P50330 (DC)
Installation Manual
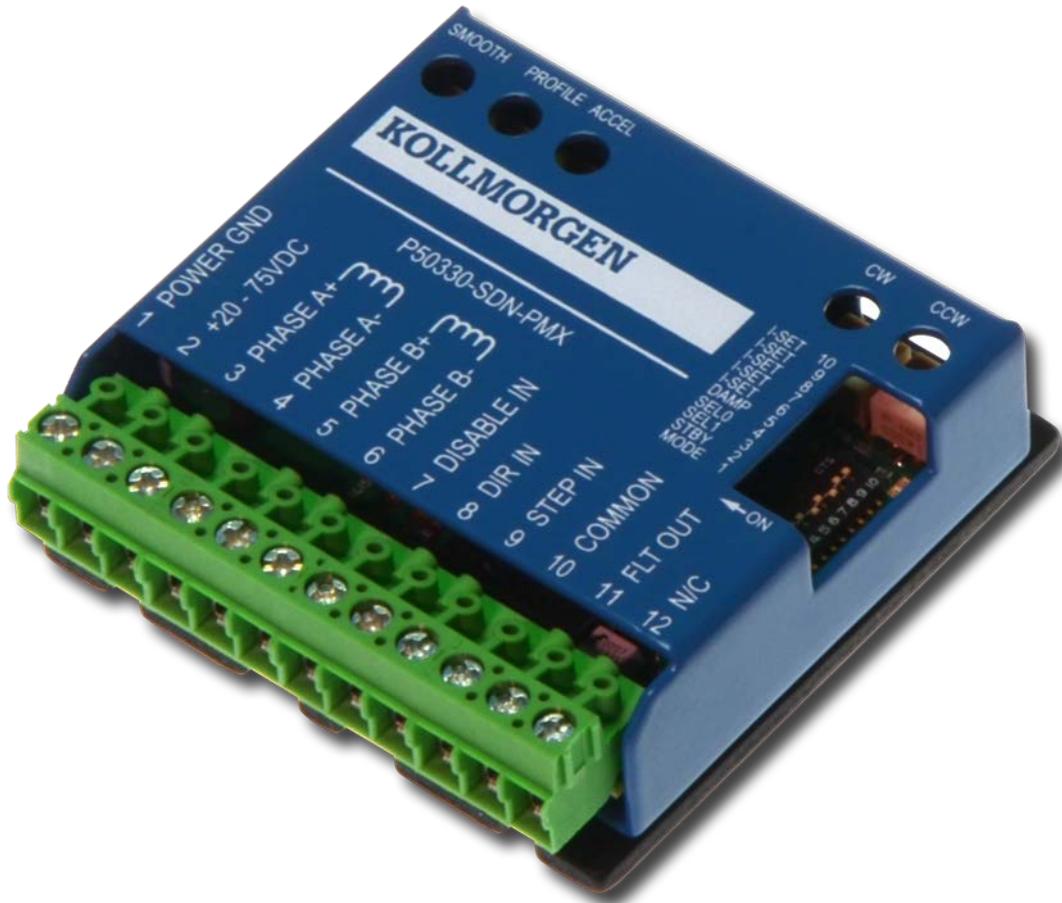
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KOLLMORGEN ®

Because Motion Matters™

RECORD OF DOCUMENT REVISIONS

REVISION	REMARKS
- 9/2012	INITIAL RELEASE
B 4/2013	UPDATE 2.3.3 FOR MORE ACCURATE WORDING
C 1/2014	ADD INFORMATION TO A.1

Technical changes which improve the performance of the device may be made without prior notice!

⚠ WARNING — *Alerts users to potential physical danger or harm. Failure to follow warning notices could result in personal injury or death.*

⚠ CAUTION — *Directs attention to general precautions, which if not followed, could result in personal injury and/or equipment damage.*

NOTE — *Highlights information critical to your understanding or use of the product.*

1   P5000 OVERVIEW

This chapter introduces the P5000 stepper drive. Topics covered:

1.1   P5000 Definition
1.2   P5000 Part Number Scheme
1.3   Other System Components and System Diagram
1.4   How to use this Manual
1.5   Warranty Information

1.1   P5000 Definition

The P50330-SDN-PMX is a micro-stepping step motor drive with an integral VCO oscillator function. The drive can operate as a conventional step motor drive using its step and direction inputs, or use its internal VCO. Principal features include:

- Current Output from 0.16-2.5 Arms; DIP switch selectable
- 20-75VDC Input Voltage
- Wave matching for Kollmorgen Motors to provide optimal performance for the Kollmorgen POWERMAX II Hybrid Stepper Motors.
- All Inputs and Outputs are Optically Isolated
- Command Source from External Step and Direction Inputs or Internal Velocity Controlled Oscillator (VCO); DIP switch selectable
- External Single-Ended Step and Direction Command
    - Disable, Step & Direction Inputs
    - Fault Output
- VCO Command
    - Run/Stop, CW & CCW Jog Inputs
    - Motor Stopped Output
- 1/10th Microstep Resolution
- Pulse multiplier function synthesizes smooth step resolution
- Standby Current Reduction, DIP switch selectable
- Compensation for mid-range instability
- RoHS & CE certified
- UL Pending

