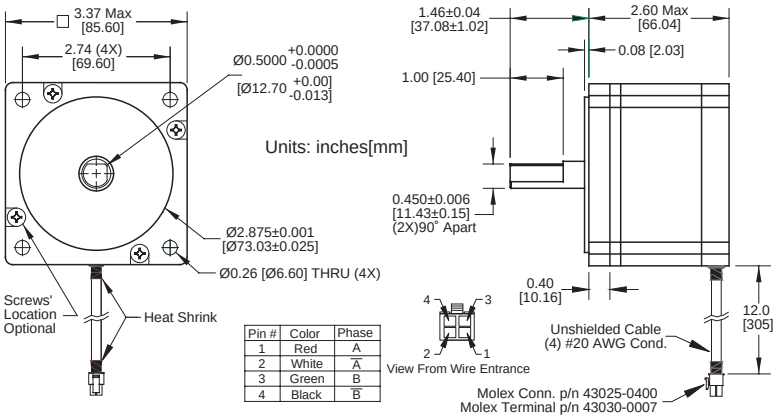
Pin #	Color	Phase
1	Red	A
2	White	$\overline{A}$
3	Green	B
4	Black	$\overline{B}$

STP-MTR-23079



Pin #	Color	Phase
1	Red	A
2	White	$\overline{A}$
3	Green	B
4	Black	$\overline{B}$

STP-MTR-34066

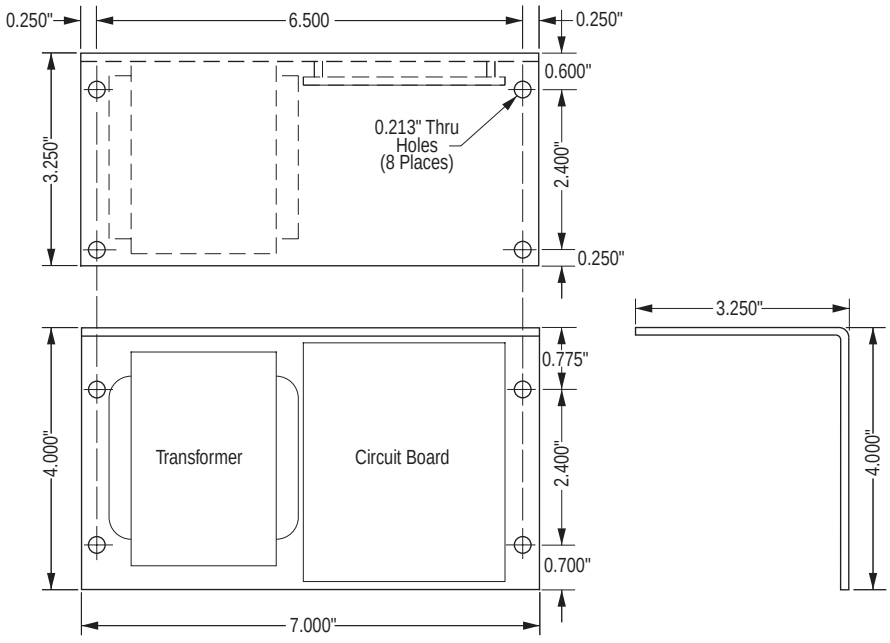


Pin #	Color	Phase
1	Red	A
2	White	$\overline{A}$
3	Green	B
4	Black	$\overline{B}$

