

Kinetix 300 to Kinetix 5100 Servo Drives Migration Guide

Catalog Numbers 2198-E1004-ERS, 2198-E1007-ERS, 2198-E1015-ERS, 2198-E1020-ERS, 2198-E2030-ERS, 2198-E2055-ERS, 2198-E2075-ERS, 2198-E2150-ERS, 2198-E4004-ERS, 2198-E4007-ERS, 2198-E4015-ERS, 2198-E4020-ERS, 2198-E4030-ERS, 2198-E4055-ERS, 2198-E4075-ERS, 2198-E4150-ERS

Allen-Bradley
by ROCKWELL AUTOMATION

Reference Manual

Original Instructions

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.

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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).

Table of Contents

The purpose of this guide is to provide you with the essential information to determine necessary changes when migrating from a system containing Kinetix® 300 servo drives to one containing Kinetix 5100 servo drives.

Migrating from a motion control system that uses Kinetix 300 drives to a system that uses Kinetix 5100 drives requires a comprehensive design review of the motion control system. There are multiple drive replacement combinations, and multiple configurations for how the drives can be used. As a result, this migration guide is not an all-inclusive document. It does not describe all redesign steps required, nor contain the detailed product information necessary to finalize the redesign. The generalities of the replacement process are covered, and the decision-making steps likely to be encountered in a typical replacement scenario are described.

This manual is intended for engineers and technicians that are directly involved in the installation and wiring of the Kinetix 5100 drives, and programmers who are directly involved in the operation, field maintenance, and integration of these drives. You must have previous experience with, and a basic understanding of, electrical terminology, programming procedures, networking (and required equipment and software), and safety precautions.

Download Firmware, AOP, EDS, and Other Files

Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes from the Product Compatibility and Download Center at rok.auto/pcdc.

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Added information for Kinetix 5100 400V-class drives.	Throughout
Added drive compatibility with Kinetix TL/TLY (200V-class) servo motors.	Throughout
Added Kinetix 5100 drive ratings - 400V-class.	8
Added Table 15 and Table 16 Kinetix 5100 Power Specifications (480V nom three-phase).	18, 19
Added Table 18 Kinetix 5100 Drive Control Power Specifications - 400V-class.	20
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Added Figure 13 Features and Indicators (catalog numbers 2198-E4020-ERS, 2198-E4030-ERS)	39
Added Table 52 Maximum Cable Lengths (400V-class) Motors with Kinetix 5100 Drives.	50
Added Figure 26 Kinetix 300 Drives Three-phase (400V) Power Configuration (Wye secondary).	52

Additional Resources

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

Resource	Description
Kinetix Rotary Motion Specifications Technical Data, publication KNX-TD001	Product specifications for Kinetix VP, Kinetix MP, Kinetix TL and TLY, Kinetix RDB, Kinetix TLP, and Kinetix HPK rotary motors.
Kinetix Servo Drives Specifications Technical Data, publication KNX-TD003	Product specifications for Kinetix Integrated Motion over the EtherNet/IP™ network, Integrated Motion over Sercos interface, EtherNet/IP networking, and component servo drive families.
Kinetix 5100 EtherNet/IP Indexing Servo Drives User Manual, publication 2198-UM004.	Information on how to install, configure, startup, and troubleshoot, your Kinetix 5100 servo drive system. Information on applications for your Kinetix 5100 servo drive system.
Kinetix 5100 Drive Systems Design Guide, publication KNX-RM011.	System design guide to select the required (drive specific) drive module, power accessory, feedback connector kit, and motor cable catalog numbers for your Kinetix 5100 drive and Kinetix motion control system.
Ethernet Reference Manual, publication ENET-RM002.	Provides information on how to design Ethernet and EtherNet/IP networks.
Kinetix Motion Control Selection Guide, publication KNX-SG001	Overview of Kinetix servo drives, motors, actuators, and motion accessories that are designed to help make initial decisions for the motion control products best suited for your system requirements.
Kinetix 300 and Kinetix 350 Drive Systems Design Guide, publication KNX-RM004.	Provides information to help identify the drive system components and accessory items you need for your Kinetix 300/350 drive and motor/actuator combination.
Kinetix 300 EtherNet/IP Indexing Servo Drives User Manual, publication 2097-UM001	Provides installation instructions to mount, wire, and troubleshoot your Kinetix 300 drive; and system integration for your drive/motor combination with a Logix controller.
Kinetix 300 EtherNet/IP Indexing Servo Drive Installation Instructions, publication 2097-IN001	Provides information on how to install your Kinetix 300 drive system.
Kinetix 300 Shunt Resistor Installation Instructions, publication 2097-IN002	Provides information on how to install and wire the Kinetix 300 drive shunt resistors (also compatible with the Kinetix 350 drive).
Kinetix 300 AC Line Filter Installation Instructions, publication 2097-IN003	Provides information on how to install and wire the Kinetix 300 drive AC line filter (also compatible with the Kinetix 350 drive).
Kinetix 300 I/O Terminal Expansion Block Installation Instructions, publication 2097-IN005	Provides information on how to install and wire the Kinetix 300 drive I/O terminal expansion block (also compatible with the Kinetix 350 drive).
Servo Drive Installation Best Practices Application Technique, publication MOTION-AT004	Best practice examples to help reduce the number of potential noise or electromagnetic interference (EMI) sources in your system and to make sure that the noise sensitive components are not affected by the remaining noise.
System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.	Provides information on the concept of high-frequency (HF) bonding, the Ground Plane principle, and electrical noise reduction.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines to install a Rockwell Automation industrial system.
Product Certifications website: rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.

You can view or download publications at rok.auto/literature.

Migration Options

This migration guide provides you with the essential information to determine hardware design changes that can be necessary when migrating from a motion system that contains Kinetix® 300 servo drives to one that contains Kinetix 5100 servo drives. For each Kinetix 300 drive control mode, there is a suitable solution with Kinetix 5100 servo drives, Logix 5000™ controller platforms, and the Studio 5000 Logix Designer® application. Table 1 and Table 2 provide some common considerations and information when migrating from Kinetix 300 drives to Kinetix 5100 drives.

Table 1 - Kinetix 300 Drive to Kinetix 5100 Drive Control Mode Migrations

Kinetix 300 Drive	Kinetix 5100 Drive
Analog Current	T mode
Analog Velocity	S mode
Indexing	PR Mode
Master Gearing, Step, and Direction	PT Mode
EtherNet/IP™ External Reference	I/O Mode

Table 2 - Kinetix 5100 Drive Control Modes

Control Mode	Short Name	Description
Position mode (terminal block input)	PT	This mode is sometimes referred to as Pulse Train. The servo drive receives the Position command and commands the motor to the target position. The Position command is provided through the I/O terminal block and the signal type is pulse.
Position mode (register input)	PR	The servo drive receives the Position command and commands the motor to the target position. Position commands comes from the program registers (99 in total). You can select the register number with binary-weighted DI signals or through communication.
Speed mode	S	The servo drive receives the Speed command and commands the motor to the target speed. The Speed command comes from the internal registers (3 in total) or by analog voltage (-10V...+10V) that is provided through the terminal block. You can select the command with binary-weighted DI signals.
Speed mode (no analog input)	Sz	The servo drive receives the Speed command and commands the motor to the target speed. The Speed command comes from the internal registers (4 in total, one is fixed at 0). You can select the command with binary-weighted DI signals.
Torque mode	T	The servo drive receives the Torque command and commands the motor to the target torque. The Torque command comes from the internal registers (3 in total) and by analog voltage (-10V...+10V) that is provided through the I/O terminal block. You can select the command with binary-weighted DI signals.
Torque mode (no analog input)	Tz	The servo drive receives the Torque command and commands the motor to the target torque. The Torque command comes from the internal registers (4 in total, one is fixed at 0). You can select the command with binary-weighted DI signals.
I/O mode	IO	The servo drive receives commands from the Logix controller through the EtherNet/IP network connection. Commands are issued through the Add-On_Profile (AOP) with Add-On Instruction (AOI) instructions in the Logix Designer application.

Table 2 - Kinetix 5100 Drive Control Modes (Continued)

Control Mode	Short Name	Description
Dual mode	PT-S	Switches PT and S mode with DI signals.
	PT-T	Switches PT and T mode with DI signals.
	PR-S	Switches PR and S mode with DI signals.
	PR-T	Switches PR and T mode with DI signals.
	S-T	Switches S and T mode with DI signals.
	–	Reserved
	PT-PR	Switches PT and PR mode with DI signals.
Multi-mode	PT-PR-S	Switches PT, PR, and S mode with DI signals.
	PT-PR-T	Switches PT, PR, and T mode with DI signals.

Kinetix 5100 Servo Drive Catalog Numbers

Table 3 and Table 4 lists the catalog numbers and ratings of the Kinetix 5100 servo drives.

Table 3 - Kinetix 5100 Drive Ratings - 200V-class

Cat. No.	Input AC Voltage (V AC)	Input Phases	Rated Power @ 230V (kW)	Rated Power @ 120V (kW)	Cont. Output Current (A rms)	Peak Output Current (A rms)
2198-E1004-ERS	95...132, 170...253	1 PH 1 PH,3 PH	0.4	0.2	2.60	6.5
2198-E1007-ERS	95...132, 170...253	1 PH 1 PH,3 PH	0.75	0.375	5.10	15.41
2198-E1015-ERS	95...132, 170...253	1 PH 1 PH,3 PH	1.5	0.75	7.9	23.7
2198-E1020-ERS	95...132, 170...253	1 PH 1 PH,3 PH	2	1	13.4	53.03
2198-E2030-ERS	170...253	3 PH	3	–	17.9	55.95
2198-E2055-ERS	170...253	3 PH	5.5	–	41.3	91.4
2198-E2075-ERS	170...253	3 PH	7.5	–	49	127.49
2198-E2150-ERS	170...253	3 PH	15	–	78	162

Table 4 - Kinetix 5100 Drive Ratings - 400V-class

Cat. No.	Input AC Voltage (V AC)	Input Phases	Rated Power @ 480V (kW)	Rated Power @ 380/480V (kW)	Cont. Output Current (A rms)	Peak Output Current (A rms)
2198-E4004-ERS	342...528	3 PH	0.4	–	1.60	5.40
2198-E4007-ERS	342...528	3 PH	0.75	–	3.19	8.0
2198-E4015-ERS	342...528	3 PH	1.5	–	6.05	15.11
2198-E4020-ERS	342...528	3 PH	2	–	7.42	20.78
2198-E4030-ERS	342...528	3 PH	–	3	13.95	26.08
2198-E4055-ERS	342...528	3 PH	–	5.5	24.8	37.65
2198-E4075-ERS	342...528	3 PH	–	7.5	31.0	53.32
2198-E4150-ERS	342...528	3 PH	–	15	41.26	70.14

For Kinetix 5100 servo drive module specifications not included in this publication, see the Kinetix Servo Drives Technical Data, publication KNX-TD003.

Potential Design Changes

The design changes required for converting to the Kinetix 5100 drives depend on the original/replacement drive combination and the specifics of the application. This publication provides you with knowledge about the type and extent of work required to migrate from a Kinetix 300 system to a Kinetix 5100 system.

Due to the flexibility of drive installation and use, it is not feasible to cover all possibilities. In addition to the items described in this publication, pay attention to unique features and functions of the Kinetix 300 system when considering replacement with a Kinetix 5100 system. See Appendix A for a comparison of features. See the Kinetix Servo Drives Specifications Technical Data, publication KNX-TD003 for complete specifications.

Notes:

Replacement Considerations

Replacing a Kinetix® 300 drive with a Kinetix 5100 drive can require some system design changes:

- Review the hardware and software design of the existing Kinetix 300 system.
- Compare these designs to the hardware and software specifications for the Kinetix 5100 drives.

WARNING: Because of the variety of uses for the products described in this publication, those responsible for the application and use of these products must satisfy themselves that all necessary steps have been taken to make sure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes, and standards. In no event will Rockwell Automation be responsible or liable for indirect or consequential damage resulting from the use or application of these products.

This publication highlights the major similarities and differences between the Kinetix 300 drives and the Kinetix 5100 drives. Additional criteria not covered in this publication can also impact your application. Review this publication to evaluate the Kinetix 5100 drives for your needs.

Design considerations:

- Upload the programmable logic controller (PLC) programs and determine what you can use for the new system.
- See the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001, for information on the concept of high-frequency (HF) bonding, the Ground Plane principle, and electrical noise reduction.
- Verify that your current motor is compatible.
- Verify that the motor power and feedback cable length in your existing system does not exceed the maximum cable length for the new system.
- Verify that the drive size is compatible.
- Verify that the drive dimensions are compatible.
- Verify that the drive connections and connectors are acceptable or compatible.

Selecting a Replacement Drive

There are a number of different factors that affect the selection of a replacement servo drive and the system redesign effort. Drive sizing is the primary factor in selecting a replacement servo drive. To identify the correct replacement drive size, compare the continuous and peak output current ratings.

Kinetix 300 drives can be replaced with a Kinetix 5100 drive of similar, or in some cases greater, output current capability.

The Kinetix 5100 drives with similar current ratings require less or equivalent physical space than the Kinetix 300 drives.

Factors that affect the redesign effort include the following considerations:

- Drive sizing (ratings and physical)
- Dimension comparison
- Drive interconnects and cabling
- Communication (Serial, USB, or EtherNet/IP™)
- Accessories

Drive Sizing

This section lists the Kinetix 300 servo drives and the suggested Kinetix 5100 servo drives. The tables show the output ratings and dimensional differences. Information in this migration guide is based on the drive combinations that are shown in Table 5 and Table 6.

Nominal Voltage and Output Current Comparison

Table 5 compares the Output Current of the Kinetix 300 and Kinetix 5100 drives for a given input voltage. Review Table 6 to be sure that the replacement drive can deliver the required peak and continuous current to the motor.

Table 5 - Suggested Kinetix 5100 Replacement Drives by Output Current

Kinetix 300 drive					Kinetix 5100 drive				
Cat. No.	**Voltage Range**	**Nominal Voltage Range**	**Continuous Output Current A rms (0-pk)**	**Peak Output Current A rms (0-pk)**	**Cat. No.**	**Voltage Range**	**Nominal Voltage Range**	**Continuous Output Current A rms (0-pk)**	**Peak Output Current A rms (0-pk)**
2097-V31PR0	70...132V, 1 PH (120V nom), voltage-doubler mode 80...264V, 1 PH (120/240V nom)	1 PH, 120/240V	2 (2.8)	6.0 (8.5)	2198-E1004-ERS	95...132V, 1 PH 170...253V, 1 PH/3 PH	120V, 1 PH 230V, 1 PH/3 PH	2.60 (3.68)	6.5 (9.19)
2097-V31PR2		1 PH, 120/240V	4 (5.7)	12.0 (17.0)	2198-E1007-ERS	95...132V, 1 PH 170...253V, 1 PH/3 PH	120V, 1 PH 230V, 1 PH/3 PH	5.10 (7.21)	15.41 (21.79)
2097-V32PR0	80...264V, 1 PH (240V nom)	1 PH, 240V	2 (2.8)	6.0 (8.5)	2198-E1004-ERS	95...132V, 1 PH 170...253V, 1 PH/3 PH	120V, 1 PH 230V, 1 PH/3 PH	2.60 (3.68)	6.5 (9.19)
2097-V32PR2		1 PH, 240V	4 (5.7)	12.0 (17.0)	2198-E1007-ERS	95...132V, 1 PH 170...253V, 1 PH/3 PH	120V, 1 PH 230V, 1 PH/3 PH	5.10 (7.21)	15.41 (21.79)
2097-V32PR4		1 PH, 240V	8 (11.3)	24.0 (33.9)	2198-E1015-ERS	95...132V, 1 PH 170...253V, 1 PH/3 PH	120V, 1 PH 230V, 1 PH/3 PH	7.9 (11.17)	23.7 (33.51)
2097-V33PR1	80...132V, 1 PH (120V nom) 80...264V, 1 PH (240V nom) 80...264V, 3 PH (240V nom)	1 PH, 3 PH, 240V	2 (2.8)	6.0 (8.5)	2198-E1004-ERS	95...132V, 1 PH 170...253V, 1 PH/3 PH	120V, 1 PH 230V, 1 PH/3 PH	2.60 (3.68)	6.5 (9.19)
2097-V33PR3		1 PH, 3 PH, 240V	4 (5.7)	12.0 (17.0)	2198-E1007-ERS	95...132V, 1 PH 170...253V, 1 PH/3 PH	120V, 1 PH 230V, 1 PH/3 PH	5.10 (7.21)	15.41 (21.79)
2097-V33PR5		1 PH, 3 PH, 240V	8 (11.3)	24.0 (33.9)	2198-E1015-ERS	95...132V, 1 PH 170...253V, 1 PH/3 PH	120V, 1 PH 230V, 1 PH/3 PH	7.9 (11.17)	23.7 (33.51)
2097-V33PR6		1 PH, 3 PH, 240V	12 (17.0)	36.0 (50.9)	2198-E1020-ERS	95...132V, 1 PH 170...253V, 1 PH/3 PH	120V, 1 PH 230V, 1 PH/3PH	13.4 (18.95)	53.03 (74.98)
2097-V34PR3	320...528V, 3 PH (480V nom)	3 PH, 480V	2 (2.8)	6 (8.5)	2198-E4007-ERS	342...528V, 3PH (480V nom)	3 PH, 480V, 3PH	3.19 (4.51)	8 (11.31)
2097-V34PR5		3 PH, 480V	4 (5.7)	12 (17)	2198-E4015-ERS		3 PH, 480V, 3PH	6.05 (8.56)	15.11 (21.36)
2097-V34PR6		3 PH, 480V	6 (8.5)	18 (25.5)	2198-E4020-ERS		3 PH, 480V, 3PH	7.42 (10.49)	20.78 (29.38)

Dimension Comparison

Table 6 compares the dimensions of the Kinetix 300 and Kinetix 5100 drives.

Table 6 - Suggested Kinetix 5100 Replacement Drives by Dimensions

Kinetix 300 drive				Kinetix 5100			
Cat. No.	Height mm (in.) (1)	Width mm (in.)	Depth mm (in.)	Cat. No.	Height mm (in.) (1)	Width mm (in.)	Depth mm (in.)
2097-V31PR0	238 (9.37)	68.0 (2.68)	185 (7.28)	2198-E1004-ERS	170 (6.69)	35(1.38)	178.3 (7.02)
2097-V31PR2	238 (9.37)	69.0 (2.72)	185 (7.28)	2198-E1007-ERS	180 (7.09)	50 (1.97)	188.4 (7.42)
2097-V32PR0	238 (9.37)	68.0 (2.68)	230 (9.06)	2198-E1004-ERS	170 (6.69)	35(1.38)	178.3 (7.02)
2097-V32PR2	238 (9.37)	69.0 (2.72)	230 (9.06)	2198-E1007-ERS	180 (7.09)	50 (1.97)	188.4 (7.42)
2097-V32PR4	238 (9.37)	87.0 (3.43)	230 (9.06)	2198-E1015-ERS	180 (7.09)	50 (1.97)	188.4 (7.42)
2097-V33PR1	238 (9.37)	68.0 (2.68)	185 (7.28)	2198-E1004-ERS	170 (6.69)	35 (1.38)	178.3 (7.02)
2097-V33PR3	238 (9.37)	69.0 (2.72)	185 (7.28)	2198-E1007-ERS	180 (7.09)	50 (1.97)	188.4 (7.42)
2097-V33PR5	238 (9.37)	94.0 (3.70)	185 (7.28)	2198-E1015-ERS	180 (7.09)	50 (1.97)	188.4 (7.42)
2097-V33PR6	238 (9.37)	68.0 (2.68)	230 (9.06)	2198-E1020-ERS	180 (7.09)	95 (3.74)	208.4 (8.20)
2097-V34PR3	238 (9.37)	69.0 (2.70)	185 (7.28)	2198-E4007-ERS	180 (7.09)	95.0 (3.74)	208 (8.20)
2097-V34PR5	238 (9.37)	94.0 (3.72)	185 (7.28)	2198-E4015-ERS	180 (7.09)	95.0 (3.74)	208 (8.20)
2097-V34PR6	238 (9.37)	68.0 (2.68)	230 (9.06)	2198-E4020-ERS	260 (10.24)	110 (4.33)	204 (8.02)

(1) Height includes connectors.

AC Input Power Wiring and Fusing

This section provides comparisons for the wiring and fusing of the drives.

AC Input Power Configuration

The Kinetix 300 drive supports multiple types of AC input power: center grounded wye secondary, and corner grounded delta secondary.

The Kinetix 5100 drive only supports AC input power with center grounded wye secondary.

