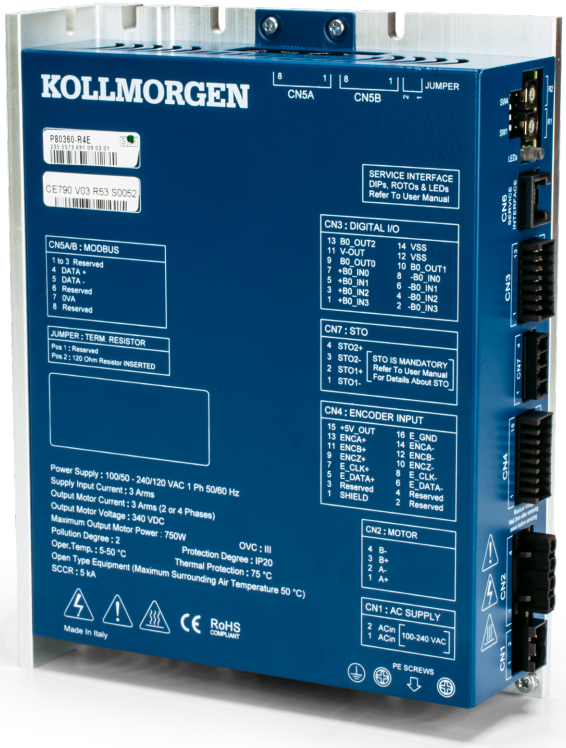
P80360-R4E Stepper Drive
Installation Manual



P8000

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

Document Edition: E, November 2023

Part Number: 903-803600-00

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

Front Matter

Record of Document Revisions

Version	Date	Notes
A	June 2023	Initial documentation
B	August 2023	Circuitry of the Control Ports diagram and Model Nomenclature update
C	September 2023	Updated Modbus cable, Service SCI Interface, and connections information. Added thermal dissipation table.
D	September 2023	Added Thermal Dissipation information
E	November 2023	Updated Wiring Guidelines and Safety Guidelines

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Table of Contents

1 Introduction

This manual describes the P80360-R4E 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
- Manual Bus Communication
- Kollmorgen Space Help
- Motor technical specifications
- 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/.

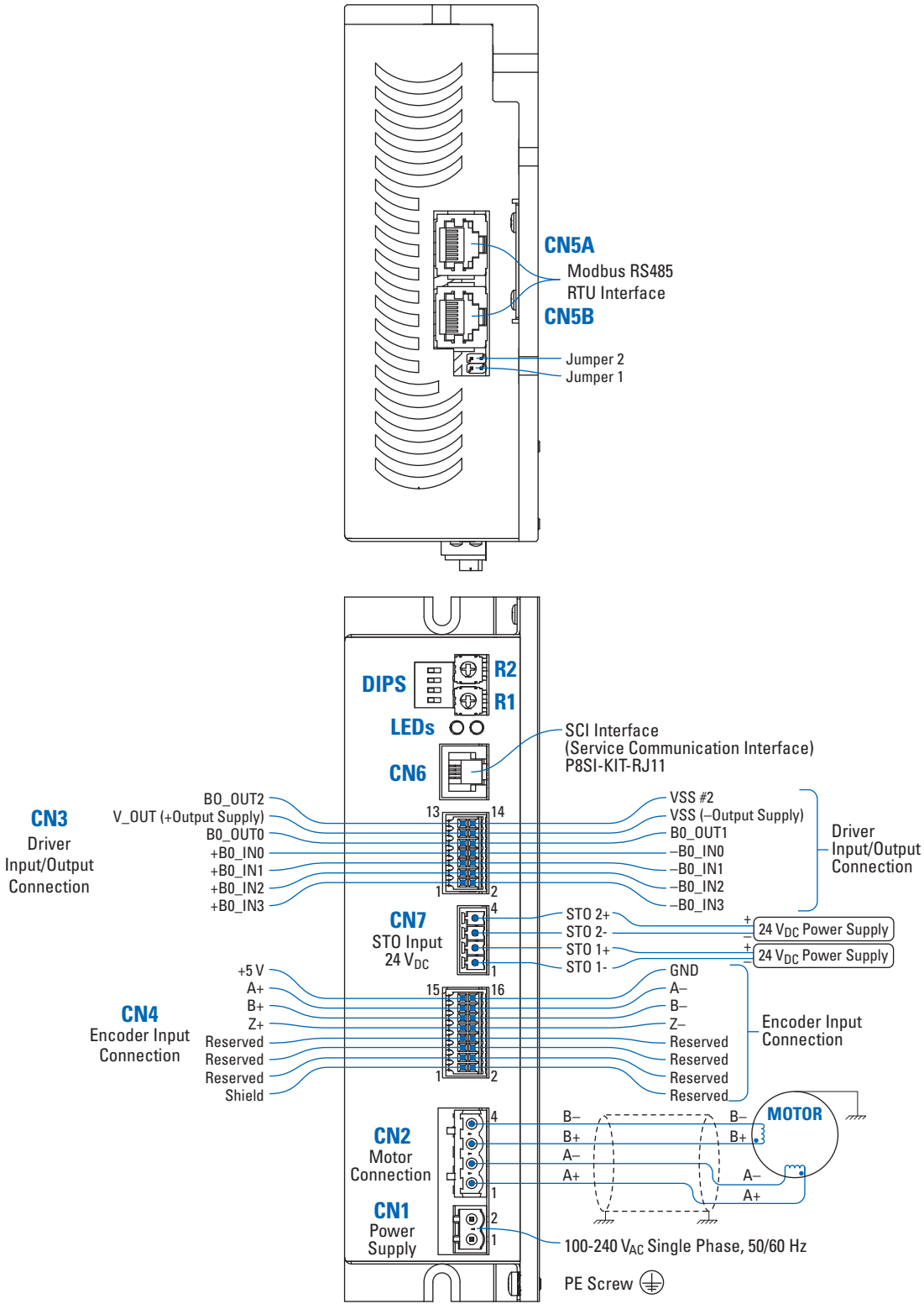
Kollmorgen Space Help can be found at: https://webhelp.kollmorgen.com/space/content/index.htm.

2 Additional System Components and System Diagram

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

- AC Power (100-240 V_{AC}, single-phase, 50/60 Hz)
- DC Power Supply ($24V_{DC}$) for STO inputs and Digital Outputs
- Stepper Motor
- Modbus Master Controller (if applicable)

2.1 System Diagram



NOTE: Your installation may vary from this configuration.

3 You Should Read This

This section contains guidelines for the safe installation of the drives and the stepper motor.

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.
	An essential element to stay within the limits specified by the EMC directives is, in addition to the use of filters, the installation in accordance with the EMC requirements.

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.
- 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. Remove the power supply before touching or removing a connection. 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.
- Be careful of the motor terminals (CN2 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.
- The negative pole of the power supply is NOT connected to the ground through an internal connection to the drive. Ensure PE connection is made to the external screw on the drive case. The Protective Earth connection (PE) has to comply with the local requirements in force. Keep all covers and cabinet doors shut during operation.
- 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.
- Wait until the green LED light is switched off before manipulating or executing maintenance to the drive.
- 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.
- Pay attention to the temperature of the drive. Using the drive in extreme applications can result in some surfaces reaching high temperatures. Wait until the drive has cooled down before disconnecting it.
- Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Manufacturer Instructions, National Electrical Code, and any additional local codes.

3.5 Electromagnetic Compatibility

- Take all precautions and requirements which are necessary for the compliance with the electromagnetic compatibility. The drive is in Category C3 following standard EN 61800-3 without an EMC line filter. With an appropriate EMC line filter, the drive will meet Category C2.
- The drive should be installed using EMC best practices.
- When making the connections, take into account the requirements of the Wiring Guidelines.

3.6 Unpacking and Inspecting

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

3.6.1 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.

3.6.2 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.

3.7 Wiring Guidelines

For proper drive installation:

Guideline For Wiring	Effects
Establish the PE connection on the drives by means of a mechanical screw. (Tightening torque = 1.51 Nm)	Necessary electrical safety connection. Increases the immunity against irradiated disturbances and electrostatic discharges (ESD).
Connect both ends of the signal cable's shielding to the earth/ground.	Increases the immunity against disturbances and reduces the irradiated and conducted emissions.
Use shielded cables for the motor connection. When a shielded cable is used for the motor, connect the shield to PE screw on the drive. AVOID the connection of the shield to the motor body.	Increases the immunity against disturbances and reduces the irradiated and conducted emissions.
Connect the body of the motor to the earth/ground. The motor body and the cable shield must be connected to the ground terminal by means of 2 separated cables.	Necessary electrical safety connection. Reduces the conducted emissions.
Keep the cables between the motor and the drive as short as possible and avoid ground loops.	Increases the immunity against disturbances and reduces the irradiated and conducted emissions.
The paths of the signal cables must be separated and/or shielded from the motor cables and power supply to avoid inductive coupling that can cause erratic behavior.	Increases the immunity against disturbances.

NOTE

Only use:

- 60/75 °C wires
- Copper conductors

4 General Drive Description

The information in this manual refers to all released versions of the P80360 drive. This manual contains the procedures for installation, start up, and maintenance of the drive. For information regarding the operating software, consult Kollmorgen Space Help. Functions of the drive may vary depending on the drive model used.

P80360 Series drives utilize a control algorithm that optimizes the output current to the motor phases, whether full-stepping or micro-stepping, enabling smooth motion across the full speed range.

The drives can control 2-phase or 4-phase hybrid stepper motors with phase currents up to 3.0 A_{RMS} (4.2 Apk).

