

Kinetix 2000 Integrated Axis Module and Axis Module

Catalog Numbers 2093-AC05-MP1, 2093-AC05-MP2, 2093-AC05-MP5, 2093-AMP1, 2093-AMP2, 2093-AMP5, 2093-AM01, 2093-AM02

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About the Kinetix 2000 Drives

The Kinetix® 2000 integrated axis module (IAM) and up to seven axis modules (AM) mount on the Bulletin 2093 power rail and provide power and control for up to eight servo motors.

Refer to the Kinetix 2000 Multi-axis Servo Drives User Manual, publication [2093-UM001](#), for detailed information on wiring, applying power, troubleshooting, and integration with ControlLogix®, CompactLogix™, and SoftLogix™ controller platforms.

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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 consequence.

IMPORTANT Identifies information that is critical for successful application and understanding of the product.

Labels may also be on or inside the equipment to provide specific precautions.



SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.



BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.



ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

Before You Begin

Remove all packing material, wedges, and braces from within and around the components. After unpacking, check the catalog number on the name-plate against the purchase order.

Parts List

Drive component	Ships With
Integrated axis module (IAM)	<ul style="list-style-type: none"> Wiring plugs for main AC input power (IPD), control AC input power (CPD), contactor enable relay (CED), motor power (MP), and motor brake (BC) These installation instructions, publication 2093-IN001
Axis module (AM)	<ul style="list-style-type: none"> Wiring plugs for motor power (MP) and motor brake (BC) These installation instructions, publication 2093-IN001

TIP

The motor feedback connector kit (catalog number 2090-K2CK-D15M) and auxiliary feedback and I/O connector kit (catalog number 2090-K2CK-COMBO) are not provided. Refer to the Kinetix Motion Accessories Specifications Technical Data, publication [GMC-TD004](#), for more information.

Installing a Kinetix 2000 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.



ATTENTION: To avoid the hazard of electrical shock, perform all mounting and wiring of the IAM, AM, shunt, and slot filler module, and the Bulletin 2093 power rail before you apply power. Once power is applied, connector terminals can 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 and result in damage to components.

Set the IAM Ground Jumper for the Power Grounding Configuration

Setting the ground jumper is necessary only when using an ungrounded or high-impedance grounded power configuration. Refer to the Kinetix 2000 Multi-axis Servo Drives User Manual, publication [2093-UM001](#), for diagrams illustrating grounded and ungrounded input power.

Follow these steps to set the ground jumper for ungrounded or high-impedance grounded power configurations.

1. Remove the front panel on your IAM module.

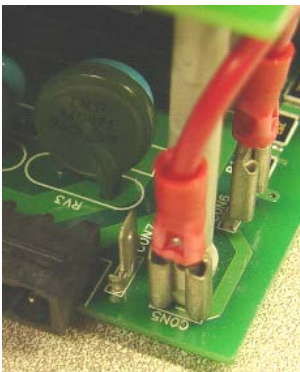
IMPORTANT Disconnect all headers from the electrical connectors, and the SERCOS fiber-optic cables on the IAM module, before attempting to remove the front panel.

2. Move the jumper wire to connect CON6 to CON7.

IMPORTANT A jumper wire and the grounding connections (CON5, CON6, and CON7) are on the lower front of the power converter (leftmost) board, below the input power (IPD) connector.

The factory default configuration (for grounded power) has the jumper installed between CON5 and CON6.

Grounded Configuration
CON5 to CON6 (default setting)



Ungrounded Configuration
CON7 to CON6



3. Replace the IAM module front panel.

You are now ready to mount the IAM module on the power rail.

