

## User Manual

### P860



#### High Performance Microstepping Driver

Thank you for purchasing the Astrosyn P860 drive. Please read this manual thoroughly before installing and operating the driver and always keep the manual where it is readily accessible.

#### **Astrosyn International Technology Ltd**

The Old Courthouse, New Road Avenue, Chatham, Kent ME4 6BE England

Telephone: +44 (0) 1634 815175 Fax: +44 (0) 1634 826552

Email: [sales@astrosyn.com](mailto:sales@astrosyn.com) Web: [www.astrosyn.com](http://www.astrosyn.com)

Registered office: Montague Place, Quayside, Chatham Maritime, Kent. ME4 4QU Registered in England No. 1188550

## Table of Contents

---

|   | Page     |
|---|----------|
| <b>General</b>  | <b>1</b> |
| Features of the Driver                                | 1        |
| Applications of the Driver                            | 1        |
| <br>  |          |
| <b>Specifications and Operating Environment</b>       | <b>2</b> |
| Electrical Specifications                             | 2        |
| Operating Environment and Parameters                  | 2        |
| <br>  |          |
| <b>Driver Connectors, P1, P2 and P3</b>               | <b>2</b> |
| Control Signal Connector P1 Pins                      | 2        |
| Power Connector P2 Pins                               | 2        |
| Power Connector P3 Pins                               | 2        |
| <br>  |          |
| <b>Power Supply Selection</b>                         | <b>3</b> |
| Maximum Voltage Input                                 | 3        |
| Regulated or Unregulated Power Supply                 | 3        |
| Multiple Drivers                                      | 3        |
| <br>  |          |
| <b>Driver Voltage and Current Selection</b>           | <b>4</b> |
| Selecting Supply Voltage                              | 4        |
| Setting Proper Output Current                         | 4        |
| <br>  |          |
| <b>Microstep Resolution and Driver Current Output</b> | <b>4</b> |
| Microstep Resolution Selection                        | 4        |
| Current Setting                                       | 4        |
| <br>  |          |
| <b>Driver connection to Motors</b>                    | <b>5</b> |
| <b>Driver Dimensions</b>                              | <b>5</b> |

## 1. GENERAL

---

The P860 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 24V dc to 110V dc
- Current selectable from 2.8A to 8.5A / phase
- 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
- 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   | 2.8A   | By User | 8.5A    | By DIP Switch |
| Supply Voltage (DC)   | +24Vdc | +36Vdc  | +110Vdc |               |
| Supply Voltage (AC)   | 18Vac  |         | 80Vac   |               |
| Logic Signal Current  | 6mA    | 10mA    | 30mA    |               |
| Pulse Input Frequency | 0 Hz   | By User | 200 kHz |               |
| Minimum Pulse Rate    | 2.5µs  |         |         |               |

### Operating Environment and Parameters

|               |                  |  |
|---------------|------------------|--|
| Coolant       | Heatsink and fan |  |
| Environment   | Space            | Avoid dust, oil, frost and corrosive gases |
|               | Temperature      | 0°C to 50°C                                |
|               | Humidity         | 40% to 90%RH                               |
|               | Vibration        | 5.9m/s <sup>2</sup> Max                    |
| Storage Temp. | -20 °C to +65°C  |  |
| Weight        | Approx 600g      |  |

## 3. DRIVER CONNECTORS, P1, P2 and P3

The following is a brief description of the three connectors of the drive.

### Control Signal Connector P1 Pins

| Pin No. | Signal      | Functions                                |
|---------|-------------|--|
| 1       | Direction - | Triggers change in direction of rotation |
| 2       | Direction + | Connect to +5Vdc                         |
| 3       | Pulse -     | Triggers motor to move                   |
| 4       | Pulse +     | Connect to +5Vdc                         |

*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                      |
|---------|----------|--------------------------------|
| 5       | Enable - | Connect to 0v to disable drive |
| 6       | Enable + | Connect to +5Vdc               |

### Power Connector P3 Pins

| Pin No. | Signal  | Functions                          |
|---------|---------|------------------------------------|
| 7, 8    | Phase A | Motor coil A (leads A+ and A-)     |
| 9, 10   | Phase B | Motor coil B (leads B+ and B-)     |
| 11      | V+      | Positive supply for dc or ac input |
| 12      | V-      | Ground for dc or ac input          |

## 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 24Vdc to 110Vdc, including power input fluctuation and back EMF voltage generated by motor coils during motor shaft deceleration, or from 18Vac to 80Vac via a transformer.

Higher voltages will damage the driver.

### ***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.

## 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. Switch Settings

---

### Current Setting (Peak)

SW1, 2, 3 are used to set the operating current during motion (dynamic current).  
SW4 Off, sets stand still current to 50% of dynamic current value.

| Current | SW1 | SW2 | SW3 |
|---------|-----|-----|-----|
| 2.8A    | On  | On  | On  |
| 3.5A    | Off | On  | On  |
| 4.5A    | On  | Off | On  |
| 5.4A    | Off | Off | On  |
| 5.9A    | On  | On  | Off |
| 6.8A    | Off | On  | Off |
| 7.5A    | On  | Off | Off |
| 8.5A    | Off | Off | Off |

### Microstepping Resolution Selection

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

| Step/Rev 1.8° Motor | SW5 | SW6 | SW7 | SW8 |
|---------------------|-----|-----|-----|-----|
| 400                 | On  | On  | On  | On  |
| 800                 | Off | On  | On  | On  |
| 1600                | On  | Off | On  | On  |
| 3200                | Off | Off | On  | On  |
| 6400                | On  | On  | Off | On  |
| 12800               | Off | On  | Off | On  |
| 25600               | On  | Off | Off | On  |
| 51200               | 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: Power must be removed before changing settings and the re-applied.**

SW9            On, allows double pulse operation, ie Pulse + and Pulse - and Dir + and Dir -.  
SW10          On, self-tests at 30rpm.

## 7. DRIVER CONNECTION TO MOTOR

---

### Series Connection:

P860 driver 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

---

150 x 53 x 97.5mm