Input Power Wiring and Fusing

Determine the wire length for the AC line input after the drive location and cable routing are finalized.

In general, the recommended drive replacement should not require changes in wiring length; however, the routing may need to change as the input power (Mains IPD) and motor power (MP) connections on the Kinetix 300 drives and Kinetix 5100 could be in different physical locations with different connector sizes. Table 7 gives an overview of the connection placement for Kinetix 5100 drives. See Connectors for a comparison of the Kinetix 300 drive and Kinetix 5100 drive connectors.

Table 7 shows a comparison of the connector locations of the Kinetix 300 drives and Kinetix 5100 drives.

Table 7 - Input Power and Motor Power Connection Placement of Kinetix 300 and Kinetix 5100 drives

Kinetix 300			Kinetix 5100		
Cat. No.	**Input Power Connector Location**	**Motor Power Connector Location**	**Cat. No.**	**Input Power Connector Location**	**Motor Power Connector Location**
2097-V31PR0	Top	Bottom	2198-E1004-ERS	Top	Bottom
2097-V31PR2			2198-E1007-ERS		
2097-V32PR0			2198-E1015-ERS		
2097-V32PR2			2198-E1020-ERS	Front	Front
2097-V32PR4			2198-E2030-ERS		
2097-V33PR1			2198-E2055-ERS		
2097-V33PR3			2198-E2075-ERS		
2097-V33PR5			2198-E2150-ERS		
2097-V33PR6			2198-E4004-ERS		
2097-V34PR3	Top	Bottom	2198-E4007-ERS		
2097-V34PR5			2198-E4015-ERS		
2097-V34PR6			2198-E4020-ERS		
—	—	—	2198-E4030-ERS		
			2198-E4055-ERS		
			2198-E4075-ERS		
			2198-E4150-ERS		

Circuit Breaker and Fuse Considerations

Review the fusing requirements when you change a drive.

Table 8 - Kinetix 300 Drive Fuse and Circuit Breaker (CB) Specifications

Drive Cat. No.	Drive Voltage	Phase	UL Applications			IEC (non-UL) Applications		
			Fuses (Bussmann)	**Miniature CB Cat. No.**	**Motor Protection CB Cat. No.**	**DIN gG Fuses Amps max**	**Minature CB Cat. No.**	**Motor Protection CB Cat. No.**
2097-V31PR0	120V	Single-phase (voltage doubler)	KTK-R-20 (20 A)	1489-A1C200	140M-D8E-C20	20	1492-SP1D200	140M-D8E-C20
	120/240V	Single-phase	KTK-R-10 (10 A)	1489-A1C100	140M-C2E-C10	10	1492-SP1D100	140M-C2E-C10
2097-V31PR2	120V	Single-phase (voltage doubler)	KTK-R-30 (30 A)	1489-A1C300	140M-F8E-C32	32	1492-SP1D300	140M-F8E-C32
	120/240V	Single-phase	KTK-R-20 (20 A)	1489-A1C200	140M-D8E-C20	20	1492-SP1D200	140M-D8E-C20
2097-V32PR0	240V	Single-phase	KTK-R-15 (15 A)	1489-A1C150	140M-D8E-C16	16	1492-SP1D150	140M-D8E-C16
2097-V32PR2	240V	Single-phase	KTK-R-20 (20 A)	1489-A1C200	140M-D8E-C20	20	1492-SP1D200	140M-D8E-C20
2097-V32PR4	240V	Single-phase	KTK-R-30 (30 A)	1489-A1C300	140M-F8E-C32	32	1492-SP1D320	140M-F8E-C32
2097-V33PR1	120/240V	Single-phase	KTK-R-20 (20 A)	1489-A1C200	140M-D8E-C20	20	1492-SP1D200	140M-D8E-C20
	240V	Three-phase	KTK-R-15 (15 A)	1489-A3C150	140M-D8E-C16	16	1492-SP3D150	140M-D8E-C16
2097-V33PR3	120/240V	Single-phase	KTK-R-20 (20 A)	1489-A1C200	140M-D8E-C20	20	1492-SP1D200	140M-D8E-C20
	240V	Three-phase	KTK-R-15 (15 A)	1489-A3C150	140M-D8E-C16	16	1492-SP3D150	140M-D8E-C16
2097-V33PR5	120/240V	Single-phase	KTK-R-30 (30 A)	1489-A1C300	140M-F8E-C32	32	1492-SP1D300	140M-F8E-C32
	240V	Three-phase	KTK-R-20 (20 A)	1489-A3C200	140M-D8E-C20	20	1492-SP3D200	140M-D8E-C20
2097-V33PR6	120/240V	Single-phase	LPJ-40SP	—	140M-F8E-C32	40	—	140M-F8E-C32
	240V	Three-phase	KTK-R-30 (30 A)	1489-A3C300	140M-F8E-C32	32	1492-SP3D300	140M-F8E-C32
2097-V34PR3	480V	Three-phase	KTK-R-10 (10 A)	1489-A3C100	140M-C2E-C10	10	1492-SP3D100	140M-C2E-C10
2097-V34PR5			KTK-R-10 (10 A)	1489-A3C100	140M-C2E-C10	10	1492-SP3D100	140M-C2E-C10
2097-V34PR6			KTK-R-20 (20 A)	1489-A3C200	140M-D8E-C20	20	1492-SP3D200	140M-D8E-C20

Table 9 - Kinetix 5100 Drive Fuse and Circuit Breaker Selection

		UL/CSA Application		IEC (non-UL/CSA) Application	
Cat. No.	**Voltage (nom) and Phase**	**Recommended Fuse Cat. No.**	**Recommended Circuit Breaker Cat. No.**	**DIN gG Fuses Rating (amps, max)**	**Recommended Circuit Breaker Cat. No.**
2198-E1004-ERS	120V/230V, 1 PH	KTK-R-15 (15 A)	1489-M2D100	15	1489-M2D100
	230V, 3 PH	KTK-R-10 (10 A)	1489-M3D100	10	1489-M3D100
2198-E1007-ERS	120V/230V, 1 PH	KTK-R-20 (20 A)	1489-M2D200	20	1489-M2D200
	230V, 3 PH	KTK-R-15 (15 A)	1489-M3D130	15	1489-M3D130
2198-E1015-ERS	120V/230V, 1 PH	KTK-R-30 (30 A)	1489-M2D300	30	1489-M2D300
	230V, 3 PH	KTK-R-25 (25 A)	1489-M3D200	25	1489-M3D200
2198-E1020-ERS	120V/230V, 1 PH	LPJ-40SP (40 A)	1489-M2D400	40	1489-M2D400
	230V, 3 PH	LPJ-35SP (35 A)	1489-M3D300	35	1489-M3D300
2198-E2030-ERS	230V, 3 PH	LPJ-50SP (50 A)	1489-M3D350	50	1489-M3D350
2198-E2055-ERS	230V, 3 PH	LPJ-70SP (70 A)	1489-M3D600	70	1489-M3D600
2198-E2075-ERS	230V, 3 PH	LPJ-80SP (80 A)	140G-G2C3-C70	80	140G-G2C3-C70
2198-E2150-ERS	230V, 3 PH	LPJ-125SP (125 A)	140G-G2C3-D12	125	140G-G2C3-D12
2198-E4004-ERS	380...480V AC, three-phase	KTK-R-10 (10A)	1489-M3D100	10	1489-M3D100
2198-E4007-ERS		KTK-R-15 (15A)	1489-M3D100	15	1489-M3D100
2198-E4015-ERS		KTK-R-20 (20A)	1489-M3D150	20	1489-M3D150
2198-E4020-ERS		KTK-R-25 (25A)	1489-M3D200	25	1489-M3D200
2198-E4030-ERS		KTK-R-30 (30A)	1489-M3D300	30	1489-M3D300
2198-E4055-ERS		LPJ-35SP (35A)	–	35	1489-M3D350
2198-E4075-ERS		LPJ-45SP (45A)	–	45	140G-G6C3-C45
2198-E4150-ERS		LPJ-90SP (90A)	–	90	140G-G6C3-C60

Power Specifications

This section provides the power specifications for the Kinetix 300 and Kinetix 5100 servo drives. Table 10 and Table 11 list power specifications and requirements for the Kinetix 300 servo drives.

Table 10 - Kinetix 300 Drives (Single-phase) Power Specifications

Attribute	2097-V31PR0	2097-V31PR2	2097-V32PR0	2097-V32PR2	2097-V32PR4
AC input voltage	70...132V rms single-phase (120V nom) 80...264V rms single-phase (240V nom)		80...264V rms single-phase (240V nom)		
AC input frequency	48...62 Hz				
Main AC input current Rms (nom) 120V input (voltage doubler) Inrush (0-pk) Max 120V input Rms (nom) 120/240V input Inrush (0-pk) max 240V input	 9.70 A 1.15 A 5.0 A 1.1 A	 15.0 A 1.15 A 8.6 A 1.1	 5.0 A 136 A	 8.6 A 2.3 A	 15.0 A 2.3 A
Integrated AC line filter	No	No	Yes	Yes	Yes
Continuous output current (rms)	2.0 A	4.0 A	2.0 A	4.0 A	8.0 A
Continuous output current (0-pk)	2.8 A	5.7 A	2.8 A	5.7 A	11.3 A
Peak output current (rms)	6.0 A	12.0 A	6.0 A	12.0 A	24.0 A
Peak output current (0-pk)	8.5 A	17.0 A	8.5 A	17.0 A	39.9 A
Continuous power output @ 240V nom or 120V (Voltage-doubler mode)	0.40 kW	0.80 kW	0.40 kW	0.80 kW	1.70 kW
Shunt On	390V DC				
Shunt Off	375V DC				
Overvoltage	430V DC				
Short-circuit current rating	100,000 A (rms) symmetrical				

Table 11 - Kinetix 300 Drives (single-phase and three-phase) Power Specifications

Attribute	2097-V33PR1	2097-V33PR3	2097-V33PR5	2097-V33PR6
AC input voltage	80…132V rms single-phase (120V nom) 80…264V rms single-phase (240V nom) 80…264V rms three-phase (240V nom)			
AC input frequency	48…62 Hz			
Main AC input current Rms (nom) 120V input (voltage doubler) Inrush (0-pk) max 120V input Rms (nom) 120/240V input Inrush (0-pk) max 240V input	 5.0 A 68.0 A 3.0 A 136 A	 8.6 A 1.15 A 5.0 A 2.3 A	 15.0 A 1.15 A 8.7 A 2.3 A	 24.0 A 5.65 A 13.9 A 11.3 A
Integrated AC line filter	No	No	No	No
Continuous output current (rms)	2.0 A	4.0 A	8.0 A	12.0 A
Continuous output current (0-pk)	2.8 A	5.7 A	11.3 A	17.0 A
Peak output current (rms)	6.0 A	12.0 A	24.0 A	36.0 A
Peak output current (0-pk)	8.5 A	17.0 A	39.9 A	50.9 A
Continuous power output @ 240V nom or 120V (Voltage-doubler mode)	0.50 kW	1.00 kW	2.00 kW	3.00 kW
Shunt On	390V DC			
Shunt Off	375V DC			
Overvoltage threshold	430V DC			
Short-circuit current rating	100,000 A (rms) symmetrical			

Table 12 - Kinetix 300 Drives Control Power Specification

Attribute	Kinetix 300 Drives
Control power input voltage	20…26V DC
Control power input current Nom Inrush max (0-pk)	 500 mA 30 A

Table 13 and Table 14 list power specifications and requirements for the Kinetix 5100 drives.

Table 13 - Kinetix 5100 Input Power Specifications (single-phase and three-phase)

Attribute	2198-E1004-ERS	2198-E1007-ERS	2198-E1015-ERS	2198-E1020-ERS
AC input voltage	95…132V rms, single-phase (120V nom) 170…253V rms, single-phase (200…230V nom) 170…253V rms, three-phase (230V nom)			
AC input frequency	47…63 Hz			
Main AC input current [1] Nom (rms) 120V input (single-phase) Inrush max (0-pk) 120V input Nom (rms) 230V input (single-phase) Inrush max (0-pk) 230V input Nom (rms) 230V input (three-phase) max Inrush max (0-pk) 230V input	 4.08 A 0.84 A 4.79 A 1.40 A 2.84 A 1.44 A	 7.88 A 0.76 A 8.85 A 1.32 A 5.20 A 1.40 A	 12.22 A 0.76 A 14.41 A 1.36 A 7.87 A 1.44 A	 18.40 A 2.56 A 21.36 A 4.40 A 11.57 A 4.64 A
Continuous output current (rms)	2.6 A	5.1 A	7.9 A	13.4 A
Continuous output current (0-pk)	3.7 A	7.2 A	11.2 A	18.9 A
Peak output current (rms) [2]	6.5 A	15.4 A	23.7 A	40.6 A
Peak output current (0-pk)	9.2 A	21.8 A	33.5 A	57.4 A
Continuous power output @ 120V nom @ 230V nom	 0.20 kW 0.40 kW	 0.375 kW 0.75 kW	 0.75 kW 1.50 kW	 1.0 kW 2.0 kW
Internal shunt on	370V @120V AC input 370V @230V AC input			
Internal shunt off				
Internal shunt resistor	100 Ω	100 Ω	100 Ω	20 Ω
Internal shunt power	5 W	14 W	14 W	20 W

Table 13 - Kinetix 5100 Input Power Specifications (single-phase and three-phase) (Continued)

Attribute	2198-E1004-ERS	2198-E1007-ERS	2198-E1015-ERS	2198-E1020-ERS
Undervoltage threshold	70V @120V AC input 150V @230V AC input			
Overvoltage threshold	410V @120V AC input 410V @230V AC input			
Bus capacitance	540 µF	1680 µF	1680 µF	2160 µF
Capacitive energy absorption	6.24 J	19.40 J	19.40 J	24.95 J
Short-circuit current rating	5,000 A (rms) symmetrical			

(1) Kinetix 5100 drive modules are limited to one AC mains power cycling per minute.
(2) Peak RMS current that is allowed for up to 1.8 seconds.

Table 14 - Kinetix 5100 Input Power Specifications (three-phase)

Attribute	2198-E2030-ERS	2198-E2055-ERS	2198-E2075-ERS	2198-E2150-ERS
AC input voltage	170...253V rms, three-phase (230V nom)			
AC input frequency	47...63 Hz			
Main AC input current [1] Nom (rms) 230V input (three-phase) Inrush max (0-pk) 230V input	 14.65 A 4.42 A	 27.32 A 9.55 A	 37.90 A 28.68 A	 70.45 A 32.0 A
Continuous output current (rms)	17.9 A	41.3 A	49.0 A	78.0 A
Continuous output current (0-pk)	25.3 A	58.4 A	69.3 A	110.3 A
Peak output current (rms) [2]	55.95 A	91.4 A	127.5 A	162.0 A
Peak output current (0-pk)	79.1 A	129.2 A	180.3 A	229.1 A
Continuous power output @ 230V nom	3.0 kW	5.5 kW	7.5 kW	15.0 kW
Internal shunt on	370V @230V AC input			
Internal shunt off				
Internal shunt resistor	20 Ω	–	–	–
Internal shunt power	20 W	–	–	–
Undervoltage threshold	150V @230V AC input			
Overvoltage threshold	410V @230V AC input			
Bus capacitance	2160 µF	4100 µF	7000 µF	13,500 µF
Capacitive energy absorption	24.95 J	47.36 J	69.30 J	155.93 J
Short-circuit current rating	5,000 A (rms) symmetrical			

(1) Kinetix 5100 drive modules are limited to one AC mains power cycling per minute.
(2) Peak RMS current that is allowed for up to 1.8 seconds.

Table 15 - Kinetix 5100 Power Specifications (480V nom three-phase)

Attribute	2198-E4004-ERS	2198-E4007-ERS	2198-E4015-ERS	2198-E4020-ERS
AC input voltage	342...528V rms, three-phase (480V nom)			
AC input frequency	47...63 Hz			
Mains AC input current [1] Nom (rms) 380V input (three-phase) Max inrush (0-pk) 380V input Nom (rms) 480V input (three-phase) Max inrush (0-pk) 480V input	 1.49 A 5.66 A 1.34 A 7.15 A	 2.31 A 5.66 A 2.08 A 7.15 A	 5.009 A 5.66 A 4.38 A 7.15 A	 6.29 A 9.43 A 4.94 A 11.91 A
Control power input voltage	21.6...26.4V DC 24V DC nom			
Control power input current @ 24V DC [2] Control power in-rush current @ 24V DC	1.27 A_{DC} 4.14 A_{DC}			1.40 A_{DC} 4.97 A_{DC}
Continuous output current (rms)	1.60 A	3.19 A	6.05 A	7.42 A
Continuous output current (0-pk)	2.26 A	4.51 A	8.56A	10.49 A
Peak output current (rms) [3]	5.40 A	8.0 A	15.11 A	20.78 A
Peak output current (0-pk)	7.63 A	11.31 A	21.36 A	29.38 A
Line loss ride through	20 ms			
Continuous output power	0.40 kW	0.75 kW	1.50 kW	2.0 kW
Internal shunt on Internal shunt off	760V			
Internal shunt resistor	80 Ω			–
Internal shunt power	10 W			–
Bus undervoltage	282V			
Bus overvoltage	820V			
Bus capacitance	165 µF		235 µF	470 µF
Capacitive energy absorption	11.2 J		16.0 J	32.0 J
Short-circuit current rating	5,000 A (rms) symmetrical			

(1) Kinetix 5100 drive modules are limited to 1 AC mains power cycling per minute.
(2) Kinetix 5100 drive modules are limited to 1 control power cycling every 20 seconds.
(3) Peak RMS current allowed for up to 1.8 seconds.

Table 16 - Kinetix 5100 Power Specifications (480V nom three-phase, continued)

Attribute	2198-E4030-ERS	2198-E4055-ERS	2198-E4075-ERS	2198-E4150-ERS
AC input voltage	342…528V rms, three-phase (380/480V nom)			
AC input frequency	47…63 Hz			
Mains AC input current [1] Nom (rms) 380V input (three-phase) Max inrush (0-pk) 380V input Nom (rms) 480V input (three-phase) Max inrush (0-pk) 480V input	 9.96 A 9.43 A 7.91 A 11.91 A	 16.825 A 9.43 A 13.35 A 11.91 A	 23.664 A 9.43 A 18.78 A 11.91 A	 36.855 A 28.28 A 29.25 A 35.73 A
Control power input voltage	21.6…26.4V DC, 24V DC nom			
Control power input current @ 24V DC [2] Control power in-rush current @ 24V DC	1.77 A_{DC} 4.97 A_{DC}	2.03 A_{DC} 3.24 A_{DC}		4.43 A_{DC} 3.40 A_{DC}
Continuous output current (rms)	13.95 A	24.8 A	31.0 A	41.26 A
Continuous output current (0-pk)	19.73 A	35.07 A	43.84 A	58.35 A
Peak output current (rms) [3]	26.08 A	37.65 A	53.32 A	70.14 A
Peak output current (0-pk)	36.88 A	53.24 A	75.39 A	99.18 A
Line loss ride through	20 ms			
Continuous output power	3.0 kW	5.5 kW	7.5 kW	15.0 kW
Internal shunt on Internal shunt off	760V			
Internal shunt resistor	–	–	–	–
Internal shunt power	–	–	–	–
Bus undervoltage	282V			
Bus overvoltage	820V			
Bus capacitance	560 µF	1120 µF	1640 µF	2500 µF
Capacitive energy absorption	38.2 J	76.3 J	111.7 J	170.3 J
Short-circuit current rating	5,000 A (rms) symmetrical			

(1) Kinetix 5100 drive modules are limited to 1 AC mains power cycling per minute.
(2) Kinetix 5100 drive modules are limited to 1 control power cycling every 20 seconds.
(3) Peak RMS current allowed for up to 1.8 seconds.