The drive features include:

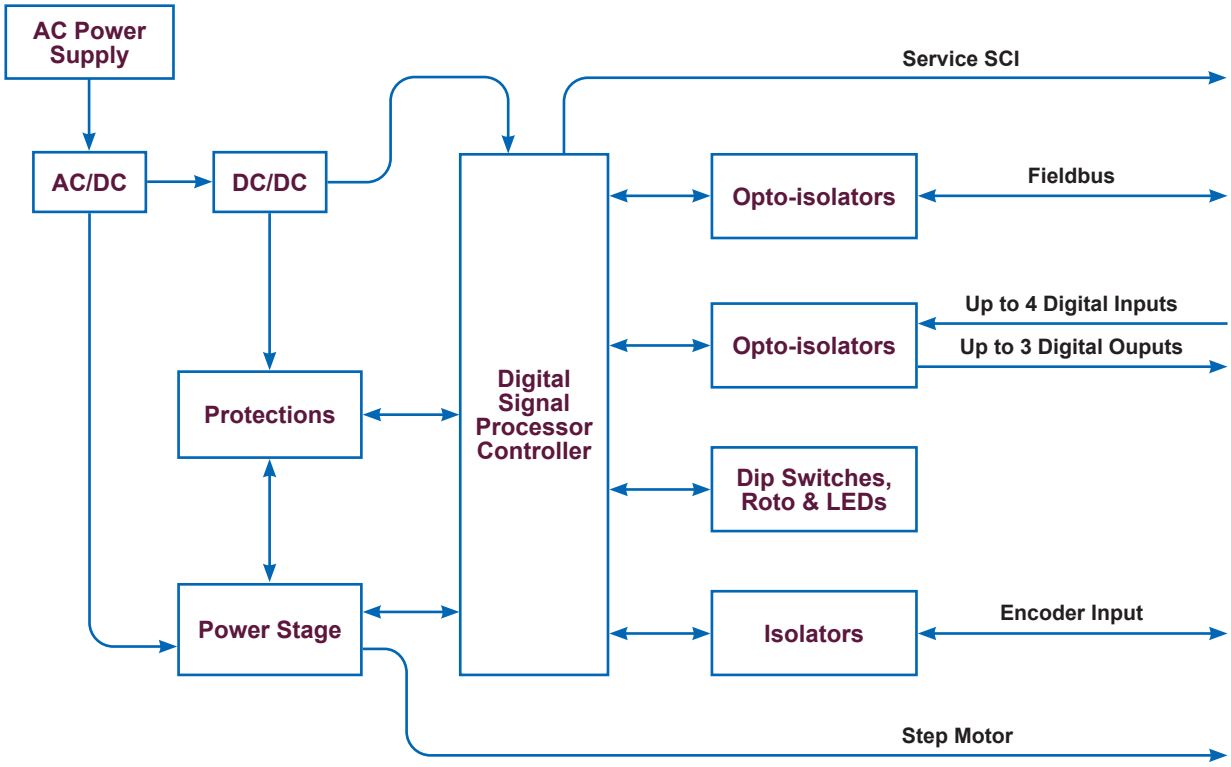
- Active monitoring of the system status
- Fault indicators such as:
  - Overvoltage/Undervoltage
  - Overheating/Overtemperature
  - Over Current
  - Open Motor Phase/Short Circuit

  NOTE

  Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance with the Manufacturer Instructions, National Electrical Code, and any additional local codes.

- Capability to generate operational ramps for the motor

The diagram shows the functional blocks composing the drives:



5 Model Nomenclature

P8 06 3 0 – SDN –

P-Series

P8 P8000 Series

Current Rating

03 3.0 A_{rms} continuous (AC models only)

06 5.5 A_{rms} continuous (DC models only)

Voltage Range

3 24-75 V_{dc}

6 100-240 V_{ac}, single-phase

Electrical Options

0 None

Functionality

SDN Pulse Input Step/Direction or CW/CCW (Open Loop, DC model only)

R4E Modbus RS485 RTU programmable (Open or Close Loop, AC model only)

ECE EtherCAT DS402 (Open or Close Loop, AC model only)

Customization

Omit field for standard configurations

001, 002, 003... = Special

6 Choosing the Stepper Motor

The P80360 drives have been designed to function with 2- phase hybrid stepper motors with the following characteristics:

The nominal winding current depends on the drive model.

	MIN	TYP	MAX	UNIT	Notes
Motor current	—	—	3.0	A_{RMS}	SW setting
	—	—	4.2	A_{pk}	

The stepper motor is chosen depending on the application requirements including the:

- Torque required by the shaft
- Speed
- Size of the motor
- Current
- Inductance

NOTE

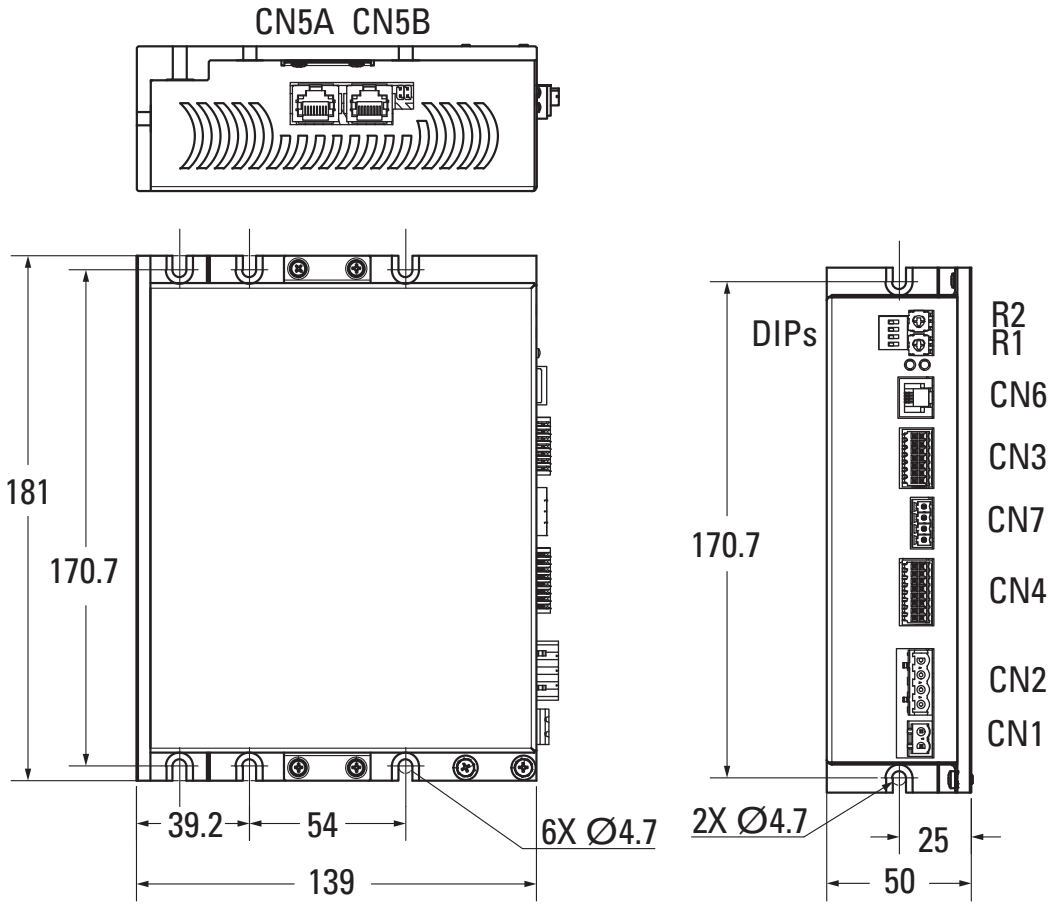
When selecting a Kollmorgen stepper motor, always be sure to consult the Stepper Optimizer tool when sizing your application. Certain voltage levels may cause overheating when operating at or near maximum current.

7 Technical Data Overview

- Power Supply: 100 – 240 V_{AC}, single-phase, 50/60Hz
- Mandatory, Dual Safe Torque Off (STO) Inputs (isolated): 24 V_{DC}
- Phase Current: up to 3.0 A_{RMS} (4.2 Apeak)
- Chopper Frequency: ultrasonic 40KHz
- Micro-stepping Range: Full-Step up to 1/256 (51,200 steps/rev)
- Fault Indicators: over current, overvoltage/undervoltage, overheating, short circuit between motor phase-to-phase and phase-to-ground
- Modbus RTU communication interface
- Incremental Encoder Input: 5V Differential (RS422) or 5V single-ended TTL/CMOS
- Service SCI interface for programming and real-time debugging
- Digital Inputs: 4
- Digital Outputs: 3
- Dimensions: 180.7 x 138.5 x 50 mm (without connectors)
- Weight: 800g
- Protection Degree: IP20
- Pollution Degree: 2
- Overvoltage Category III
- Short Circuit Current: 5 kA
- Protection Class: Class I Equipment
- Working Temperature 5 °C to 50 °C
- Storage Temperature -25 °C to 55 °C
- Humidity: 5% to 85%, non-condensing

8 Mechanical Data

CN1: Power Supply Inputs
CN2: Motor Connections
CN3: Digital Inputs/Outputs
CN4: Feedback Connections
CN5A or CN5B: Modbus RTU Interface
CN6: Service SCI Interface
CN7: STO Inputs (mandatory)



8.1 Connections

8.1.1 CN1: Power Supply Inputs

2 position, pitch 5.08mm, PCB header connector

CN1.1	ACin	PWR_IN	AC power supply input
CN1.2	ACin	PWR_IN	AC power supply input

⚠WARNING

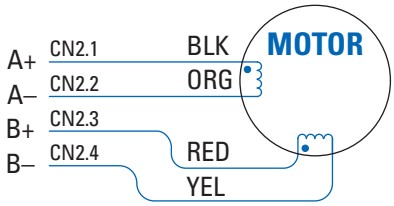
Ensure PE (Ground) connection for the AC Power Supply Input is connected to the PE Screw located on the drive.

