

P80630-SDN Stepper Drive Installation Manual



P8000



www.kollmorgen.com/en-us/products/drives/stepper/p8000

Document Edition: C, August 2023

Part Number: 903-806300-00



For safe and proper use, follow these instructions. Keep for future use.

Front Matter

Record of Document Revisions

Version	Date	Notes
A	January 2023	Initial documentation
B	April 2023	Revisions to Digital Inputs
C	August 2023	Revised Model Nomenclature and Connections table information

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1 Introduction

This manual describes the P80630-SDN series of stepper drives. The drives are operated in systems together with other Kollmorgen devices. Please observe the entire system documentation, consisting of:

- Instruction manual for the stepper amplifier
- Technical description of the P8000 series of drives

More background information can be found in the Support section of the Kollmorgen website at www.kollmorgen.com/en-us/developer-network/.

2 Additional System Components and System Diagram

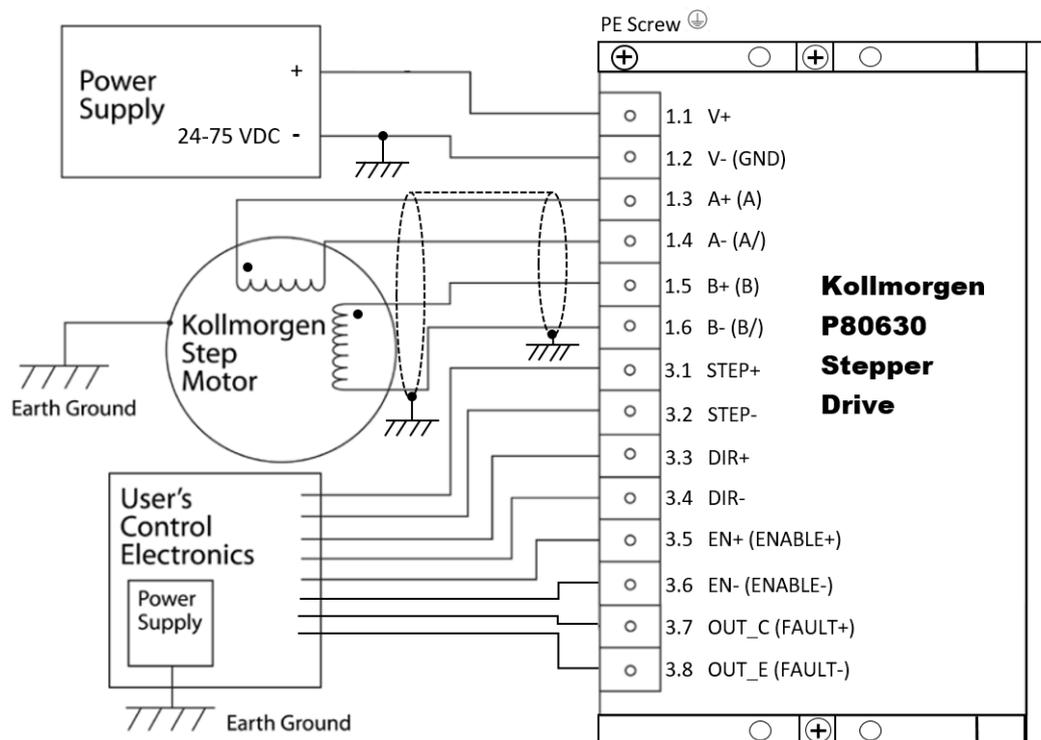
In addition to the drive, the components that comprise a motor control system include:

- Indexer or pulse generator
- Single power supply (24-75 V_{DC})
- Stepper Motor

Installation guidelines for these components are described in [You Should Read This](#).

2.1 System Diagram

The following diagram shows an installation of the drive in a typical system.



NOTE

Your installation may vary from this configuration. Always use shielded, twisted pairs for STEP and DIR inputs. Route away from motor leads.

3 You Should Read This

3.1 Safety Symbols

Symbol	Indication
 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	This symbol indicates important notes.
	Warning of a danger (general). The type of danger is specified by the text next to the symbol.

3.2 Safety

This section describes the safety requirements for the P8000 stepper drive.