Table 17 - Kinetix 5100 Drive Control Power Specifications - 200V-class

Attribute	2198-E1004-ERS,	2198-E1007-ERS,	2198-E1015-ERS,	2198-E1020-ERS	2198-E2030-ERS	2198-E2055-ERS	2198-E2075-ERS	2198-E2150-ERS
Control power input voltage 120V AC input power	95…132V rms, 120V AC nom, single-phase				–	–	–	–
Control power input voltage 200…230V AC input power	170…253V rms, 200…230V AC nom, single-phase							
Control power input current Nom (rms) 120V input max inrush (0-pk)	0.34 A 15.80 A	0.38 A 18.20 A	0.38 A 19.20 A	0.63 A 19.20 A	–	–	–	–
Control power input current Nom (rms) 230V input max inrush (0-pk)	0.20 A 37.0 A	0.22 A 37.40 A	0.22 A 39.80 A	0.35 A 32.40 A	0.35 A 36.40 A	0.46 A 32.80 A	0.48 A 40.0 A	0.92 A 37.0 A

Table 18 - Kinetix 5100 Drive Control Power Specifications - 400V-class

Attribute	2198-E4004-ERS,	2198-E4007-ERS,	2198-E4015-ERS,	2198-E4020-ERS	2198-E4030-ERS	2198-E4055-ERS	2198-E4075-ERS	2198-E4150-ERS
Control power input voltage	21.6...26.4V DC 24V DC nom							
Control power input current @ 24V DC (1) Control power in-rush current @ 24V DC	1.27 A_{DC} 4.14 A_{DC}			1.40 A_{DC} 4.97 A_{DC}	1.77 A_{DC} 4.97 A_{DC}	2.03 A_{DC} 3.24 A_{DC}		4.43 A_{DC} 3.40 A_{DC}

(1) Kinetix 5100 drive modules are limited to 1 control power cycling every 20 seconds.

I/O Availability and Specifications

All Kinetix 300 drives and Kinetix 5100 have a comprehensive set of digital I/O and analog I/O. Use the following specifications to verify if the IO functionality is comparable.

Digital Inputs

This section describes digital inputs for Kinetix 300 and Kinetix 5100 servo drives. Table 19 compares the digital inputs of the two drive families.

Table 19 - Digital Input Comparison

Feature	Kinetix 300 Drive	Kinetix 5100 Drive
Inputs	12 Inputs	10 total (Eight standard inputs, two optional high-speed inputs)
DC common terminations	3 groups (A,B,C) each with an isolated common	1
Number of Pre-selectable indexes (using binary weighted digital inputs)	32	99
Multiple input assignments	–	Yes (via software programming only)
Fixed assignment for Enable/Overtravel/Registration	Yes	–
De-bounce for inputs	Yes	Yes
Registration Input	IN_C3 only	Yes - can be assigned to two-high speed inputs only (Input 9 and Input 10)
Overtravel contact type	Can be N.O. or N.C.	Can be N.O. or N.C.

Kinetix 300 Drives

The Kinetix 300 drive has 12 digital inputs. Some input assignments are fixed, and some are programmable. See Table 20 for input assignments. Each input can be assigned an individual de-bounce time via MotionView software or Explicit Messaging.

The inputs are separated into three groups: A, B, and C. Each group has four inputs that share one common: IN_A_COM, IN_B_COM, and IN_C_COM, respectively. Overtravel limits, the inhibit/enable input, and registration input have dedicated inputs as shown in Table 20.

Table 20 - Kinetix 300 Drives Fixed Digital Input Assignments

Digital Input	Function
IN_A1 (pin 27)	Negative travel limit input
IN_A2 (pin 28)	Positive travel limit input
IN_A3 (pin 29)	Inhibit/enable input
IN_A4 (pin 30)	—
IN_B1 (pin 32)	—
IN_B2 (pin 33)	—
IN_B3 (pin 34)	—
IN_B4 (pin 35)	—
IN_C1 (pin 37)	—
IN_C2 (pin 38)	—
IN_C3 (pin 39)	Registration sensor input
IN_C4 (pin 40)	—

You can assign the inputs that are listed as — for any of these functions.

- Abort Homing
- Abort Index
- Start Homing
- Start Index
- Fault Reset
- Home Sensor
- Index Select

The digital inputs are optically isolated and sink up to 24V DC. Electrical details are shown in Table 21.

Table 21 - Kinetix 300 Digital Input Signal Specifications

Attribute	Value
Scan time	500 µs
Current max	9 mA, typical
Input impedance	1.2 kΩ, typical
Voltage range	5...24V DC

Kinetix 5100 Drives

The Kinetix 5100 drives have eight standard inputs and two-high speed inputs, both with configurable functions. The digital inputs on Kinetix 5100 drives have the same physical characteristics. Table 22 shows the Kinetix 5100 digital inputs physical characteristics.

Table 22 - Kinetix 5100 Digital Input Signal Specifications

Attribute	Value
Digital Input response (delay)	Standard inputs: 1.25 ms max High-speed inputs: 3 µs
Digital Input scan time	Standard inputs: 500us max High-speed inputs: 1µs
ON state voltage	15V min, 26.4V max
ON state Current	2.0 mA min, 6.0 mA max
OFF state voltage	-1.0 V min, 5V max

The Kinetix 5100 drive digital inputs are assigned to specific functions by using the KNX5100C software. INPUT9 and INPUT10 are high-speed digital inputs and registration functionality is supported on these inputs only.

Valid Input functions are shown here:

- Alarm Reset (ARST)
- Clear pulse counter (CCLR)
- Command triggered (CTRG)
- Emergency stop (EMGS)
- Negative Limit (NL)
- Positive Limit (PL)
- Position Selection (POS0... POS6)
- Servo is on (SON, Drive Enable)
- Speed / Position Selection (S-P)
- Speed Selection (SPD0,SPD1)
- Torque mode speed Limit (SPDLM)
- Torque Command (TCM0 TCM1)
- Torque / Position Selection (T-P)
- Torque limit (TRQLM)

See the Programming via Drive Parameters chapter in the Kinetix 5100 Single-axis EtherNet/IP Servo Drives User Manual, publication 2198-UM004 for the full list of digital input functions.

Digital Input Circuits

In both the Kinetix 300 and Kinetix 5100 drives, the digital inputs are optically isolated. You can configure the inputs for PNP sourcing or NPN sinking as shown in Figure 1 and Figure 2.

Figure 1 - Kinetix 300 Drive Digital Input Circuit

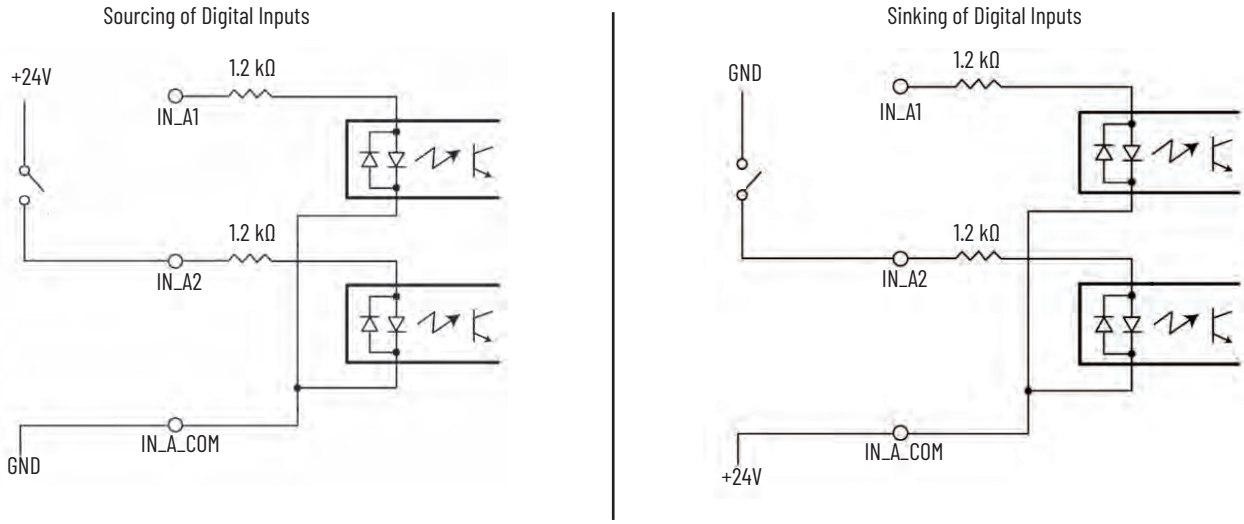
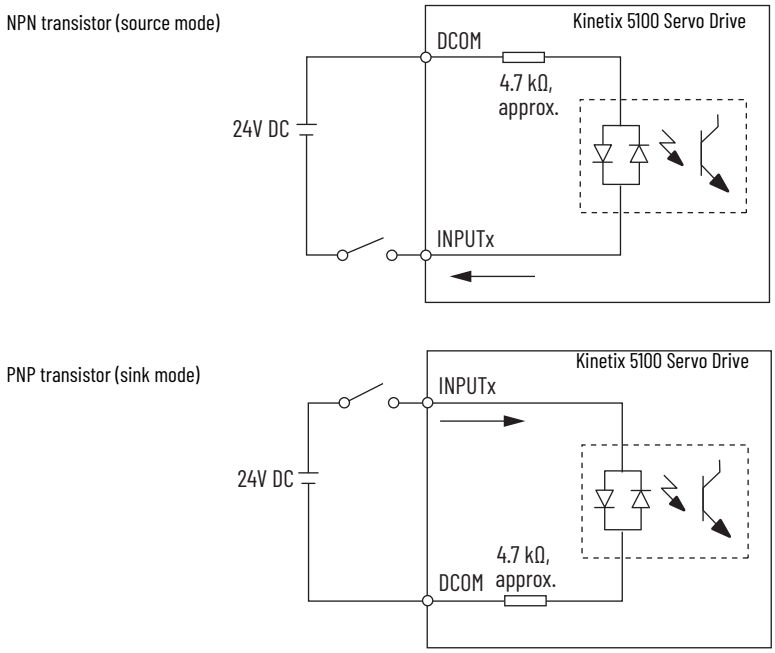


Figure 2 - Kinetix 5100 Drive Digital Input Circuit



Digital Outputs

This section describes the digital outputs for Kinetix 300 and Kinetix 5100 servo drives. Table 23, Table 24, and Table 25 compare the digital outputs between the two drive families.

Table 23 - Digital Outputs Comparison

Features	Kinetix 300	Kinetix 5100
Outputs	5	6
Brake output assignment	Programmable, transistor type	Programmable, transistor type
Configurable output assignment	Yes	Yes

Table 24 - Kinetix 300 Drives Digital Output Signal Specifications

Parameter	Value
Scan time	500 µs
Current max	100 mA
Voltage max	30V DC

Table 25 - Kinetix 5100 Drives Digital Output Signal Specifications

Attribute	Value
Digital outputs type	Open collector or open emitter
Digital outputs ON state current	40 mA max continuous
Digital outputs ON state voltage drop	1.5V max @40mA
Digital outputs OFF state current	100 µA max
Digital outputs OFF state voltage	30V max
Digital Outputs scan time	250 µs max
Digital Outputs pass through delay	1 ms max
Electrical Isolation	Optically isolated SELV/PELV
Isolation Insulation Safety Rating	Functional Insulation
Short-circuit protection	Yes

Kinetix 300 drives have five digital outputs, OUT1…OUT4 and RDY, available on the IOD connector. Outputs are optically isolated open collector/emitter and are fully isolated from the drive circuits. Each output, OUT1…OUT4, can be assigned to one of these functions:

- Not assigned
- Zero speed
- In-speed window
- Current limit
- Runtime fault
- Ready
- Brake (motor holding brake)

The Ready Output (RDY) of the Kinetix 300 has a fixed operation. The Output turns on when the drive is enabled and the output power transistors become energized.

Kinetix 5100 drives have six outputs that can be assigned through the KNX5100C software. Their outputs are assigned to similar functions as the Kinetix 300 drive and additional assignments are available for the Kinetix 5100 drive. For the full list of digital output functions, see the Kinetix 5100 Single-axis EtherNet/IP Servo Drives User Manual, publication 2198-UM004.

Digital Output Circuits

The digital outputs of Kinetix 300 drive are optically isolated. Figure 3 shows the digital output circuit of the Kinetix 300 drives. Figure 4 is the Digital Output Circuit of the Kinetix 5100 drives.

Figure 3 - Kinetix 300 Drive Digital Output Circuit

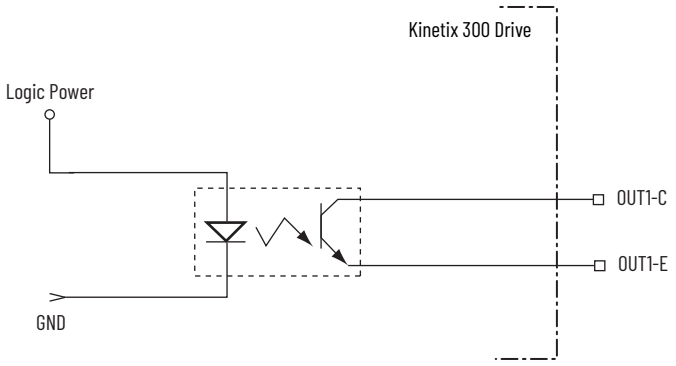
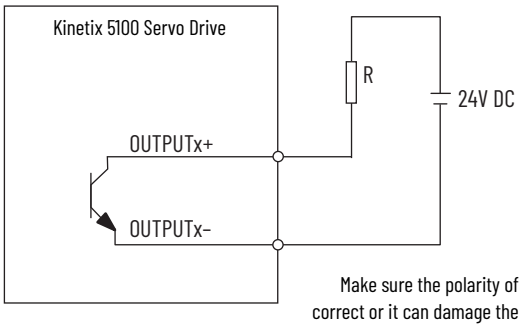


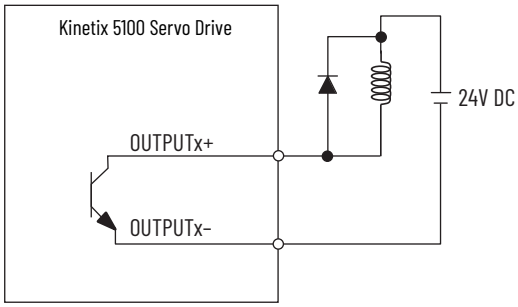
Figure 4 - Kinetix 5100 Digital Output Circuit

An external 24V DC power supply is required to energize the load.



Make sure the polarity of the diode is correct or it can damage the servo drive.

An external 24V DC power supply is required to energize the inductive load.



Analog Inputs

This section describes analog inputs for the Kinetix 300 and Kinetix 5100 servo drives.

The Kinetix 300 drive analog reference input AIN1+ and AIN1- terminals (IOD-24 and IOD-25) accepts up to a ±10V DC analog signal. This analog signal is converted to a digital value with 12-bit resolution (11 bit plus sign). The total reference voltage as seen by the drive is the voltage difference between the AIN1+ and AIN1- terminals. If used in Single-ended mode, one of the analog terminals must be connected to a voltage source while the other one must be connected to ACOM. If used in Differential mode, the voltage source is connected across AIN1+ and AIN1- and the driving circuit common, if available, is connected to the drive Analog Common (ACOM) terminal.

The Kinetix 5100 servo drive has two analog input terminals (COMMAND1 and COMMAND2) which are single-ended inputs referencing the analog single ground (AGND). The analog COMMAND1 (T-REF) input provides a torque command signal, and COMMAND2 (V-REF) input can provide position or speed command signal. A 16-bit A/D converter digitizes the input signal.

Table 26 shows the characteristics between Kinetix 300 and Kinetix 5100 drive analog inputs.

Table 26 - Analog Inputs Parameters Comparison

Parameter	Kinetix 300	Kinetix 5100
Analog Inputs Resolution	12 bits	15 bits min
Analog Inputs Impedance	47 kΩ, typical	12 kΩ approx, typical
Analog Inputs Voltage	-10 V ~ +10V	-10 V ~ +10V
Analog Inputs Scan Time	0.0625 ms	0.0625 ms max

Analog Outputs

This section describes analog outputs for Kinetix 300 and Kinetix 5100 servo drives.

Kinetix 300 Drive Analog Outputs

Figure 5 shows the analog output circuit for the Kinetix 300 Drives. Table 27 lists the Kinetix 300 analog output specifications.

Figure 5 - Kinetix 300 Drive Analog Output Circuit

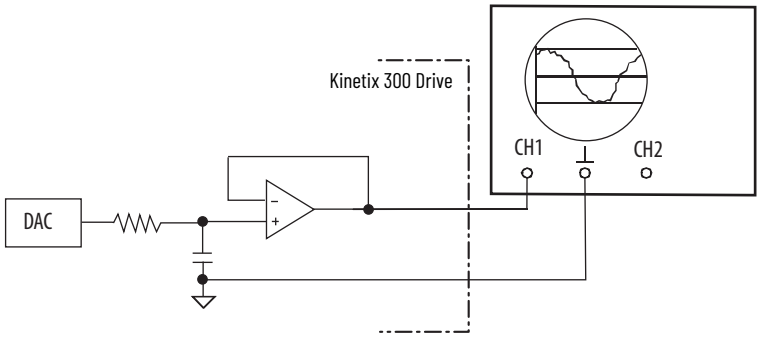


Table 27 - Kinetix 300 Drive Analog Output Specifications

Parameter	Value
Scan time	0.0625 ms
Current max	10 mA
Voltage range	-10...10V DC

The analog output (AO) on terminal IOD-23 has a 10-bit resolution. The analog output is a single-ended signal and referenced to analog common (ACOM) that can be assigned to the following:

- Not Assigned
- RMS Phase Current
- RMS Peak Current
- Motor Velocity
- Phase Current U
- Phase Current V
- Phase Current W
- Iq Current
- Id Current

IMPORTANT Output values can vary during power-up until the specified power supply voltage is reached. MotionView software refers to phase current U, V, and W as R, S, and T respectively.

Kinetix 5100 Analog Outputs

Figure 6 shows the analog output circuit for the Kinetix 5100 Drives. Table 28 lists the Kinetix 5100 analog output specifications.

Figure 6 - Kinetix 5100 Analog Output Circuit

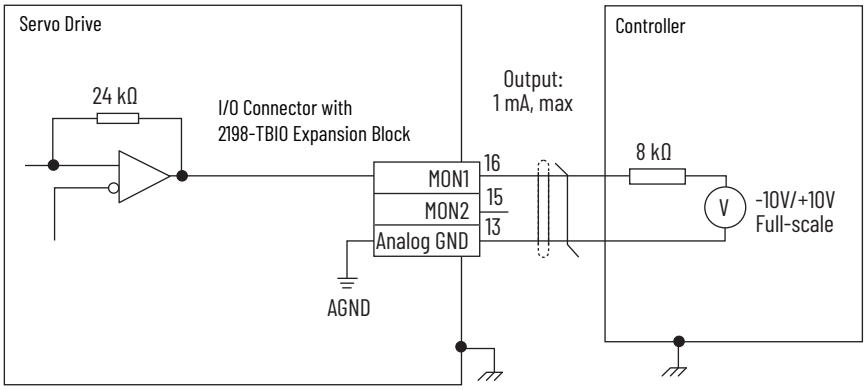


Table 28 - Kinetix 5100 Drives Analog Output Specifications

Parameter	Kinetix 5100
Analog Output Resolution	10 bits min
Analog Output Current max	1 mA
Analog Output Voltage	–8V ... +8V DC, or –10...+10V DC, configurable
Analog Outputs Scan Time	0.25 ms max
Offset Error	100 mV max
Gain Error	5% max
Bandwidth	50 Hz min

The Kinetix 5100 servo drive provides two single-ended analog outputs (MON1 and MON2) referenced to an analog ground.

The operation status of drive and motor can be displayed in the manner of analog voltage, such as speed and current. You can select the data to be monitored via parameter ID 103 (P0.003) AOMonitorSelection. Table 29 describes the details of motor parameters which can be displayed through MON1 and MON2 analog outputs.

Table 29 - Kinetix 5100 Analog Outputs Monitoring

MON1 and MON2 Setting Value (in P0.003)	Description
0	Motor speed (+/- 8 volts or 10 volts / max. speed)
1	Motor torque (+/- 8 volts or 10 volts / max. torque)
2	Pulse command frequency (+/- 8 volts or 10 volts / 4.5 MHz)
3	Speed command (+/- 8 volts or 10 volts / max speed command)
4	Torque command (+/- 8 volts or 10 volts / max torque command)
5	VBUS voltage (+/- 8 volts or 10 volts / 450V max)

Control and Auxiliary Power Specifications

The control power input allows the drive to maintain logic power wen main power is removed. Control power input allows communication between the controller and the drive to remain active; as well as maintaining the USB connection for the drive.

The Kinetix 300 drives use a 24V DC logic power source for all drives (referred to as control power). Table 30 shows the control power specifications for Kinetix 300 drives.

