Allen-Bradley

Kinetix 350 Single-axis EtherNet/IP Servo Drives

Catalog Numbers 2097-V31PR0-LM, 2097-V31PR2-LM, 2097-V32PR0-LM, 2097-V32PR2-LM, 2097-V32PR4-LM, 2097-V33PR1-LM, 2097-V33PR3-LM, 2097-V33PR5-LM, 2097-V33PR6-LM, 2097-V34PR3-LM, 2097-V34PR5-LM, 2097-V34PR6-LM

About the Kinetix 350 Drives

Kinetix® 350 single-axis EtherNet/IP servo drives provide an Ethernet enabled solution for applications with output power requirements in the range of 0.4...3.0 kW (2...12 A rms).

Refer to the Kinetix 350 Single-axis EtherNet/IP Servo Drives User Manual, publication 2097-UM002, for detailed information on wiring, applying power, troubleshooting, and integration with ControlLogix®, or CompactLogix® controller platforms.

Important User Information

Solid-state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid-state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid-state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

	**WARNING:** Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
	**ATTENTION:** Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard and recognize the consequences.
	**SHOCK HAZARD: L**abels may be on or inside the equipment, for example, drive or motor, to alert people that dangerous voltage may be present.
	**BURN HAZARD:** Labels may be on or inside the equipment, for example, drive or motor, to alert people that surfaces may reach dangerous temperatures.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.

Catalog Number Explanation

This publication applies to the following Kinetix 350 drives.

Kinetix 350 Drives, Single-phase

Cat. No.	Description
2097-V31PR0-LM	120/240V, 1 Ø, 2.0 A
2097-V31PR2-LM	120/240V, 1 Ø, 4.0 A
2097-V32PR0-LM	240V, 1 Ø, 2.0 A, with integrated filter
2097-V32PR2-LM	240V, 1 Ø, 4.0 A, with integrated filter
2097-V32PR4-LM	240V, 1 Ø, 8.0 A, with integrated filter

Kinetix 350 Drives, Single/Three-phase

Cat. No.	Description
2097-V33PR1-LM	240V, 1 Ø or 3 Ø, 2.0 A
2097-V33PR3-LM	240V, 1 Ø or 3 Ø, 4.0 A
2097-V33PR5-LM	240V, 1 Ø or 3 Ø, 8.0 A
2097-V33PR6-LM	240V, 1 Ø or 3 Ø, 12.0 A

Kinetix 350 Drives, Three-phase

Cat. No.	Description
2097-V34PR3-LM	480V, 3 Ø, 2.0 A
2097-V34PR5-LM	480V, 3 Ø, 4.0 A
2097-V34PR6-LM	480V, 3 Ø, 6.0 A

Before You Begin

Remove all packing material, wedges, and braces from within and around the components. After unpacking, check the item nameplate catalog number against the purchase order.

Parts List

The Kinetix 350 drive ships with the following:

- General-purpose power input (IPD) header, back-up power (BP) header, shunt resistor and DC bus (BC) header, motor power (MP) header, and safe torque off (STO) header
- A ground clamp that also provides strain relief for motor power cable
- These installation instructions, publication 2097-IN008

TIP The connector kit for motor feedback (catalog number 2090-K2CK-D15M) is not provided. Replacement connector sets (catalog number 2097-CONN1) are also available. Refer to the Kinetix Motion Control Selection Guide, publication GMC-SG001, for more information on connector kits and replacement connector sets.

Install the Kinetix 350 Drive

These procedures assume you have prepared your panel, and understand how to bond your system. For installation instructions regarding equipment and accessories not included here, refer to the instructions that came with those products.

SHOCK HAZARD: To avoid hazard of electrical shock, perform all mounting and wiring of the Kinetix 350 drive prior to applying power. Once power is applied, connector terminals may have voltage present even when not in use.