8.1.2 CN2: Motor Connections

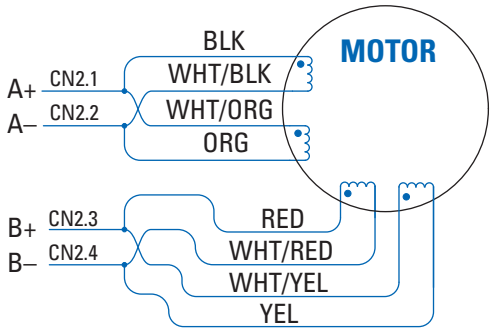
4 position, pitch 5.08mm, PCB header connector

CN2.1	A+ (A)	PWR_OUT	Motor phase A+ (A)
CN2.2	A- (A/)	PWR_OUT	Motor phase A- (A/)
CN2.3	B+ (B)	PWR_OUT	Motor phase B+ (B)
CN2.4	B- (B/)	PWR_OUT	Motor phase B- (B/)

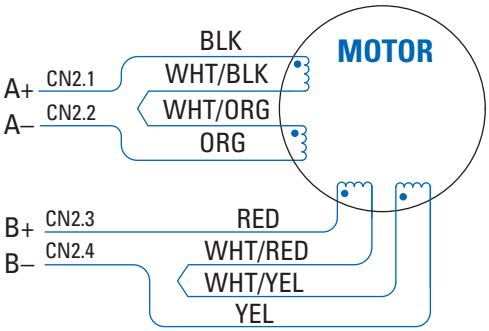
The following diagrams show the required connections between the P80360 Motor Connector and Kollmorgen Stepper Motors with flying leads. Connections are shown for 4 lead motors, 8 lead motors with paralleled windings and 8 lead motors with series windings.



FOUR LEAD MOTOR



EIGHT LEAD MOTOR CONNECTED IN PARALLEL



EIGHT LEAD MOTOR CONNECTED IN SERIES

⚠CAUTION

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

8.1.3 CN3: Digital Inputs/Outputs

14 position, pitch 2.54mm double row, PCB header connector

CN3.1	+B0_IN3	DIG_IN	Digital input B0_IN3 positive side
CN3.2	-B0_IN3	DIG_IN	Digital input B0_IN3 negative side
CN3.3	+B0_IN2	DIG_IN	Digital input B0_IN2 positive side
CN3.4	-B0_IN2	DIG_IN	Digital input B0_IN2 negative side
CN3.5	+B0_IN1	DIG_IN	Digital input B0_IN1 positive side
CN3.6	-B0_IN1	DIG_IN	Digital input B0_IN1 negative side
CN3.7	+B0_IN0	DIG_IN	Digital input B0_IN0 positive side
CN3.8	-B0_IN0	DIG_IN	Digital input B0_IN0 negative side
CN3.9	B0_OUT0	DIG_OUT	PNP digital output B0_OUT0
CN3.10	B0_OUT1	DIG_OUT	PNP digital output B0_OUT1
CN3.11	V_OUT	PWR_IN	24 V_{DC} input supply for digital outputs
CN3.12	VSS #1	PWR_IN	Negative side of supply for digital outputs
CN3.13	B0_OUT2	DIG_OUT	PNP digital output B0_OUT2
CN3.14	VSS #2	PWR_IN	Negative side of supply for digital outputs

8.1.4 CN4: Feedback Connections

NOTE

CN4 Encoder Inputs are only used when operating in Closed Loop operation mode.

16 positions, pitch 2.54mm double row, PCB header connector

CN4.1	SHIELD	/	Cable Shield connection for feedback interface
CN4.2	Reserved	—	Reserved
CN4.3	Reserved	—	Reserved
CN4.4	Reserved	—	Reserved
CN4.5	Reserved	—	Reserved
CN4.6	Reserved	—	Reserved
CN4.7	Reserved	—	Reserved
CN4.8	Reserved	—	Reserved
CN4.9	ENCZ+	DIG_IN	Encoder Zero differential input positive
CN4.10	ENCZ-	DIG_IN	Encoder Zero differential input negative
CN4.11	ENCB+	DIG_IN	Encoder Phase B differential input positive
CN4.12	ENCB-	DIG_IN	Encoder Phase B differential input negative
CN4.13	ENCA+	DIG_IN	Encoder Phase A differential input positive
CN4.14	ENCA-	DIG_IN	Encoder Phase A differential input negative
CN4.15	+5V OUT	PWR_OUT	5 V_{DC} power supply output
CN4.16	E_GND	PWR_OUT	Negative side of supply

8.1.5 CN5A or CN5B: Modbus RTU Interface

RJ45, 8 positions shielded, PCB header connector

CN5.1	N.C.	—	Not Connected
CN5.2	N.C.	—	Not Connected
CN5.3	N.C.	—	Not Connected
CN5.4	DATA+	Digital I/O	Positive RS485 signal
CN5.5	DATA-	Digital I/O	Negative RS485 signal
CN5.6	N.C.	—	Not Connected
CN5.7	0VA	PWR_OUT	Signal Ground for Modbus
CN5.8	N.C.	—	Not Connected

8.1.6 CN6: Service SCI Interface

RJ11, 6P4C, PCB header connector

CN6.1	TX/RX	Transmit / Receive Line
CN6.2	DE/RE	Drive Enable Negated / Receive Enable
CN6.3	+5V	+5V power out
CN6.4	GND+	GND power out

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

8.1.7 CN7: STO Inputs (Mandatory)

4 positions, pitm 3.81mm, PCB header connector

CN7.1	STO1-	PWR_IN	STO1 input negative side
CN7.2	STO1+	PWR_IN	STO1 input positive side
CN7.3	STO2-	PWR_IN	STO2 input negative side
CN7.4	STO2+	PWR_IN	STO2 input positive side

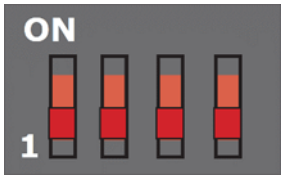
8.1.8 Jumpers

Position 1	Reserved
Position 2	120 Ohm resistor INSERTED

8.2 Switches Settings

8.2.1 Dip-Switches Settings

The drives are equipped with a series of dip-switches and roto-switches with which the user parameters can be set.



NOTE

- 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.
- Before setting the dip-switch and roto-switch settings: shut down the system, remove the CN1 power supply connector, and wait until all LEDs are switched off.
- For fieldbus communications other than Modbus the Dip-Switches and Roto-Switches functionality depends on the firmware installed on the drive. See Kollmorgen Space Help for more information.
- Default positions are:
  - Dips SW1, SW2, and SW3 = OFF; SW4 = ON
  - Roto R1=1 and R2=0

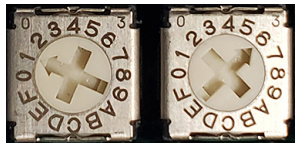
Drive Baud Rate Selection

SW2	SW3	SW4	Modbus
OFF	OFF	OFF	115200
OFF	OFF	ON	57600 (Default)
OFF	ON	OFF	38400
OFF	ON	ON	19200
ON	OFF	OFF	9600
ON	OFF	ON	4800
ON	ON	OFF	2400
ON	ON	ON	1200

8.2.1.1 Dip-Switches Setting SW1

Position	U0 Software Defined
ON	
OFF	X (Default)

8.2.2 Roto-Switches Settings



NOTE

The Node ID roto-switches utilize a hexadecimal system when setting the Node ID. To interpret the correct Node ID, you must convert the hexadecimal value of the roto-switches to a decimal format.
For example, if Node ID = R2R1

Node ID	R2 Value	R1 Value
202	C	A
172	A	C

Node ID Selection

Node ID #	Reserved	1 (Default)	2	3	...	100	101	102	...	200	201	202	...	253	254	255
R1	0	1	2	3	...	4	5	6	...	8	9	A	...	D	E	F
R2	0	0	0	0	...	6	6	6	...	C	C	C	...	F	F	F

9 Working Status (LED)

Visualization Status			Description
1		Green ON	Driver enabled (Properly functioning)
2		Green Blinking	Driver disabled (Enable Off, Current zero)
3		Blue ON	Error: Connect with Service SCI Interface kit and check with Kollmorgen Space Drive Diagnostic window.
4		Blue ON + Yellow ON	Drive in boot mode. A new firmware should be downloaded to the drive.
5		Blue ON + Red Blinking (200ms)	Initialization phase. Should last for a few seconds. Drive is not fully operational while present.
6		Yellow ON	Missing I_nominal current setting
7		Yellow Blinking (500ms)	Warning: Connect with Service SCI Interface kit and check with Kollmorgen Space.
8		Red ON	Protection: Motor is in open phase condition.
9		Red Blinking (200ms)	Protection: Motor phase shortcut (short circuit).
10		Red ON (1s) + Yellow 1 Blink	Protection: Overvoltage.
11		Red ON (1s) + Yellow 3 Blink	Protection: Undervoltage.
12		Red ON (1s) + Yellow 4 Blink	Thermal Protection: Overtemperature.
13		Red ON (1s) + Yellow 5 Blink	Motor Feedback Error
14		Red ON (1s) + Yellow 6 Blink	Missing Torque Enable (24 V_{DC} STO not powered before AC supply).
15		Red ON (1s) + Yellow 7 Blink	Motor Current Regulation is out of range.

NOTE

The drive could be considered in a correct status if LEDs don't show Red, Yellow, or Blue.
In general:

- Red LED: an alarm or a drive protection
- Yellow LED: a warning
- Blue LED: a software internal fault or a non-operative condition

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

Defect	Cause	Action
Intervention of the thermal protection (heatsink > 75 °C)	Can be caused by a prolonged duty cycle, high current in the motor, or high voltage paired with a low inductance motor.	It is necessary to wait until the temperature is within the acceptable range. Next, improve the drive cooling by a natural or fan air flow. Consider using a motor with a higher torque vs current rating.
Intervention of the current protection	Short circuit on the motor power stage of the drive, excessive current absorption or power supply current too low.	Remove the power to the drive to eliminate the cause of the protection. Next, check motor windings and cables to remove the short circuits replacing faulty cables or motor if necessary. Can also occur due to power supply current being too low.
Intervention of the over/under voltage protection	Supply voltage out of range. Too high, too low, or increased voltage due to BEMF generated by the motor	It is necessary to wait until the voltage is within the acceptable range. Check the value for the supply voltage and verify it is within the input voltage limit for the drive.
Open phase motor protection	Motor windings to the drive are not connected properly	Remove the power to the drive to eliminate the cause of the protection. Next, 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
- Alarm Reset within Kollmorgen Space Drive Diagnostic window

When any of the following situations occur, the drive does NOT work, and is NOT placed in an error condition.