1.2   Part Number

P5 03 3 0 – SD N – PMX

P5000 Series

Current Rating
03 = 2.5 Arms continuous, 3.5 Arms peak

Voltage Range
3 = 20 - 75 Vdc

Electrical Options
0 = None

Customization
PMX = Optimized Powermax Settings

Feedback Device
N = None

Fuctionality
SD = Step/Direction, Internal VCO
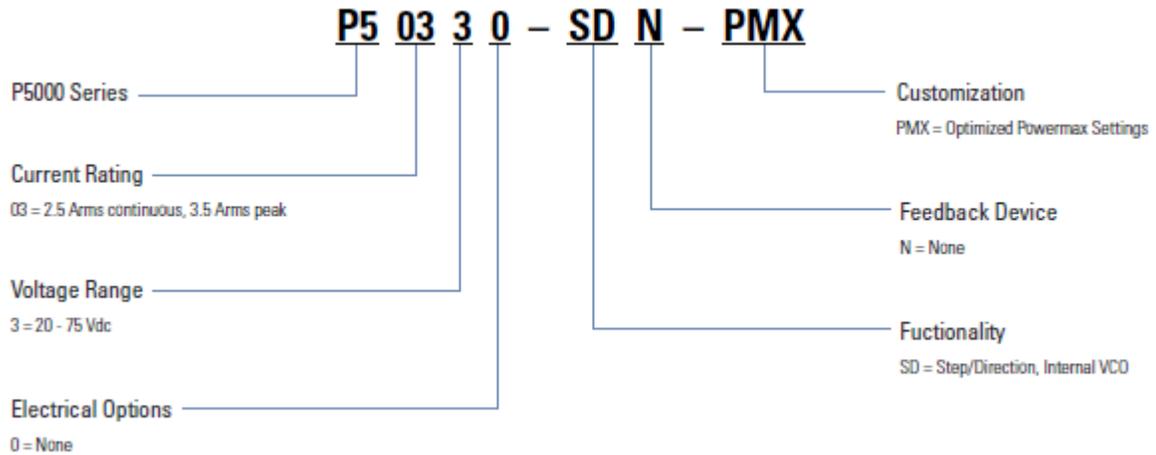
1.3   Other System Components and System Diagram

The other components that, along with the drive, comprise a motor control system are:

- Indexer or pulse generator
- Single power supply (20-75 volts)
- Motor

Installation guidelines for these components are described in Chapter 2, "Installing the P5000 Stepper Motor Drive."

The following diagram shows an installation of the drive in a typical system:
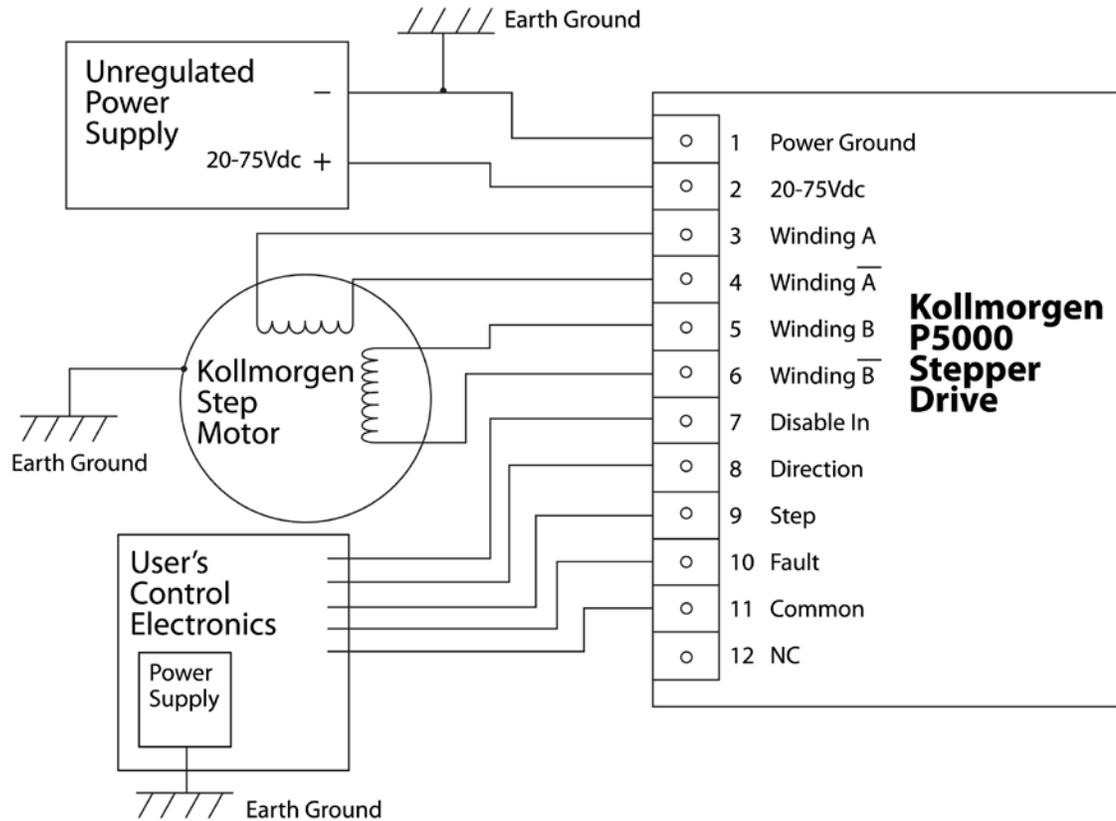
Figure 1: System Diagram

Note: Your installation may vary from this configuration.

1.4   How to use this manual

This manual contains information and procedures to install, setup, and troubleshoot the P5000 stepper motor drive. The most effective way to use this manual is to follow the Installation and Configuration instructions contained in Chapters 2 and 3.

1.5   Warranty

The Kollmorgen P5000 drives have a **one year warranty** against defects in material and assembly. Products that have been modified by the customer, physically mishandled, or otherwise abused through mis-wiring or incorrect switch settings are void from the warranty plan.

2   INSTALLING THE P5000

This chapter explains how to install the P5000 stepper motor drive.
Topics covered:
2.1   Safety
2.2   Unpacking and inspecting the P5000
2.3   Selecting other system components
2.4   Mounting the P5000 in your installation
2.5   Wiring the P5000

2.1   Safety

Your responsibility

As the user or person applying this unit, you are responsible for determining the suitability of this product for any application you intend. In no event will Kollmorgen be responsible or liable for indirect or consequential damage resulting from the misuse of this product.

Read this manual completely to effectively and safely operate the P5000 unit.

⚠ WARNING   *The circuits in the P5000 drive are a potential source of severe electrical shock. Follow the safety guidelines to avoid shock.*

Safety Guidelines

It is the machine builder's responsibility to insure that the complete machine complies with the Machine Directive (EN60204). The following requirements relate directly to the stepper controller:

- Do not operate the drive without the motor case tied to earth ground.
- Do not make any connections to the internal circuitry. The input and output signals are the only safe connection points.
- Never plug or unplug connectors with power applied
- Never connect or disconnect any wires to terminals with power applied
- Be careful of the motor terminals (Terminals 3, 4, 5, & 6) when disconnected from the motor. With the motor disconnected and power applied to the drive, these terminals have high voltage present, even with the motor disconnected.
- Do not use the DISABLE input as a safety shutdown. Always remove power to the drive for a safety shutdown
- If the drive indicates a fault condition, find the cause of the fault and fix it prior to resetting the fault or power cycling the drive
- The temperature of the drive's heat sink and housing may exceed 70C. There is a danger of severe burns if these regions are touched.