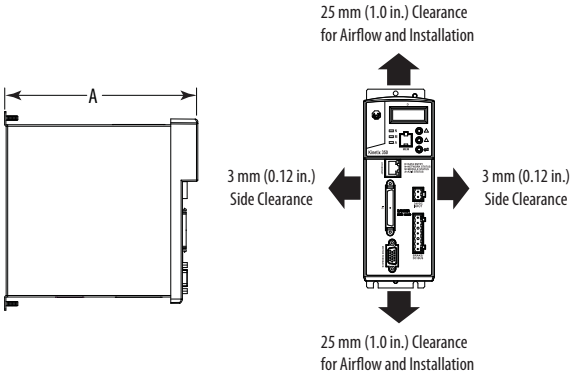
ATTENTION: Plan the installation of your system so that you can perform all cutting, drilling, tapping, and welding with the system removed from the enclosure. Because the system is of the open type construction, be careful to keep any metal debris from falling into it. Metal debris or other foreign matter can become lodged in the circuitry, which can result in damage to components.

Mount the Kinetix 350 Drive

Follow these steps to mount the drive.

1. Observe these clearance requirements when mounting the drive to the panel. .

IMPORTANT	Mount the module in an upright position as shown. Do not mount the module on its side.



Drive Cat. No.	Dimensions A mm (in.)
2097-V31PR0-LM	185 (7.29)
2097-V31PR2-LM	
2097-V32PR0-LM	230 (9.04)
2097-V32PR2-LM	
2097-V32PR4-LM	
2097-V33PR1-LM	185 (7.29) (1)
2097-V33PR3-LM	
2097-V33PR5-LM	
2097-V33PR6-LM	230 (9.04)
2097-V34PR3-LM	185 (7.29) (1)
2097-V34PR5-LM	
2097-V34PR6-LM	230 (9.04)

(1) If using an AC line filter, add 50 mm (2 in.).

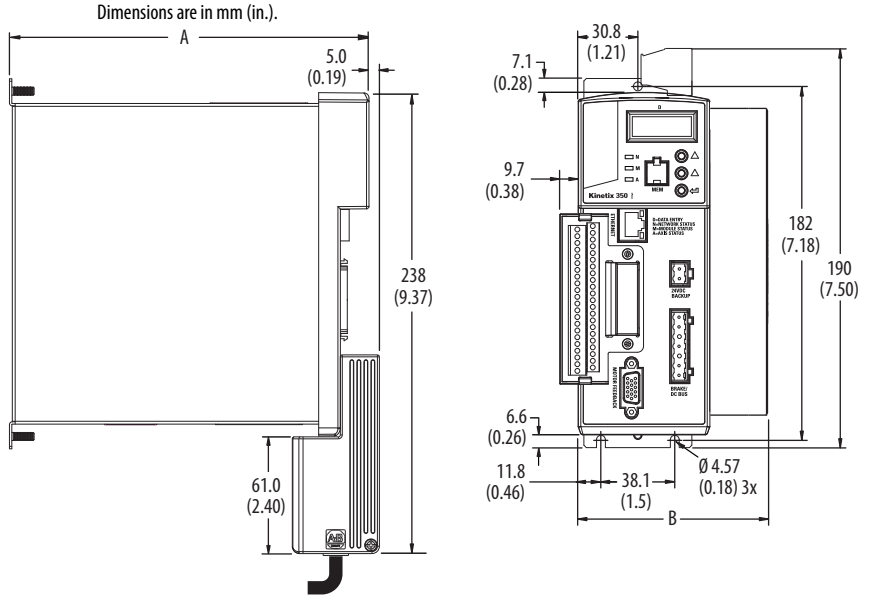
- Additional clearance and different hole patterns are required for side mount and rear mount AC line filters. See the table and step 2 for more details.
- Additional clearance is required depending on the other accessory items installed.
- Additional clearance is required for the cable and wires connected to the top, front, and bottom of the drive.
- Additional 150 mm (6.0 in.) is required when the drive is mounted adjacent to noise sensitive equipment or clean wire ways.

Refer to page 6 for Kinetix 350 drive dimensions.

2. Mount the Kinetix 350 drive to the cabinet sub-panel with a M4 (#6-32) steel machine screw torqued to 1.1 N•m (9.8 lb•in).

   For catalog numbers 2097-V33PR1-LM, 2097-V33PR3-LM, 2097-V33PR5-LM, 2097-V34PR3-LM, and 2097-V34PR5-LM that will be using an AC line filter, refer to the AC Line Filter Installation Instructions, publication 2097-IN003, for sub-panel mounting hole pattern.