Defect	Cause	Action
Noisy motor movement with vibrations	Can be caused by a lack of power supply to a phase of the motor or a poor regulation of the winding currents	Check the cables and connections of the motor and/or change the motor speed to avoid a resonance region.
The external fuse on the power supply of the drive is burned.	Can be caused by a wrong connection of the power supply.	Connect the power supply correctly and replace the fuse.
At high speed, the motor torque is not enough.	Can be due to a "self-limitation" of motor current and torque.	Increase the motor current (always within the limits).

10 Installing the Drive

Mount the P80360 drive to either a cold plate or the wall of the electric cabinet (panel) using M4 screws.

ENVIRONMENT

- The environment in which the drive will be installed needs to be free of impurities, corrosive vapor, gases or liquids.
- Avoid environments where vapor and humidity will condensate.
- Never put the drive where it can get wet or where metal or other electrically conductive particles can get on the circuitry.

When installing the drive in an electrical cabinet (panel), make sure that the opening of the air stream or the cooling system of the cabinet (panel) doesn't make the internal temperature rise above the maximum allowed working temperature (75 °C).

When the drives are built into machines or a plant, the drive must not be used until it has been established that the machine or plant fulfills the requirements of the regional directives.

ASSEMBLY GUIDE

Your installation should meet the following guidelines:

- Securely fastened to a flat, solid, non-painted, conductive, PE grounded metal surface that will support up to a 1200g mass in a vertical orientation.
- Free of excessive vibration or shock
- Maximum case temperature of 75 °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.
- Minimum unobstructed space of 1.5 in. (38.1mm) of space around all sides.

COOLING

Cooling of the drive requires adequate thermal conduction area from the mounting plate within the cabinet, air flow by forced or passive convection, and by thermal radiation. Insufficient cooling can increase the drive temperature until the overtemperature threshold is reached and thermal protection engages (signaled by LEDs).

10.1 Thermal Dissipation

P80360 Thermal Dissipation Specifications

Thermal dissipation with motor powered at max rated current (3.0 A_{RMS})	W	36.0
Thermal dissipation with motor disabled	W	4.4

11 Power Supply Connections

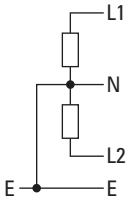
An AC power supply is needed to operate P80360 drives.

For the technical specifications, limitations, and connections regarding the power supply, see Planning the Power Supply.

- AC power supply: 100-240 V_{AC}, Single-Phase, 50/60Hz (1)
- Input Voltage Limit: 85-265 V_{AC} (including ripple and network fluctuations)
- Output Phase Current: Continuous up to 3.0 A_{RMS} (4.2 Apeak) (2)
- Chopper frequency: ultrasonic 40kHz
- Step Angle: Full-Step up to 1/256 (51,200 steps/rev)
- Rotation speed limit: 3000 rpm (3)

1. Drive must be supplied by single-phase (split-phase) three-wire system, AC.

Phase-to-Phase / Phase-to-Earth Voltage	Frequency
100/50 - 240/120 V_{AC}, 1 Ph	50/60Hz



2. Maximum current and power consumption depend on the motor characteristics, load applied to the shaft, and the motion parameters set.
3. Theoretical rotation speed limit is managed by the drive depending on the following parameters: Power supply voltage, output phase current, dynamic motor characteristics, and shaft loading. Above this rotation speed limit, the drive is not able to guarantee a proper control sequence.

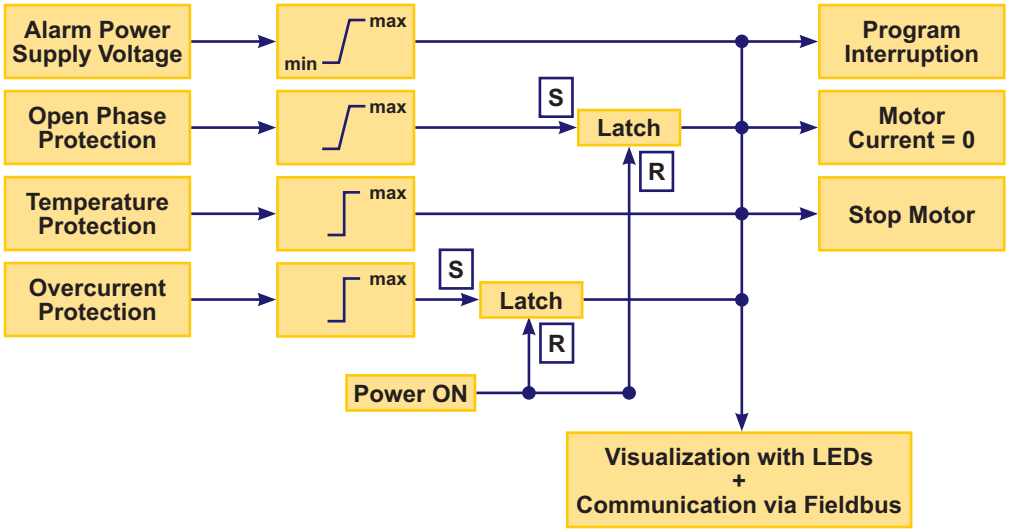
11.1 Protections

Protection	Trigger	Effect	Restore
 Over current: Electronic protection on the motor outputs against short circuits between the motor phases, and between the phases and ground.	Short circuit on the motor power stage of the drive or excessive current absorption.	• Opening of the drive power stages • LEDs signaling	Remove the power supply to the drive to eliminate the cause of the protection. Check motor windings and cables to remove the short circuits replacing faulty cables or motor if necessary.
 Open Motor Phase Detects an open circuit on the motor phases	Motor windings to the drive are not properly connected	• Opening of the drive power stages • LEDs signaling	Remove the power supply to the drive to eliminate the cause of the protection. Check motor cables and connections to the drive.
Overheating/Overtemperature Detects an over temperature of the heatsink.	Temperature of heatsink >75 °C	• Opening of the drive power stages • LEDs signaling	It is necessary to wait until the temperature is within the acceptable range. Improve the drive cooling by a natural or fan air flow. Consider using a motor with a higher torque vs current rating
Overvoltage/Undervoltage Detects a power supply voltage outside the functioning range.	Low power supply voltage, too high, increased voltage due to BEMF generated by the motor	• Opening of the drive power stages • LEDs signaling	It is necessary to wait until the voltage is within the acceptable range. Check the value for the supply voltage and verify it is within the Input Voltage Limit.

When the protection interrupts the power supply to the motor, no current is supplied to the motor (no holding torque) and the load can move to a rest. The user must provide devices that will ensure the safety of the load.

A detailed description of the protections and the related causes/actions are given in Working Status (LED).

11.1.1 Functional Diagram of Protections



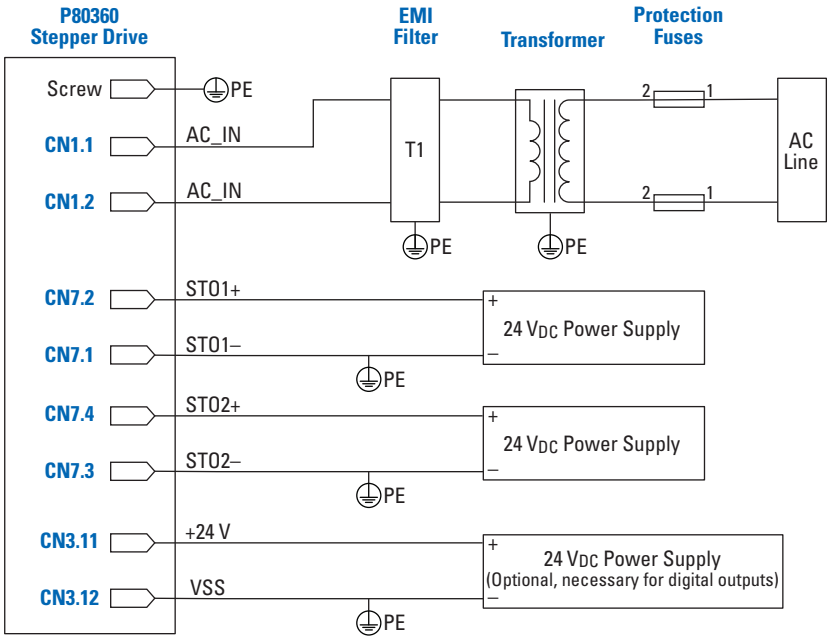
12 Planning the Power Supply

An AC power input is needed to operate the P80360 drives.

NOTE

Digital inputs require a 5-24V_{DC} supply.

12.1 Circuit and Power Supply Connection Schemes



NOTE

A transformer is required for use with 240 V_{AC} in Europe. A transformer with a center tap should be used in order to maintain 120 V_{AC} (line-to-ground) maximum rated voltage. The transformer is optional, or unnecessary, for 120 V_{AC} (line-to-ground) power systems.