Determine Mounting Order

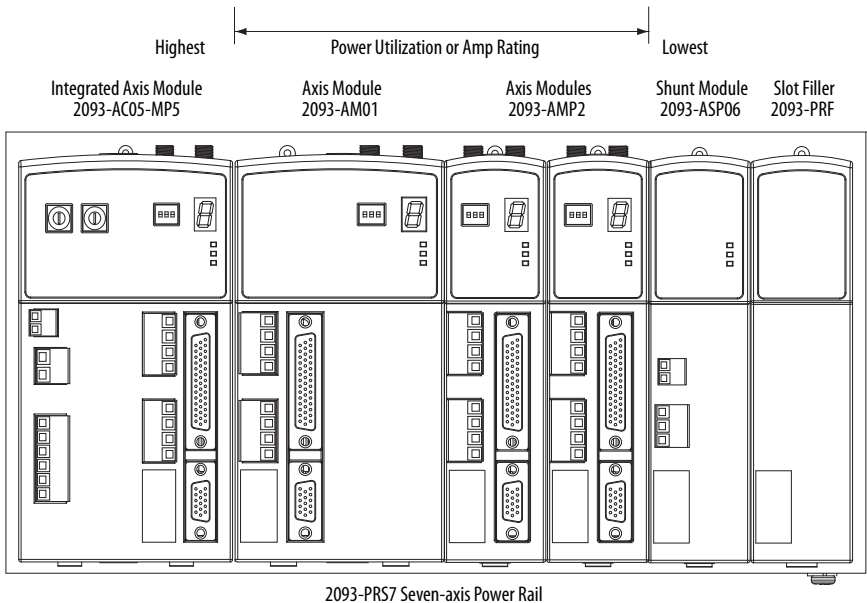
Mount axis modules in the order (left to right) shown in the figure.

IMPORTANT The integrated axis module (IAM) must be positioned in the leftmost slot on the power rail, followed by axis modules (AM).

Mount axis modules from left to right starting with the highest power utilization.

The shunt module is mounted to the right of the last AM module. The only exception is the eight-axis power rail (catalog number 2093-PRS8S) that requires the shunt module mounted in the rightmost slot.

Module Mounting Order



ATTENTION: To avoid personal injury due to electrical shock, place a 2093-PRF slot filler module in all empty slots on the power rail. Any power rail connector without a module disables the Kinetix 2000 drive system; however, control power is still present.

Mount a Module

Follow these steps to mount an axis module on the Kinetix 2000 power rail.

IMPORTANT The IAM module must be positioned in the leftmost slot of the power rail, followed by AM modules in descending order of power utilization.

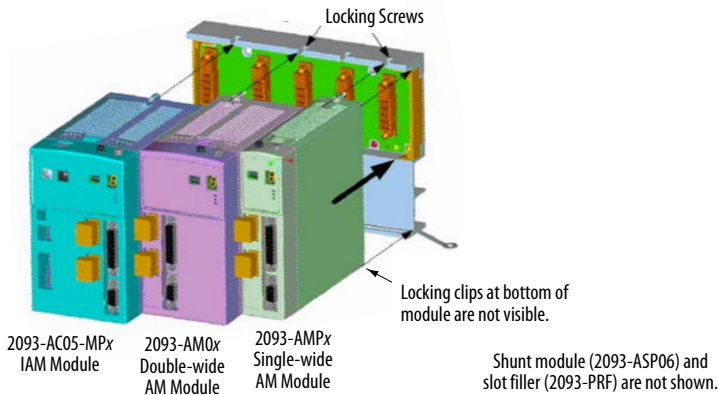


ATTENTION: To avoid damage to pins on the back of each module, and to make sure that module pins mate properly with the power rail, install modules as shown below.

ATTENTION: The power rail must be mounted with the connectors in an upright or vertical orientation to the panel. This provides proper cooling of the modules. Do not mount modules if the power rail is not within 3° of vertical.

1. Align the module locking screw with its corresponding slot on the power rail.
2. Push the module straight forward, by applying force at the top and bottom edges of the front cover.

The module is fully seated when each locking clip snaps into the bottom of the power rail and the locking screw boss is flush at the top of the power rail.