3.3 Your responsibility

Only qualified personnel are permitted to transport, assemble, commission, and maintain this equipment. Properly qualified personnel are persons who are familiar with the transport, assembly, installation, commissioning and operation of motors, and who have the appropriate qualifications for their jobs.

Read all available documentation before assembling and using. Incorrect handling of products in this manual can result in injury and damage to persons and machinery. Strictly adhere to the technical information regarding installation requirements. 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 P8000 unit.

WARNING

- The circuits in the P8000 drive are a potential source of severe electrical shock. Follow the safety guidelines to avoid shock.
- Miswiring of the P8000 drive may result in damage to the unit and void the warranty. Improper grounding of the drive may cause serious injury to the operator.

3.4 Safety Guidelines



It is the machine builder's responsibility to ensure 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. Keep all covers and cabinet doors shut during operation.
- 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. During operation, the product has electrically charged components and hot surfaces. Control and power cables can carry a high voltage, even when the motor is not rotating.
- Never disconnect or connect the product while the power source is energized.
- Be careful of the motor terminals (CN1 Port) 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.
- After removing the power source from the equipment, wait at least 3 minutes before touching or disconnecting sections of the equipment that normally carry electrical charges (e.g., capacitors, contacts, screw connections). To be safe, measure the electrical contact points with a meter before touching the equipment.
- Do not use the Enable 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.

3.5 Unpacking and Inspecting

This section describes the unpacking and inspection procedures for the P8000 stepper drive.

3.5.1 Unpacking Procedure

1. Remove the P8000 and any other contents from the shipping container.
2. 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.
3. A label located on the side of the unit identifies the unit by both the model number and serial number.

3.5.2 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.

3.6 Selecting Additional System Components

3.6.1 Indexer Selection

The P80630 drive requires step and direction or CW/CCW step inputs. Select an indexer that provides 5-24 nominal V_{DC} logic signals. A compatible indexer will provide the capability to drive the input circuits described in Input Connections. For most applications that operate at speeds above 300 RPM, an indexer that can ramp the step frequency is required.

3.6.2 Motor Selection

The P8000 is designed for use with most Kollmorgen 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.

3.6.3 Power Supply Selection

A single power supply is required to operate the P80630 unit. The power supply voltage can vary between 24 V_{DC} and 75 V_{DC} maximum at a maximum current of 5.5 Amps. 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 P8000 drive has a short time delay for power-on reset before the motor is energized.

⚠ CAUTION

Power supply voltage in excess of 75 V_{DC} will damage the P80630.

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 P8000 drive or the ON/OFF switch.

3.7 Wiring The P8000

3.7.1 Wiring Is Application Specific

Wiring sizes, wiring practices and grounding/shielding techniques described in this manual 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 than what is described here.