12.2 Main Characteristics of the Power Supply

Primary Protectors	Use Class J or RK1 Time Delay fuses on the AC bus or an equivalent safety switch.
EMC Filters	Generally necessary to satisfy the EMC compatibility requirements related to the emissions. An EMC filter is recommended in case of sensitive circuits powered by an AC line. If a commercial line filter is chosen, take into account the total RMS current of the powered system.
	The AC line filter needs to be installed following the builder's directives. Generally, the filter needs to be inserted between the principal AC line and the drive. If a transformer is used, then the filter should be placed between the transformer and the drive.
Transformer	The primary circuit of the transformer must be designed to satisfy the characteristics of the AC power supply line. The voltage peaks on the secondary circuit of the transformer are equal to 1.41*secondary RMS voltage.
	DO NOT use an auto-transformer to interface with the electric network. Only a transformer guarantees the galvanic isolation necessary for electrical safety. Ensure PE connection is made for the transformer.
NOTE	Alternatively, the following procedure can be used to approximately define the power supply characteristics: 1. Power to the motor shaft for each load in Watts: $Wn = \pi * Nn\,[RPM] * \frac{Tn[Nm]}{30}$ 2. Power to support the total load in Watts : WS = sum of the Wn of the loads moving simultaneously; 3. Power of the transformer in Watts: $TW = 2 * WS$ (efficiency = 0.5) 4. Power of the transformer in VA: $TVA = \frac{TW}{0.7}$ (single phase) OR $TVA = \frac{TW}{0.8}$ (three phase) 5. Take into account a voltage drop of about 8% for the transformer during the application of the load (the secondary voltage must not exceed a voltage value of 108% of the nominal value when the load is zero). A simple and fast alternative method to calculate the power in VA of the transformer is: $TVA\ (VA) = \sqrt{2} * VDC_{BUS} * Imax_{PHASE(RMS)}$

12.3 Inrush Current and Fusing

Peak Current	4.2 Apeak (3.0 A_{RMS})
Suggested External Fusing	3A Slow Blow (Class J or RK1 Time Delay)
NOTE	The suggested external fusing refers to applicable external fuses on the power supply. Fuses should be wired in series over the AC line inputs as shown in the power supply diagram in Circuit and Power Supply Connection Schemes. If you suspect the drive may be damaged, contact Kollmorgen Customer Support to evaluate repair or replacement options.

13 Modbus RS485 Interface

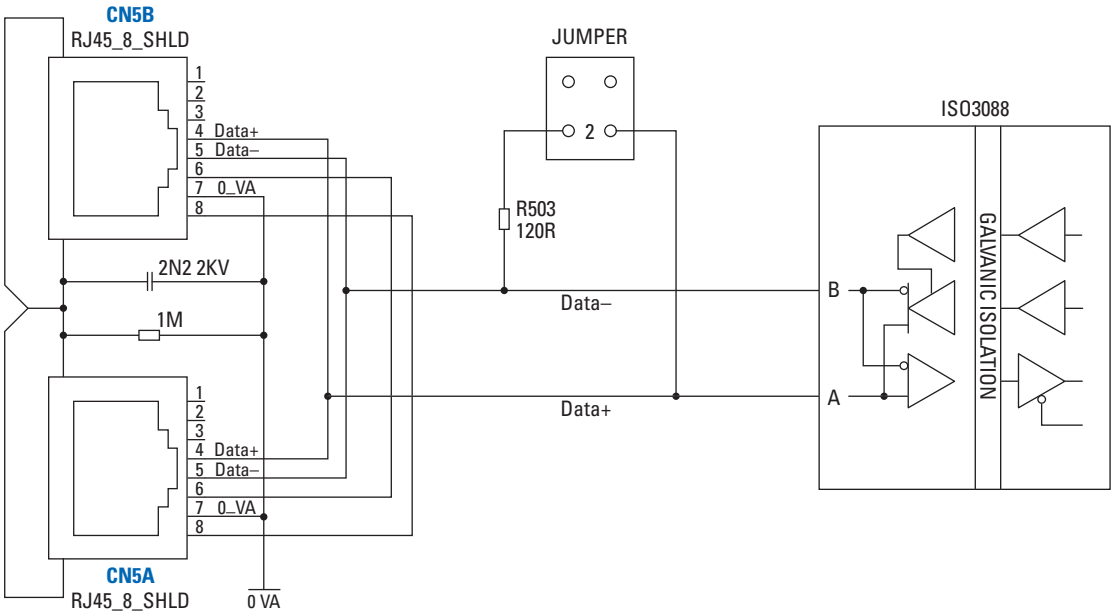
The Modbus interface allows a multi-point link connection conforming to the standard RS-485 CCITT V.11 X.27. The isolated interface is supplied of power through an internally isolated DC/DC converter. No external power supply is needed.

The presence of the Modbus interface depends on the system version.

The drive version, P80360-R4E, is equipped with two RJ45 connectors with 8 parallel pins (CN5A and CN5B) to simplify the connection of the nodes to the MODBUS ® network.

Cat. 5 Ethernet cables can be used for connection between P80360-R4E drives and between the P80360-R4E drive and the Modbus master (HMI, controller, etc.).

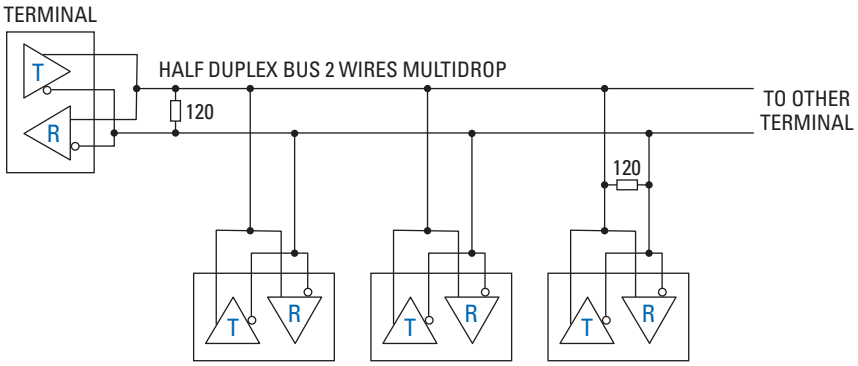
Connection between the P80360-R4E drive and Modbus master may require a RJ45 to RS485 Serial Converter or Modbus gateway. Ensure the Modbus master and P80360-R4E drive are powered off when making the connection. Please reference the manual for your Modbus master for compatibility and connection diagrams.



NOTE

Shielded cables are required for use with the communication interfaces. The machine layout influences the shielded connection. Connecting the shield to the ground on both ends is recommended. Follow the instructions under Wiring Guidelines to ensure proper usage.

13.1 Connection to the RS485 Network



Note: A termination resistor must be inserted in the first and last driver of the circuit.

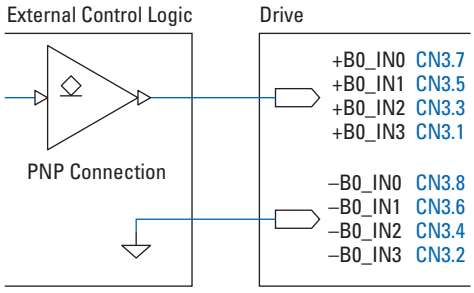
If a system is present at the beginning or at the end of the network, the terminal resistor can be inserted by closing the JUMPER in position 2. The position of the JUMPER is indicated in Connections.

14 Input Connections

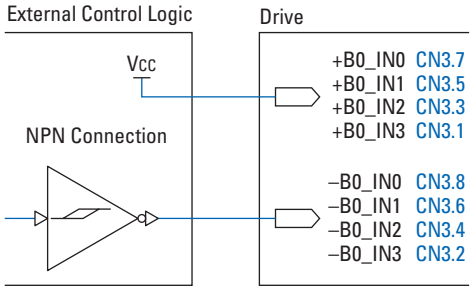
14.1 Digital Input Connections

The drives are equipped with a CN3 connector with 4 digital inputs (opto-isolated) which can use voltages between 5-24V_{DC} in PNP, NPN and Line-Driver connection.

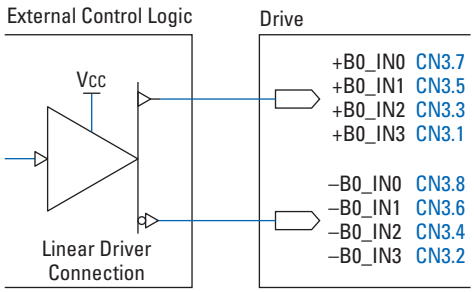
14.1.1 Examples of connections to digital inputs



Standard (B0_IN0 & B0_IN1)			
Characteristics	**Min**	**Max**	**Unit**
Nominal Supply Voltage	5	24	V_{DC}
Input Frequency Limits	—	10	kHz
Threshold Switching Voltage	1.9	2.4	V_{DC}
Current at 5 V_{DC}	—	6.28	mA
Current at 24 V_{DC}	—	8.75	mA



High-Speed (B0_IN2 & B0_IN3)			
Characteristics	**Min**	**Max.**	**Unit**
Nominal Supply Voltage	5	24	V_{DC}
Input Frequency Limit	—	250	kHz
Threshold Switching Voltage	1.9	2.4	V_{DC}
Current Draw at 5 V_{DC}	—	7.52	mA
Current Draw at 24 V_{DC}	—	10	mA



NOTE

Shielded cables are required for use with the Digital Inputs. The machine layout influences the shielded connection. Connecting the shield to the ground on both ends is recommended. Follow the instructions under Wiring Guidelines to ensure proper usage.

14.2 Incremental Encoder Input Connection

The CN4 connector on the P80360 drives allow a direct interface (isolated) for incremental encoder connection in two configurations:

- Differential 5 V_{DC} meeting the RS422 standard
- Single-Ended 5 V_{DC} TTL/CMOS

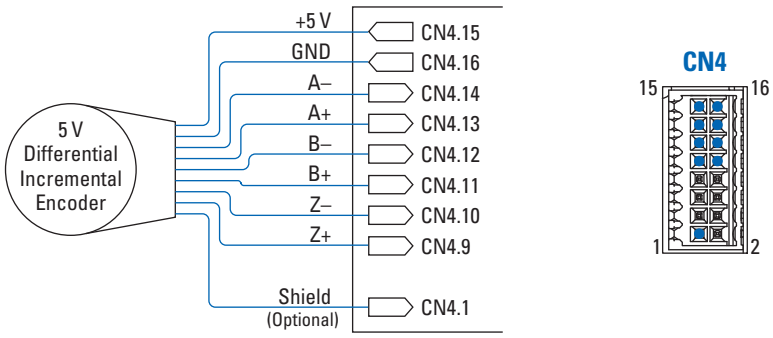
Kollmorgen Space software settings:

- 0 = Incremental Encoder (AB)
- 3 = Incremental Encoder + Zero (ABZ)

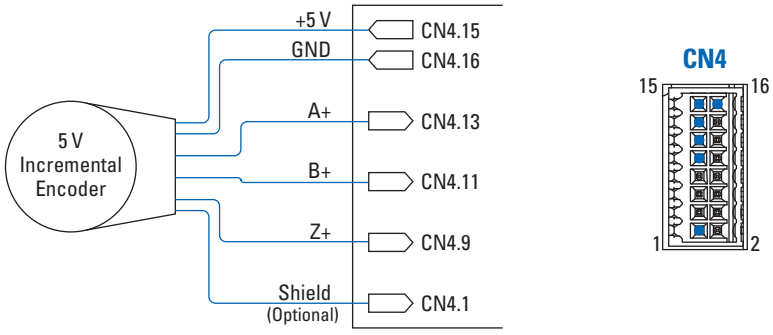
NOTE

The maximum supply current of the 5V is 100 mA.