2.2   Unpacking and Inspecting

Unpacking Procedure

1. Remove the P5000 and any other contents from the shipping container. Remove all packing material from the shipping container. Be aware that some connector kits and other equipment pieces may be quite small and can be accidentally discarded.

Inspection Procedure
Inspect the unit for any physical damage that may have been sustained during shipment. If damage is detected, either concealed or obvious, notify the carrier immediately.

Storing the Unit
After inspection, store the drive in a clean, dry place. The storage temperature must be between 0 °C and 70 °C. To prevent damage during storage, replace the unit in the original shipping carton.

2.3   Selecting Other System Components

2.3.1 Indexer Selection

If you will be using the Step and Direction inputs to command your motor, select an indexer that provides these as a minimum (2.5 - 24 volt logic). A compatible indexer will provide the capability to drive the input circuits described in Appendix A. For most applications that operate at speeds above 300 rpm, an indexer that can ramp the step frequency is required.

2.3.2 Motor Selection

The P5000 is designed for use with Kollmorgen's POWERMAX II line of hybrid stepper motors or most other 2 phase stepper motors. When using Kollmorgen Motors, the drive's output waveform is optimized to maximize smoothness in order to achieve the best system performance. When using non-Kollmorgen motors, the motor winding current rating must be compatible with the output current of the drive package.

Refer to the Torque/Speed Curves in the "Kollmorgen Stepper Solutions Catalog" for best motor selections or contact your local Kollmorgen distributor for sizing and motor compatibility assistance.

2.3.3 Power Supply Selection

A single power supply is required to operate the P5000 unit.
The power supply voltage can vary between 20 VDC and 75 VDC maximum. A regulated power supply is recommended. An unregulated power supply may be used as long as the voltage stays between the limits; keep the ripple voltage to 10% or less for best results. The P5000 drive has a two second power-on reset time before the motor is energized.

⚠ CAUTION   *Power supply voltage in excess of 75 VDC will damage the P5000*

The choice of power supply voltage depends on the required speed performance of the motor and the motor's inductance. The motor's holding torque and low-speed torque is unaffected by power supply voltage. Supply voltage affects motor power (speed times torque) output and power output increases proportionally with supply voltage. Motor eddy current heating goes up with the square of the supply voltage so motor heating outraces the motor's mechanical power output with increasing supply voltage. The maximum practical power supply voltage is capped by the motor's rated case temperature.

⚠ CAUTION *Avoid ON / OFF switching of the DC connection to the drive. Hard-wire the drive to the power supply and switch the power supply AC input ON / OFF instead. Switching the DC to the drive results in very high inrush currents. This could potentially damage the P5000 drive or the ON/OFF switch.*

2.4   Mounting the P5000

2.4.1   Connector Removal

The P5000 has one 12-position terminal block for input power, motor power, and command I/O. The terminal mating connector is a 2-piece modular connector. Each piece can be removed separately by pulling the connector body upwards and off of the mating header pins on the P5000. **The connectors must initially be removed to mount the P5000 to a heatsink or chassis**.

2.4.2   Heat Sink Mounting

A finned aluminum heatsink **is required** for operating the drive above 2A at a 25°C ambient temperature.

⚠ CAUTION *Operating the P5000 at current settings above 2 Amps without a heatsink will result in damage to the P5000 drive.*

The case temperature of the P5000 (measured on the bottom plate) should not exceed 70°C and for best life should be kept to 50°C or less. Use heatsink compound between the P5000 drive and the heatsink. The drive can be mounted in any orientation. 6-32 screws should be used in the four half-holes on the bottom plate of the drive to secure it to the heatsink. The P5000 drive should be mounted with unobstructed space of at least one half inch (0.50") around all sides of the drive.

2.4.3   Chassis Mounting

The P5000 drive can only be mounted on the bottom plate of the chassis. The drive can be mounted in any orientation. 6-32 screws should be used in the four holes on

the back of the drive. If possible, the drive should be securely fastened to a smooth, flat, non-painted metal surface that will help conduct heat away from the chassis.

Never put the drive where it can get wet or where metal or other electrically conductive particles can get on the circuitry.
Always provide air flow around the drive. The P5000 drive should be mounted with unobstructed space of at least one half inch (0.50") around all sides of the drive.