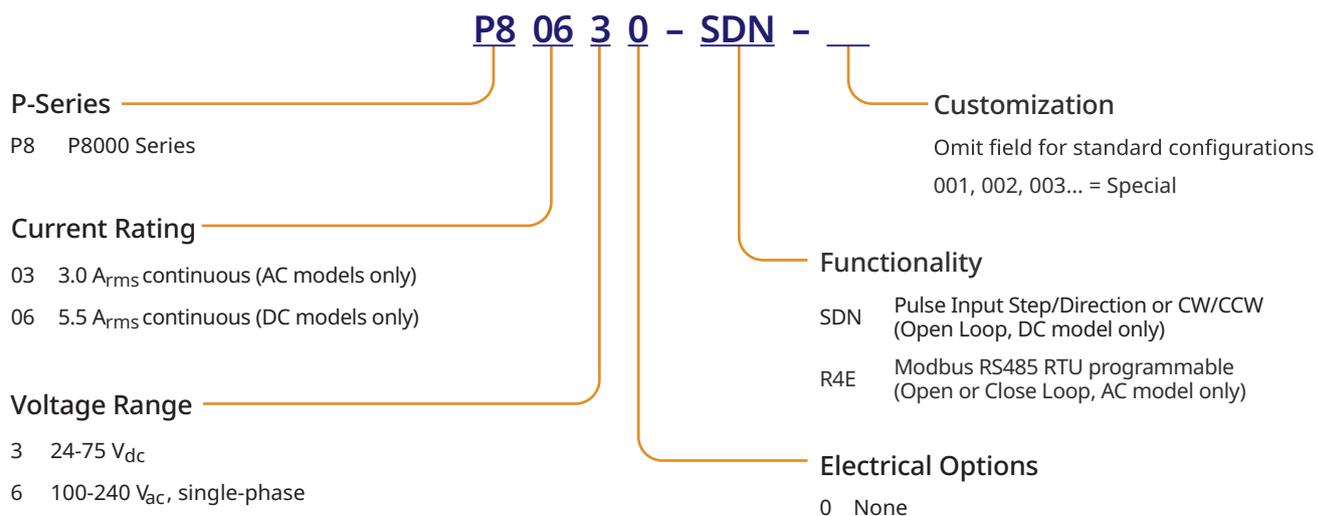
3.7.2 Electrical Noise Reduction

Use shielded and twisted cabling for the signal and motor power cables to reduce electrical noise.

3.7.3 Shock Hazard Reduction

See the [Your responsibility](#) and [Safety Guidelines](#) sections for safety information that must be followed to reduce shock hazard.