The following figure shows the connection schematic for a differential incremental encoder:



The following figure shows the connection schematic for a single-ended incremental encoder:



NOTE

Shielded cables are required for use with the Encoder Inputs. The machine layout influences the shielded connection. Connecting the shield to the ground on both ends is recommended. Follow the instructions under Wiring Guidelines to ensure proper usage.

14.3 Service SCI Interface

The CN6 connector on the P80360 drives is dedicated to the Service SCI interface.

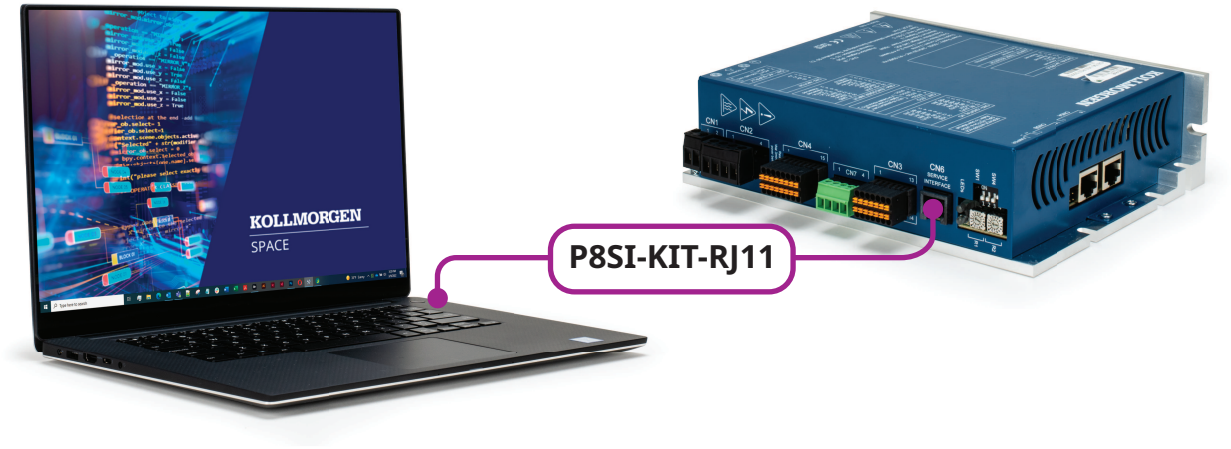
The Service SCI interface allows a point-to-point connection between the drive and the PC. This CN6 port is used for the programming and debugging of the application via the Kollmorgen Space graphical user interface (GUI).

In addition, the Service SCI Interface may be used for initial Modbus setup, testing, and simulation using software such as Modbus Poll. You cannot simultaneously program or debug your application using the Kollmorgen Space GUI while using Modbus simulation software.

Refer to Kollmorgen Space Help for information on using the Service SCI interface.

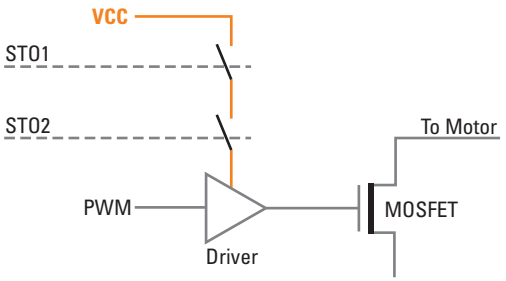
NOTE

This connection is only possible with P8SI-KIT-RJ11 hardware and software provided by Kollmorgen.



15 Safe Torque Off (STO) Inputs (Mandatory)

Two terminals, 24 V_{DC} compatible (opto-isolated)



STO1	STO2	Drive Status	Motor Status
+24 V_{DC}	+24 V_{DC}	Enabled	SW Controlled
+24 V_{DC}	Not Connected	Disabled	Inertia Controlled Stop
Not Connected	+24 V_{DC}	Disabled	Inertia Controlled Stop
Not Connected	Not Connected	Disabled	Inertia Controlled Stop

Safety Specifications

Characteristics	Value	Description
Safety Function	STO	Safe Torque Off
Category	4	In accordance with EN ISO 13849-1
Performance Level	PLe	In accordance with EN ISO 13849-1
Safety Integrity Level	SIL3	In accordance with EN ISO 13849-1 table 3
DCavg [%]	99	Average Diagnostic Coverage
PFHD [1/h]	7.04×10^{-9}	Probability of dangerous failures per hour
T Service Life [Years]	20	In accordance with EN ISO 13849-1
Type Test	The STO function has been certified by an independent testing body.	

NOTE

- STO Inputs are opto-isolated and require separate, isolated 24 V_{DC} power supplies.
- If not using the STO feature, both signals must be connected to a 24 V_{DC} supply in order to enable the drive.
- If a drive in motion is disabled by the STO signal, it will immediately stop producing torque but continue running until inertia brings it to a complete stop.
- The drive has a safety feature that is designed to provide the Safe Torque Off (STO) function. Two input signals are provided which, when not connected, prevent the upper and lower devices in the PWM outputs from being operated by the digital control core. This provides a positive OFF capability that cannot be overridden by the control firmware, or associated hardware components. When both STO signals are activated (current is flowing in the input diodes of the opto-couplers), the control core will be able to control the ON/OFF state of the PWM outputs.

15.1 Safe Torque Off (STO): Safety

15.1.1 Safety and Requirements for using Safe Torque Off (STO)

This document only describes the usage of the safety function Safe Torque Off (STO) in accordance with EN IS0 13849-1, which is implemented in the series of drives reported which is implemented in the P80360 drive.

15.1.2 Safety

When commissioning electrical drives:

- Always observe the safety instructions and warnings in the product documentation.
- Switch off the supply voltage and secure it against being switched on again before mounting and installing the device. Only switch the supply voltage on when mounting and installation is complete.
- Never remove or insert a plug connector when the motor controller is powered.
- Observe the handling specifications for electrostatically sensitive devices.
- Only enable the controller if the drive has been professionally installed and fully parametrized.
- Do not carry out repairs on the device. If defective, replace the device.

15.1.3 Safety instruction for the STO safety function

In order to achieve safety characteristics according to EN ISO 13849-1:

- Conduct a risk assessment of the application.
- Select the components and connect them in accordance with the required category in accordance with EN ISO 13849-1.

Failure of the safety function can result in serious, irreversible injuries.

- Do not bypass the connections for safety equipment.
- Observe the input voltage ranges of the device.
- Only use the STO function when all of the necessary safeguards have been set up and are functional.
- Validate the STO function to complete commissioning.

Severe injuries can result from uncontrolled movement of the passive actuators when switching off the power output stage. The STO function is insufficient as the sole safety function for drives that are subject to permanent torque (e.g., through suspended loads).

- Shut down the passive actuators mechanically, if required, e.g., via a brake. This especially applies to vertical axes without automatic locking arrangement, clamping units or counterbalancing.
- Reliably prevent movement of the actuators by suspended loads or other external forces, e.g., with a mechanical holding brake.

NOTE

The device is not intended to provide any automatic or manual reset/restart safety function. Manual Reset and Restart operation have to be provided in end application

15.1.4 Intended use of the STO function

The drive supports the STO safety function (Safe Torque Off) in accordance with EN ISO 13849-1.

The STO function is intended to disconnect the torque from the integrated motor and prevents the unexpected restart of the motor. The STO function may only be used for applications in which the specified safety characteristics suffice.

15.1.5 Safety characteristics

The STO function satisfies the requirements for the following safety characteristic values:

- PLe/cat.4 in accordance with EN ISO 13849-1 (Performance Level/PL)

The achievable safety level depends on the other components that are used to implement the safety function.

The device must be activated via the connection [CN7] with the category required for the application in accordance with EN ISO 13849-1.

15.1.6 Foreseeable misuse of the STO function

Unintended use includes the following misuses:

- Bypassing of the safety function
- Applications where switching off can result in hazardous movements or conditions

⚠WARNING

The STO function does not provide protection against electric shock, only against dangerous movements.

15.1.7 Diagnostic coverage (DC)

Diagnostic coverage depends on how the device is integrated in the control chain and on the measures implemented for the diagnostics.

In order to achieve the specified diagnostic coverage, the status of the FAULT output (B0_OUT0) could be evaluated by the control system every time the STO function is requested.

If the signal of the FAULT output (B0_OUT0) does not have the expected value, a potentially dangerous malfunction may exist. In this case, appropriate measures must be implemented to maintain the safety level.

IMPORTANT

The drive cannot detect a cross circuit in the input circuit by itself.

- Find out if cross-circuit detection is needed for the input circuit and wiring in final application.
- If required, use a safety switching device with cross-circuit detection.

15.1.8 Requirements for product use

For correct and safe use of the product in a machine or system:

- Provide the complete product documentation of the product to the following specialists:
  - the design engineer and the installer of the machine or system
  - the personnel responsible for commissioning
- Have the documentation available throughout the entire product lifecycle.
- Ensure compliance with all of the specifications in the documentation for the device
- Take into consideration the documentation for the other components (e.g. cables).
- Take into consideration all of the legal regulations that are applicable for the installation site, as well as the following documents:
  - regulations and standards
  - regulations of the testing organisations and insurers
  - national specifications

For correct and safe use of the STO function:

- Conduct a risk assessment for your machine or system.
- Comply with the specified safety characteristics.
- Comply with the connection and environmental conditions, in particular the voltage ranges of the product and all connected components. Only compliance with the limit values and load limits will enable operation of the product in compliance with the specified safety regulations.