Table 30 - Kinetix 300 Control Power Specifications

Specification	Value
Control Power back-up input voltage	20...26V DC
Control Power back-up input current (nom)	500 mA
Control Power back-up input current (max inrush [0-pk])	30 A

The Kinetix 5100 drive requires a control power supply shown in Table 31 and Table 32. Depending on the voltage class of the drive, the control power is either a phase from the incoming power (non-400V-class) or 24V DC (400V-class)

Table 31 - Kinetix 5100 Servo Drive Control Power and Auxiliary Power Rating - 200V-class

Cat. No.	Maximum Input Current of Control Power A rms at 120Vrms nom	Inrush current of Control Power A 0-pk at 120V rms nom	Maximum Input Current of Control Power A rms at 230Vrms nom	Inrush current of Control Power A 0-pk at 230V rms nom
2198-E1004-ERS	0.34	15.80	0.20	37.0
2198-E1007-ERS	0.38	18.20	0.22	37.40
2198-E1015-ERS	0.63	19.20	0.22	39.80
2198-E1020-ERS	–	19.20	0.35	32.40
2198-E2030-ERS	–	–	0.35	36.40
2198-E2055-ERS	–	–	0.46	32.80
2198-E2075-ERS	–	–	0.48	40.0
2198-E2150-ERS	–	–	0.92	37.0

The Kinetix 5100 400V-class drives require 24V DC control power.

Table 32 - Kinetix 5100 Servo Drive Control Power and Auxiliary Power Rating - 400V-class

Cat. No.	Maximum Input Current of Control Power A rms at 24V DC	Inrush current of Control Power A at 24V DC
2198-E4004-ERS	1.27	4.14
2198-E4007-ERS		
2198-E4015-ERS		
2198-E4020-ERS	1.40	4.97
2198-E4030-ERS	1.77	4.97
2198-E4055-ERS	2.03	3.24
2198-E4075-ERS		
2198-E4150-ERS	4.43	3.40

Compatible Motors

Table 33 compares different motor families that are supported by Kinetix 300 servo drives and Kinetix 5100 servo drives. Only the Kinetix MP and TL/TLY motors are supported by both Kinetix 300 and Kinetix 5100. For more information on supported motors and feedback, see the Kinetix 5100 Single-axis EtherNet/IP Servo Drives User Manual, publication 2198-UM004.

Table 33 - Supported Motor Families

Servo Motor	Kinetix 300	Kinetix 5100
Kinetix MPL, MPM, MPF, MPS	Yes	Yes (unless it uses resolver-based feedback)
Kinetix TL and TLY	Yes	Yes
Kinetix TLP	–	Yes

Feedback Devices

The Kinetix 300 drives and the Kinetix 5100 drives accept motor feedback signals from Hiperface absolute high-resolution encoders, 17-bit Tamagawa encoders, and generic TTL incremental encoders.

In addition, when using the Kinetix TLP motor, the Kinetix 5100 drive accepts the 24-bit absolute (single-turn and multi-turn) feedback. The Kinetix 5100 drives accept motor feedback signals from 17-bit absolute encoders that are used in Kinetix TL/TLY motors.

For more information on the Kinetix 5100 compatible feedback encoders see the Kinetix 5100 Single-axis Ethernet/IP Servo Drives User Manual, publication 2198-UM004. For more information on the Kinetix 300 compatible feedback encoders see the Kinetix 300 EtherNet/IP Indexing Servo Drives User Manual, publication 2097-UM001.

Accessories

You can reuse motor power and feedback cables between Kinetix MP motors and Kinetix 300 drives in Kinetix 5100 applications.
See Dimensions, Cables, and Wiring for more detail.

In some instances, existing shunt resistors used with Kinetix 300 drives can be reused with Kinetix 5100 drives.

Required Accessories

See the Kinetix Motion Accessories Technical Data, publication KNX-TD004, for detailed descriptions and specifications of these servo drive accessories.

Table 34 - Kinetix 300 Required Drive Accessories

Drive Accessory	Cat. No.(1)	Description
Ethernet Cable	1585J-M8CBJM-*x* 1585J-M8UBJM-*x* 1585J-M8CB-*x*	Ethernet cables (double-ended, non/high-flex, shielded are available in standard lengths. Shielded cable is required to meet EMC specifications.
I/O terminal expansion block	2097-TB1	Input/output signal connector-PLC and I/O function.
Low-profile connector kit	2090-K2CK-D15M	Required for flying lead feedback cables
Motor power and feedback cables (2)	—	See the specific drive/motor combination for the motor cables required for your system.

(1) Where *x* equals the cable length in meters.
(2) Motor Power and feedback cable for Kinetix MP servo motor (Bulletin -2090) can be shared with Kinetix 5100 servo drive.

Table 35 - Kinetix 5100 Required Drive Accessories

Accessory	Cat. No.(1)	Description
Communication Cables	1585J-M8CBJM-*x* 1585J-M8UBJM-*x* 1585J-M8CB-*x*	Ethernet cables (Double-ended, non/high-flex, shielded) are available in standard lengths. Shielded cable is required to meet EMC specifications.
	2198-USBC	Mini USB Cable (for connecting Kinetix 5100 to Personal Computer).
	2198-USBF	Filter used with 2198-USBC to remove noise.
Feedback Connector kit	2198-K51CK-D15M	Required for flying lead feedback cables
I/O Connector kit	2198-TBIO	Required for wiring I/O signals to the controllers
Motor Power and Feedback Cables	See the specific drive/motor combination for the motor cable required for your system	

(1) Where *x* equals the cable length in meters.

Optional Drive Accessories - Shunt Resistors

The Kinetix 300 drives do not have internal shunt resistors.

The Kinetix 300 drives have pre-defined passive shunt modules that are used with certain drive sizes. Table 36 lists the passive shunts for the Kinetix 300 drives.

Table 36 - Kinetix 300 Drives Passive Shunt Resistor Specifications

Kinetix 300 Cat. No.	Shunt Module Cat. No.	Specifications					
		%RD_Application max	Resistance Ω	Peak Power kW	Peak Current A	Continuous Power W	Shipping Weight kg (lb)
2097-V32PR4 2097-V33PR5	2097-R2	1.97	20	7.6	19.5	150	0.3 (0.7)
2097-V33PR6	2097-R3	2.96	30	5.1	13.0		
2097-V31PR0 2097-V31PR2 2097-V32PR0 2097-V32PR2 2097-V33PR1 2097-V33PR3	2097-R4	2.10	40	3.8	9.8	180	0.2 (0.4)
2097-V34PR5-*xx* 2097-V34PR6-*xx*	2097-R6	1.90	75	7.9	10.3	150	0.3 (0.7)
2097-V34PR3-*xx*	2097-R7	2.02	150	4.0	5.1	80	0.2 (0.4)

The Kinetix 5100 drives have internal shunt capability (shunt IGBT), some have internal shunt resistors (400 W...3 kW) and some do not.

External shunt resistors (Bulletin 2198-Rxxx shunt resistors) can be used to provide additional shunt capacity for applications when the internal shunt capacity of the drive is exceeded, or when using 200V; 5.5 kW ... 15 kW Kinetix 5100 drives. Catalog number 2198-R031 is composed of resistor coils that are housed inside an enclosure. Catalog numbers 2198-R004, 2097-R6, and 2097-R7 are shunt resistors without an enclosure. The figures and tables below describe the shunt resistor specification and dimensions.

These dimensions apply to units with an enclosure.

Figure 7 - Product Dimensions: Catalog Number 2198-R031

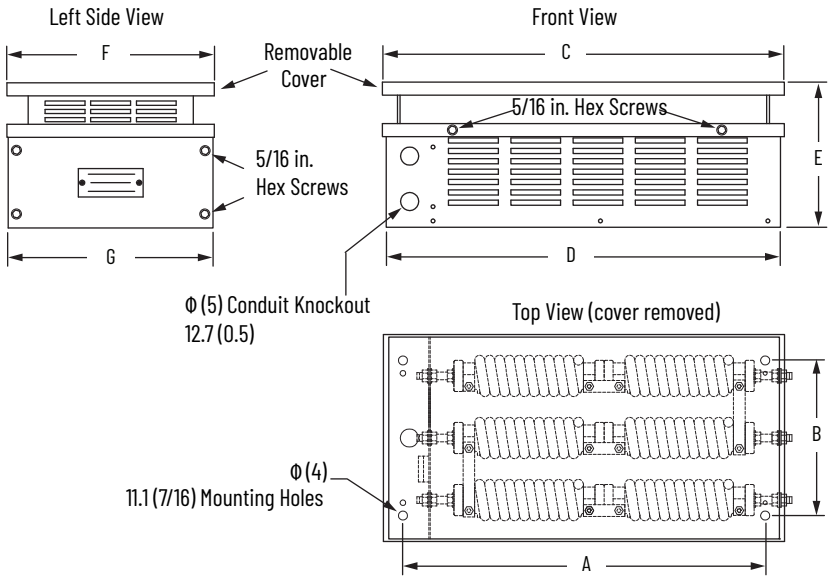
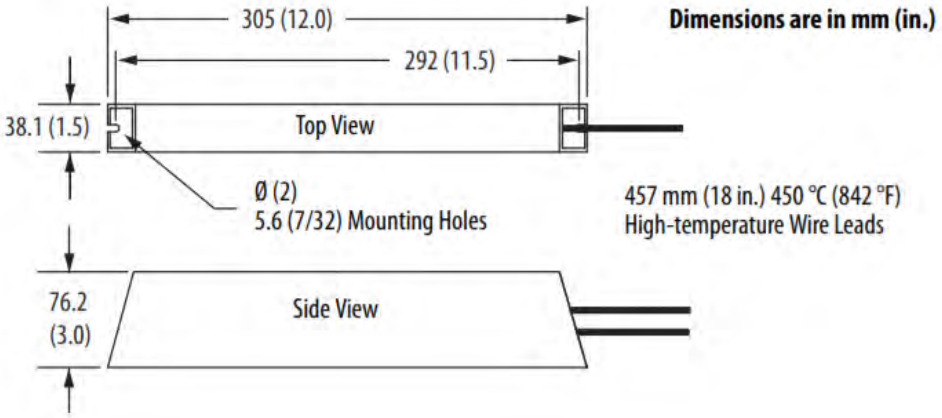


Table 37 - 2198-R031 Shunt Resistor Dimensions

Cat. No.	A	B	C	D	E	F	G
2198-R031	635 (25.0)	343 (13.5)	683 (26.88)	673 (26.5)	178 (7.0)	406 (16.0)	403 (15.88)

The dimensions in Figure 8 apply to catalog number 2198-R004 (unit without an enclosure).

Figure 8 - Product Dimensions: Catalog Number 2198-R004



The dimensions in Figure 9 apply to catalog numbers 2097-R6 and 2097-R7 (shunt resistors without an enclosure).

Figure 9 - Shunt Resistors without Enclosure Dimensions

Shunt Resistor Cat. No.	L1	L2	L3
2097-R6	210 (8.3)	197 (7.7)	170(6.7)
2097-R7	150 (5.9)	137 (5.4)	110 (4.3)

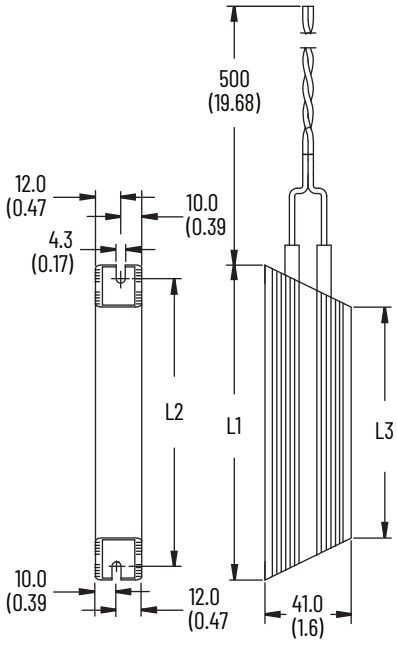


Table 38 - Shunt Resistor Power Specifications

Cat. No.	Resistance Ω	Continuous Power W	Weight, approx kg (lb)
2198-R004	33	400	1.8 (4.0)
2198-R031	33	3100	16.8 (37)
2097-R6	75	150	0.3 (0.7)
2097-R7	150	80	0.2 (0.4)

For more information on 2198-Rx shunt resistor, see the Kinetix 5700 Passive Shunt Modules Installation Instructions, publication 2198-IN011.

Optional Drive Accessories - AC Line Filters

An AC line filter is a key component in meeting CE requirements. This section describes the specifications for the line filters used with each drive.

Table 39 - AC Line Filter Specifications

AC Line Filter Cat. No.	Mount	Voltage 50/60 Hz	Phase	Current A @ 40 °C (104 °F)	Power Loss W	Leakage Current mA	Weight, approx kg (lb)	Kinetix 300/350 (1) Drive Cat. No.
2097-F1	Side	240V AC	1	24.0	5.2	9.0	0.6 (0.13)	2097-V33PR6-*xx* (2)
2097-F2		480V AC	3	10.0	2.8	1.0		2097-V34PR6-*xx*
2097-F4 (3)	Rear	240/480V AC	3	4.40	1.2	1.0	0.8 (0.18)	2097-V33PR1-*xx* (4)
								2097-V34PR3-*xx*
2097-F5 (3)				6.90	1.3			2097-V34PR5-*xx*
								2097-V33PR3-*xx* (5)
2097-F6 (3)				15.0	4.1			2097-V33PR5-*xx* (6)

(1) Use 2090-UXLF-110 (single-phase) line filter for 2097-V31PR0-*xx* drive operation. Use 2090-XXLF-TC116 (single-phase) line filter for 2097-V31PR2-*xx* drive operation.
(2) Use 2097-F1 (single-phase) line filter for 2097-V33PR6-*xx* (single-phase) drive operation. Use the 2090-XXLF-TC316 (three-phase) line filter for 2097-V33PR6-*xx* (three-phase) drive operation.
(3) This filter is rated for multiple voltage/phase line conditions.
(4) Use 2090-UXLF-106 (single-phase) line filter for 2097-V33PR1-*xx* (single-phase) drive operation.
(5) Use 2090-UXLF-110 (single-phase) line filter for 2097-V33PR3-*xx* (single-phase) drive operation.
(6) Use 2090-UXLF-123 (single-phase) line filter for 2097-V33PR5-*xx* (single-phase) drive operation.
Refer to the Kinetix Motion Accessories Technical Data, publication KNX-TD004 for AC line filter specifications not listed here.

For Kinetix 5100, the AC line filters are mounted directly beside the drive (side) with flying lead connections.

Table 40 - Kinetix 5100 Drives AC Line Filter Selection

Kinetix 5100 Drive Cat. No.	AC Line Filter Cat. No. (single-phase operation)	AC Line Filter Cat. No. (three-phase operation)
2198-E1004-ERS	2198-DB111-F	2198-DB310-F
2198-E1007-ERS	2198-DB127-F	
2198-E1015-ERS		2198-DB324-F
2198-E1020-ERS		
2198-E2030-ERS (1)	–	
2198-E2055-ERS (1)	–	2198-DB335-F
2198-E2075-ERS (1)	–	2198-DB356-F
2198-E2150-ERS (1)	–	2198-DBR90-F
2198-E4004-ERS	–	2198-DB418-F
2198-E4007-ERS	–	
2198-E4015-ERS	–	
2198-E4020-ERS	–	
2198-E4030-ERS	–	
2198-E4055-ERS	–	21980DB433-F
2198-E4075-ERS	–	
2198-E4150-ERS	–	2198-DBR40

(1) 2198-E4*xxx*-ERS (200V-class) drives do not support single-phase operation.

Table 41 - Kinetix 5100 Servo AC Line Filter Specifications

Cat. No.	Voltage Rating max	Current Rating @ 50 °C (122 °F) A	Power Loss @ Rated Current W	Leakage Current, typical mA	Weight approx kg (lb)	Operating Temperature
2198-DB111-F	253V AC 1 PH, 50/60 Hz	11.0	4.9	52.9	1.05 (2.314)	0...50 °C (32...122 °F)
2198-DB127-F		27.0	15.5	54.9	1.80 (3.968)	
2198-DB310-F	253V AC 3 PH, 50/60 Hz	10.0	14.0	3.9	1.10 (2.425)	
2198-DB324-F		24.0	29.0	9.3	1.95 (3.968)	
2198-DB335-F	253V AC 3 PH, 50/60 Hz	34.8	30.0	5.8	2.90 (6.393)	
2198-DB356-F		56.0	57.0	2.8	4.00 (8.818)	
2198-DB418-F	528V AC 3 PH, 50/60 Hz	18.4	16.0	4.21	1.2 (2.65)	
2198-DB433-F		33.0	35.0	3.58	1.9 (4.19)	
2198-DBR40-F		54.0	15.0	30.0	3.3 (7.28)	
2198-DBR90-F		90.0	16.8	34.0	7.2 (15.87)	

Communication

This section lists the communication protocols that are supported by Kinetix 300 servo drive and Kinetix 5100 servo drive respectively and describes different communication configurations of Kinetix 5100.

Kinetix 300 Servo Drive Configuration Port

Configuration of the Kinetix 300 drive is performed over the standard 10/100 Mbps Ethernet communication port. MotionView java-based software is used to configure the drive.

Kinetix 5100 Servo Drive Configuration Port

Configuration of the Kinetix 5100 is performed over a mini-USB to personal computer cable (2198-USBC and USB filter 2198-USBF) connected to the drive. KNX5100C software is used to configure the drive.

Kinetix 300 Servo Drive Control Port

The Kinetix 300 drive can accept commands from controllers over the Ethernet port, by using a Class 1 Ethernet/IP connection (I/O assembly) or Class 3 connection by using Explicit messaging. Kinetix 300 drives support a star topology natively or a linear/ring topology using a 1783-ETAP module.

Kinetix 5100 Servo Drive Control Port

The Kinetix 5100 servo drives can accept commands from controllers over the Ethernet port, by using a Class 1 EtherNet/IP connection (with a pre-defined Add-On-Profile) or Class 3 connection using Explicit messaging.

All Kinetix 5100 servo drives include two RJ45 ports that support 10/100 Mb communication speeds. Ethernet topologies including linear, ring, and star.

For more information on Ethernet design considerations, see:

- Scalability - The Best Approach to Change, publication IA-WP002.
- Ethernet Design Considerations Reference Manual, publication ENET-RM002.
- EtherNet/IP Design, Commissioning, and Troubleshooting Quick Reference, publication IASIMP-QR023.

Programming Software

The Kinetix 300 uses MotionView OnBoard software that is contained within the drive itself for configuration and programming.

The Kinetix 5100 drive uses KNX5100C software for configuration. Depending on the drive mode, programming the drive uses KNX5100C, Studio 5000®, or Connected Components Workbench™ software. For information on using KNX5100C software, see the Kinetix 5100 Single-axis EtherNet/IP Servo Drives User Manual, publication 2198-UM004.

Notes:

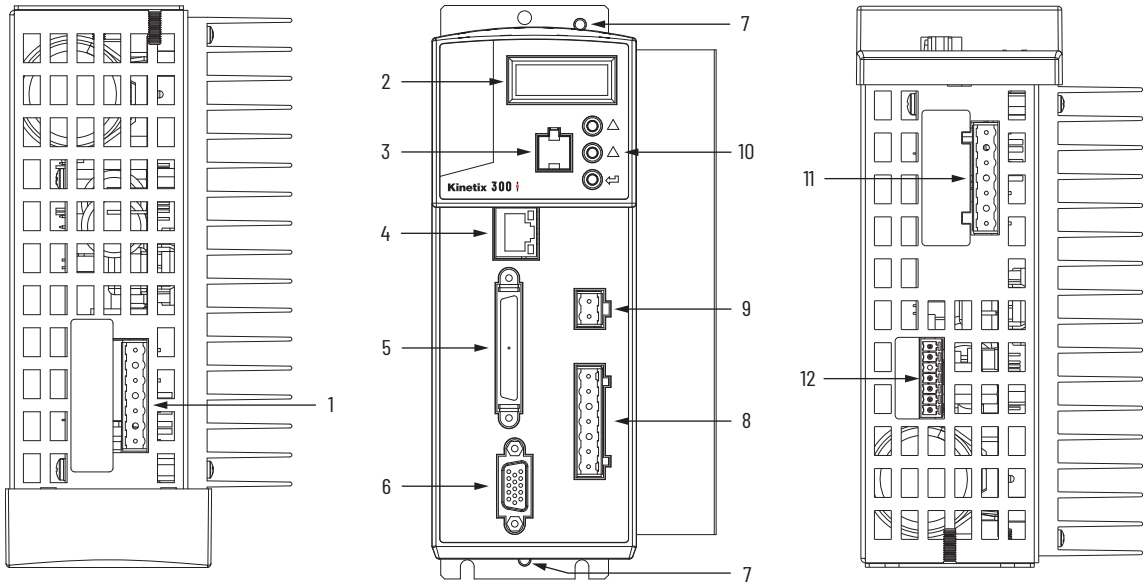
Connectors

Connectors on the Kinetix® 300 servo drives and on the Kinetix 5100 servo drives are of different types in different locations. Make sure that your cables are long enough for the differences.