4 Model Nomenclature

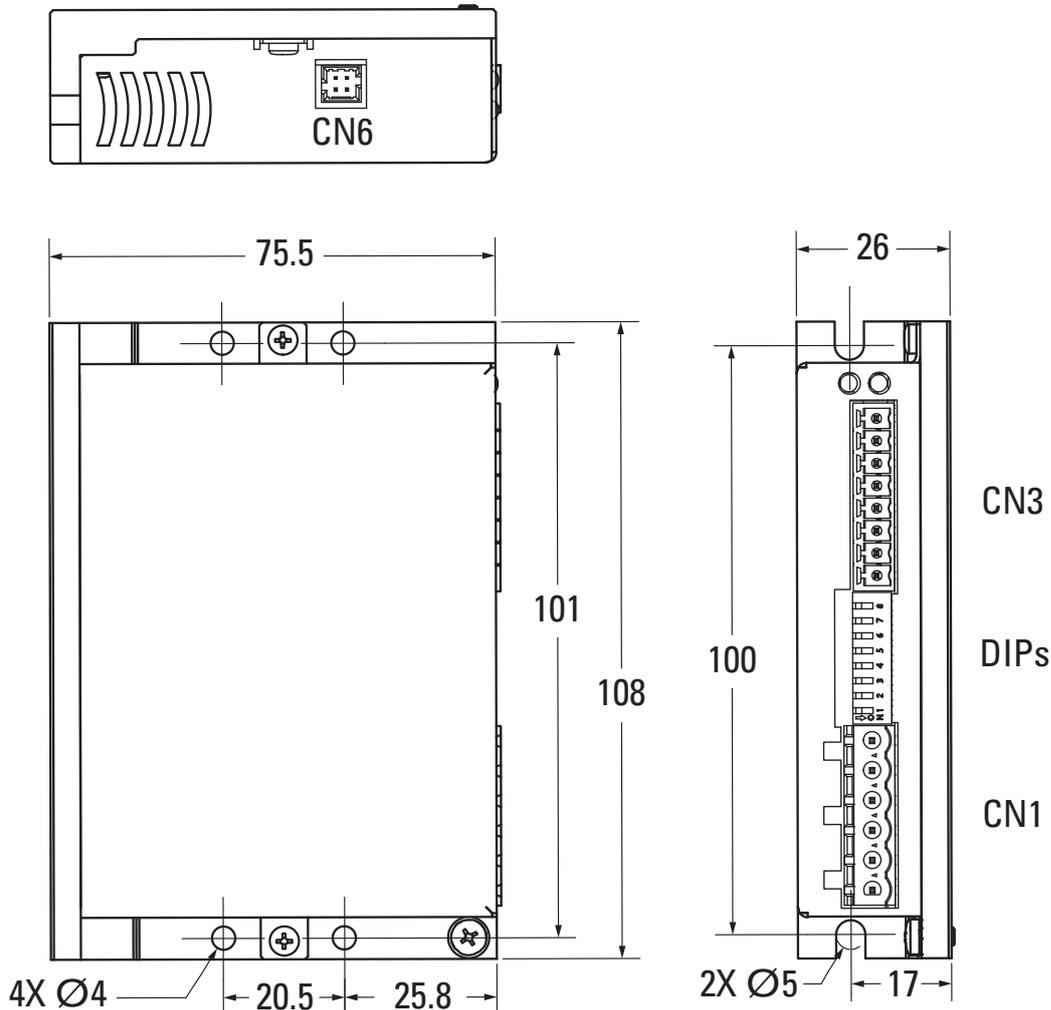


5 Technical Data Overview

- Power Supply: 24-75 V_{DC}
- Phase Current: up to 5.5 A_{RMS} (7.8 A_{peak})
- Chopper Frequency: ultrasonic 40KHz
- Protections Against: over current, overvoltage/undervoltage, overheating, short circuit between motor phase-to-phase and phase-to-ground
- Emulated Step Angle: Full Step, 1/2, 1/4, 1/8, 1/16, 1/32, 1/64, 1/128, 1/5, 1/10, 1/20, 1/25, 1/30, 1/36, 1/50, 1/100 configurable by means of dip-switches
- Pulse Input (Step/Direction or CW/CCW) control mode
- Digital Inputs : 3 (Step, Direction, and Enable)
- Digital Outputs: 1 (Fault Output)
- Dimensions: 108 x 75.5 x 26 mm (without connectors)
- Weight: 200g
- Protection Degree: IP20
- Pollution Degree: 2
- Working Temperature: 5 °C to 40 °C
- Storage Temperature: -25 °C to 55 °C
- Humidity: 5% to 85%, non-condensing

6 Mechanical Data

CN1: Power Supply & Motor Connections
 CN3: Digital Inputs/Outputs
 CN6: Service SCI Interface



6.1 Mounting The P8000

Mount the P80630 drive to either a cold plate using four M4 screws located on the bottom plate of the drive or a panel wall using two M5 screws located on the back plate of the drive.

Your installation should meet the following guidelines:

- Securely fastened to a flat, solid, non-painted surface that will support the 200g mass (7.05 oz) to help conduct heat away from the chassis.
- Free of excessive vibration or shock
- Minimum unobstructed space of 1.5 in. (38.1 mm) of space around all sides.
- Maximum case temperature of 70 °C. If the case exceeds this temperature, it may shut down due to overheating and potentially reduce the lifespan of the drive. Fan cooling or a lower working temperature may be required to allow the drive to run properly.

CAUTION

Never put the drive where it can get wet or where metal or other electrically conductive particles can get on the circuitry.

6.2 Connections

NOTE: This connection is only possible with hardware and software provided by Kollmorgen.

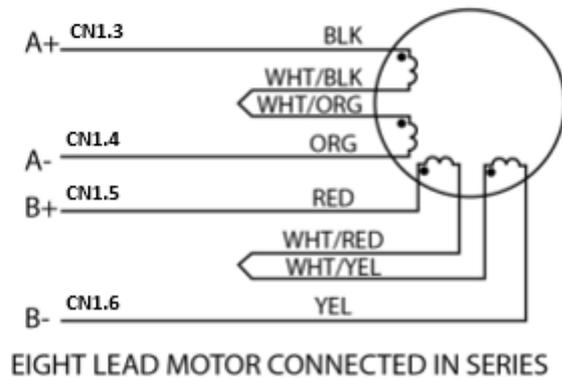
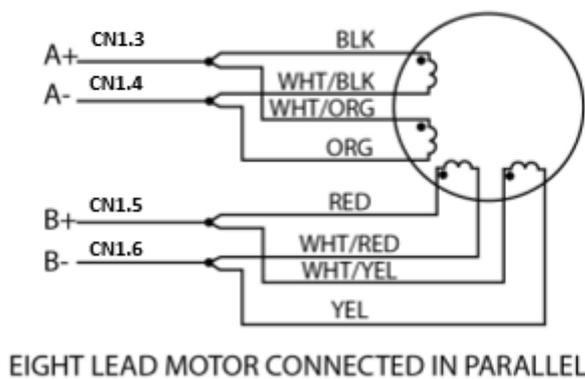
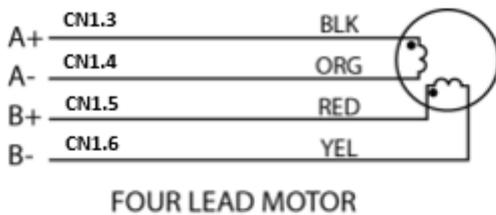
6.2.1 CN1: Power Supply & Motor Connections