15.1.9 Training of specialized personnel

The function should only be integrated into the machine by a qualified electrical technician of the machine manufacturer. The qualified technician must be familiar with:

- installation and operation of electrical control systems
- applicable regulations for operating safety-engineering systems
- applicable regulations for accident prevention and operational safety
- documentation for the product

15.1.10 Range of application

The device has the CE marking and certain configurations of the product have been certified by Underwriters Laboratories Inc. (UL) for the USA and Canada.

Additional information including certificates and EU Declarations of Conformity can be found on the Kollmorgen website.

15.1.11 Specified standards

Version Status ISO 13849-1:2015

15.1.12 Function and application

The securely switched-off torque safety function (Safe Torque Off) enables 2-channel, secure disconnection of the motor.

The safety function is requested solely via the control ports of the STO connection [C7] of the device.

Safety-oriented circuitry for additional interfaces of the device is not required.

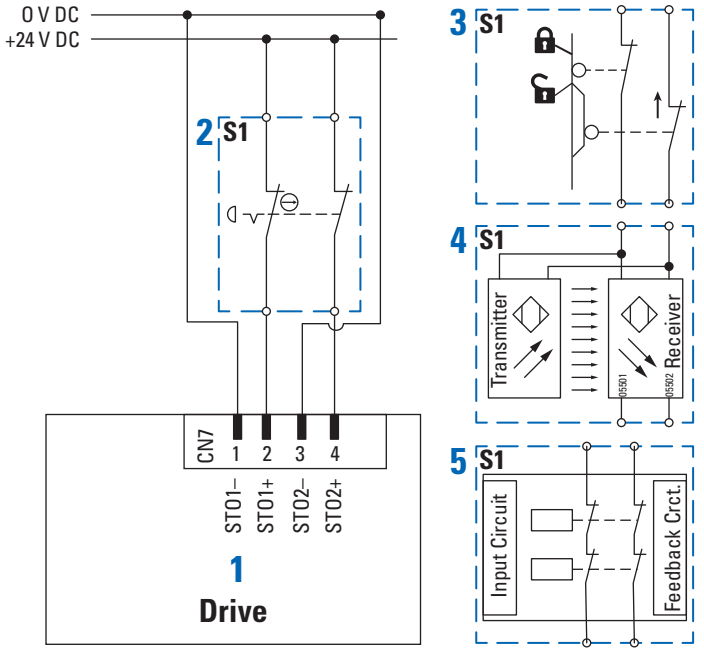
15.1.13 Circuitry of the control ports

IMPORTANT

To protect against unintended start-up, the device must be powered via the connection [CN7] with the category required for the application in accordance with ISO 13849-1.

The following components can be connected to the control ports to request the STO function:

- Safe semiconductor outputs (electronic safety switching devices, active safety sensors, e.g. light curtains with OSSD signals) (Output signal switching device/OSSD)
- Switch contacts (safety switching devices with relay outputs, passive safety sensors, e.g. forced position switches)



1. Drive with STO interface (only relevant connections illustrated)
2. Emergency stop switches
3. Guard door (alternative to 2)
4. Light curtain (alternative to 2)
5. Safety switching device (alternative to 2)

Functional description

The STO function is requested over 2 channels via switch S1, whereby the control voltage (+24 V DC, item 2 in the previous graphic) is switched off at both control ports STO 1 and STO 2.

The control ports should be switched simultaneously. The discrepancy value between the two inputs is monitored continuously by the hardware diagnostic circuit. If the values are different the diagnostic circuit disables the power of the output stage, informs the microcontroller that there is a fault and a diagnostic message is generated on the display (flashing S) and the FAULT output of the drive opens.

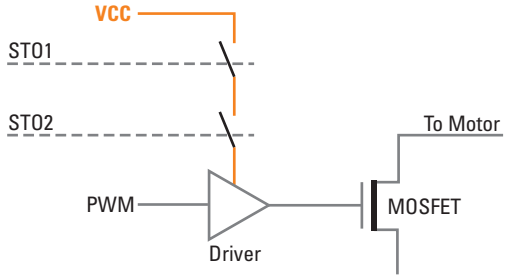
The drive monitors the status of the control ports. The control ports are of equal value. As soon as logic 0 (0 V) is present at one of the control ports, the drive reacts as follows:

- Channel 1 (STO 1): As long as logic 0 is present at the STO 1 input, the output stage drivers are not supplied with voltage. The motor will not generate a torque.
- Channel 2 (STO 2): As long as logic 0 is present at the STO 2 input, the output stage drivers are not supplied with voltage. The motor will not generate a torque.

Behavior of the drive when the STO 1 or STO 2 is opened

- Behavior of the drive with a running motor: The movement of the drive is not decelerated via a braking ramp. The drive continues to move uncontrolled through inertia or external forces until it comes to a standstill by itself.
- Behavior of the drive with a stopped motor: The drive is uncontrolled and can move through external forces.

This design implements Safe Torque Off (STO) functionality by using dual-channel, isolated STO signals that enable or disable the power (VCC) to the gate-driver integrated circuit (IC) through load switches providing a redundant option. To ensure a high degree of safety, two independent STO control channels are implemented in hardware. The STO circuit is designed such that a fault in one control channel will not affect the other channel's ability to prevent the drive from starting (single fault tolerant).



This implementation of the STO works with negative logic, deactivating the power stage by default. In order to activate the power stage, and therefore allow the motor to operate, two differential inputs must be energized. These inputs activate two optocouplers that enable the power supply of the Half-Bridge Gate-Drives that control the power stage. If the STO inputs are not energized, the transistors of the power stage are turned off because the Half-Bridge Gate-Drives are turned off.

Severe injuries can result from uncontrolled movement of the passive actuators when switching off the power output stage. The STO function is insufficient as the sole safety function for drives that are subject to permanent torque (e.g. through suspended loads).

- Shut down the passive actuators mechanically, if required, e.g. via a brake. This especially applies to vertical axes without automatic locking arrangement, clamping units or counterbalancing.
- Reliably prevent movement of the actuators by suspended loads or other external forces, e.g. with a mechanical holding brake.

IMPORTANT

If the output stage of the device fails when an STO function is active, it may result in the drive jerking through a limited detent movement of the rotor. The maximum rotation angle/travel corresponds to the pole pitch of the motor used.

15.2 STO Interface [CN7]

15.2.1 Switching statuses

As long as a logic 1 (+24 V_{DC}) is present at both control ports, the motor can be operated (STO function is inactive). If there is a logic 0 (0 V_{DC}) at one or both of the control ports, the power to the motor is interrupted.

STO 1	STO 2	Status
1	1	Normal operation
1	0	The STO function is open on one channel, e.g. in the event of a failure of a channel: • The output stage is switched off on one channel. • The motor can no longer be operated. • STO function is inactive.
0	1	
0	0	The STO function is open on two channels: • The output stage is switched off on two channels. • The motor can no longer be operated. • The STO function is active.

Switching Statuses [CN7]	
Control ports STO1/STO2 • Deactivate STO[V_{DC}] • Active STO[V_{DC}]	N.B. Intermediate range id undefined > 19 < 5

The amount of energy stored in the components of the STO function (e.g. capacitors) depends on the input voltage level. These amounts of energy must be charged or discharged depending on the switching operation. Depending on the input voltage, this results in different values for the transition to the safe status (STO) and the tolerance time (buffer time) regarding OSSD signals.

Signal	Switching Time	
STO1/STO2	Activate STO [ms]	<= 100
	Deactivate STO [ms]	<= 100

15.2.2 Reaction to test pulses

Short test pulses from a safety control are tolerated and thus do not trigger the STO function.

Control Ports STO1/STO2		
Maximum permissible test pulse width	[ms]	1

15.3 Installation and Commissioning

Danger of electric shock from voltage sources without protective measures.

Danger of electric shock from voltage sources without protective measures.

- Use for the electrical power supply only PELV circuits (Protective extra-low voltage/PELV) in accordance with EN 60204-1.
- Also observe the general requirements for PELV circuits in accordance with EN 60204-1.
- Use only voltage sources which guarantee reliable electrical isolation of the operating and load voltage in accordance with IEC 60204-1.

15.3.1 Installation

Unexpected and unintended movement of the drive during mounting, installation and maintenance work.

- Before starting work: Switch off power supplies.
- Secure the power supplies against accidental reactivation

Installation instructions:

- Observe all of the information on electrical installation of the device reported on the user manual.
- Comply with the handling specifications for electrostatically sensitive devices.
- Connect the control ports in 2 channels with parallel wiring.
- For the connection [CN7], use the mating connector Phoenix 1708329.

IMPORTANT

The STO function must never be bridged. Make sure that no jumpers, etc. can be used parallel to the safety wiring.

15.3.2 Note on Commissioning

Recommendation for first commissioning without complete safety equipment:

- Set-up at least with emergency stop switching device and 2-channel shut-down via the control ports STO 1 and STO 2 [CN7].
- Implement the set-up in such a way that it must be forcibly removed when the final protection wiring is carried out.

NOTE

Incorrect wiring or use of inappropriate components will result in failure of the STO function or non-compliance with the requirements of EN ISO 13849-1 (category).

Prior to commissioning:

- Make sure that components are used and wired in accordance with the required category according to EN ISO 13849-1.
- Check the electrical installation (connecting cable, pin allocation).
- Validate the STO function to conclude the installation process and after every modification to the installation.
- Only use the STO function when all of the necessary safeguards have been set up and are functional.

For a performance test of the STO function:

1. Switch off each channel individually and check the reaction of the motor.
2. Switch off both channels and check the reactions.

15.3.3 Diagnostic

Diagnostic	Description
FAULT Output (B0_OUT0)	Low
LED Signaling	Red and Yellow

15.3.4 Obligations of the machine operator

The implemented safety function must be subjected to a regular and documented performance test by a specialist during the machine's period of use. The frequency of these tests must be determined by the machine operator based on the specifications of the machine manufacturer.