Kinetix 350 Drive Mounting Dimensions



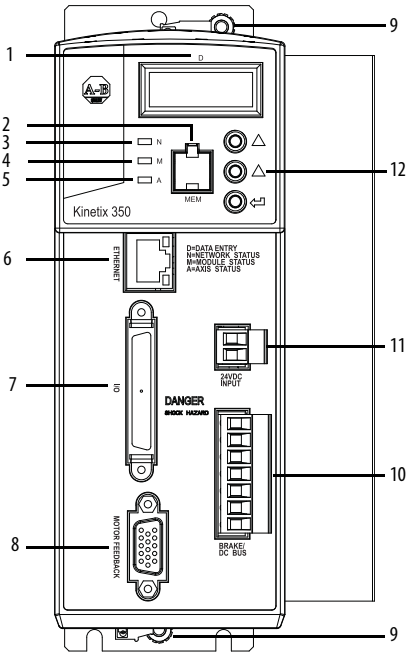
Cat. No.	Dimensions mm (in.)	
	A	B
2097-V31PR0-LM	185.1 (7.29)	68.0 (2.68)
2097-V31PR2-LM	185.1 (7.29)	68.5 (2.70)
2097-V32PR0-LM	229.6 (9.04)	68.0 (2.68)
2097-V32PR2-LM	229.6 (9.04)	68.5 (2.70)
2097-V32PR4-LM	229.6 (9.04)	86.8 (3.42)
2097-V33PR1-LM	185.1 (7.29)	68.0 (2.68)

Cat. No.	Dimensions mm (in.)	
	A	B
2097-V33PR3-LM	185.1 (7.29)	68.5 (2.70)
2097-V33PR5-LM	185.1 (7.29)	94.4 (3.72)
2097-V33PR6-LM	229.6 (9.04)	68.0 (2.68)
2097-V34PR3-LM	185.1 (7.29)	68.5 (2.70)
2097-V34PR5-LM	185.1 (7.29)	94.4 (3.72)
2097-V34PR6-LM	229.6 (9.04)	68.0 (2.68)

Connector Data

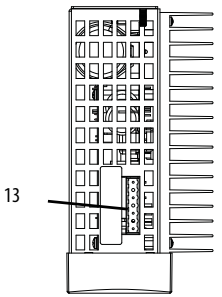
Use this illustration to identify the Kinetix 350 drive features and indicators.

Kinetix 350 Drive Features and Indicators

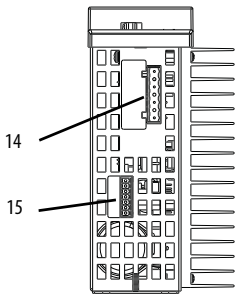


Item	Description
1	Data status indicator and diagnostic display
2	Memory module socket
3	Network status indicator
4	Module status indicator
5	Axis status indicator
6	Ethernet communication port (Port 1)
7	I/O (IOD) connector
8	Motor feedback (MF) connector
9	Ground Lug
10	Shunt resistor and DC bus (BC) connector
11	Back-up power (BP) connector
12	Display control push buttons (3)
13	Mains (IPD) connector
14	Motor power (MP) connector
15	Safe torque-off (STO) connector

Top View
(2097-V33PR5-LM
Kinetix 350
drive is shown)



Bottom View
(2097-V33PR5-LM
Kinetix 350
drive is shown)



Kinetix 350 Drive Connectors

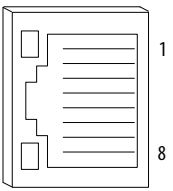
Designator	Description	Connector
IPD	AC mains input power	4-position plug/header
PORT1	Ethernet communication port	RJ45 Ethernet
IOD	I/O	SCSI 50 pin high density connector
MF	Motor feedback	15-pin high-density D-shell (male)
BP	Back-up power	2-pin quick-connect terminal block
BC	Brake resistor and DC bus	5-pin quick-connect terminal block
MP	Motor power	6-pin quick-connect terminal block
STO	Safe torque off (STO) terminal	6-pin quick-connect terminal block