Kinetix 300 Servo Drive Connector Locations

The connectors of the Kinetix 300 servo drive are shown in Figure 10. Although the physical sizes of the Kinetix 300 drives vary, the location of the connectors and indicators is identical.

Figure 10 - Kinetix 300 Connector Locations



Kinetix 300 Drive, Top View (2097-V33PR5 drive is shown)

Kinetix 300 Drive, Front View (2097-V33PR5 drive is shown)

Kinetix 300 Drive, Bottom View (2097-V33PR5 drive is shown)

Table 42 - Kinetix 300 Drive Connectors

Item	Description	Item	Description
1	Mains (IPD) connector	7	Ground lug
2	Status and diagnostic display	8	Shunt resistor and DC bus (BC) connector
3	Memory module socket	9	Back-up power (BP) connector
4	Ethernet communication port (Port 1)	10	Display control push buttons (3)
5	I/O (IOD) connector	11	Motor power (MP) connector
6	Motor feedback (MF) connector	12	Safe Torque Off (STO) connector

Kinetix 5100 Servo Drive Connector Locations

The connectors of the Kinetix 5100 servo drive are shown in Figure 11, Figure 12, and Figure 14.

Figure 11 - Features and Indicators (catalog numbers 2198-E1044-ERS, 2198-E1007-ERS, 2198-E1015-ERS)

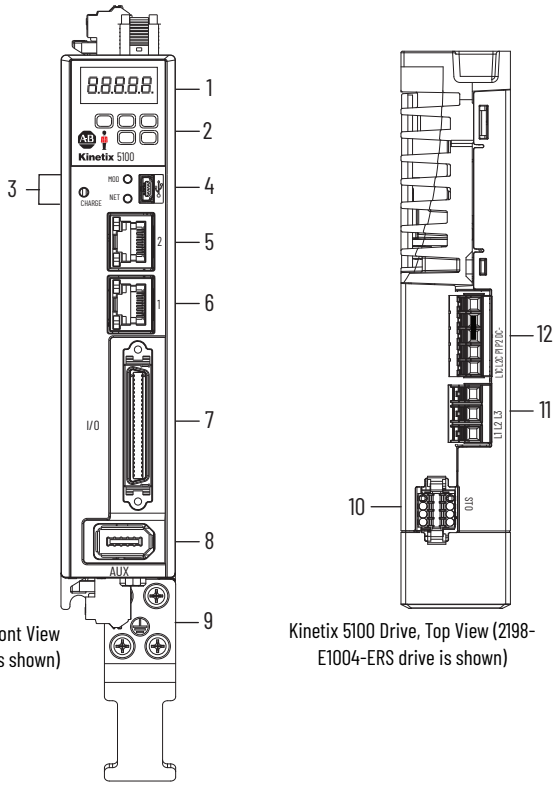


Table 43 - Features and Indicators Description (catalog numbers 2198-E1004-ERS, 2198-E1007-ERS, and 2198-E1015-ERS)

Item	Description
1	Status display
2	Navigation push buttons
3	Module, Network, and Charge status indicators
4	Mini USB connector
5	Ethernet (PORT2) RJ45 connector
6	Ethernet (PORT1) RJ45 connector
7	I/O signal connector
8	Auxiliary feedback (AUX) connector

Item	Description
9	Motor cable ground plate
10	Safe Torque Off (STO) connector
11	Mains input power connector
12	• Control power input (L1C and L2C) connections • Reserved (P1, P2, and negative DC-bus) not-used connections
13	Motor feedback (MFB) connector
14	Motor power output terminals
15	Shunt resistor terminals

Figure 12 - Features and Indicators (catalog numbers 2198-E1020-ERS, 2198-E2030-ERS, 2198-E4004-ERS, 2198-E4007-ERS, 2198-E4015-ERS)

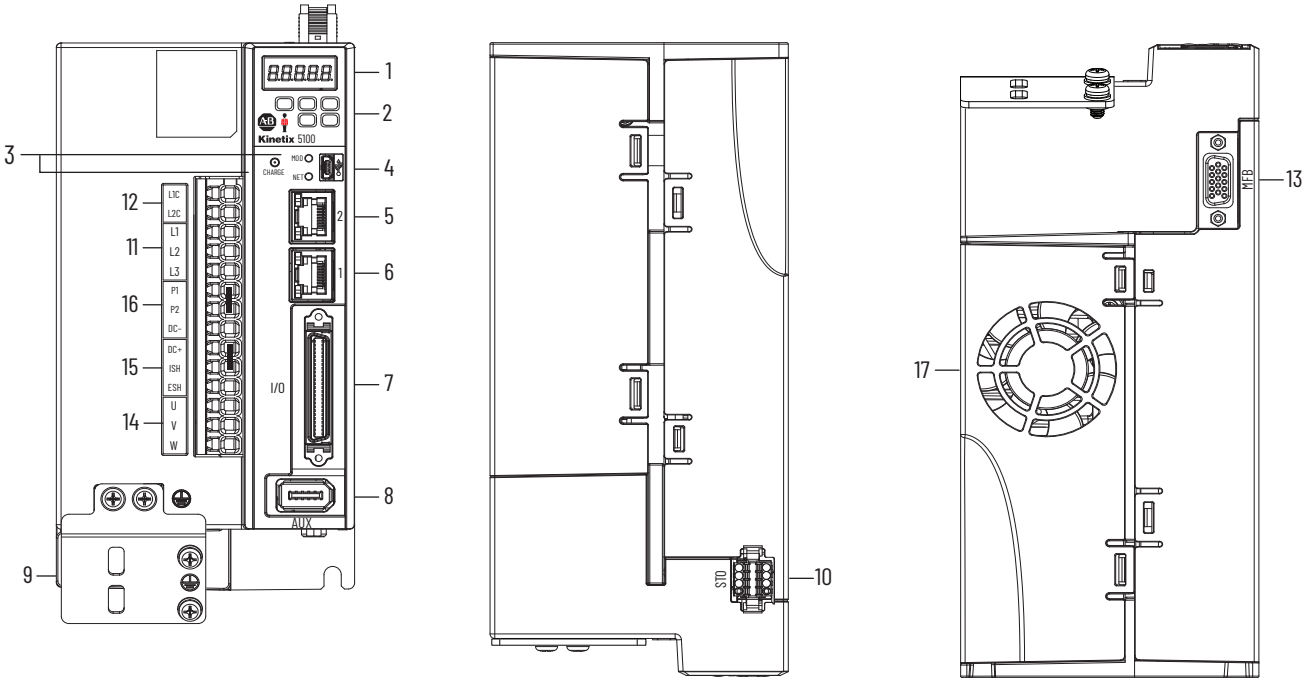
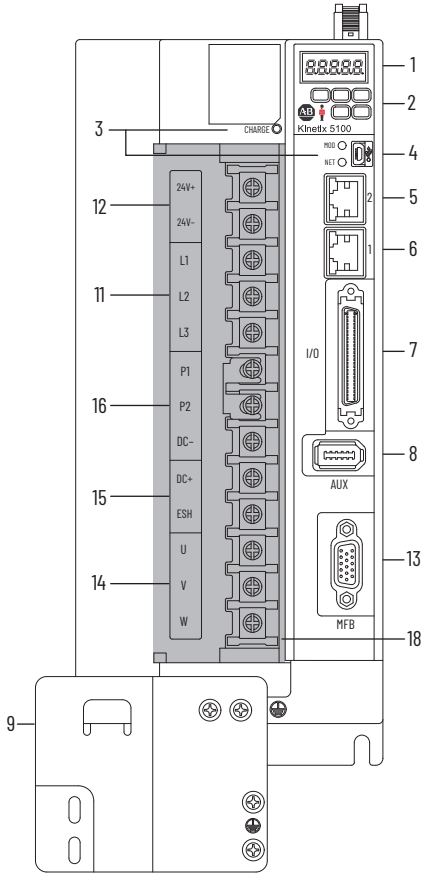
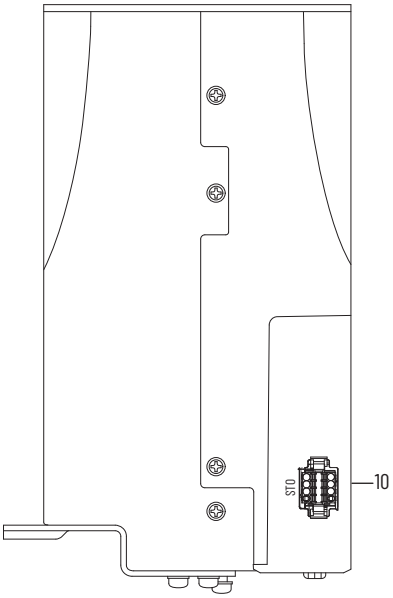


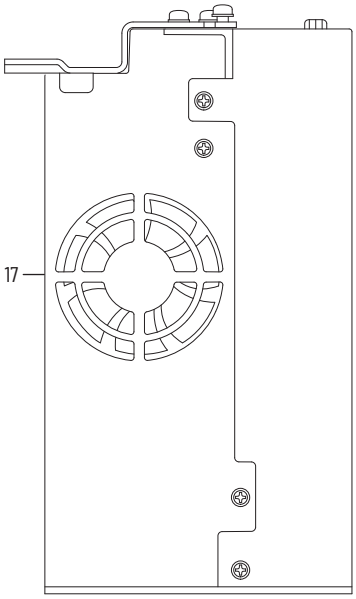
Figure 13 - Features and Indicators (catalog numbers 2198-E4020-ERS, 2198-E4030-ERS)



Kinetix 5100 Drive, Front View
(2198-E4020-ERS drive is shown)



Kinetix 5100 Drive, Top View
(2198-E4020-ERS drive is shown)



Kinetix 5100 Drive, Bottom View
(2198-E4020-ERS drive is shown)

Figure 14 - Features and Indicators (catalog numbers 2198-E2055-ERS, 2198-E2075-ERS, 2198-E2150-ERS, 2198-E4055-ERS, 2198-E4075-ERS, and 2198-E4150-ERS)

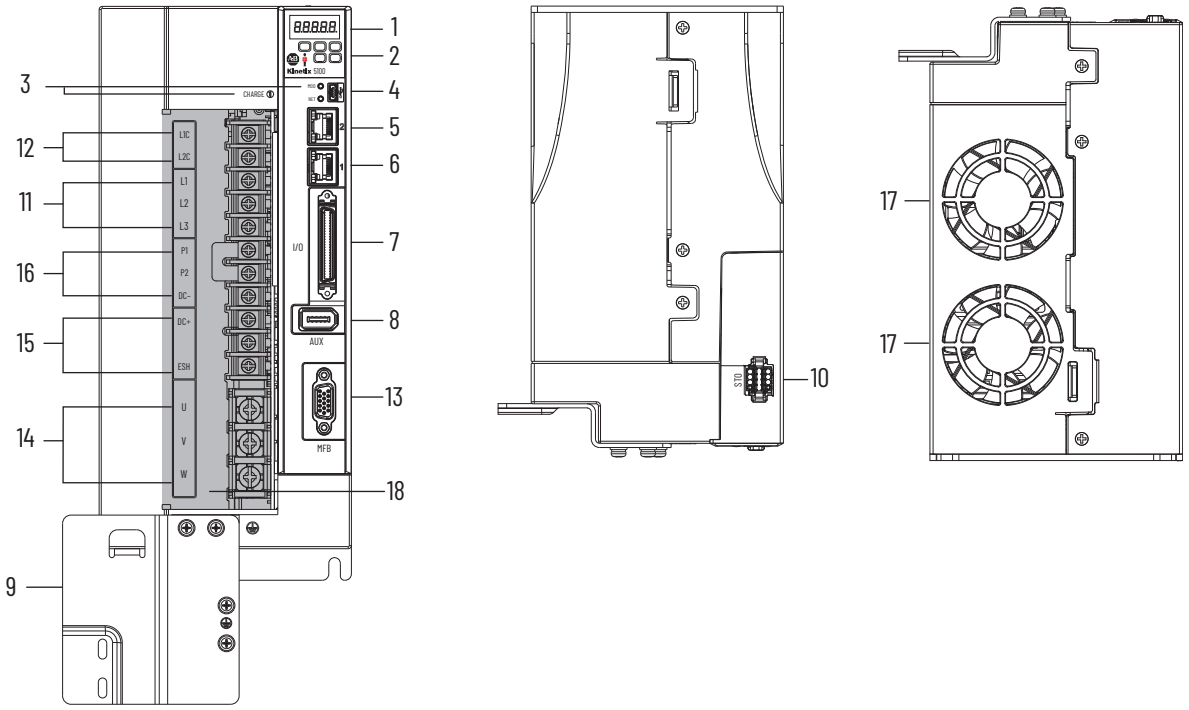


Table 44 - Features and Indicators Description (catalog numbers 2198-E1020-ERS, 2198-E2030-ERS, 2198-E2055-ERS, 2198-E2075-ERS, and 2198-E2150-ERS,2198-E4055-ERS, 2198-E4075-ERS, and 2198-E4150-ERS)

Item	Description
1	Status display
2	Navigation push buttons
3	Module, Network, and Charge status indicators
4	Mini USB connector
5	Ethernet (PORT2) RJ45 connector
6	Ethernet (PORT1) RJ45 connector
7	I/O signal connector
8	Auxiliary feedback (AUX) connector
9	Motor cable ground plate

Item	Description
10	Safe Torque Off (STO) connector
11	Mains input power terminals
12	Control power input terminals
13	Motor feedback (MFB) connector
14	Motor power output terminals
15	Shunt resistor terminals
16	Reserved (P1, P2, and negative DC-bus) not-used connections
17	Cooling fans
18	Protective cover

I/O Connector Pinouts

This section describes the I/O Connector pin assignments and compares the pin assignments for the Kinetix 300 Servo Drive and the Kinetix 5100 Servo Drive. See Figure 10 for locations of connectors on your Kinetix 300 drive. See in Figure 11, Figure 12, and Figure 14 for locations of connectors on your Kinetix 5100 drive.

Table 45 compares the I/O connector pin assignments for the Kinetix 300 (IOD connector) and Kinetix 5100 servo drives (I/O connector).

Table 45 - I/O Connector Assignment Comparison

	Kinetix 300 Servo Drives		Kinetix 5100 Servo Drives	
Pin	**Description**	**Signal**	**Description**	**Signal**
1	Master encoder A+/Step+ input	MA+	Digital output	OUTPUT4+
2	Master encoder A-/Step- input	MA-	Digital output	OUTPUT3-
3	Master encoder B+/Direction+ input	MB+	Digital output	OUTPUT3+
4	Master encoder B-/Direction- input	MB-	Digital output	OUTPUT2-
5	Reserved	–	Digital output	OUTPUT2+
6	Reserved	–	Digital output	OUTPUT1-
7	Buffered encoder output: channel A+	BA+	Digital output	OUTPUT1+
8	Buffered encoder output: channel A-	BA-	Digital Input	INPUT4
9	Buffered encoder output: channel B+	BB+	Digital Input	INPUT1
10	Buffered encoder output: channel B-	BB-	Digital Input	INPUT2
11	Buffered encoder output: channel Z+	BZ+	Common terminal for digital inputs, connected to +24V DC or 0V	DCOM
12	Buffered encoder output: channel Z-	BZ-	Analog input signal ground	AGND
13	Reserved	–	Analog input signal ground	AGND
14	Reserved	–	Not in use	-
15	Reserved	–	Analog monitor output 2	MON2
16	Reserved	–	Analog monitor output 1	MON1
17	Reserved	–	Not in use	-
18	Reserved	–	Analog torque input	COMMAND1
19	Reserved	–	Analog input signal ground	AGND
20	Reserved	–	Not in use	-
21	Reserved	–	Encoder A+ pulse output	AMOUT+
22	Analog common	ACOM	Encoder A- pulse output	AMOUT-
23	Analog output (max 10 mA)	AO	Encoder B- pulse output	BMOUT-
24	Positive (+) of analog signal input	AIN1+	Encoder Z- pulse output	ZMOUT-
25	Negative (-) of analog signal input	AIN1-	Encoder B+ pulse output	BMOUT+
26	Digital input group ACOM terminal	IN_A_COM	Digital output	OUTPUT4-
27	Negative travel- limit switch	IN_A1	Digital output	OUTPUT5-
28	Positive travel limit switch	IN_A2	Digital output	OUTPUT5+
29	Inhibit/enable input	IN_A3	Digital input	INPUT9
30	Digital input A4	IN_A4	Digital input (High-Speed Input)	INPUT8
31	Digital input group BCOM terminal	IN_B_COM	Digital input (High-Speed Input)	INPUT7
32	Digital input B1	IN_B1	Digital input	INPUT6
33	Digital input B2	IN_B2	Digital input	INPUT5
34	Digital input B3	IN_B3	Digital input	INPUT3
35	Digital input B4	IN_B4	External power input of BX+/BX- for single-end operation	BPWR
36	Digital input Group CCOM Terminal	IN_C_COM	B+/DIR+/CCW+	BX+
37	Digital input C1	IN_C1	B-/DIR-/CCW-	BX–
38	Digital input C2	IN_C2	Digital input	INPUT10
39	Registration input sensor	IN_C3	External power input of AX+/AX- for single-end operation	APWR
40	Digital input C4	IN_C4	Digital output	OUTPUT6-
41	Ready output collector	RDY+	A-/Step-/CW-	AX-
42	Ready output emitter	RDY-	Analog position and speed command input (+)	COMMAND2
43	Programmable output #1 collector	OUT1-C	A+/Step+/CW+	AX+
44	Programmable output #1 emitter	OUT1-E	Analog input signal ground	AGND
45	Programmable output #2 collector	OUT2-C	Not in use	–
46	Programmable output #2 emitter	OUT2-E	Digital output	OUTPUT6+
47	Programmable output #3 collector	OUT3-C	Not in use	–
48	Programmable output #3 emitter	OUT3-E	Encoder Z pulse open-collector output	OCZMOUT
49	Programmable output #4 collector	OUT4-C	Not in use	–
50	Programmable output #4 emitter	OUT4-E	Encoder Z+ pulse output	ZMOUT+

Motor Feedback

The Table 46 compares the motor feedback connector pinouts for the Kinetix 300 (motor feedback connector) and Kinetix 5100 servo drives (MFB connector). Both the Kinetix 300 drive and Kinetix 5100 drive accept motor feedback signals from Hiperface and Generic TTL incremental encoders. The Kinetix 300 drive also supports 17-bit serial encoders. The Kinetix 5100 drive supports both 17-bit serial encoders and 24-bit serial encoders.

Figure 15 - 15 Pin Motor Feedback Connector Pin Assignment

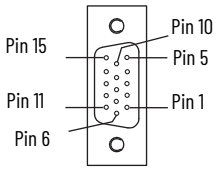


Table 46 - Motor Feedback Connectors Assignment Comparison

	Kinetix 300				Kinetix 5100				
Pin	Description	Signal			Description	Signal			
		Hiperface	Generic TTL Incremental	17-bit Serial		Hiperface	Generic TTL Incremental	17-bit Serial	24-bit Serial
1	Sine differential input+ AM+ differential input+	SIN+	AM+	–	Sine Differential Input + A Differential Input +	MTR_SIN+	MTR_AM+	-	–
2	Sine differential input- AM- differential input-	SIN-	AM-	–	Sine Differential Input - A Differential Input -	MTR_SIN-	MTR_AM-	-	–
3	Cosine differential input+ BM+ differential input+	COS+	BM+	–	Cosine Differential Input + A Differential Input +	MTR_COS+	MTR_BM+	-	–
4	Cosine differential input- BM- differential input-	COS-	BM-	–	Cosine Differential Input - A Differential Input -	MTR_COS-	MTR_BM-	-	–
5	Data differential input+ Index pulse+	DATA+	Index pulse+	DATA+	Data Differential Input/Output + Index Differential Input +	DATA+ IM+	MTR_DATA+	MTR_DATA+ (TLY-B) MTR_SD+ (TL-B)	MTR_DATA+
6	Common	ECOM	ECOM	ECOM	Encoder Common	ECOM	MTR_ECOM	MTR_ECOM	MTR_ECOM
7	Encoder power (+9V) (1)	EPWR9V	–	–	Encoder 9V Power Output(1)	EPWR_9V	MTR_EPWR9V	-	–
8	Single-ended 5V Hall effect commutation	–	S3		Hall Commutation S3 Input	S3	–	-	–
9	Reserved	–	–	–	Reserved	–	–	-	–
10	Data differential input- Index pulse-	DATA-	IM-	DATA-	Data Differential Input/Output - Index Differential Input -	MTR_DATA-	MTR_IM-	MTR_DATA- (TLY-B) MTR_SD- (TL-B)	MTR_DATA-
11	Motor thermal switch (normally closed) (2)	TS	TS	–	Motor Thermostat (2)	MTR_TS	MTR_TS	-	–
12	Single-ended 5V Hall effect commutation	–	S1		Hall Commutation S1 Input	–	MTR_S1	-	–
13	Single-ended 5V Hall effect commutation	–	S2		Hall Commutation S1 Input	–	MTR_S2	-	–
14	Encoder power (+5V) (1)	–	EPWR_5V	EPWR_5V	Encoder 5V Power Output (1)	MTR_EPWR5V	MTR_EPWR5V	MTR_EPWR5V	MTR_EPWR5V
15	Reserved	–	–	–	Reserved	–	–	-	–

(1) Determine which power supply your encoder requires and connect to that supply only. Do not make connections to both supplies.
(2) Not applicable unless motor has integrated thermal protection.