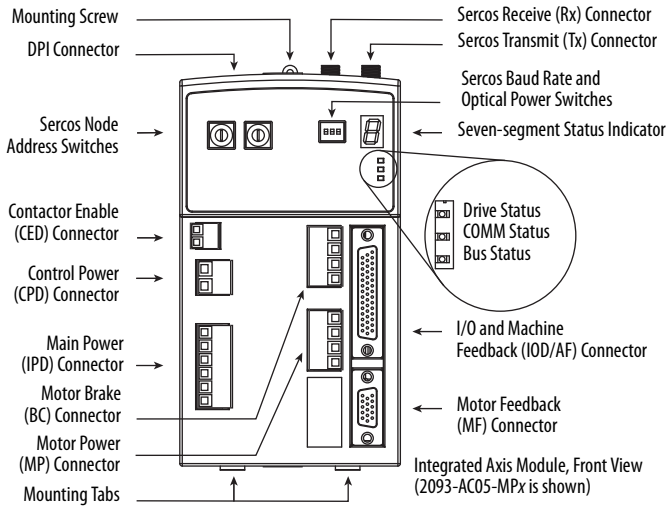


3. Torque mounting screw to 0.7 N•m (6.0 lb•in).

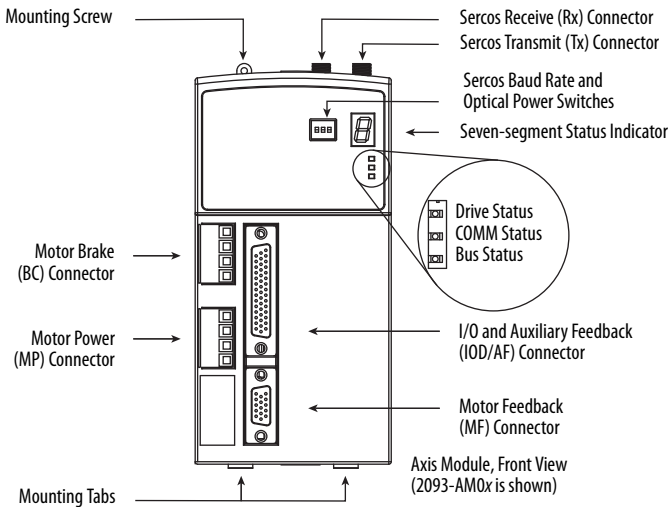
IAM and AM Connector Data

Use these illustrations to identify the IAM and AM module connectors and indicators.

Integrated Axis Module Connectors and Indicators



Axis Module Connectors and Indicators



Connector Descriptions

Designator	Description	Connector
BC	Motor brake	4-position plug/header
CE ⁽¹⁾	Contact enable	2-position plug/header
CPD ⁽¹⁾	Control input power (drive)	2-position plug/header
DPI ⁽¹⁾	Drive peripheral interface (factory use only)	8-pin mini-DIN
IOD/AF	User I/O (drive) and auxiliary feedback	44-pin high-density D-shell (female)
IPD ⁽¹⁾	230V AC input power (drive) and DC bus	6-position plug/header
MF	Motor feedback	15-pin high-density D-shell (female)
MP	Motor power	4-position plug/header
Tx and Rx	SERCOS transmit and receive	SERCOS fiber-optic (2)

(1) Connector is only on integrated axis modules (catalog numbers 2093-AC05-MPx).

Contact Enable and Power Connector Pinouts

These connectors are supplied with removable wiring plugs. The pins are numbered consecutively from top to bottom.

IMPORTANT These connectors are available only on integrated axis modules (catalog numbers 2093-AC05-MPx).

Contact Enable (CED) Connector

CED Pin	Description	Signal
1	Relay-driven dry contact used in the safety string for a three-phase power contactor.	CONT EN+
2		CONT EN-

Control Power (CPD) Connector

CPD Pin	Description	Signal
1	Control power VAC input line 1	CTRL 1
2	Control power VAC input line 2	CTRL 2

Main Power and DC Bus (IPD) Connector

IPD Pin	Description	Signal
1	Single- or three-phase input power (230V AC)	L1
2		L2
3		L3 ⁽¹⁾
4	Chassis ground	\perp
5	An integral, unregulated power supply, consisting of AC line, three-phase bridge rectifier, and filter capacitors	DC+
6		DC-

(1) Not used with single-phase power.

Motor Power and Brake Connector Pinouts

These connectors are supplied with removable wiring plugs and are keyed to prevent incorrect insertion. The pins are numbered consecutively from top to bottom.

Motor Brake Control (BC) Connector

BC Pin	Description	Signal
1	+24V brake power (from LIM or customer supplied)	PWR
2	Motor brake connections	MBRK+
3		MBRK-
4	Motor brake common	COM

Motor Power (MP) Connector

MP Pin	Description	Signal
1	Three-phase motor power	U
2		V
3		W
4	Chassis ground	\perp

I/O Connector Pinouts

These connections require customer-supplied connectors.

IAM and AM I/O and Auxiliary Feedback 44-pin (IOD/AF) Connector

IOD/AF Pin	Description	Signal
1	Reserved	—
2	Reserved	—
3	Reserved	—
4	Reserved	—
5	Reserved	—
6	Reserved	—
7	Reserved	—
8	Reserved	—
9	Reserved	—
10	Reserved	—
11	Reserved	—
12	Reserved	—
13	Reserved	—
14	Reserved	—
15	Reserved	—
16	Data/index negative input	DATA- / I- ⁽¹⁾
17	Data/index positive input	DATA+ / I+ ⁽¹⁾
18	Encoder 5V power supply	EPWR_5V ⁽¹⁾
19	Encoder common	ECOM ⁽¹⁾
20	Encoder 9V power supply	EPWR_9V ⁽¹⁾
21	Reserved	—
22	Registration common	24VCOM_REG ⁽²⁾