6 position, pitch 5.08mm, PCB header connector

CN1.1	V+	PWR_IN	Positive DC power supply input
CN1.2	V- (GND)	PWR_IN	Negative DC power supply input
CN1.3	A+ (A)	PWR_OUT	Motor Output phase A+ (A)
CN1.4	A- (A/)	PWR_OUT	Motor Output phase A- (A/)
CN1.5	B+ (B)	PWR_OUT	Motor Output phase B+ (B)
CN1.6	B- (B/)	PWR_OUT	Motor Output phase B- (B/)

The following diagrams show the required connections between the P80630 Motor Connector and Kollmorgen stepper motors with flying leads. Connections are shown for 4 lead motors, 8 lead motors with paralleled windings, and 8 lead motors with series windings.

6.2.1.1 Motor Phase Connection Configurations Diagram



CAUTION

If applicable, ensure motor ground wire is connected to the PE screw located on the drive.

6.2.2 CN3: Digital Inputs/Outputs

8 positions, pitch 3.81mm, PCB header connector

CN3.1	STEP+	DIG_IN	Clock frequency + input (Clock_up+)
CN3.2	STEP-	DIG_IN	Clock frequency - input (Clock_up-)
CN3.3	DIR+	DIG_IN	Motor direction + input (Clock_down+)
CN3.4	DIR-	DIG_IN	Motor direction - input (Clock_down-)
CN3.5	EN+	DIG_IN	Enable + input
CN3.6	EN-	DIG_IN	Enable - input
CN3.7	OUT_C	DIG_OUT	FAULT + (Fault output collector side)
CN3.8	OUT_E	DIG_OUT	FAULT - (Fault output emitter side)

NOTE

See [Digital Input Connections](#) and [Digital Output Connections](#) for Input/Output specifications.

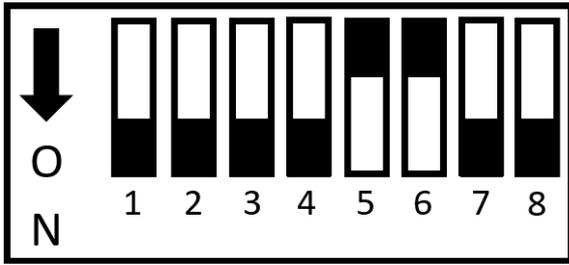
6.2.3 CN6: Service SCI Interface

CN6.1	Not Used	Not Used
CN6.2	Not Used	Not Used
CN6.3	Not Used	Not Used
CN6.4	Not Used	Not Used

NOTE

The Service SCI Interface is only used for field maintenance or applicable firmware changes performed in conjunction with the Kollmorgen Customer Support team.

6.3 Switches Settings



Factory default positions shown

This chapter explains how to configure the P80630 using the dip-switches. The intent is to familiarize the P80630 user with the hardware adjustments and settings required to power and operate the P80630 drive.

The device reads the dip-switches only during the power up sequence. If it's necessary to change settings, shut down the system, change the settings and start up the system again to implement the changes.

6.3.1 Dip-Switches Setting - Motor Phase Current

NOTE

Drive current is set by the dip-switches. For Kollmorgen motors, use the Rated Current per Phase (A_{RMS} = Amps DC in 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. Ensure you properly check the units of the current rating. If you cannot select the exact current rating of the motor, then select the closest Motor Phase Current rating that does not exceed the current rating of the motor.