Auxiliary Feedback

There is no separate auxiliary feedback connector used with the Kinetix 300 drive. The auxiliary encoder signal is wired using the I/O connector, see Table 47. The Kinetix 5100 uses a 10-pin auxiliary encoder connector, which is used for wiring a master reference input signal or load feedback encoder, shown in Figure 16.

Table 47 - Kinetix 300 Drive Auxiliary Feedback on I/O Connector

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–

Figure 16 - Kinetix 5100 Drive 10-pin Auxiliary Feedback Connector

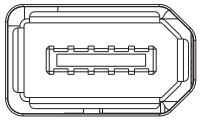


Table 48 lists the auxiliary feedback connector pin assignments for the Kinetix 5100 servo drives (AUX connector).

Table 48 - Kinetix 5100 Auxiliary Feedback Connector Assignment

Signal (Generic TTL Incremental)	Description	AUX Pin#
MTR_AM+	A Differential Input +	1
MTR_AM-	A Differential Input -	2
MTR_BM+	B Differential Input +	3
MTR_BM-	B Differential Input -	4
MTR_IM+	Index Differential Input +	5
MTR_IM-	Index Differential Input -	6
MTR_ECOM	Encoder Common	7
MTR_EPWR5V	Encoder 5V Power Output	8
Reserved	Reserved	9
Reserved	Reserved	10

Safe Torque Off Connector

Both the Kinetix 300 drive and Kinetix 5100 drive have a Safe Torque Off (STO) connector. The STO pinouts are different between the two drives. See Figure 17 for a comparison of the two connectors. See the Kinetix 300 EtherNet/IP™ Indexing Servo Drives User Manual, publication 2097-UM001 for information on STO with the Kinetix 300 drive. See the Kinetix 5100 Single-axis EtherNet/IP Servo Drives User Manual, publication 2198-UM004 for information on STO with the Kinetix 5100 drive.

Figure 17 - STO Connector Assignment Comparison

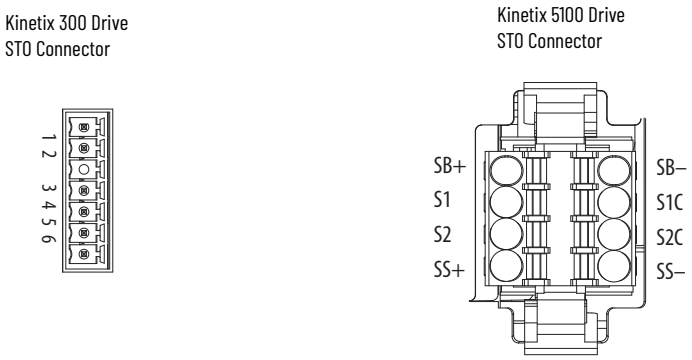


Table 49 - STO Connector Assignment Comparison

Kinetix 300 Servo Drive			Kinetix 5100 Servo Drive	
Pin	**Signal**	**Description**	**Signal**	**Description**
1	+24V DC control	+24V DC output from the drive	SB+	used for jumper +
2	Control COM	+24V DC output common	SB-	used for jumper -
3	Safety Status	Safety status	S1	STO 1 +
4	Safety Input 1	Safety input 1 (+24V DC to enable)	S1C	STO 1 -
5	Safety COM	Safety common	S2	STO 2 +
6	Safety Input 2	Safety input 2 (+24V DC to enable)	S2C	STO 2 -
7	–	–	SS+	Safety Status or Feedback
8	–	–	SS-	Safety Status or Feedback

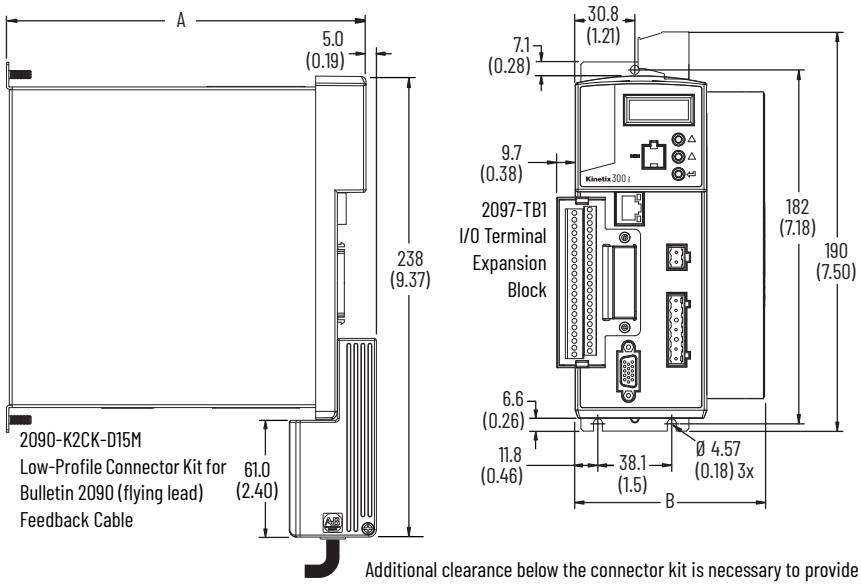
Dimensions, Cables, and Wiring

This section provides dimensions of the drives to help you determine the space that is needed to install the drives.

Dimension Drawings

The dimensions for Kinetix® 300 drives are shown in Figure 18 and Table 19.

Figure 18 - Kinetix 300 Dimensions in mm (in.)



Additional clearance below the connector kit is necessary to provide the recommended cable bend radius.

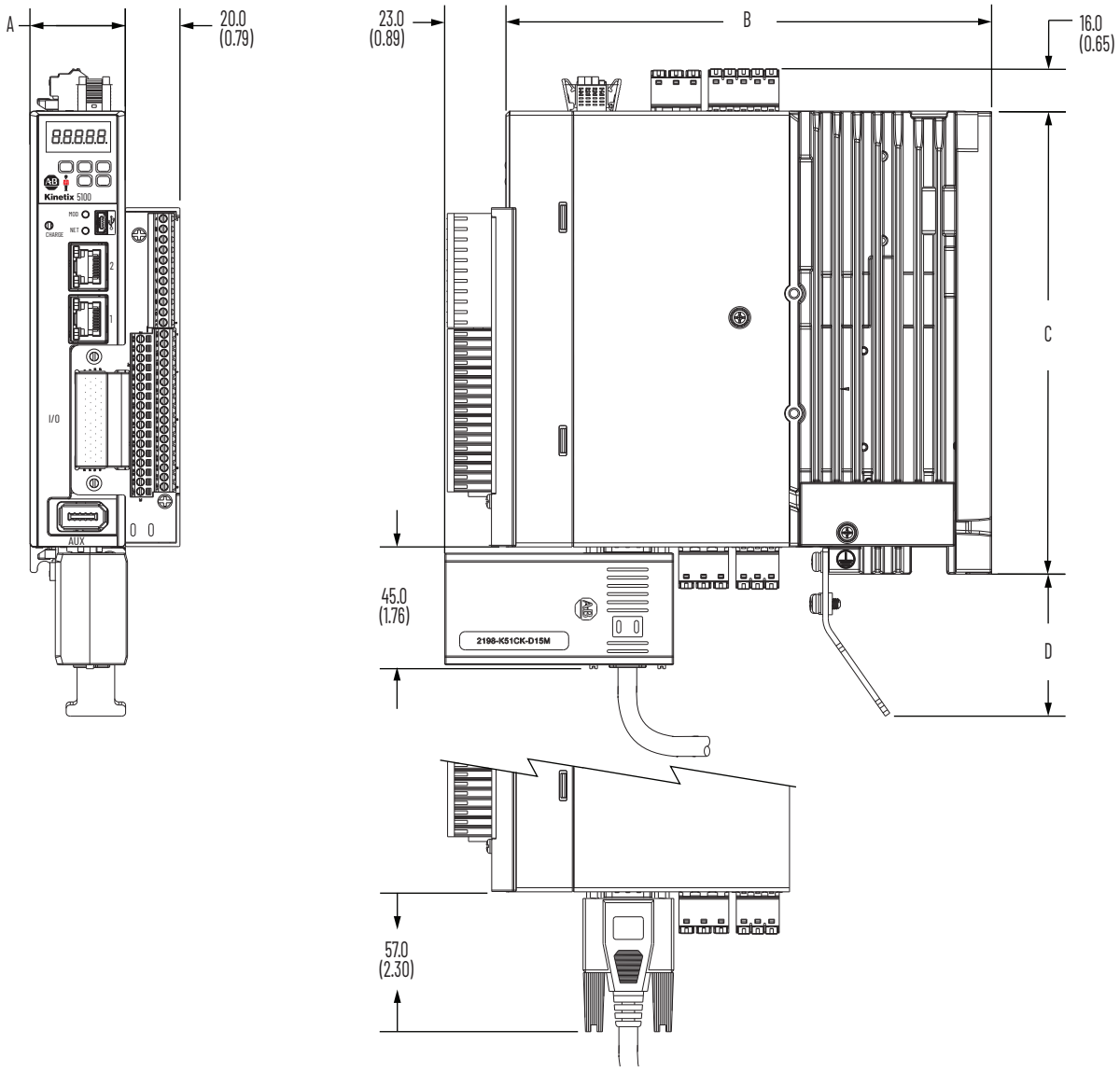
Table 50 - Kinetix 300 Dimensions

Cat. No.	Dimensions mm (in.)	
	A	B
2097-V31PR0	185.1 (7.29)	68.0 (2.68)
2097-V31PR2	185.1 (7.29)	68.5 (2.70)
2097-V32PR0	229.6 (9.04)	68.0 (2.68)
2097-V32PR2	229.6 (9.04)	68.5 (2.70)
2097-V32PR4	229.6 (9.04)	86.8 (3.42)
2097-V33PR1	185.1 (7.29)	68.0 (2.68)
2097-V33PR3	185.1 (7.29)	68.5 (2.70)
2097-V33PR5	185.1 (7.29)	94.4 (3.72)
2097-V33PR6	229.6 (9.04)	68.0 (2.68)
2097-V34PR3	185.1 (7.29)	68.5 (2.70)
2097-V34PR5		94.4 (3.72)
2097-V34PR6	229.6 (9.04)	68.0 (2.68)

Kinetix 5100 Drive Dimensions

The Kinetix 5100 drive dimensions are shown in Figure 19, Figure 20, and Figure 21.

Figure 19 - Catalog Numbers 2198-E1004-ERS, 2198-E1007-ERS, and 2198-E1015-ERS



Cat. No.	A mm (in.)	B mm (in.)	C mm (in.)	D mm (in.)
2198-E1004-ERS	35.0 (1.37)	178 (7.0)	170 (6.68)	52.0 (2.05)
2198-E1007-ERS	50.0 (2.0)	188 (7.41)	180 (7.10)	47.0 (1.84)
2198-E1015-ERS				

Figure 20 - Catalog Numbers 2198-E1020-ERS, 2198-E2030-ERS, 2198-E4004-ERS, 2198-E4007-ERS, and 2198-E4015-ERS

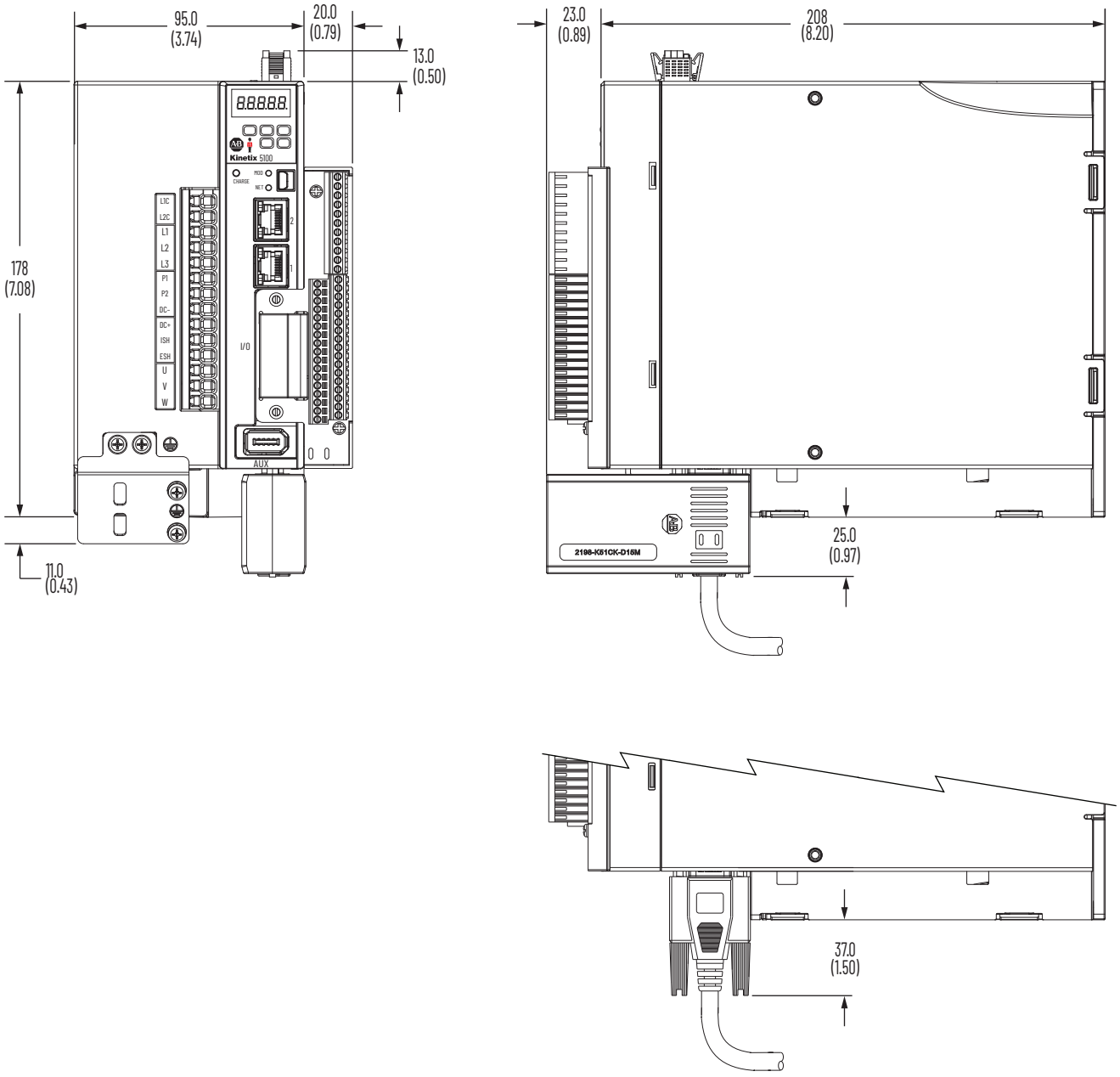
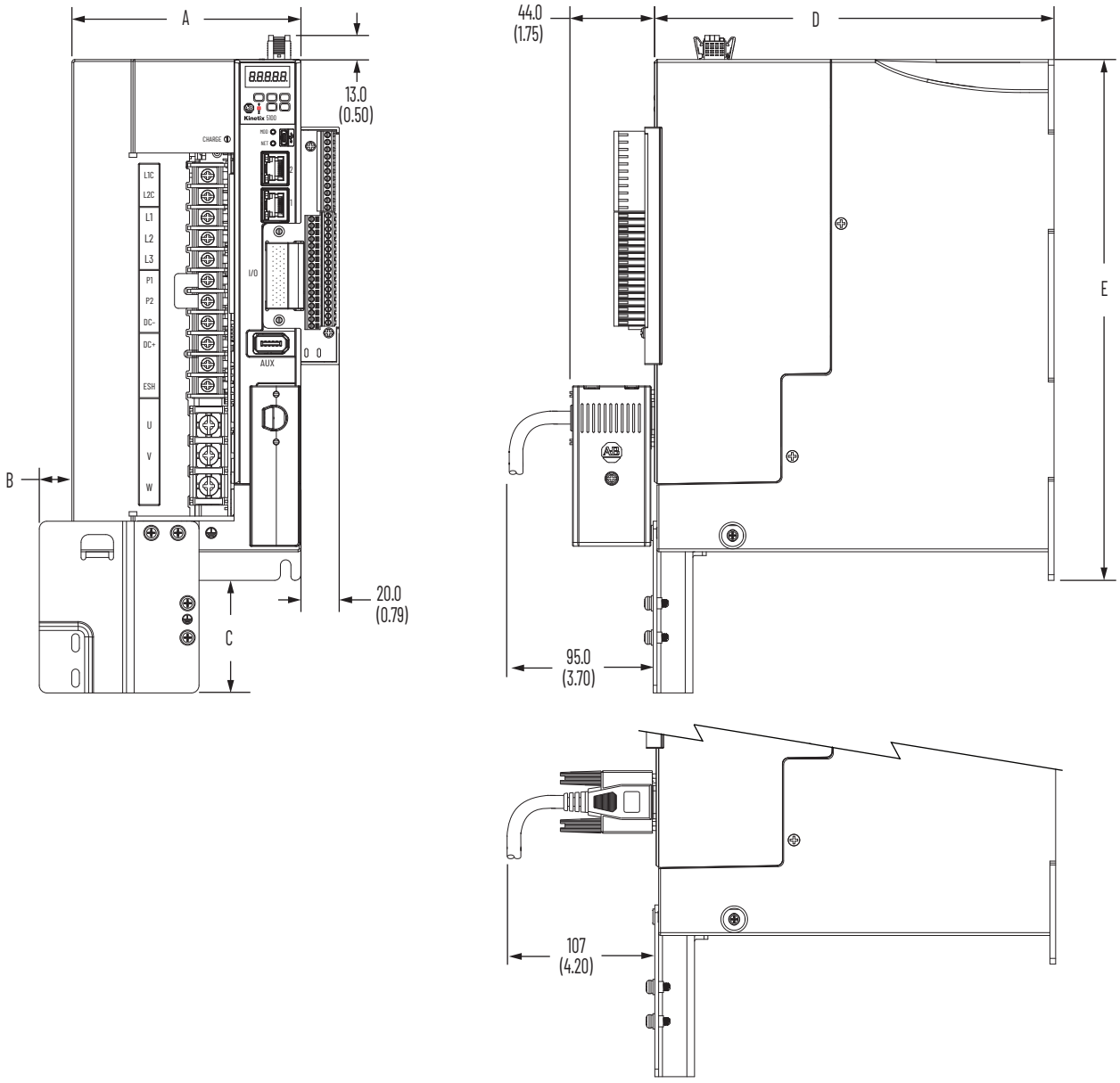


Figure 21 - Catalog Numbers 2198-E4020-ERS, 2198-E4030-ERS, 2198-E2055-ERS, 2198-E4055-ERS, 2198-E2075-ERS, 2198-E4075-ERS, 2198-E2150-ERS, and 2198-E4150-ERS



Cat. No.	A mm (in.)	B mm (in.)	C mm (in.)	D mm (in.)	E mm (in.)
2198-E4020-ERS	110 (4.33)	14.0 (0.55)	38.0 (1.50)	204 (8.02)	260 (10.24)
2198-E4030-ERS					
2198-E2055-ERS	120 (4.72)	37.0 (1.47)	59.0 (2.32)	209 (8.24)	273 (10.75)
2198-E4055-ERS					
2198-E2075-ERS	141 (5.55)	16.0 (0.65)	35.0 (1.36)	225 (8.87)	312 (12.28)
2198-E4075-ERS					
2198-E2150-ERS	186 (7.32)			281 (11.08)	390 (15.35)
2198-E4150-ERS					

Cables

This section provides information to help you determine interconnects and cabling requirements of the drives.

Motor and Feedback Cables

Only the Kinetix MP and TL/TLY motors are supported by both Kinetix 300 drives and Kinetix 5100 drives. All Kinetix MP and TL/TLY cables are reusable when you migrate from Kinetix 300 drives using MP or TL/TLY motors to Kinetix 5100 drives using MP or TL/TLY motors. However, the cables are different for each motor family. See Table 53 and Table 54 for a list of compatible motors and cables.