IOD/AF Pin	Description	Signal
23	Registration 2	REG2 ⁽²⁾
24	24V power to registration	24V_REG ⁽²⁾
25	Registration common	24VCOM_REG ⁽²⁾
26	Registration 1	REG1 ⁽²⁾
27	24V power to registration	24V_REG ⁽²⁾
28	24V common	24VCOM ⁽²⁾
29	Overtravel negative input	OT- ⁽²⁾
30	24V power output	24V PWR ⁽²⁾
31	Cosine/negative input B	COSINE-/B- ⁽¹⁾
32	Cosine/positive input B	COSINE+/B+ ⁽¹⁾
33	Sine/negative input A	SINE-/A- ⁽¹⁾
34	Sine/positive input A	SINE+/A+ ⁽¹⁾
35	Reserved	—
36	24V common	24VCOM ⁽²⁾
37	Overtravel positive input	OT+ ⁽²⁾
38	24V power output	24VPWR ⁽²⁾
39	24V common	24VCOM ⁽²⁾
40	Home input	HOME ⁽²⁾
41	24V power output	24VPWR ⁽²⁾
42	24V common	24VCOM ⁽²⁾
43	Enable	ENABLE ⁽²⁾
44	24V power output	24VPWR ⁽²⁾

(1) Machine (auxiliary) feedback.

(2) User I/O.

IMPORTANT

+24V_PWR and +24V_COM are a 24V DC power source used only to power inputs on the 44-pin IOD/AF connector.

IAM and AM Motor Feedback 15-pin (MF) Connector

MF Pin	Stegmann Hiperface	Tamagawa 17-bit Serial ⁽¹⁾	Sine/Cosin ⁽²⁾	Sine/Cosine ⁽³⁾	AQB ⁽²⁾	AQB ⁽³⁾	Renishaw
1	AM+	–	AM+	AM+	AM+	AM+	AM+
2	AM-	–	AM-	AM-	AM-	AM-	AM-
3	BM+	–	BM+	BM+	BM+	BM+	BM+
4	BM-	–	BM-	BM-	BM-	BM-	BM-
5	DATA+	DATA+	IM+	IM+	IM+	IM+	IM+
6	ECOM	ECOM	ECOM	ECOM	ECOM	ECOM	ECOM
7 ⁽⁴⁾	–	–	–	–	–	–	–
8	–	–	S3	–	S3	–	S3
9	–	–	–	–	–	–	E_OT+
10	DATA-	DATA-	IM-	IM-	IM-	IM-	IM-
11 ⁽⁵⁾	TS+	TS+	TS+	TS+	TS+	TS+	TS+
12	–	–	S1	–	S1	–	S1
13	–	–	S2	–	S2	–	S2
14	EPWR_5V	EPWR_5V	EPWR_5V	EPWR_5V	EPWR_5V	EPWR_5V	EPWR_5V
15	–	–	–	–	–	–	E_OT-

(1) Encoder is 17-bit serial. The 3.6V battery connections are made in the 2090-K2CK-D15M connector kit.

(2) Encoder is an incremental with Halls.

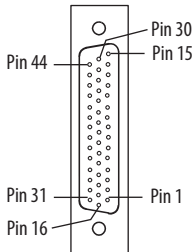
(3) Encoder is an incremental without Halls.

(4) Pin 7 is EPWR_9V connection that can be used for third-party motor applications, Hiperface, for example.

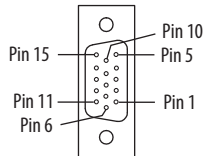
(5) Not applicable unless motor has integrated thermal protection.

I/O and Motor Feedback Connector Pinouts

44-pin I/O and Auxiliary Feedback (IOD/AF) Connector



15-pin Motor Feedback (MF) Connector



Wiring Requirements

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




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.

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

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

IMPORTANT NEC and local electrical codes take precedence over the values and methods provided.