2.4.4   Mounting Dimensions
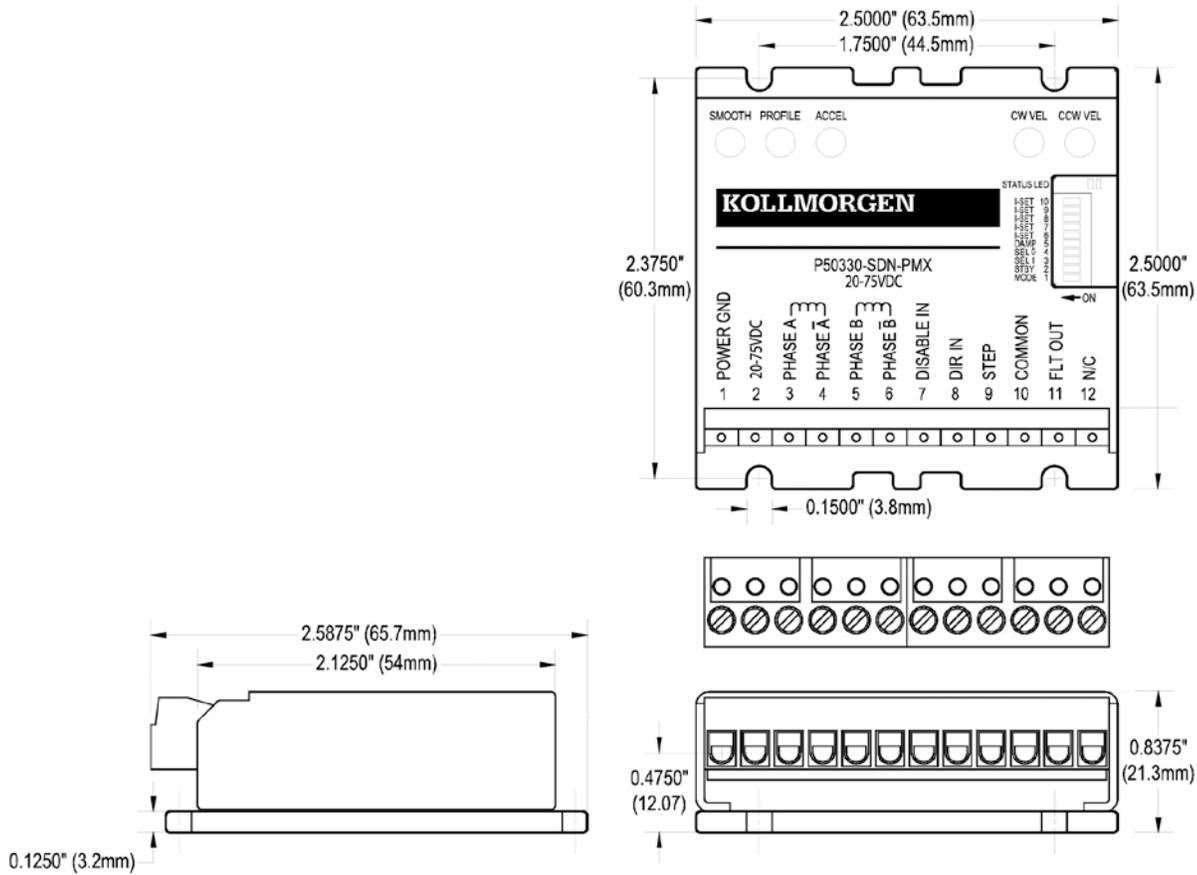
**Figure 2: Mounting Dimensions**

2.4.5   Mounting Guidelines

Your installation should meet the following guidelines:

- Flat, solid surface capable of supporting the approximate 3.4 oz weight (97 g mass) of the unit
- Free of excessive vibration or shock
- Minimum unobstructed space of 0.50 inches above and below the unit
- Maximum case temperature of 70°C

2.5   Wiring the P5000

Overview

Wiring is application specific
Wiring sizes, wiring practices and grounding/shielding techniques described in the following section represent common wiring practices and should prove satisfactory in the majority of applications.

⚠ CAUTION   *Non-standard applications, local electrical codes, special operating conditions, and system configuration wiring needs take precedence over the information included here. Therefore, you may need to wire the drive differently then described here.*

Electrical noise reduction
Use shielded and twisted cabling for the signal and power cables as described below. This precaution reduces electrical noise.

Shock hazard reduction
Refer to section 2.1 for safety information that must be followed to reduce shock hazard.

2.5.1   Introduction

The P5000 has one 12-position terminal block for input power, motor power, and command I/O. The terminal mating connector is a 2-piece modular connector. The two modules are for power supply and motor power connection (terminals 1 through 6) and for control interface connection (terminals 7 through 12). Each piece can be removed separately by pulling the connector body upwards and off of the mating header pins on the P5000 drive. **The connectors must initially be removed to mount the P5000 to a heatsink or chassis**.

Connector Diagram is shown below:

	Step Drive Mode	VCO Mode
1	POWER GND	POWER GND
2	20-75VDC	20-75 VDC
3	PHASE A+	PHASE A+
4	PHASE A-	PHASE A-
5	PHASE B+	PHASE B+
6	PHASE B-	PHASE B-
7	DISABLE IN	RUN/STOP
8	DIR IN	CW JOG
9	STEP IN	CCW JOG
10	COMMON	COMMON
11	FLT OUT	MOTOR STOPPED
12	N/C	N/C
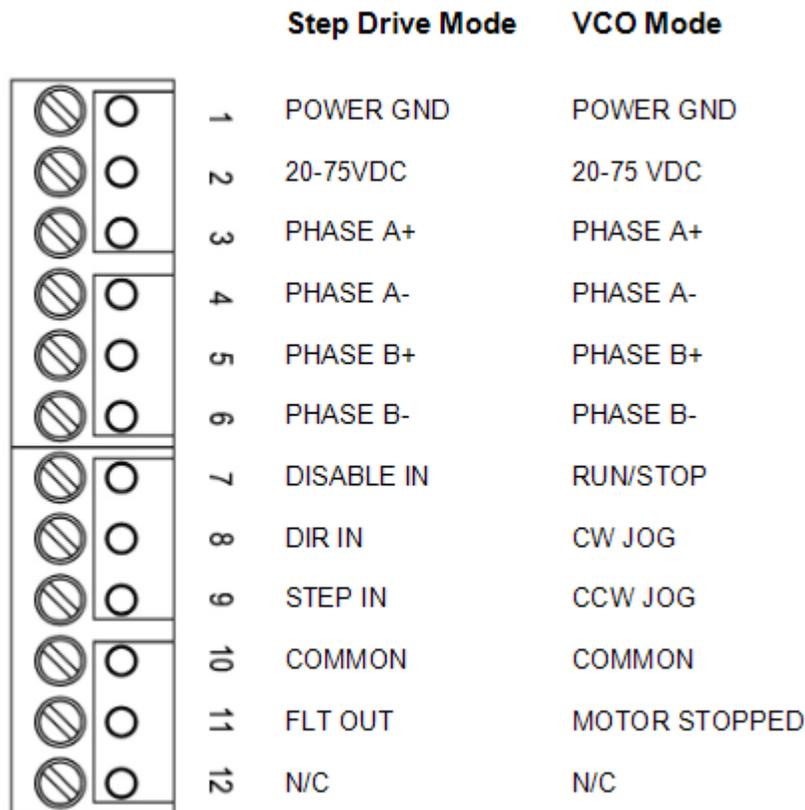
Figure 3: Connector Diagram

2.5.2 Power Connection

Terminals 1 and 2 connect the P5000 to the DC power supply. Please refer to section 2.3.3 for additional information on power supply considerations.