When migrating your Kinetix 300 servo drive system, do not exceed the maximum cable lengths for the Kinetix 5100 servo drives. See Table 51 and Table 52 for the maximum length of the power and feedback cables for the Kinetix 5100 drives

Table 51 - Maximum Cable Lengths (200V-class) Motors with Kinetix 5100 Drives

Compatible Motor and Actuator Cat. No.	Feedback Type	Cable Length, max m (ft)
TLP-A*xxx*-*xxx*-D	Nikon (24-bit) absolute high-resolution, multi-turn and single-turn	50 (164)
MPL-A15*xxx*-V/Ex7xAA MPL-A2*xxx*-V/Ex7xAA	Hiperface, absolute high-resolution, multi-turn and single-turn	
MPL-A3*xxx*-S/Mx7xAA MPL-A4*xxx*-S/Mx7xAA MPL-A45*xxx*-S/Mx7xAA MPL-A5*xxx*-S/Mx7xAA		
MPM-A*xxxx*-S/M MPF-A*xxxx*-S/M MPS-A*xxxx*-S/M		
MPL-A15*xxx*-Hx7xAA MPL-A2*xxx*-Hx7xAA	Incremental	30 (98.4)
MPL-A3*xxx*-Hx7xAA MPL-A4*xxx*-Hx7xAA MPL-A45*xxx*-Hx7xAA		
TLY-A*xxxx*-B	Tamagawa (17-bit) absolute high-resolution, multi-turn	
TL-A*xxxx*-B		
TLY-A*xxxx*-H	Incremental	

Table 52 - Maximum Cable Lengths (400V-class) Motors with Kinetix 5100 Drives

Compatible Motor and Actuator Cat. No.	Feedback Type	Cable Length, max m (ft)	
		≤ 400V AC Input	480V AC Input
TLP-B200-*xxx*-D	Nikon (24-bit) absolute high-resolution, multi-turn and single-turn	50 (164)	15 (49.2)
TLP-B070-*xxx*-D, TLP-B090-*xxx*-D, TLP-B115-*xxx*-D, TLP-B145-*xxx*-D, TLP-B235-*xxx*-D			50 (164)
MPL-B15*xxx*-V/Ex7xAA MPL-B2*xxx*-V/Ex7xAA	Hiperface, absolute high-resolution, multi-turn and single-turn	50 (164)	20 (65.6)
MPL-B3*xxx*-S/Mx7xAA MPL-B4*xxx*-S/Mx7xAA MPL-B45*xxx*-S/Mx7xAA MPL-B5*xxx*-S/Mx7xAA MPL-B6*xxx*-S/Mx7xAA MPL-B8*xxx*-S/Mx7xAA MPL-B9*xxx*-S/Mx7xAA		50 (164)	
MPM-B*xxxx*-S/M MPF-B*xxxx*-S/M MPS-B*xxxx*-S/M			
MPL-B15*xxx*-Hx7xAA MPL-B2*xxx*-Hx7xAA	Incremental	30 (98.4)	20 (65.6)
MPL-B3*xxx*-Hx7xAA MPL-B4*xxx*-Hx7xAA MPL-B45*xxx*-Hx7xAA		30 (98.4)	

Replacement Considerations

If you are using a new wire gauge, verify that the capacity of the new wire is capable of handling the current to the motor.

Cable shield and lead preparation is provided with most Allen-Bradley® cable assemblies. Follow the guidelines if your motor power cable shield and wires require preparation.

- The existing motor power cables can be used for the Kinetix MP motors because they are supported by both the Kinetix 300 drives and the Kinetix 5100 drives.
- The existing motor feedback cables can be used for the Kinetix MP and TL/TLY motors because they are supported by both the Kinetix 300 drives and the Kinetix 5100 drives. The existing TL/TLY motor feedback cables can be used, but the drive-end connector of 2090-DANFCT needs to be removed and 2198-K51CK-D15M is used for wiring.
- Factory-made motor power and feedback cables with premolded connectors are designed to minimize electromagnetic interference (EMI). Rockwell Automation recommends factory-made cables to achieve the expected system performance.

For details and drawings of recommended cables see the Kinetix Motion Accessories Specifications Technical Data, publication KNX-TD004, the bill of materials (BOM) configuration tool within Motion Analyzer, or ProposalWorks™ system configuration tool from Rockwell Automation.

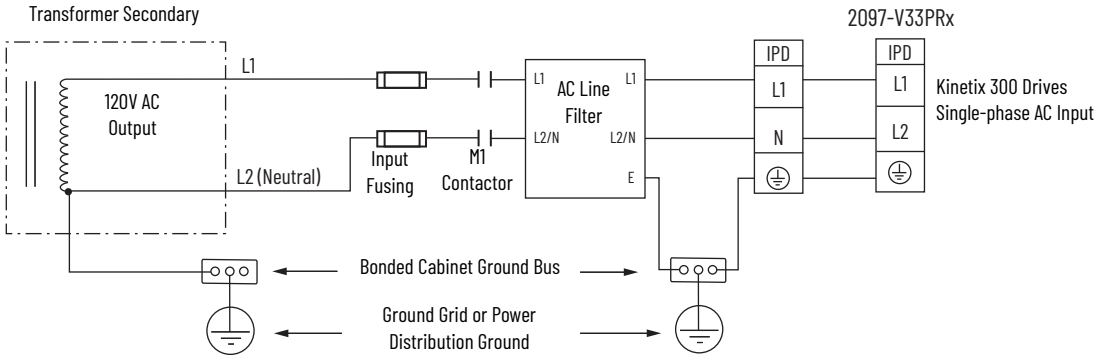
Power Wiring

Use these power wiring examples to assist you in comparing the power wiring for the Kinetix 300 servo drive and the Kinetix 5100 drive systems.

Kinetix 300 Servo Drive Power Wiring Examples

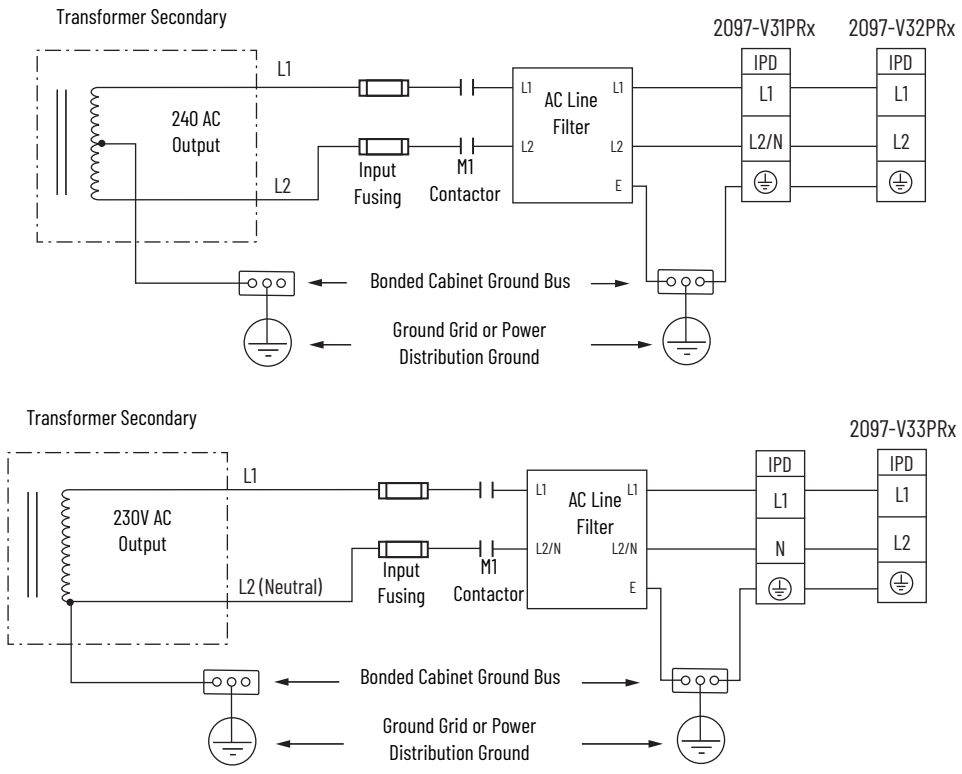
In Figure 22, the 2097-V31PRx drives are wired to the voltage doubling circuit. The 120V input voltage provides 240V output to motors. The 2097-V33PRx drives are wired for single-phase 120V operation.

Figure 22 - Kinetix 300 Drive (120V single-phase input power)



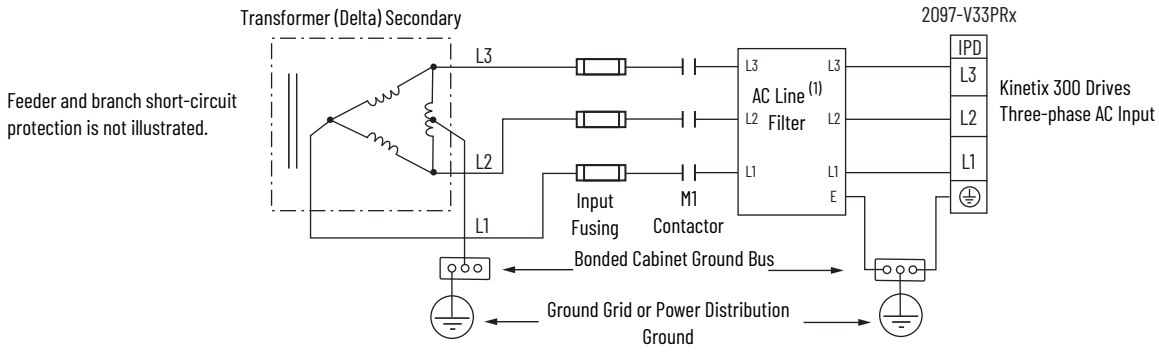
In Figure 23, single-phase 240V AC is applied to 2097-V31PRx and 2097-V32PRx drives.

Figure 23 - Kinetix 300 Drives (240V single-phase input power)



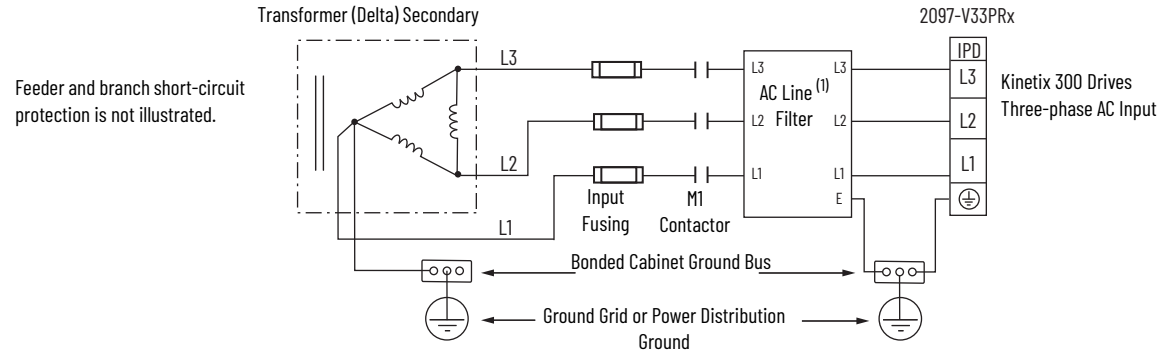
The examples in Figure 24 and Figure 25 illustrate grounded three-phase power that is wired to three-phase Kinetix 300 drives when phase-to-phase voltage is within drive specifications.

Figure 24 - Kinetix 300 Drives Three-phase (240V) Power Configuration (Delta secondary)



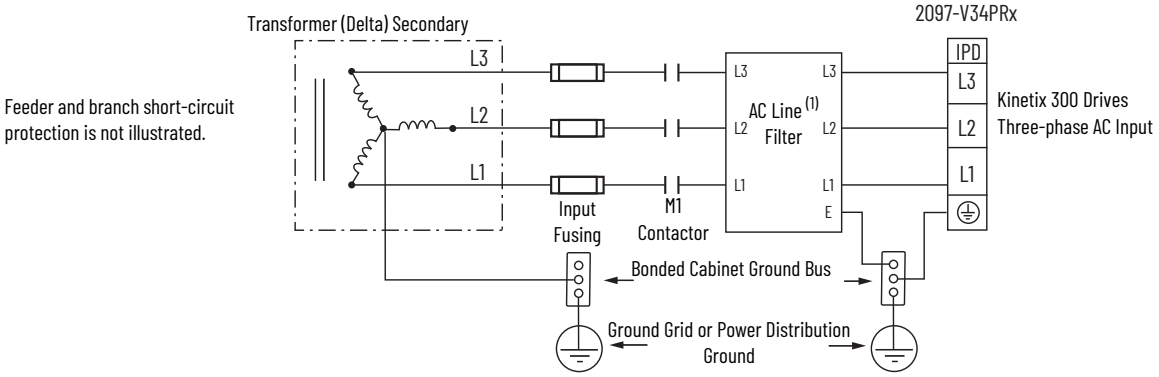
(1) Leakage current from the line filter, in this configuration, typically is higher than a balanced (center ground) configuration.

Figure 25 - Kinetix 300 Drives Three-phase (240V) Power Configuration (Delta secondary)



(1) Leakage current from the line filter, in this configuration, typically is higher than a balanced (center ground) configuration.

Figure 26 - Kinetix 300 Drives Three-phase (400V) Power Configuration (Wye secondary)



(1) Leakage current from the line filter, in this configuration, typically is higher than a balanced (center ground) configuration.

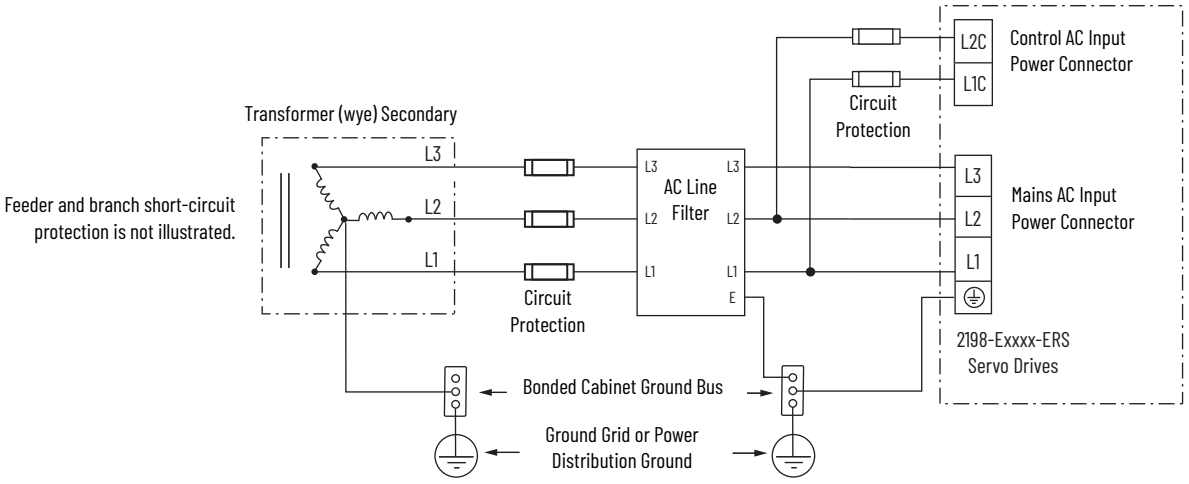
Kinetix 5100 Servo Drives Power Wiring Examples

This section provides wiring examples to assist you in wiring the Kinetix 5100 servo drive system. Drawing notes are listed after the drawings.

Three-phase Power Wired to Three-phase Kinetix 5100 Drives

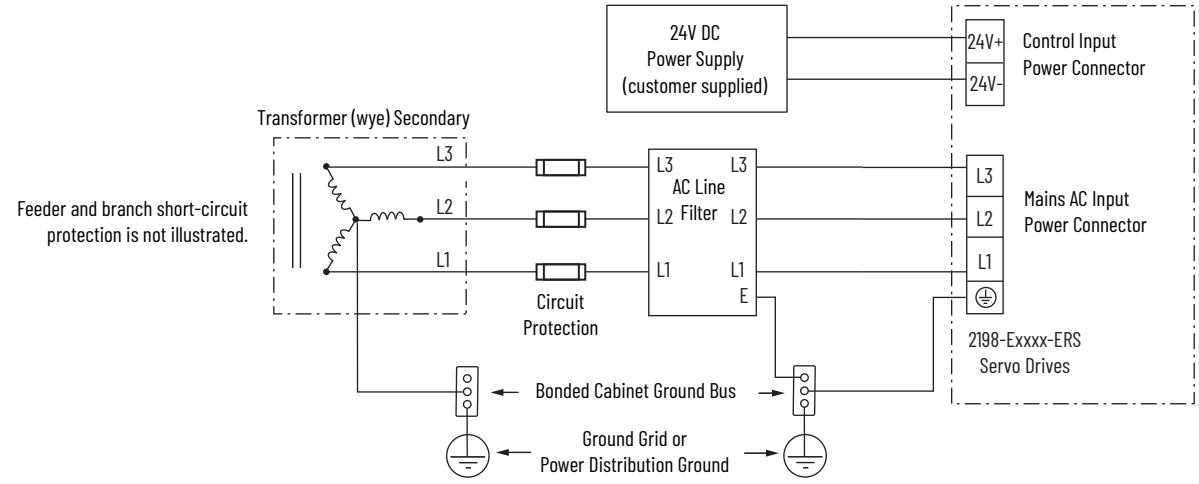
This example illustrates grounded three-phase power that is wired to three-phase Kinetix 5100 drives when phase-to-phase voltage is within drive specifications. You must supply input power components. The three-phase AC line filter is wired as shown in Figure 27.

Figure 27 - Kinetix 5100 Drive Three-phase (200...230V) Grounded Power Configuration (wye secondary)



ATTENTION: The power system must be center-grounded wye secondary configuration for Kinetix 5100 drives.

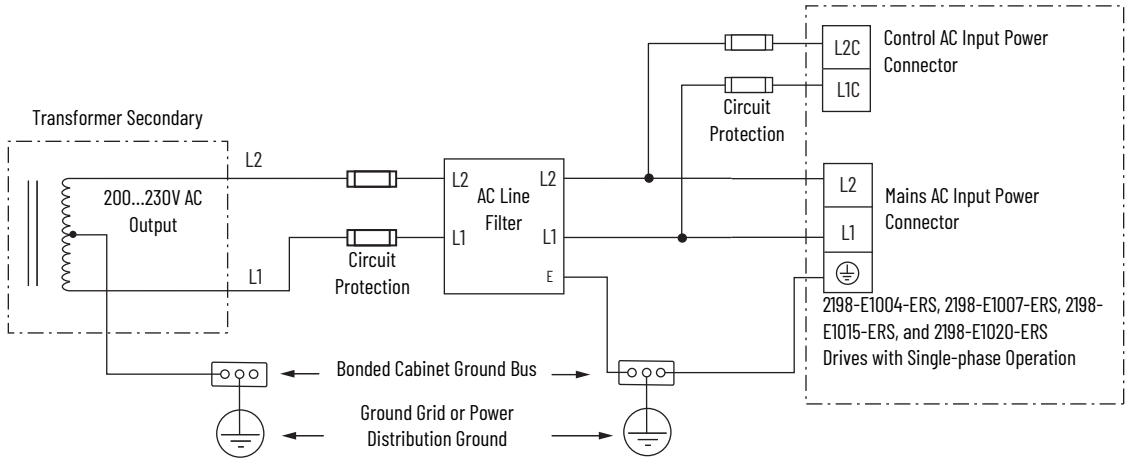
Figure 28 - Kinetix 5100 Drive Three-phase (380...480V) Grounded Power Configuration (wye secondary)



Single-phase Power Wired to Single-phase Kinetix 5100 Drives

The examples in Figure 29, Figure 30, and Figure 31 illustrate grounded single-phase power that is wired to single-phase Kinetix 5100 drives when phase-to-phase voltage is within drive specifications.

Figure 29 - Kinetix 5100 Drive Single-phase (200...230V) Grounded Power Configuration



Reducing the transformer output reduces motor speed. Feeder and branch short-circuit protection is not illustrated.