Motor Phase Current, A_{RMS} (A_{peak})	DIPs			
	SW1	SW2	SW3	Default
5.5 (7.8)	OFF	OFF	OFF	
4.9 (7.0)	ON	OFF	OFF	
4.5 (6.4)	OFF	ON	OFF	
3.9 (5.6)	ON	ON	OFF	
3.4 (4.8)	OFF	OFF	ON	
2.8 (4.0)	ON	OFF	ON	
2.2 (3.2)	OFF	ON	ON	
1.7 (2.4)	ON	ON	ON	X

NOTE

The default unit is A_{peak} . A_{RMS} is calculated by dividing the A_{peak} value by 1.41.

6.3.2 Dip-Switches Setting - Idle Current Reduction

NOTE

Idle Current Reduction automatically reduces the motor phase current at times when no motion is commanded. Motor current is reduced 1.0 seconds after no step commands are received. Setting SW4 to OFF cuts motor current to 90% of its commanded value, while setting SW4 to ON cuts motor current to 50% of its commanded value. It is recommended to use the 90% setting when high holding torque is required in the application.

SW4	Current reduction range	Default
OFF	Idle current reduction to 90%	
ON	Idle current reduction to 50%	X

6.3.3 Dip-Switches Setting - Motor Step Resolution

NOTE

Motor Step Resolution sets the amount of rotation per input step. For all stepper motors with a 1.8 degree step angle, steps per revolution can be calculated using the table shown. The advantages of a smaller microstep size, such as 1/8 or smaller, are:

- Higher resolution
- Smoother low speed operation
- Ability to operate in low-speed resonance regions

Steps per Revolution (Step Size)	DIPs				Default
	SW5	SW6	SW7	SW8	
20,000 (1/100 Step)	OFF	OFF	OFF	OFF	
10,000 (1/50 Step)	ON	OFF	OFF	OFF	
7,200 (1/36 Step)	OFF	ON	OFF	OFF	
6,000 (1/30 Step)	ON	ON	OFF	OFF	
5,000 (1/25 Step)	OFF	OFF	ON	OFF	
4,000 (1/20 Step)	ON	OFF	ON	OFF	
2,000 (1/10 Step)	OFF	ON	ON	OFF	
1,000 (1/5 Step)	ON	ON	ON	OFF	
25,600 (1/128 step)	OFF	OFF	OFF	ON	
12,800 (1/64 Step)	ON	OFF	OFF	ON	
6,400 (1/32 Step)	OFF	ON	OFF	ON	
3,200 (1/16 Step)	ON	ON	OFF	ON	
1,600 (1/8 Step)	OFF	OFF	ON	ON	X
800 (1/4 Step)	ON	OFF	ON	ON	
400 (1/2 Step)	OFF	ON	ON	ON	
200 (Full-Step)	ON	ON	ON	ON	

7 Working Status (LED)

Visualization Status			Description
1		Green ON	Driver enabled
2		Green Blinking (1sec)	Driver disabled
3		Red ON	Protection: Motor is in open phase condition
4		Red Blinking (200ms)	Protection: Motor phase shortcut (short circuit)
5		Red ON (2sec) + Yellow (1sec) Blink	Protection: Over voltage
6		Red ON (2sec) + Yellow (1sec) Blink + Yellow (1sec) Blink	Protection: Under voltage
7		Red ON (2sec) + Yellow (1sec) Blink + Yellow (1sec) Blink + Yellow (1sec) Blink	Thermal Protection: Over temperature
8		Yellow Blinking (200ms)	Motor stalled

When any of the following situations occur, the drive is placed in a fault condition.

Defect	Cause	Action
Intervention of the thermal protection	Can be caused by a prolonged duty cycle, high current in the motor, or high voltage paired with a low inductance motor	Improve the drive cooling by a natural or fan airflow. Consider using a motor with a higher torque vs. current rating.
Intervention of the current protection	Short circuit on the motor power stage (s) of the drive	Check the motor windings and cables to remove the short circuits; replace any faulty cables or the motor if necessary
Intervention of the over/under voltage protection	Supply voltage out of range	Check the value for the supply voltage.
Open phase motor protection	Motor windings to the drive are not connected properly	Check the motor cables and connections to the drive.