TERM 1: POWER GND. Power supply ground terminal. This is normally wired to the DC power supply '-'. The hard anodized aluminum mounting plate is internally connected to TERM 1.

TERM 2: 20 - 75 VDC. Power supply positive terminal. This is normally wired to the DC power supply '+'.

It is suggested to use a black color wire for the POWER GND (terminal 1) connection and a red color wire for the 20-75 VDC (terminal 2) connection. Using these different colors minimizes the chance for polarity reversal when wiring the drive to the power supply. The P5000 drive has a two second power-on reset time before the motor is energized.

⚠ **CAUTION** *Reversing the power supply polarity will blow the drive's internal protection fuse.*

2.5.3   Motor Connections

Terminals 3, 4, 5, and 6 connect the P5000 to the motor phases. Typically for Kollmorgen Powermax II hybrid stepper motors phases A & /A are black and orange leads; phases B & /B are red and yellow leads.

TERM 3: PHASE A+
TERM 4: PHASE A-
TERM 5: PHASE B+
TERM 6: PHASE B-

The figure below shows the connections required between the P5000 terminals and Kollmorgen Stepper motors having flying leads. Connections are shown for 4 lead motors, 8 lead motors with paralleled windings, and 8 lead motors with series windings.
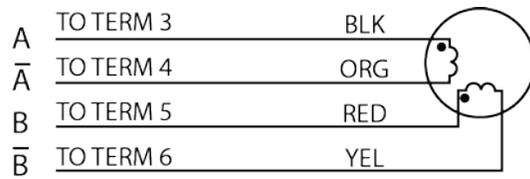
FOUR LEAD MOTOR
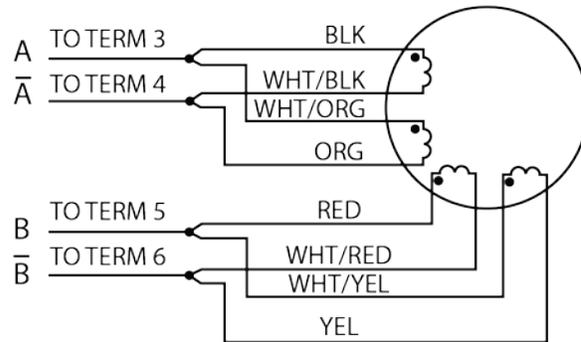
EIGHT LEAD MOTOR CONNECTED IN PARALLEL
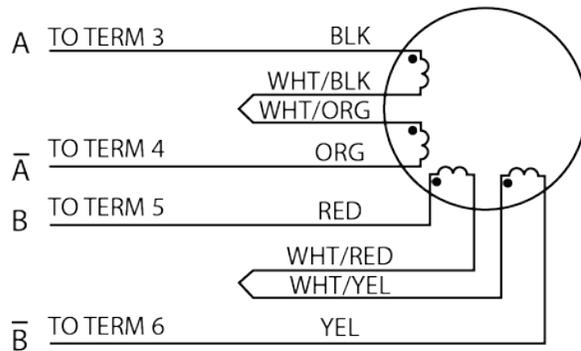
EIGHT LEAD MOTOR CONNECTED IN SERIES

Figure 4: Motor Phase Connection Configurations

2.5.4 Command I/O Connections

The P5000 has two modes of operation. The drive can operate as a conventional step motor drive using step and direction inputs or it can use its internal Velocity Controlled Oscillator (VCO). The drive has four I/O terminals (7,8,9,11) whose functionality depends on which operation mode the drive is in.

The connector diagram below shows the input and output functionality for each operation mode:
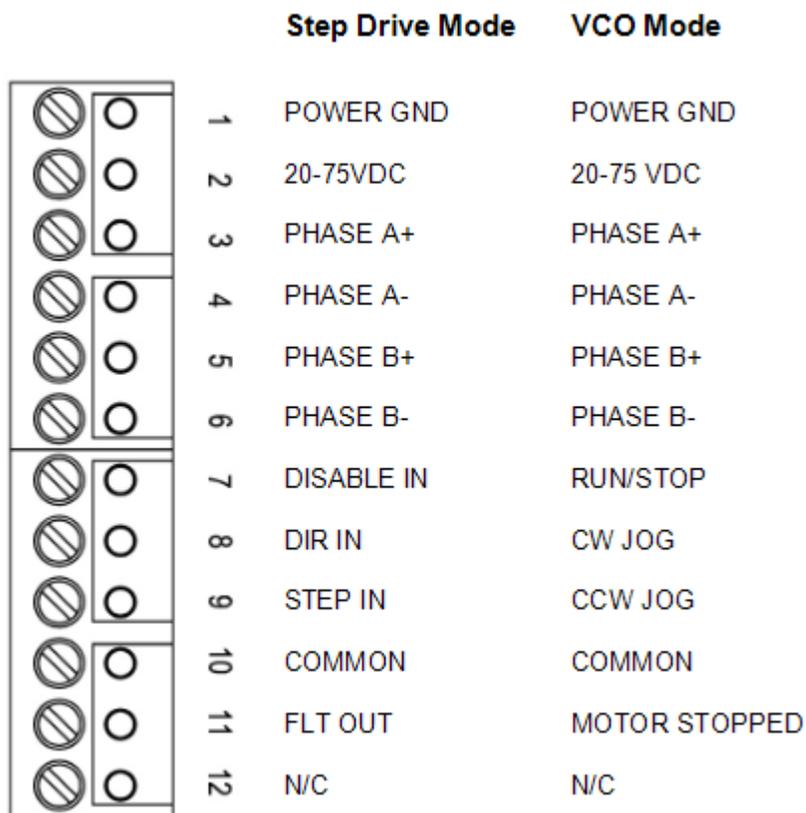
Figure 5: Connector Diagram

2.5.4.1 Step Drive Mode (SW1 ON)

The P5000 drive operates as a conventional step motor drive using external single-ended step and direction inputs in this mode. The SW1 dip switch must be in the ON position for Step Drive Mode to be active.

When the P5000 is in Step Drive Mode, terminals 7, 8, and 9 are DISABLE IN, DIR IN, and STEP IN inputs; terminal 11 is the FLT OUT output. All inputs and outputs are optically isolated.