Mains (IPD) Connector

IPD Pin	Description	Signal
1	Protective earth (ground)	PE
2	AC power in	L1
3	AC power in	L2
4	AC power in (3-phase models)	L3

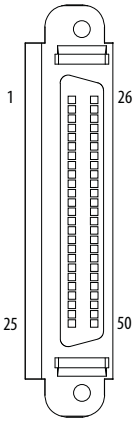
Pin Orientation for 8-pin Ethernet Communication Port (port 1)

Port 1 Pin	Description	Signal
1	Transmit port (+) data terminal	+ TX
2	Transmit port (-) data terminal	- TX
3	Receive port (+) data terminal	+ RX
4	—	—
5	—	—
6	Receive port (-) data terminal	- RX
7	—	—
8	—	—



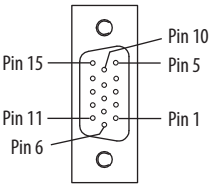
I/O (IOD) Connector Pinout

IOD Pin	Description	Signal
1…25	Reserved	—
5	Drive logic common	GND
6…25	Reserved	—
26	+/- Overtravel, enable and home common	COM
27	Negative hardware overtravel	NEG_OT
28	Positive hardware overtravel	POS_OT
29	Drive enable	ENABLE
30	Home switch	HOME_SW
31…35	Reserved	—
36	Registration common	REG_COM
37…38	Reserved	—
39	Registration input	REG
40…42	Reserved	—
43	Brake release positive	BRAKE+
44	Brake release negative	BRAKE-
44…50	Reserved	—



Motor Feedback (MF) Connector Pinout

MF Pin	Description	Signal
1	Sine differential input+ AM+ Differential input+	SIN+ AM+
2	Sine differential input- AM- Differential input-	SIN- AM-
3	Cosine differential input+ BM+ Differential input+	COS+ BM+
4	Cosine differential input- BM- Differential input-	COS- BM-
5	Data differential input + Index pulse+	DATA+ IM+
6	Common	ECOM
7	Encoder power (+9V)	EPWR_9V (2)
8	Single-ended 5V Hall effect commutation	S3
9	Reserved	—
10	Data differential input - Index pulse-	DATA- IM-
11	Motor thermal switch (normally closed) (1)	TS
12	Single-ended 5V Hall effect commutation	S1
13	Single-ended 5V Hall effect commutation	S2
14	Encoder power (+5V)	EPWR_5V (2)
15	Reserved	—



(1) Not applicable unless motor has integrated thermal protection.

(2) Encoder power supply uses either 5V or 9V DC based on encoder/motor used.

Control Power Back-up (BP) Pinout

BP Pin	Description	Signal
1	Positive 24V DC	+24V DC
2	24V DC power supply return	Return

Shunt Resistor and DC Bus (BC) Pinout

BC Pin	Description	Signal
1…2	Positive DC bus/brake resistor	B+
3	Brake resistor	BR
4…5	Negative DC bus	B-

Motor Power (MP) Pinout

MP Pin	Description	Signal
1	Motor power out	U
2	Motor power out	V
3	Motor power out	W
4	Protective earth (ground)	PE

Safe Torque Off (STO) Pinout

STO Pin	Description	Signal
1	+24V DC output from the drive	+24V DC control
2	+24V DC output common	Control COM
3	Safety status	Safety Status
4	Safety input 1 (+24V DC to enable)	Safety Input 1
5	Safety common	Safety COM
6	Safety input 2 (+24V DC to enable)	Safety Input 2

The Kinetix 350 drive ships with the safe torque off enabled. Connect the safe torque off inputs to a safety circuit, or install motion-allowed jumpers to obtain motion. Refer to the Kinetix 350 Single-axis EtherNet/IP Servo Drive User Manual, publication 2097-UM002, for details.

Power Wiring Requirements

Wire should be copper with 75 °C (167 °F) minimum rating. Phasing of main AC power is arbitrary and earth ground connection is required for safe and proper operation.

IMPORTANT The National Electrical Code and local electrical codes take precedence over the values and methods provided.