NOTE

The fault condition will remain until the drive is reset by the following method:

- Power Cycle

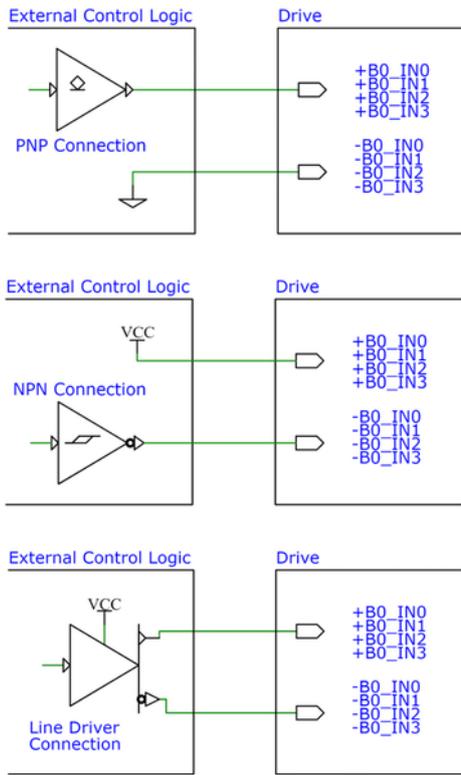
CAUTION

Remember to avoid ON/OFF switching of any 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 P8000 drive or the ON/OFF switch.

8 Digital Input Connections

Single-ended PNP or NPN and Differential Line Driver type (5 – 24 V_{DC} Inputs)



Standard (EN)			
Characteristics	Min	Max	Unit
Nominal Supply Voltage	5	24	V _{DC}
Input Frequency Limit	—	20	kHz
Threshold Switching Voltage	2.25	2.75	V _{DC}
Current Draw at 5 V _{DC}	—	6	mA
Current Draw at 24 V _{DC}	—	15	mA

High-Speed (STEP & DIR)			
Characteristics	Min	Max.	Unit
Nominal Supply Voltage	5	24	V _{DC}
Input Frequency Limit	—	200	kHz
Threshold Switching Voltage	2.25	2.75	V _{DC}
Current Draw at 5 V _{DC}	—	6	mA
Current Draw at 24 V _{DC}	—	15	mA
Min. STEP Pulse Width	—	0.5	μs
Min. DIR Pulse Width	—	50	μs

The P80630 stepper drive has two inputs dedicated to step (STEP) and direction (DIR). They accept a nominal range of 5-24 V_{DC} signals up to 200 kHz. The threshold switching voltage represents the min. supply voltage (amplitude of waveform) that may be recognized by the input. The limit is 2.5 +/- 10% V_{DC}. Therefore, in some cases with an input voltage of 5 V_{DC} peak-to-peak, a voltage offset of +0.5 V_{DC} or greater may be required to trigger the input.

The STEP input is used to command motor rotation. The motor executes one step when the STEP input closes. The minimum pulse width (ON/OFF) times are 0.5μs (500 ns). Pulses that do not meet the minimum times may be ignored by the drive's electronics.

NOTE

Alternatively, the STEP input can be used as a Clock Up input to rotate the motor clockwise (CW) or counterclockwise (CCW) depending on the wiring configuration. If wired according to the [Motor Phase Connection Configurations Diagram](#) Clock Up should result in CCW rotation when closed (5-24V_{DC} applied).

The DIR input is used to control direction of rotation. If wired according to the [Motor Phase Connection Configurations Diagram](#), an open input ($0 V_{DC}$) will result in clockwise (CW) rotation and a closed input ($5-24 V_{DC}$ applied) will result in counterclockwise (CCW) rotation. If necessary, once power is removed, the direction can be reversed by reversing the connection of either (not both) of the motor phase connectors (i.e. switching A+ & A- OR B+ & B-).