TERM 7: DISABLE IN
When +5VDC is applied to this input, the drive instantly freewheels the motor and changes the STATUS LED color to red. The drive is enabled 1 second after removing +5V from the DISABLE IN input.

Cycling the disable input also clears the internal fault protection latch if it is set.

TERM 8: DIR IN
This single-ended input sets motor direction while the STEP IN input is cycled. When +5VDC is applied to the DIR IN input, the motor rotates in the counter-clockwise direction. When 0VDC is applied, the motor rotates in the clockwise direction. DIR IN must be true for 200 nsec before and after the STEP IN pulse edge. Single-ended signal.

TERM 9: STEP IN
This single-ended input moves the motor one increment of motion per input pulse. The increment of motion is defined by the pulse multiplier. The motor always moves with $1/10^{TH}$ microstep smoothness at any input pulse resolution setting. The drive uses a phase-locked loop pulse multiplier to synthesize step resolution. As an example, when the input pulse resolution set to full step and the external indexer provides 200 steps per rev to the P5000 drive, the multiplier generates 10 output pulses for every input step pulse. The drive then takes ten 0.18-degree steps to synthesize a smooth 1.8-degree step. For additional information, please see section 3.1.3.1.

The step pulse width should equal 1 µsec minimum.

TERM 10: COMMON
This is the opto-isolator ground return terminal. The STEP IN, DIR IN and DISABLE IN opto-isolator LED cathodes go to this terminal. The FLT OUT opto-isolator transistor's emitter also goes to this terminal.

TERM 11: FLT OUT
This opto-isolated open collector output indicates a drive fault condition (logic '0') such as a mis-wired or shorted motor. The STATUS LED will illuminate red when the drive is in a fault condition.
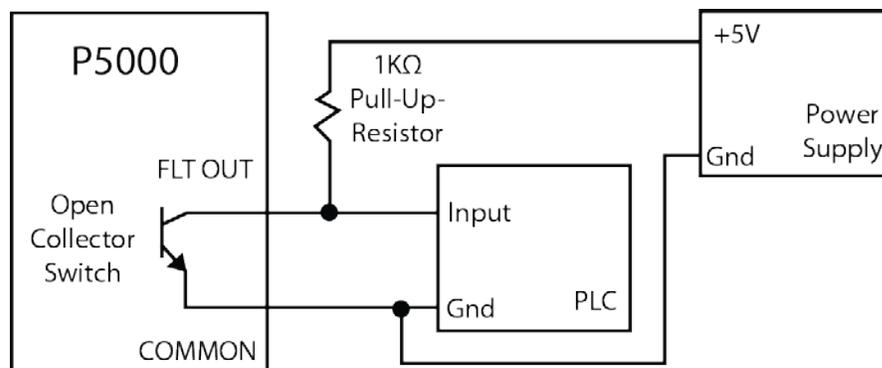

Figure 6: FLT OUT Connection Diagram

The STATUS LED is located just above DIP switch 10. Please refer to the STATUS LED blink code table below.

The fault output also indicates when the disable input is active. When +5VDC is applied to DISABLE IN, FLT OUT goes low (logic '0'). The STATUS LED will illuminate red when the drive is disabled.

Solid Green	Step & Dir MODE: 20–75VDC Power applied. VCO MODE: 20–75VDC Power applied & zero speed.
Flashing Green, Green, Green, Pause	VCO MODE only: Motor rotating CW direction.
Flashing Red, Red, Red, Pause	VCO MODE only: Motor rotating CCW direction.
Solid Red	Step MODE only: Drive is Disabled. No power to the motor.

Table 1: STATUS LED blink codes

2.5.4.2 VCO Mode (SW1 OFF)

The P5000 drive uses its integral velocity controlled oscillator function in this mode. The internal digital frequency generator is the source of motor speed. The SW1 dip switch must be in the OFF position for VCO Mode to be active.

When the P5000 is in VCO Mode, terminals 7, 8, and 9 are RUN/STOP, CW JOG, and CCW JOG inputs; terminal 11 is the MOTOR STOPPED output.

TERM 7: RUN / STOP SWITCH
This input (marked DISABLE IN) operates the RUN / STOP switch. Applying +5VDC to this input causes the motor to accelerate at a rate set by the ACCEL trimpot to the speed set by the CW or CCW trimpots. Removing +5VDC from this input causes the motor to decelerate to zero speed at a rate set by the ACCEL trimpot.

TERM 8: CW JOG SWITCH
This input (marked DIR IN) operates as the clockwise Jog switch. To operate the motor in the clockwise direction +5VDC must be applied to this input.

TERM 9: CCW JOG SWITCH
This input (marked STEP IN) operates as counter-clockwise Jog switch. To operate the motor in the counter-clockwise direction +5VDC must be applied to this input.

TERM 11: MOTOR STOPPED
This opto-isolated open collector output (marked FLT OUT) indicates when motor comes to a stop (logic '0'). A period of time will elapse anytime the RUN / STOP input commands the motor to decelerate to a stop. This output indicates only when the motor is actually stopped.

3   CONFIGURING THE P5000

This chapter explains how to configure the P5000 after installation. Topics covered are:
- Setting up functions using the dip switches (SW1 – SW10)
- Setting the five trimpots

This section is intended to familiarize the P5000 user with the hardware adjustments and settings required to power and operate the P5000 drive.

3.1   Dip Switch Set Up

Introduction

Many of the operational parameters of the P5000 can be set or changed using the dip switches – either by a single switch or combination of on/off settings of 2 or more switches. The dip switches SW1 – SW10 set the following:
- Operation mode
- Standby current reduction
- Pulse input resolution
- Velocity trimpot resolution
- Anti-resonance based on motor size
- Motor current
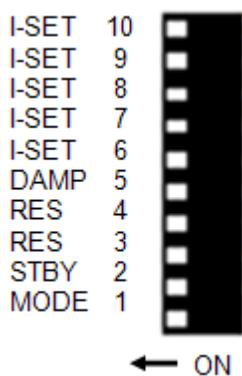
Figure 7: DIP Switch Diagram

### 3.1.1   Operation Mode

Definition

The P5000 has two modes of operation; the operation mode is set by the MODE switch (SW1). The drive can operate as a conventional step motor drive using step and direction inputs or it can use its internal Velocity Controlled Oscillator (VCO). The operation mode determines in the functionality of the inputs and output on terminals 7,8,9 and 11.