IAM Module Power Wiring Requirements

Connector	Connects to Terminals		Recommended Wire and Size mm ² (AWG)	Strip Length mm (in.)	Torque Value N-m (lb-in)
	Pin	Signal			
Contactore enable ⁽¹⁾	CED-1 CED-2	CONT EN+ CONT EN-	Solid H05(07) V-U: 1.5 (16) Stranded H07 V-R: 1.5 (16) Flexible H05(07) V-K: 1.5 (16) Flexible with ferrule: 1.5 (16)	6.5 (0.26)	0.5 (4.4)
Control power	CPD-1 CPD-2	CTRL 1 CTRL 2		7.0 (0.28)	0.5 (4.4)
Input AC and DC bus ⁽²⁾ power	IPD-1 IPD-2 IPD-3 IPD-4 IPD-5 IPD-6	L1 L2 L3  DC+ DC-	Solid H05(07) V-U: 2.5 (14) Stranded H07 V-R: 2.5 (14) Flexible H05 (07) V-K: 2.5 (14) Flexible with ferrule: 2.5 (14)	7.0 (0.28)	0.5 (4.4)

(1) The gauge of the contactor-enable wiring depends on the system configuration. Consult your machine builder, the NEC, and applicable local codes.

(2) Keep DC common-bus connections (leader IAM to follower IAM) as short as possible.

IAM and AM Module Power Wiring Requirements

Connector	Connects to Terminals		Recommended Wire and Size mm ² (AWG)	Strip Length mm (in.)	Torque Value N·m (lb·in)
	Pin	Signal			
Brake	BC-1 BC-2 BC-3 BC-4	PWR BRK+ BRK- COM	Solid H05(07) V-U: 0.75 (18) Stranded H07 V-R: 0.75 (18) Flexible H05(07) V-K: 0.75 (18) Flexible with ferrule 0.75 (18)	7.0 (0.28)	0.5 (4.4)
Motor	MP-1 MP-2 MP-3 MP-4	U V W 	Motor power cable depends on motor/drive combination 2.5 (14)	7.0 (0.28)	0.5 (4.4)

IOD/AF and MF Signal Wiring

Refer to the Kinetix Motion Accessories Specifications Technical Data, publication [GMC-TD004](#), for connector kits, breakout boards, and cable options available for Kinetix 2000 servo drives.

Motor Overload Protection

This servo drive uses solid-state motor overload protection that operates in accordance with UL 508C. Motor overload protection is provided by algorithms (thermal memory) that predict actual motor temperature based on operating conditions as long as control power is continuously applied. However, when control power is removed, thermal memory is not retained.

In addition to thermal memory protection, this drive provides an input for an external temperature sensor/thermistor device, embedded in the motor, to support the UL requirement for motor overload protection.

Some motors supported by this drive do not contain temperature sensors/thermistors; therefore, motor overload protection against excessive consecutive motor overloads with power cycling is not supported.

This servo drive meets the following UL 508C requirements for solid-state overload protection.

Motor Overload Protection Trip Point	Value
Ultimately	100% overload
Within 8 minutes	200% overload
Within 20 seconds	600% overload



ATTENTION: To avoid damage to your motor due to overheating caused by excessive, successive motor overload trips, follow the wiring diagram provided in the user manual for your motor and drive combination.

Refer to your servo drive user manual for the interconnect diagram that illustrates the wiring between your motor and drive.

Additional Resources

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

Resource	Description
Kinetix 2000 Multi-axis Servo Drives User Manual, publication 2093-UM001	Provides information on how to install, configure, startup, and troubleshoot your Kinetix 2000 servo drive system.
Kinetix Servo Drives Specifications Technical Data, publication GMC-TD003	Provides product specifications for Kinetix Integrated Motion over EtherNet/IP, Integrated Motion over sercos interface, EtherNet/IP networking, and component servo drive families.
Kinetix Motion Accessories Specifications Technical Data, publication GMC-TD004	Provides product specifications for Bulletin 2090 motor and interface cables, low-profile connector kits, drive power components, and other servo drive accessory items.

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.

Rockwell Automation Support

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 and application notes, sample code, and links to software service packs. You can also visit our Support Center at <https://rockwellautomation.custhelp.com/> for software updates, support chats and forums, technical information, FAQs, and to sign up for product notification updates.

In addition, we offer multiple support programs for installation, configuration, and troubleshooting. For more information, contact your local distributor or Rockwell Automation representative, or visit <http://www.rockwellautomation.com/services/online-phone>.

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/rockwellautomation/support/overview_page , or contact your local Rockwell Automation representative.

New Product Satisfaction Return

Rockwell Automation tests all of its products to help 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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Rockwell Otomasyon Ticaret A.Ş., Kar Plaza İş Merkezi E Blok Kat:6 34752 İçerenköy, İstanbul, Tel: +90 (216) 5698400

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

Americas: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444
Europe/Middle East/Africa: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640
Asia Pacific: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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