ADVANCING THE DRIVE TOWARDS MOTOR EFFICIENCY

User Manual

P542A

High Performance Microstepping Driver

Thank you for purchasing the Astrosyn P542A drive. Please read this manual thoroughly before installing and operating the driver and always keep the manual where it is readily accessible.

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1. GENERAL

The P542A is a fully digital high performance microstepping driver based on the latest DSP technology.

It is suitable for driving 2-phase and 4-phase hybrid stepping motors.

Features of this Driver:

- High Performance at low cost
- Supply voltage 20V dc to 50V dc
- Current selectable from 1.7A to 5.6A / phase (peak)
- Inaudible chopping frequency
- TTL compatible and optically isolated input signals
- Automatic idle-current reduction
- Mixed-decay current control for reduced motor heating
- 16 Channel microstepping in decimal and binary
- Suitable for 4, 6 or 8 lead motors
- Step, Direction and Enable inputs
- RS485 Compatible
- Short-circuit, open-circuit, under / over voltage and over temperature protection.

Applications of this Driver:

Suitable for a wide range of stepping motors of Size NEMA 17, 23, and 34, usable for various kinds of machines, such as X – Y Tables, labelling machines, laser cutters, engraving machines, and pick-place devices; particularly useful in applications with low noise, low vibration, high speed and high precision requirements

2. SPECIFICATIONS AND OPERATING ENVIRONMENT

Electrical Specifications (T = 25°C)

Parameters	Min	Typical	Max	Remark
Peak Output Current	1.7A	By User	5.6A	By DIP Switch
Supply Voltage (DC)	+20V	+36V	+50V	
Logic Signal Current	6mA	10mA	20mA	
Pulse Input Frequency	0	By User	200 kHz	
Minimum Pulse Rate	2.5µs			

Operating Environment and Parameters

Coolant	Natural Cooling or forced ventilation / heatsink	
Environment	Space	Avoid dust, oil, frost and corrosive gases
	Temperature	0°C to 50ºC
	Humidity	40% to 90%RH
	Vibration	5.9m/s^{2}Max
Storage Temp.	-20 ºC to +65ºC	
Weight	Approx. 200g	

3. DRIVER CONNECTORS, P1, P2 and P3

The following is a brief description of the two connectors of the Driver.

Control Signal Connector P1 Pins

Pin No.	Signal	Functions
1	Pulse +	Connect to +5v dc
2	Pulse -	Triggers motor to move
3	Direction +	Connect to +5v dc
4	Direction -	Triggers change in direction of rotation
5	Enable +	Connect to +5v dc
6	Enable -	Triggers change in direction of rotation
7	COM 24V	Only connect for I/O operation

Please note motion direction is also related to motor-drive wiring. Changing the connection of two-wires for a coil to the drive will also reverse motion direction.

Power Connector P2 Pins

Pin No.	Signal	Functions
8	VCC	Power supply +20V to +50V DC
9	Ground	Negative Power Supply 0v
10, 11	Phase A	Motor coil A (leads A+ and A-)
12. 13	Phase B	Motor coil B (leads B+ and B-)

Please note that there is another connector P3 for RS485 communication

4. POWER SUPPLY SECTION

It is important to choose the appropriate power supply to make the driver operate properly.

Maximum Voltage Input:

The internal power supply can operate from 20V to 50V dc, including power input fluctuation and back EMF voltage generated by motor coils during motor shaft deceleration.

Higher voltage will damage the driver. Therefore, it is suggested to use power supplies with theoretical output voltage of no more than +50V, leaving room for power line fluctuation and back EMF

Regulated or unregulated power supply:

Both regulated and unregulated power supplies can be used to supply DC power to the drive. However, unregulated power supplies are preferred due to their ability to withstand current surge. If regulated power supply (such as most switching supplies) is used, it is important to have a large current output rating to avoid problems like current clamp. For example, using a 4A supply for a 3A motor drive operation. You can use a power supply of lower current rating than that of the motor (Typically 50%~70% of motor current). The reason is that the drive draws current from the power supply capacitor only during the ON duration of the PWM cycle, but not during OFF duration. Therefore, the average current withdrawn from the power supply is considerably less than the motor current. For example, two 3 A motors can be supplied by one power supply of 4A rating.

Multiple Drivers:

It is recommended that multiple drives share one power supply to reduce cost, provided that the supply has enough capacity. **DO NOT** daisy-chain the power supply input pin of the drivers (connect them to power supply separately) to avoid cross interference.
Higher supply voltage will allow higher motor speed to be achieved. If the speed requirement is low, it's better to use lower supply voltage to improve noise, heating and reliability.

NEVER connect power and ground incorrectly, it will damage the driver.

Once the operating temperature reaches 80ºC the ALM LED lights and drive stop stops working. It will restart once the drive temperature falls to 50 ºC

5. DRIVER VOLTAGE AND CURRENT SELECTION

Selecting Supply Voltage:

Higher supply voltage can increase motor torque at higher speeds. However, higher voltage may cause more motor vibration at lower speeds. It may also cause over-voltage protection and even damage the drive. Therefore, it is suggested to choose only sufficiently high supply voltage for intended applications.

Setting Output Current

For a given motor, higher drive current will improve motor output torque, but at the same time cause more heating in the motor and driver. Therefore, output current is generally set to be such that the motor will not overheat during lengthy operation.

Since parallel and serial connections of motor coils will significantly change resulting inductance and resistance, it is important to set driver output current depending on motor phase current, motor leads and connection method.

6. MICROSTEP RESOLUTION

Current Setting (Peak)

SW1, 2, 3 are used to set the operating current during motion (dynamic current)

Current	SW1	SW2	SW3
1.7A	Off	On	On
2.1A	On	Off	On
2.8A	Off	Off	On
3.5A	On	On	Off
4.2A	Off	On	Off
4.9A	On	Off	Off
5.6A	Off	Off	Off

SW4 OFF for microstepping and On for I/O operation.

Microsteping Resolution Selection

Microstep Resolution is set by DIP SW5, 6, 7 and 8 as shown in the following table:

Step/Rev 1.8° Motor	SW5	SW6	SW7	SW8
200	On	On	On	On
400	Off	On	On	On
800	On	Off	On	On
1600	Off	Off	On	On
3200	On	On	Off	On
6400	Off	On	Off	On
12800	On	Off	Off	On
25600	Off	Off	Off	On
1000	On	On	On	Off
2000	Off	On	On	Off
4000	On	Off	On	Off
5000	Off	Off	On	Off
8000	On	On	Off	Off
10000	Off	On	Off	Off
20000	On	Off	Off	Off
40000	Off	Off	Off	Off

Please Note: DC Power must be removed before changing settings and re-applied after alteration

7. DRIVER CONNECTION TO MOTOR

Series Connection
P542A drive can drive any 4, 6 or 8 lead hybrid stepper motors.

Series Connection:
A series configuration would typically be used in applications where a higher torque at lower speeds is required. Because this configuration has the most inductance, the performance will start to degrade at higher speeds. Use the per phase (or unipolar) current rating divided by 1.4 to determine the peak output current

Parallel Connection
An 8 lead motor in parallel configuration offers a more stable, but lower torque at lower speeds. Because of the lower inductance, there will be higher torque at higher speeds. Multiply the per phase (or unipolar) current rating by rating by 1.4 to determine peak output current.

8. DRIVE DIMENSIONS