SW1	MODE
ON	Step Drive
OFF	VCO

Table 2: Operation Mode – SW1

SW1 ON (Default): STEP DRIVE MODE. The P5000 drive operates as a conventional step motor drive using external single-ended step and direction inputs in this mode. The SW1 dip switch must be in the ON position for Step Drive Mode to be active.

SW1 OFF: VCO MODE. The P5000 drive uses its integral velocity controlled oscillator function in this mode. The internal digital frequency generator is the source of motor speed. The SW1 dip switch must be in the OFF position for VCO Mode to be active.

3.1.2 Standby Current Reduction

Definition
In the P5000 the Standby Current Reduction function automatically reduces the running current at times when no motion is commanded. The state of the standby function is set by the STBY switch (SW2). When enabled, the motor phase current is reduced to 70% of the set value one second after the motor stops. It is highly recommended that the idle current reduction feature be used in order to minimize motor and drive heating.

SW2	STBY
ON	70%
OFF	100%

Table 3: Standby Current Reduction – SW2

SW2 ON (Default): 70%. Automatic standby current reduction is enabled. Motor phase current is reduced to 70% of the set value one second after the motor stops in order to reduce motor 'I-squared-R' heating.

SW2 OFF: 100%. No standby current reduction and the phase current remains at 100% of set value. The drive always enters a circulating switching mode one second after the motor stops to reduce eddy current heating while the motor is stopped regardless of the switch setting.

3.1.3 Resolution

Definition
In the P5000 the functionality of DIP Switches 3 and 4 is determined by the operation mode. If the P5000 drive is in Step Drive Mode (SW1 is ON), SW3 and SW4 set the step resolution. If the P5000 drive is in VCO Mode (SW1 is OFF), SW3 and SW4 set the velocity resolution for the CW and CCW trimpots.

3.1.3.1 Input Pulse Resolution

The input pulse resolution is set by the SEL1 and SEL0 switches (SW3 and SW4) when the P5000 is in Step Drive Mode. SW3 ON and SW4 ON are the default settings. The available input pulse resolutions are full-step, half-step, and 1/10TH microstep. The motor always moves with 1/10TH microstep smoothness at any resolution setting. The drive uses a phase-locked loop pulse multiplier to synthesize step resolution. As an example, when set to full step, the multiplier generates 10 output pulses for every input step pulse. The drive then takes ten 0.18-degree steps to synthesize a smooth 1.8-degree step.

SW3	SW4	Input Pulses (steps/rev)	
OFF	OFF	Reserved	
OFF	ON	2000	1/10
ON	OFF	400	Half
ON	ON	200	Full

Table 4: Step Resolution – SW3 & SW4

3.1.3.2 Velocity Trimpot Resolution

The velocity range for the CW and CCW trimpots is set by the SEL1 and SEL0 switches (SW3 and SW4) when the P5000 is in VCO Mode. SW3 ON and SW4 ON are the default settings. There are three different VCO velocity ranges available. The low speed range is 0 to 234 RPM. The medium speed range is 0 to 937 RPM. The high speed range is 0 to 3,750 RPM. The CW and CCW trimpots are smooth, single-turn trimpots. When rotated completely counter-clockwise, the trimpot is set to zero speed. When rotated completely clockwise, the trimpot is set to the maximum speed of the specified range.

SW3	SW4	Range (RPM)
OFF	OFF	Reserved
OFF	ON	0 - 3750
ON	OFF	0 - 937
ON	ON	0 - 234

Table 5: Velocity Range – SW3 & SW4

3.1.4   Mid-Band Resonance Compensation

Definition
In the P5000 the mid-band resonance compensation function reduces the effect of mid-range instability typical of step motors. The DAMP switch (SW5) optimizes mid-band resonance compensation for the motor frame size being used. SW5 ON is the default setting.

SW5	DAMP (motor frame size)
ON	NEMA 17 & 23
OFF	NEMA 34 & 42

Table 6: Mid-Range Instability Compensation – SW5

3.1.5 Motor Current

The P5000 drive output current is set by the I-SET switches (SW6 - SW10). There are 16 settings. The default setting is 1.87 Arms (SW6 OFF, SW7 ON, SW8 OFF, SW9 ON, SW10 ON). The following are the switch settings for programming the P5000 to output the required motor phase current. For Kollmorgen POWERMAX II hybrid stepper motors use the Rated Current per Phase from the Kollmorgen Stepper Solutions Catalog to set the drive. When using non-Kollmorgen motors, the motor winding current rating must be compatible with the output current of the drive package.

⚠ CAUTION   *Operating the P5000 at current settings above 2 Amps without a heatsink will result in damage to the P5000 drive.*

SW6	SW7	SW8	SW9	SW10	I-SET (Arms)
OFF	OFF	OFF	OFF	OFF	0.16
OFF	OFF	OFF	OFF	ON	0.31
OFF	OFF	OFF	ON	OFF	0.47
OFF	OFF	OFF	ON	ON	0.62
OFF	OFF	ON	OFF	OFF	0.78
OFF	OFF	ON	OFF	ON	0.93
OFF	OFF	ON	ON	OFF	1.09
OFF	OFF	ON	ON	ON	1.24
OFF	ON	OFF	OFF	OFF	1.40
OFF	ON	OFF	OFF	ON	1.56
OFF	ON	OFF	ON	OFF	1.71
OFF	**ON**	**OFF**	**ON**	**ON**	**1.87**
OFF	ON	ON	OFF	OFF	*2.02
OFF	ON	ON	OFF	ON	*2.18
OFF	ON	ON	ON	OFF	*2.33
OFF	ON	ON	ON	ON	*2.49

All other settings reserved

NOTE   A finned aluminum heatsink **is required** for operating the drive above 2Arms at a 25C ambient temperature.