Kinetix 350 Drive Power Wiring Requirements

Cat. No.	Description	Terminals		Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
		Pin	Signal			
2097-V31PR0-LM 2097-V32PR0-LM 2097-V32PR2-LM 2097-V33PR1-LM 2097-V33PR3-LM 2097-V34PR3-LM 2097-V34PR5-LM 2097-V34PR6-LM	Mains input power		L3 L2 L1 PE	2.5 (14)	7 (0.28)	0.5 (4.5)
2097-V32PR4-LM 2097-V33PR5-LM				4.0 (12)	7 (0.28)	0.5 (4.5)
2097-V31PR2-LM 2097-V33PR6-LM				6.0 (10)	7 (0.28)	0.56…0.79 (5.0…7.0)
2097-V31PR0-LM 2097-V32PR0-LM 2097-V32PR2-LM 2097-V32PR4-LM 2097-V33PR1-LM 2097-V33PR3-LM 2097-V33PR5-LM 2097-V34PR3-LM 2097-V34PR5-LM 2097-V34PR6-LM 2097-V31PR2-LM	Motor power		PE W V U	2.5 (14)	7 (0.28)	0.5 (4.5)
2097-V33PR6-LM				4.0 (12)	7 (0.28)	0.5 (4.5)
2097-V31PR0-LM 2097-V32PR0-LM 2097-V32PR2-LM 2097-V32PR4-LM 2097-V33PR1-LM 2097-V33PR3-LM 2097-V33PR5-LM 2097-V34PR3-LM 2097-V34PR5-LM 2097-V34PR6-LM 2097-V31PR2-LM	Brake resistor and DC bus(1)		B+ B+ BR B- B-	2.5 (14)	7 (0.28)	0.5 (4.5)
2097-V33PR6-LM				4.0 (12)	7 (0.28)	0.5 (4.5)
2097-V3*x*PR*x*-LM	Control back-up power		+24V DC Return	1.5 (16)	6 (0.25)	0.5 (4.5)
2097-V3*x*PR*x*-LM	Safe torque off	STO-1 (2) STO-2 (2) STO-3 STO-4 STO-5 STO-6	+24V DC Control Control COM Safety Status Safety Input 1 Safety COM Safety Input 2			

(1) Use for shunt resistor connection only.

(2) Use for bypassing the STO circuit only.

ATTENTION: To avoid personal injury and/or equipment damage, make sure installation complies with specifications regarding wire types, conductor sizes, branch circuit protection, and disconnect devices. The National Electrical Code (NEC) and local codes outline provisions for safely installing electrical equipment.

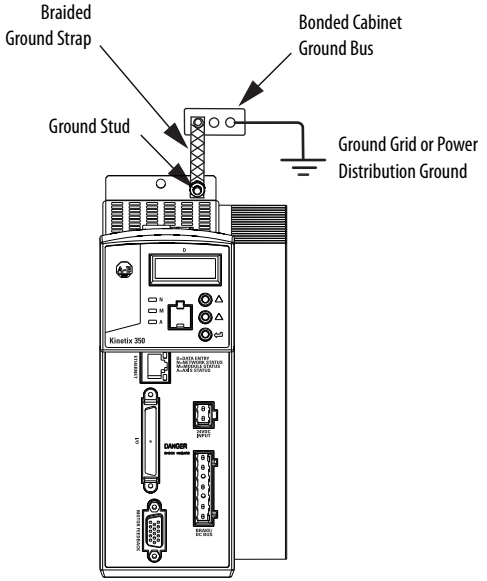
To avoid personal injury and/or equipment damage, make sure motor power connectors are used for connection purposes only. Do not use them to turn the unit on and off.

To avoid personal injury and/or equipment damage, make sure shielded power cables are grounded to prevent potentially high voltages on the shield.

Ground Your Kinetix 350 Drive to the Subpanel

If the Kinetix 350 drive is mounted on a painted subpanel, ground to a bonded cabinet ground bus with a braided ground strap or 4.0 mm^2 (12 AWG) solid copper wire 100 mm (3.9 in.) long.