Check the drive at least once per year.

15.3.5 Electrical Data

Control ports STO1/STO2 [CN7]		
Nominal voltage [V_{DC}]		24
Voltage Range [V_{DC}]		19-30
Overvoltage-safe up to [V]		50
Nominal current @ 19V_{DC} [mA]		8
Input voltage thresholds	Deactivate STO [V_{DC}] Activate STO [V_{DC}]	N.B.: intermediate range is undefined > 19 < 5
Activate STO function switching time [ms]		50
Deactivate STO function switching time [ms]		10
Protective function		Protection against polarity reversal

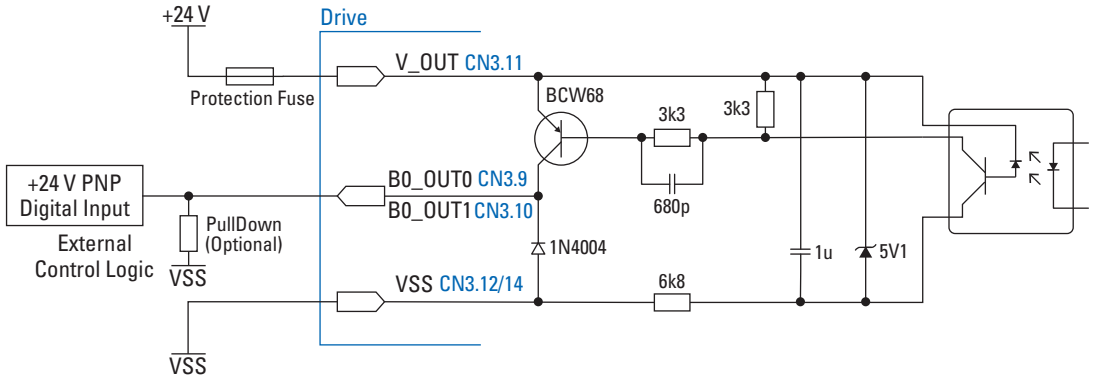
Signal Lines	
Maximum cable length [m]	30
Conductor cross-section [mm^2] 0,12 – 1,3	0,12 – 1,3

16 Digital Output Connections

16.1 Digital Output Connections (B0_OUT0 and B0_OUT1)

The drives have a CN3 connector with 2 digital outputs (opto-isolated), which can be used at $24V_{DC}$ in PNP connection (forcing at $24V_{DC}$).

The digital outputs are designed to function at $V\_OUT_{max} = 24V_{DC}$, $I\_OUT_{max} = 100mA$ and they are protected from inversion of the polarity.



Output type	Characteristics	Min.	Typ.	Max.	Unit
PNP Transistor Output	Power Supply Output Voltage	19	24	30	V_{DC}
	Output Current (load dependent)	—	—	100	mA
	Output Frequency	—	—	250	kHz

⚠CAUTION

- Digital outputs ARE NOT over-current protected.
- Provide an external current limitation device ($IOUT_{max} = 100mA$).
- The protective device may be placed on the output power conductor $+24V_{DC}$ (CN3.11).

NOTE

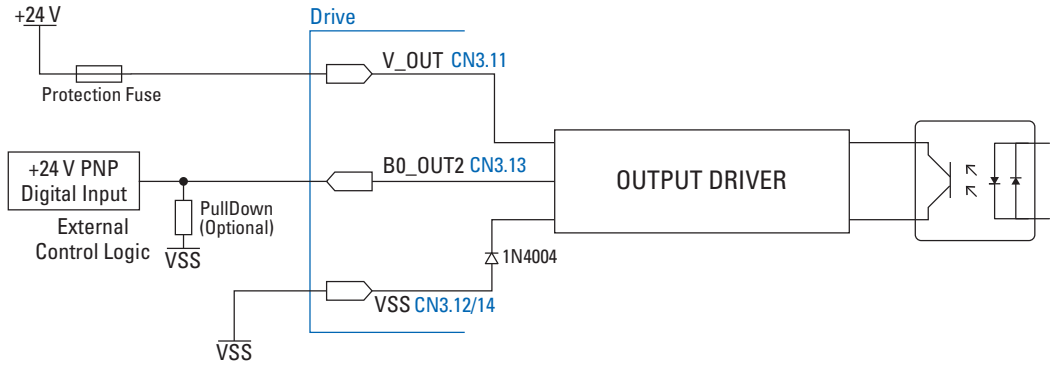
Shielded cables are required for use with the Digital Outputs. The machine layout influences the shielded connection. Connecting the shield to the ground on both ends is recommended. Follow the instructions under Wiring Guidelines to ensure proper usage.

The functions of the digital outputs depend on the firmware installed on the drive.

16.2 Digital Output Connections (B0_OUT2)

The drives have a CN3 connector with a digital output (opto-isolated) which can be used at $24V_{DC}$ in PNP connection (forcing at $24V_{DC}$).

The digital output is designed to function at $V\_OUT_{max} = 24V_{DC}$, $I\_OUT_{max} = 1.3A$ and they are protected from inversion of the polarity.



Output type	Characteristics	Min.	Typ.	Max.	Unit
PNP Transistor Output	Power Supply Output Voltage	19	24	30	V_{DC}
	Output Current (load dependent)	—	—	1.3	A
	Output Frequency	—	—	1	kHz

⚠CAUTION

- Digital outputs ARE NOT over-current protected.
- Provide an external current limitation device ($IOUT_{max} = 100mA$).
- The protective device may be placed on the output power conductor $+24V_{DC}$ (CN3.11).

Shielded cables are required for use with the Digital Inputs. The machine layout influences the shielded connection. Connecting the shield to the ground from both sides is recommended. The cables must not be exposed to disturbing sources. Follow the instructions under Wiring Guidelines to ensure proper usage.

17 Mating Connectors

Connector	Description
CN1	Phoenix 1758856
CN2	Phoenix 1731196
CN3	Dinkle 0156-1B14-BK
CN4	Dinkle 0156-1B16-BK
CN7	Phoenix 1839636

NOTE

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

18 Connection Specification Chart

Function	Wire Cross-Section	
	Minimum	Maximum
Power Supply, Motor Outputs, and PE (CN1/CN2)	0.2 mm^2 (AWG24)	2.5 mm^2 (AWG14)
Inputs and Outputs (CN3) & Encoder Input (CN4)	0.25 mm^2 (AWG24) – solid or stranded	0.5 mm^2 (AWG20) – solid or stranded
	0.25 mm^2 (AWG24) for wire-end ferrule	0.5 mm^2 (AWG20) for wire-end ferrule
STO Input (CN7)	0.14 mm^2 (AWG26)	1.5 mm^2 (AWG16)

NOTE

It is recommended to use copper conductor only. If using ferrules, follow the ferrule manufacturer's guidelines. Per mating connector manufacturer, a 7-8mm ferrule strip length is recommended. Wiring should meet all applicable regulations.

19 Accessories

CONKIT-P80360-R4E	Mating Connector Kit for P80360-R4E (CN1, CN2, CN3, CN4, and CN7 Ports)
P8SI-KIT-RJ11	Service SCI Interface Kit (CN6 Port) - Programming and Debugging Cable for P80360 drives.

NOTE

A set of mating connectors are included with each drive purchase. The P8SI-KIT-RJ11 SCI Interface kit is not included with each drive purchase and must be purchased separately. Only 1 kit should be needed per customer for programming and debugging.

20 Return (RMA) Procedure

In case it is not possible to resolve the problem using this manual, please contact Kollmorgen Technical Support and provide the following information:

- The drive model (Ex. P80360-R4E) and any other information printed on the drive labels.
- The complete problem description and the conditions when the problem occurs.
- The drive's configuration in the application including:
  - Current
  - Step type
  - Functioning type
- The value of the power supply voltage and its characteristics including:
  - Single phase
  - Ripple
- The description of the power supply and control signals cabling and the presence of other components in the installation.
- The description of the application including:
  - Motor movements
  - Loads
  - Velocity

Return Procedure

To return a damaged drive and initiate the RMA process, contact Kollmorgen Customer Support.
Email: orders@kollmorgen.com

Phone: (540) 633-3545

21 Initial Startup Procedure

1. Check all connections: power supply and motor.
2. Ensure application settings are correct.
3. Ensure the power supply characteristics are suitable for the drive.
4. If possible, remove the load from the motor shaft to avoid damage from potentially incorrect initial movements.
5. Supply power to the drive and make sure the green LED is switched ON or blinking.
   If the green LED remains OFF, shut down the system immediately and check that all connections are correct.
6. Enable the current to the motor and verify if motor holding torque is present.
7. Execute a movement of some steps and verify the rotation direction is the desired direction.
8. Disconnect the power supply, affix the motor to the load then re-enable the power supply. Once enabled, check the full functionality.

22 Regulatory Information

22.1 Conformance with RoHS

The P80360 drives are manufactured in conformance with RoHS Directive 2011/65/EU with delegated directive 2015/863/EU for installation into a machine.

22.2 Conformance with EU

Kollmorgen declares the conformity of the product series P80360 drives with the following directives:

- EU Directive 2014/30/EU, Electromagnetic compatibility (EMC) Directive, using harmonized standard EN 61800-3
- EU Directive 2014/35/EC, Electrical devices for use in special voltage limits, using harmonized standard EN61800-5-1

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.

The compliance with the Electromagnetic Compatibility directives of the P80360 product can only be verified if the entire machine, where the drive is a component, has been designed and realized in compliance with the requirements for Electromagnetic Compatibility.

The installation of the drive must be executed in accordance with the guidelines outlined in this manual.

About KOLLMORGEN

Kollmorgen, a Regal Rexnord brand, has more than 100 years of motion experience, proven in the industry's highest-performing, most reliable motors, drives, linear actuators, AGV (Automated Guided Vehicle) control solutions, and automation control platforms. We deliver breakthrough solutions that combine exceptional performance, reliability and ease of use, giving machine builders an irrefutable marketplace advantage.

Join the Kollmorgen Support Network for product support. Ask the community questions, search the knowledge base for answers, get downloads, and suggest improvements.

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