Table 7: Motor Current Setting – SW6-SW10

3.2   Trimpot Set Up

Introduction
Some of the operational parameters of the P5000 can be set or changed using the five trimpots located on the top of the drive. The trimpots are labeled SMOOTH, PROFILE, ACCEL, CW, CCW. The trimpots set the following:
- Step Smoothness
- Low-End Resonance Reduction
- Acceleration and Deceleration rates (used in VCO Mode)
- Clockwise and Counter-clockwise Velocity (used in VCO Mode)

Figure 8: Trimpots

3.2.1   Smooth Trimpot

The SMOOTH trimpot adjusts the motor smoothness at very low speeds by equalizing the microstep size at the motor's full-step locations. Unadjusted, the microstep size at the full-step location may be too large or too small. Run the motor at about 10 RPM and adjust the trimpot for desired performance. Together, the SMOOTH and PROFILE trimpots provide the smoothest possible motor performance.

3.2.2   Profile Trimpot

The PROFILE trimpot minimizes motor low-speed resonance vibration by selecting the optimum current profile from eight different shaped current waveforms. Run the motor at its low-speed resonance RPM (between 30 to 100 RPM). Adjust the trimpot to minimize vibration. Together, the SMOOTH and PROFILE trimpots provide the smoothest possible motor performance.

3.2.3   CW, CCW and Accel Trimpots

The CW, CCW, and ACCEL trimpots are only applicable if the P5000 drive is in VCO Mode (SW1 OFF).

The CW trimpot sets the clockwise velocity. Likewise, the CCW trimpot sets the counter-clockwise velocity. There are three different VCO velocity ranges available. For example if SW3 and SW4 are in the ON position, the velocity range is 0 to 234 RPM. The CW and CCW trimpots are smooth, single-turn trimpots. When rotated completely counter-clockwise, the trimpot is set to zero speed. When rotated completely clockwise, the trimpot is set to the maximum speed of the specified range.

The ACCEL trimpot sets the acceleration and deceleration rates. This trimpot sets the time from zero to full speed. The ramp rate range is 128ms to 32 seconds. Using the example mentioned above, if SW3 and SW4 are in the ON position full speed will be 234 RPM. Therefore, when the ACCEL trimpot is rotated to the highest value, it will take 32 seconds to accelerate to 234 RPM.

4   TROUBLESHOOTING

This chapter covers troubleshooting of the P5000 drive.

4.1   Maintaining the P5000

The P5000 drives are designed for minimum maintenance. The following cleaning procedure, performed as needed, will minimize problems due to dust and dirt build-up. Remove superficial dust and dirt from the unit using clean, dry, low-pressure air.

The P5000 drive has an internal protection fuse. If the STATUS LED isn't lit, it indicates no power is connected to the drive or the drive's internal protection fuse is blown. If it is suspected that the internal protection fuse is below, please return the P5000 drive to Kollmorgen for repair or replacement.

4.2   Troubleshooting the P5000

The P5000 has a STATUS LED to indicate drive status. This STATUS LED displays the condition of the power stage. When the drive is operating normally, the STATUS LED is solid or flashing green. When the protection fault latch has been set, the STATUS LED is red. A miss-wired motor or a motor short-circuit results in the protection latch being set.

Cycling the DISABLE IN input clears the internal fault protection latch; if the problem causing the fault has not been resolved, the latch will be immediately set again and the STATUS LED will continue to be red.

Normally, the STATUS LED will be red for 1 second after power-up and then become green. If the STATUS LED is not lit, it indicates no power is connected to the drive or the drive's internal protection fuse is blown.

Specific drive status conditions are shown below:

Solid Green	Step & Dir MODE: 20–75VDC Power applied. VCO MODE: 20–75VDC Power applied & zero speed.
Flashing Green, Green, Green, Pause	VCO MODE only: Motor rotating CW direction.
Flashing Red, Red, Red, Pause	VCO MODE only: Motor rotating CCW direction.
Solid Red	Step MODE only: Drive is Disabled. No power to the motor.

Table 8: STATUS LED blink codes

APPENDIX A: SPECIFICATIONS

A.1   Electrical

Input Power Supply   20-75 VDC

Rated Drive Output Current
(Motor Phase Current)   0 to 2.5 Arms, 3.5 Apeak

Motor Inductance Range   1 – 50 mH

Step Size   1/10th micro-step. 2000 steps/rev.

Signal Input Characteristics Optically isolated.
                              Drive steps on leading edge of STEP input.
                              Motor rotates in the clockwise direction with 0VDC applied to DIR IN
                              input.

                              +3.5 VDC to 5.0 VDC
                              Minimum STEP pulse width: 1 µsec
                              DIR IN must be true 200 nsec before and after the STEP IN pulse
                              edge.

                              2.5-24 VDC logic Disable IN Step Mode, Run/Stop VCO Mode
                              Minimum "on" voltage: 2.5 VDC.
                                                            470 Ohm resistor in series required for 12 VDC
                              Maximum voltage: 24 VDC with 1.2 kOhm resistor in series
                              Input current: 4 mA typical at 2.5V, 20 mA typical at 24V.

Output Characteristics   Optically isolated.
                              Output opens (logic '0') when the drive encounters a fault condition.

                              Output current: 5 mA with 1 kOhm pull-up resistor

Step Pulse Frequency   200 kHz

A.2   Environmental

Operating Temperature   0ºC - 70ºC (as measured at bottom plate)

Storage Temperature   0ºC - 70ºC

Maximum Case Temperature   70°C
                              Higher temperatures will reduce the life of the product.

Cooling Method   Natural cooling
                              Fan-forced cooling

With Heatsink

Surrounding Air Conditions   Avoid dust, oily mist and corrosive air

A.3   Mechanical

Dimensions	2.5 x 2.5 x 0.8375 inches (63.5 x 63.5 x 21.3 mm) overall. Refer to section 2.4.4.
Weight	3.4 oz (97 g) including mating connectors
Mating Connectors	2 pieces Phoenix Contact p/n 1934900. PCB terminal block - PT 1.5/ 6-PVH-5.0

About Kollmorgen

Kollmorgen is a leading provider of motion systems and components for machine builders. Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions that are unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.

For assistance with your application needs, contact us at: 540-633-3545, contactus@kollmorgen.com or visit www.kollmorgen.com

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