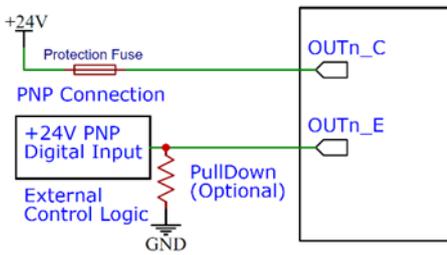
NOTE

- Allow for a $50\mu s$ setup time from changes at the DIR input prior to transition of the STEP input. Failure to meet setup time can result in the drive misinterpreting the intended direction of a step.
- Alternatively, the DIR input can be used as a Clock Down input to rotate the motor CW or CCW depending on the wiring configuration. If wired according to the [Motor Phase Connection Configurations Diagram](#) Clock Down should result in CW rotation when closed ($5-24 V_{DC}$ applied).

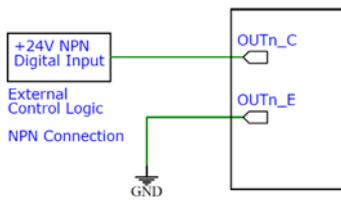
The Enable (EN) input is used to enable or disable the P80630's power stage. This input accepts a nominal range of $5-24 V_{DC}$ signals up to 20 kHz. The threshold switching voltage represents the min. supply voltage (amplitude of waveform) that may be recognized by the input. The limit is $2.5 \pm 10\% V_{DC}$. Therefore, in some cases with an input voltage of $5 V_{DC}$ peak-to-peak, a voltage offset of $+0.5 V_{DC}$ or greater may be required to trigger the input. When the EN input is closed ($5-24 V_{DC}$ applied), the drive is deactivated (disabled); all the transistors will shut down and the motor will be free. When the EN input is open ($0 V_{DC}$), the drive is activated (enabled); motor is powered.

9 Digital Output Connections

PNP with $V_{OUT} = 5-24 V_{DC}$, $I_{OUTmax} = 100 \text{ mA}$, $F_{max} = 2 \text{ kHz}$.



NPN with $V_{OUT} = 5-24 V_{DC}$, $I_{OUTmax} = 100\text{mA}$, $F_{max} = 2 \text{ kHz}$.



The P80630 stepper drive has one dedicated fault output to signal a fault condition in the drive amplifier. The maximum collector current is 100 mA, and the maximum collector to emitter voltage is $24V_{DC}$. The output can be wired as a PNP or NPN configuration based on your control logic input. When the drive is working normally, the output is active/closed (logic '1'). When the drive encounters an error, the output opens (logic '0') and signals a fault condition via the LED lights. For more information about fault conditions, see [Working Status \(LED\)](#).

10 Mating Connectors

NOTE

These connectors can also be purchased from Kollmorgen by ordering CONKIT-P80360-R4E. See Accessories.

Connector	Description
CN1	Phoenix 1758830
CN3	Phoenix 1839694

11 Connection Specification Chart

Function	Wire Cross-Section	
	Minimum	Maximum
Power Supply, Motor Outputs and PE (CN1)	0.20 mm ² (AWG24)	2.5 mm ² (AWG14)
Inputs and Outputs (CN3)	0.14 mm ² (AWG26)	1.5 mm ² (AWG16)

NOTE

Wiring should meet all applicable regulations.

12 Inrush Current and Fusing

Peak Current	5.5 ARMS (7.8 Apeak)
Suggested External Fusing	6.3A Slow Blow (Class J or RK1 Time Delay)

NOTE

The Suggested External Fusing refers to any applicable external fuse on the power supply. External fusing should be wired in series over the positive power supply input. In addition, there is a 10A internal fuse across the power supply inputs (V+ and V-) on the P80630-SDN drive. If you suspect the internal fuse is damaged, contact Kollmorgen Customer Support to evaluate repair or replacement options.

13 Regulatory Information

13.1 Conformance with RoHS

The device is manufactured in conformance with RoHS Directive 2011/65/EU with delegated directive 2015/863/EU for installation into a machine.

13.2 Conformance with EU

Kollmorgen declares the conformity of the product series P80630-SDN with the following directives: EU Directive 2014/30/EU, EMC Directive, using harmonized standard EN 61800-3. EU Declarations of Conformity can be found on the Kollmorgen website.

The drives have been tested by an authorized testing laboratory using the configuration described in this documentation. The user is responsible for ensuring conformance with regulatory requirements.

Support and Services

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.



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