Connecting the Braided Ground Strap Example



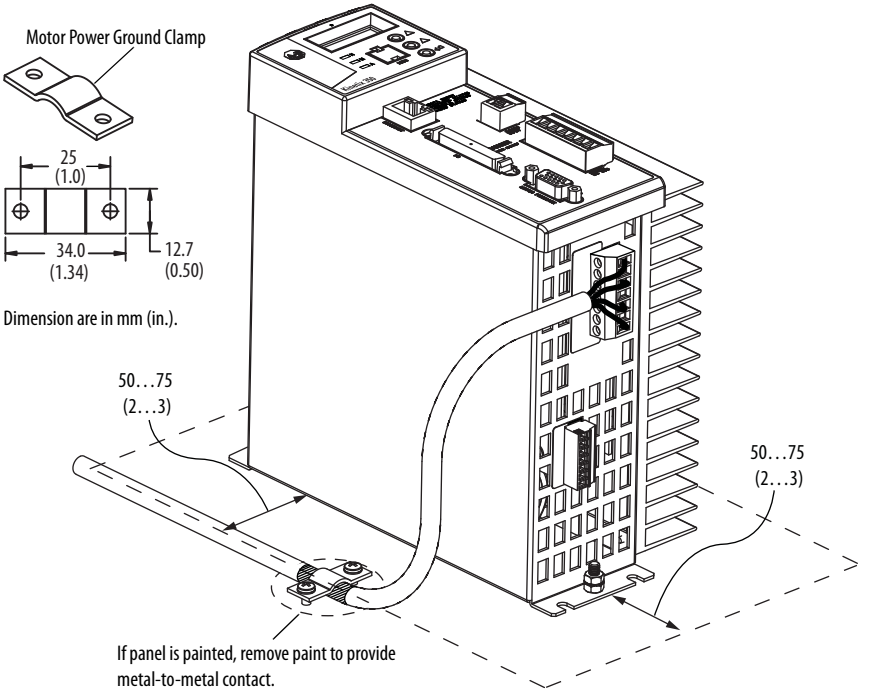
For dimensions, see Kinetix 350 Drive Mounting Dimensions on page 6.

Kinetix 350 Drive Motor-power Wire Shielding

A motor-power ground clamp and two #6-32 x 1 screws are supplied with the Kinetix 350 drive.

Install the supplied motor power ground clamp within 50...75 mm (2...3 in.) of the drive by using the two #6-32 x 1 screws.

Motor Power Ground Clamp Installation



Additional Resources

These documents contain additional information concerning related products from Rockwell Automation.

Resource	Description
Kinetix 350 Single-axis EtherNet/IP Servo Drives User Manual, publication 2097-UM002	Information on installing, configuring, starting up, troubleshooting, and specifications for your Kinetix 350 servo drive system.
Kinetix 300 Shunt Resistor Installation Instructions, publication 2097-IN002	Information on installing and wiring Kinetix 300 shunt resistors.
Kinetix 300 AC Line Filter Installation Instructions, publication 2097-IN003	Information on installing and wiring the Kinetix 300 AC line filter.
Kinetix 300 I/O Terminal Expansion Block Installation Instructions, publication 2097-IN005	Information on installing and wiring the Kinetix 300 I/O terminal expansion block.
Kinetix 300 Memory Module Installation Instructions, publication 2097-IN007	Information on installing the Kinetix 300 memory module.
Kinetix 300 Memory Module Programmer Quick Start, publication 2097-QS001	Information on using the memory module programmer to duplicate the memory module.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, http://www.ab.com	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at http://www.rockwellautomation.com/literature. To order paper copies of technical documentation, contact your local Allen-Bradley® distributor or Rockwell Automation sales representative.

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Rockwell Automation provides technical information on the Web to assist you in using its products. At http://www.rockwellautomation.com/support/, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect℠ support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://www.rockwellautomation.com/support/.

Installation Assistance

If you experience a problem within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your product up and running.

United States or Canada	1.440.646.3434
Outside United States or Canada	Use the Worldwide Locator at http://www.rockwellautomation.com/support/americas/phone_en.html, or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned, follow these procedures.

United States	Contact your distributor. You must provide a Customer Support case number (call the phone number above to obtain one) to your distributor to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for the return procedure.

Documentation Feedback

Your comments will help us serve your documentation needs better. If you have any suggestions on how to improve this document, complete this form, publication RA-DU002, available at http://www.rockwellautomation.com/literature/.

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