SureStep™ Stepping Systems

*Sure*Step™ Series Specifications – Stepping System Power Supply	
Power Supply for Stepping System	**STP-PWR-3204** 
Input Power (fuse protected)	1-phase, 120/240 VAC, 50/60 Hz, 150 va (Fuse: 3 A, form factor 3AG, fast acting)
Input Voltage Range (switch selectable)	120/240 VAC ±10%
Inrush Current	120 VAC < 12 A / 240 VAC < 14 A
Motor Supply Output (linear unregulated, fuse protected and power on LED indicator)	32 VDC @ 4 Amp (fully loaded) 35 VDC @ 1 Amp load 41 VDC @ no load (Fuse: 6 A, form factor 3AG, fast acting)
Logic Supply Output (± 5% regulated, electronically overload protected and power on LED indicator)	5 VDC @ 500 mA (Electronically Overload Protected)
Operating Temperature Range	0 °C to 50 °C full rated; derate current 1.1% per degree above 50 °C; 70 °C maximum
Storage Temperature Range	-55 °C to 85 °C
Humidity	95% (non-condensing) relative humidity maximum
Cooling Method	Natural convection (mount power supply to metal surface if possible)
Dimensions	4 x 7 x 3¼ inches
Mounting	Use four (4) #8 or #10 screws to mount on either wide or narrow side.
Weight	6.5 lbs
Connections	Screw Terminal
Agency Approvals	UL, CSA and CE

Dimensions

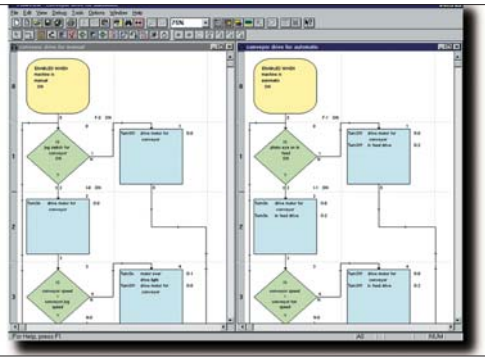


Sure step™ STEPPING SYSTEMS

Motion Control with *Direct*LOGIC PLCs and *Sure*Step™ Stepping Systems			
PLC Series = popular choices	1 axis control	1-2 axis control	1-5 axis control
	DL105 	**DL05** 	**DL06** 
Local I/O	18	14	36
Maximum Possible I/O	18	30	100
Built-In Pulse Outputs	1 axis pulse output included with the PLC base unit. (DC output models only)		
Maximum Velocity	7,000 pulses/sec		10,000 pulses/sec
Target Pulse Range	-8,388,608 to +8,388,607 pulses		
Minimum Velocity	40 pulses/sec		
Velocity Resolution	10 pulses/sec		
Accel/Decel Range	0.1 to 10 sec		
Position Control	Trapezoidal Profiles		
Velocity Control	Velocity Levels		
I/O Modules Pulse Outputs	**Not Applicable**	**H0-CTRIO (1 axis per module)** 	
Maximum Velocity		25,000 pulses/sec	
Target Pulse Range		+ / – 2.1 billion pulses (31 bits plus sign)	
Minimum Velocity		40 pulses/sec	
Velocity Resolution		10 pulses/sec	
Accel/Decel Range		0.1 to 10 sec	
Position Control		Trapezoidal Profiles (linear & S-curve ramps)	
Velocity Control		Dynamic Velocity (controlled accel/decel)	
Maximum Number of Modules		1	4

Sure step™ STEPPING SYSTEMS

Motion Control with *Direct*LOGIC PLCs and *Sure*Step™ Stepping Systems		
PLC Series  *= popular choices*		
	1-16 axis control depending on base size and power supply budget	
	DL205 	**DL405** 
Local I/O	256	640
Maximum Possible I/O	16,384	16,384



WinPLC

PC-Based Control with Think & Do:

On your PC with Windows,

or our embedded WinPLC

Integrate the motion control using the H2-CTRIO or T1H-CTRIO

I/O Modules Pulse Outputs	**D2-CTRINT (1 axis per module)** 	**H2-CTRIO** 	**T1H-CTRIO (2 axis per module)** 	**H4-CTRIO** 
Maximum Velocity	5,000 pulses/sec	25,000 pulses/sec		
Target Pulse Range	-8,388,608 to +8388,607 pulses	+ / - 2.1 billion pulses		
Minimum Velocity	40 pulses/sec			
Velocity Resolution	10 pulses/sec			
Accel/Decel Range	0.1 to 10 sec			
Position Control	Trapezoidal Profiles (linear and S-curve ramps)			
Velocity Control	Dynamic Velocity (controlled accel/decel)			
Maximum Number of Modules	1	1-8		