Figure 30 - Kinetix 5100 Drive Single-phase (120V) Grounded Power Configuration

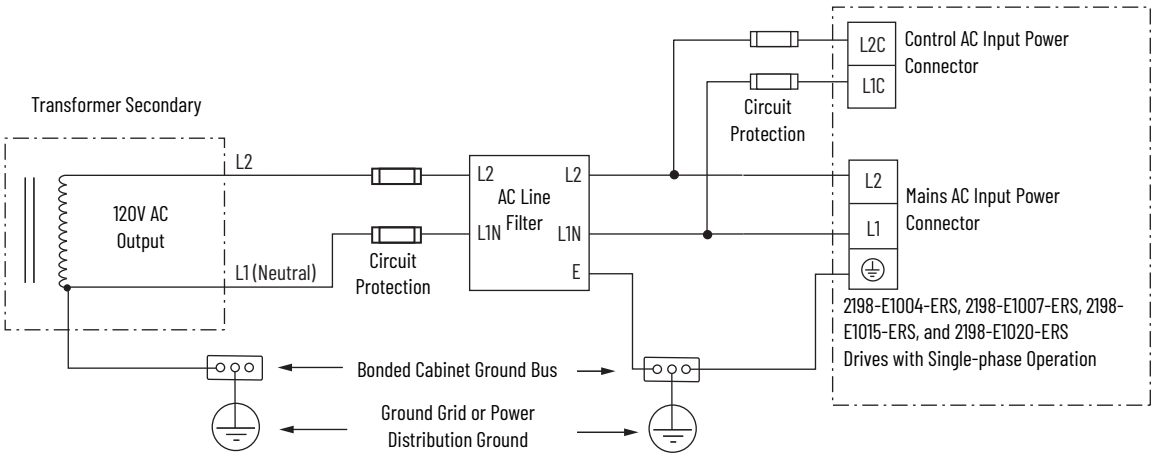
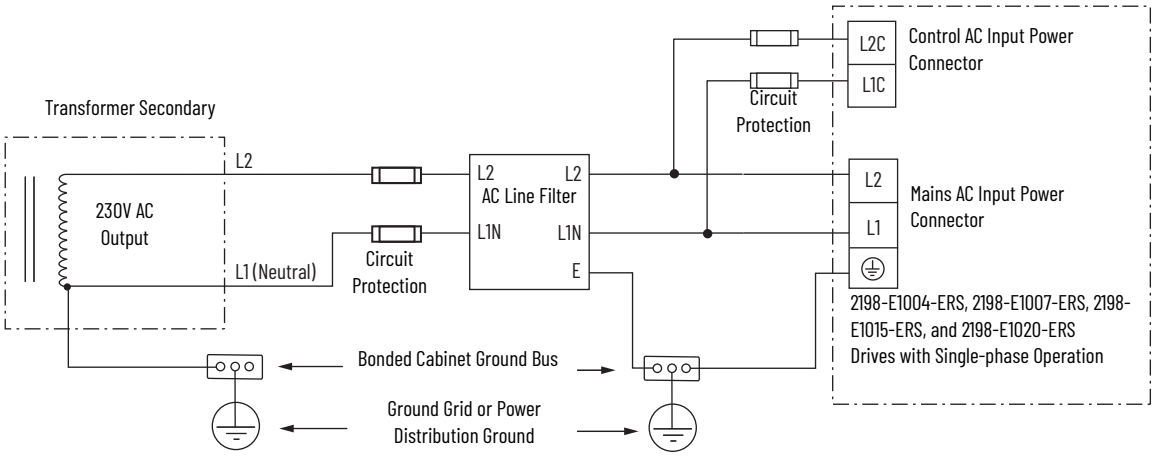


Figure 31 - Kinetix 5100 Drive Single-phase (230V) Grounded Power Configuration



Notes:

System Architecture

This section lists the typical system components and compares some configurations of Kinetix® 300 and Kinetix 5100 drives. The Kinetix 5100 drives are flexible to provide integration into your existing application or can be designed to meet your new application requirements.

Table 53 - Kinetix 5100 Drive System Overview

Kinetix 5100 System Component	Cat. No.	Description
Kinetix 5100 Servo Drive	2198-E*xxxx*-ERS	Kinetix 5100 EtherNet/IP™ indexing drives with Safe Torque Off (STO) are available with 120V single-phase, 200...230V single-phase, 230V three-phase, and 480V three-phase (nom) input voltages.
Terminal block for I/O connector	2198-TBIO	50-pin terminal block. Plugs into I/O connector for control interface connections.
Motor Feedback Connector Kit	2198-K51CK-D15M	Motor feedback connector kit with 15-pin connector plug for compatible servo motors. Kit features battery backup for Kinetix TLP, TL, and TLY multi-turn encoders.
Auxiliary Feedback Connector Kit	2198-AUXKIT	Auxiliary feedback connector kit for master feedback and load feedback connections to the AUX connector.
Feedback Battery Box	2198-KTBT	The feedback battery box is used in applications where Kinetix TLP motor position data must be maintained in the event of a power loss. The battery box is included with 2090-series cables for Kinetix TLP motors and is also available as this replacement kit.
AC Line Filters	2198-DBxx-F 2198-DBR40-F 2198-DBR90-F	Bulletin 2198 three-phase AC line filters are required to meet CE.
Shunt Module	2198-R004 and 2198-R031 2097-R6 and 2097-R7	Bulletin 2198 and 2097 external passive-shunt resistors for use when additional shunt capability is needed.
24V DC Power Supply	1606-XL*xxx*	Bulletin 1606 24V DC power supply for digital input/output, Safe Torque Off (STO), and motor brake control.
Logix PAC® Controller Platforms	Bulletin 5069 and 1769	EtherNet/IP networking with CompactLogix™ 5370 and CompactLogix 5380 controllers with embedded dual-port. CompactLogix 5480 controllers for the benefits of Logix control with Windows®-based computing.
	1756-EN2T, 1756-EN2TR, and 1756-EN3TR module	EtherNet/IP network communication modules for use with ControlLogix® 5570 and ControlLogix 5580 controllers.
Logix PLC Controller Platforms	MicroLogix™ 1100 and 1400 controllers provide communication ports, an isolated combination RS-232/485 communication port, an Ethernet port, and (MicroLogix 1400 only) a non-isolated RS-232 communication port. Micro800™ controllers with embedded inputs/outputs can accommodate from two to five plug-in modules and up to four expansion I/O modules.	
Configuration Software	Studio 5000® environment	Studio 5000 Logix Designer® application (version 30 or later) is used to program, commission, and maintain the Logix family of controllers.
	Connected Components Workbench software	Connected Components Workbench™ design and configuration software (CCW), version 10.0 or later, allows you to program and configure the Micro800 controller, and integrate with the HMI editor.
	KNX5100C software	KNX5100C software, version 1.001 or later, lets you confige and tune Kinetix 5100 drives via the mini-USB cable connection.
	RSLogix 500® software	RSLogix 500 software is used to program MicroLogix 1100 or 1400 controllers.
Rotary Servo Motors	Kinetix TLP	Compatible rotary motors include Kinetix TLP (200V and 400V-class) servo motors.
	Kinetix MP	Compatible rotary motors include Kinetix MPL, MPM, MPF, and MPS (200V and 400V-class) servo motors.
	Kinetix TL and TLY	Compatible rotary motors include Kinetix TL and TLY (200V-class) servo motors.

Table 53 - Kinetix 5100 Drive System Overview (Continued)

Kinetix 5100 System Component	Cat. No.	Description (Continued)
Cables	2090-CTFB-MxDx-xxxxx	Bulletin 2090 motor feedback cables for Kinetix TLP motors.
	2090-CTPx-MxDx-xxxxx	Bulletin 2090 motor power/brake cables for Kinetix TLP motors.
	2090-CFBM6Dx-CxAAxx	Motor feedback cables for Kinetix TLY servo motors.
	2090-CPxM6DF-16AAxx	Motor power/brake cables for Kinetix TLY servo motors.
	2090-DANFCT-Sxx	Motor feedback cables for Kinetix TL servo motors.
	2090-DANPT-16Sxx	Motor power cables for Kinetix TL servo motors.
	2090-DANBT-18Sxx	Motor brake cables for Kinetix TL servo motors.
	2090-CFBM7DF-CEAxxx	Motor feedback cables for Kinetix MP servo motors with Hiperface encoders.
	2090-CPxM7DF-xxAxxx	Motor power/brake cables for Kinetix MP servo motors.
	2090-XXNFMF-Sxx 2090-CFBM7DF-CDAFxx	Standard and continuous-flex feedback cables that include additional conductors for use with incremental encoders.
	1585J-M8CBJM-x 1585J-M8UBJM-x	Ethernet cables are available in standard lengths. Shielded cable is required to meet EMC specifications.
	2198-USBC	Interface cable with mini-USB connector for KNX5100C software configuration.
	2198-USBF	Filter for mini-USB port to reduce the vulnerability to electrical noise.
AC Line Filters	2198-DBxxx-F 2198-DBRxxx-F	Bulletin 2198 three-phase AC line filters are required to meet CE and are available for use in all Kinetix 5100 drive systems.
24V DC Power Supply	1606-XLxxx	Bulletin 1606 24V DC power supply for digital input/output, Safe Torque Off (STO) circuitry, and motor brake control.
External Shunt Resistors	2097-R6 and 2097-R7	Bulletin 2097 and 2198 external passive shunt resistors are available for when the internal shunt capability of the drive is exceeded.
	2198-R004, 2198-R031	

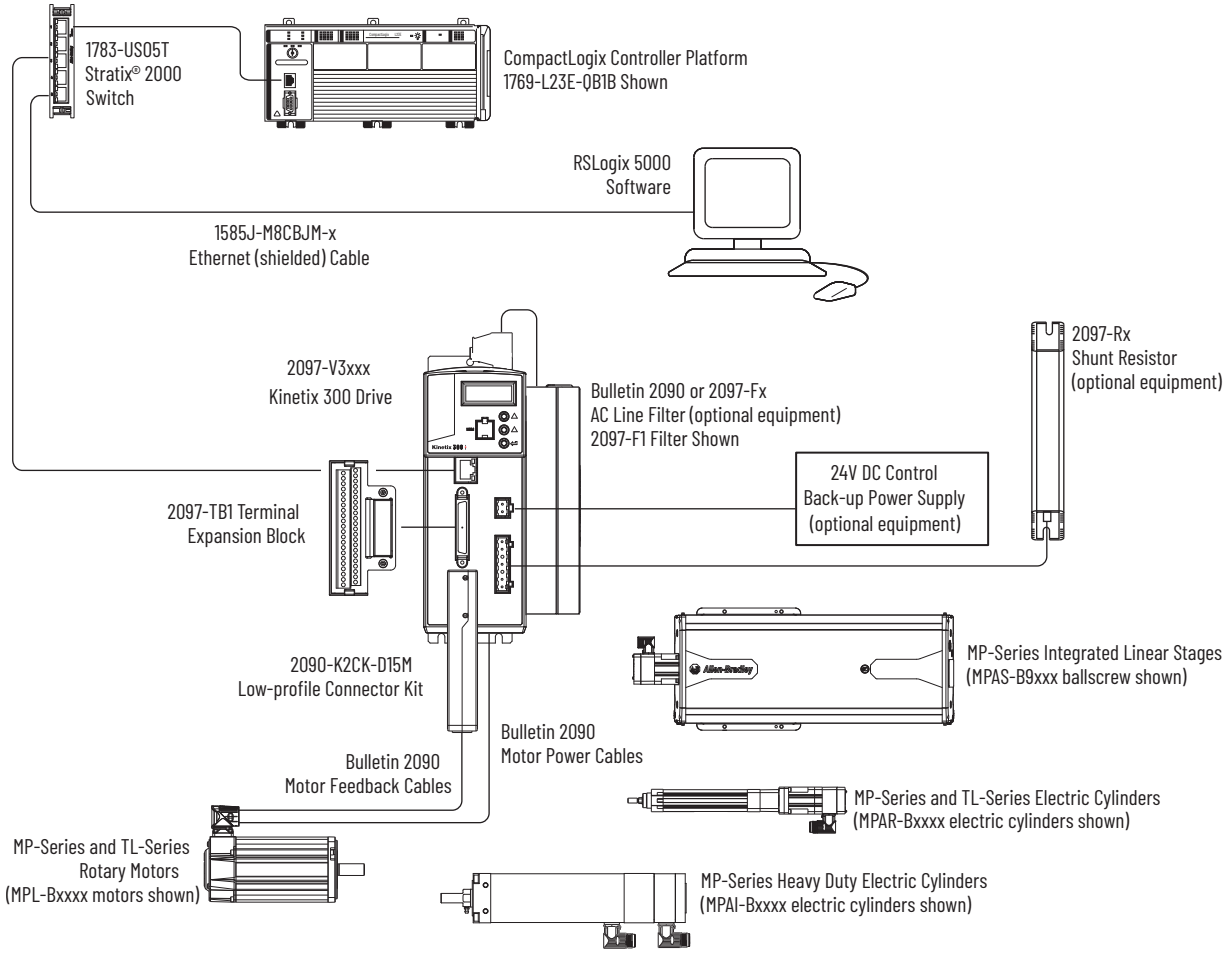
Table 54 - Kinetix 300 Drive System Overview

Kinetix 300 System Component	Cat. No.	Description
Kinetix 300 EtherNet/IP Indexing Servo Drive	2097-V3xPRx	Kinetix 300 EtherNet/IP indexing drives with Safe Torque Off feature are available with 120/240V or 480V AC input power.
AC Line Filters	2090-UXLF-xxx 2097-Fx	Bulletin 2090 and Bulletin 2097-Fx AC line filters are required to meet CE with Kinetix 300 drives without an integrated line filter. Bulletin 2097 filters are available in foot mount and side mount.
Shunt Module	2097-Rx	Bulletin 2097 shunt resistors connect to the drive and provide shunt capability in regenerative applications.
Terminal block for I/O connector	2097-TB1	50-pin terminal block. Use with IOD connector for control interface connections.
Memory Module Programmer	2097-PGMR	The EPM programmer is used to duplicate the memory and configuration of the Kinetix 300 drives.
Memory Modules 12 Pack	2097-MEM	These memory modules are removable and the drive to store parameters in them.
Logix PAC® Controller Platforms	Bulletin 5069 Bulletin 1768 and 1769	EtherNet/IP networking with CompactLogix 5370 and CompactLogix 5380 controllers with embedded dual-port. 1769-L3x controllers with embedded single port. 1768-L4x controller and 1768-L4xS safety controller with 1768-ENBT EtherNet/IP communication module.
	1756-EN2T, 1756-EN2TR, and 1756-EN3TR module	EtherNet/IP network communication modules for use with ControlLogix 5570 and ControlLogix 5580 controllers.
Logix PLC Controller Platforms	MicroLogix 1100 and 1400 controllers provide communications ports, an isolated combination RS-232/485 communication port, an Ethernet port, and (MiroLogix 1400 only) a non-isolated RS-232 communication port. Micro850® controllers with embedded inputs/outputs can accommodate from two to five plug-in modules and up to four expansion I/O modules.	
Studio 5000 Environment or RSLogix 5000® Software	—	RSLogix 5000 software (version 20 or earlier) and the Studio 5000 Logix Designer application (version 21 or later) are used to program, commission, and maintain the Logix family of controllers.
Rotary Servo Motors	Kinetix MP, Kinetix TLY	Compatible rotary motors include the Kinetix MPL, MPM, MPS, and MPF, and Kinetix TLY motors.
Cables	2090-CFBM6Dx-CxAAxx	Motor feedback cables for Kinetix TLY servo motors.
	2090-CPxM6DF-16AAxx	Motor power/brake cables for Kinetix TLY servo motors.
	2090-CFBM7DF-CEAxxx	Motor feedback cables for Kinetix MP servo motors with Hiperface encoders.
	2090-CPxM7DF-xxAxxx	Motor power/brake cables for Kinetix MP servo motors.
	2090-XXNFMF-Sxx 2090-CFBM7DF-CDAFxx	Standard and continuous-flex feedback cables that include additional conductors for use with incremental encoders.
	1585J-M8CBJM-x 1585J-M8UBJM-x	Ethernet cables are available in standard lengths. Shielded cable is required to meet EMC specifications.

Kinetix 300 Servo Drive System Architecture

Figure 32 is an example of a typical Kinetix 300 Servo Drive system, in this case a Kinetix 300 controlled through EtherNet/IP external reference. This illustrates how the required drive modules and accessories are used in a typical Kinetix 300 servo drive system.

Figure 32 - Typical Configuration - Kinetix 300 Servo Drive System



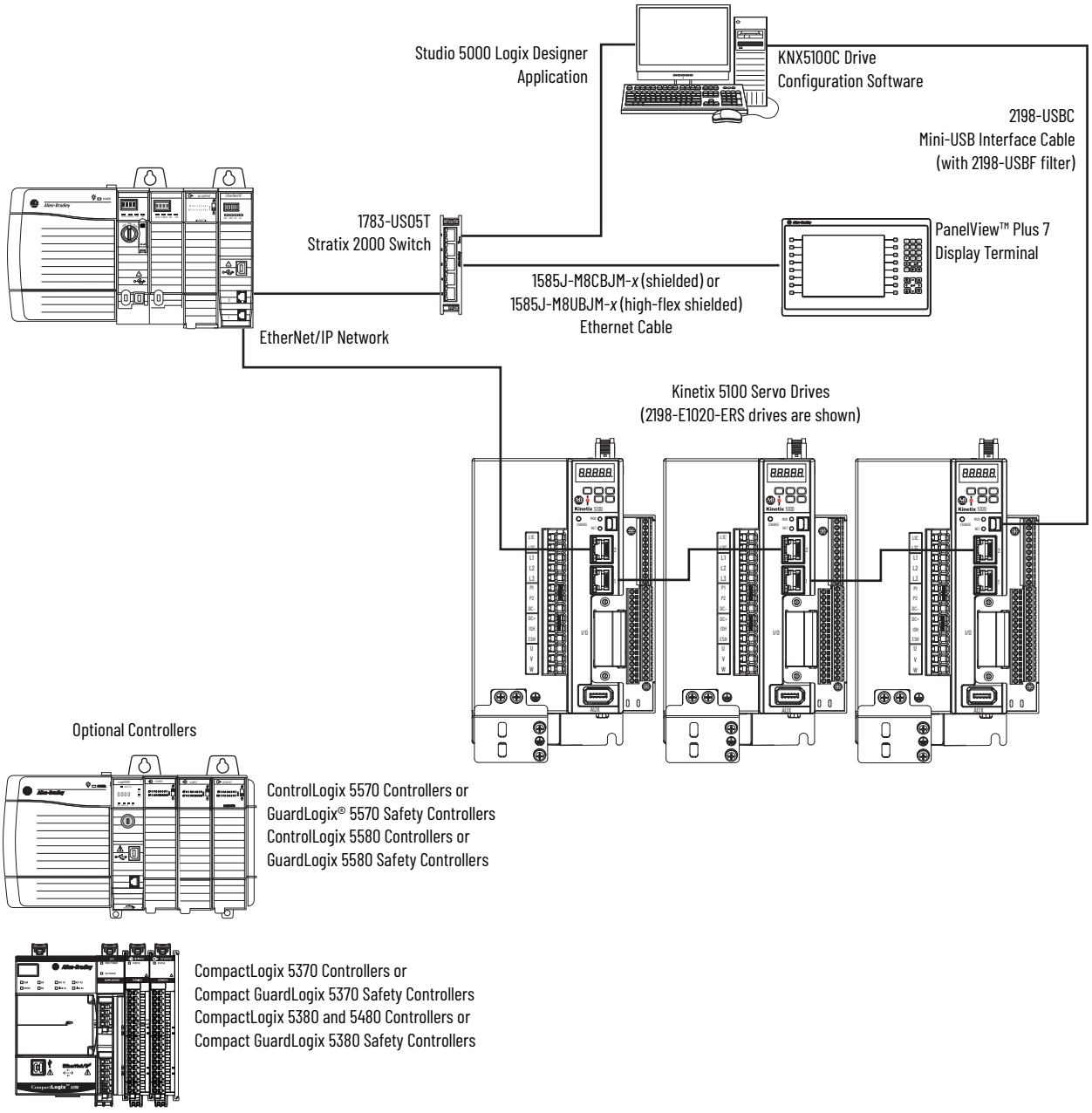
Kinetix 5100 Servo Drive System Architecture

This section shows typical Kinetix 5100 servo drive systems. Kinetix 5100 can work with different controllers and receive commands from many sources. The different system architectures that are shown in Figure 33, Figure 34, and Figure 35 illustrate how the controllers, cables, software, kits, accessories or optional modules are used.

Kinetix 5100 Drive Controlled Via Motion Control Add-On Instruction

The Kinetix 5100 Servo Drive (IO mode) commands motion via I/O assembly (position, velocity, torque, and indexing). It provides Add-On Instructions that emulate native Logix motion instructions for Studio 5000-based programming.

Figure 33 - Kinetix 5100 Controlled Via Motion Control AOIs



Kinetix 5100 Drive Controlled Via Explicit Messaging

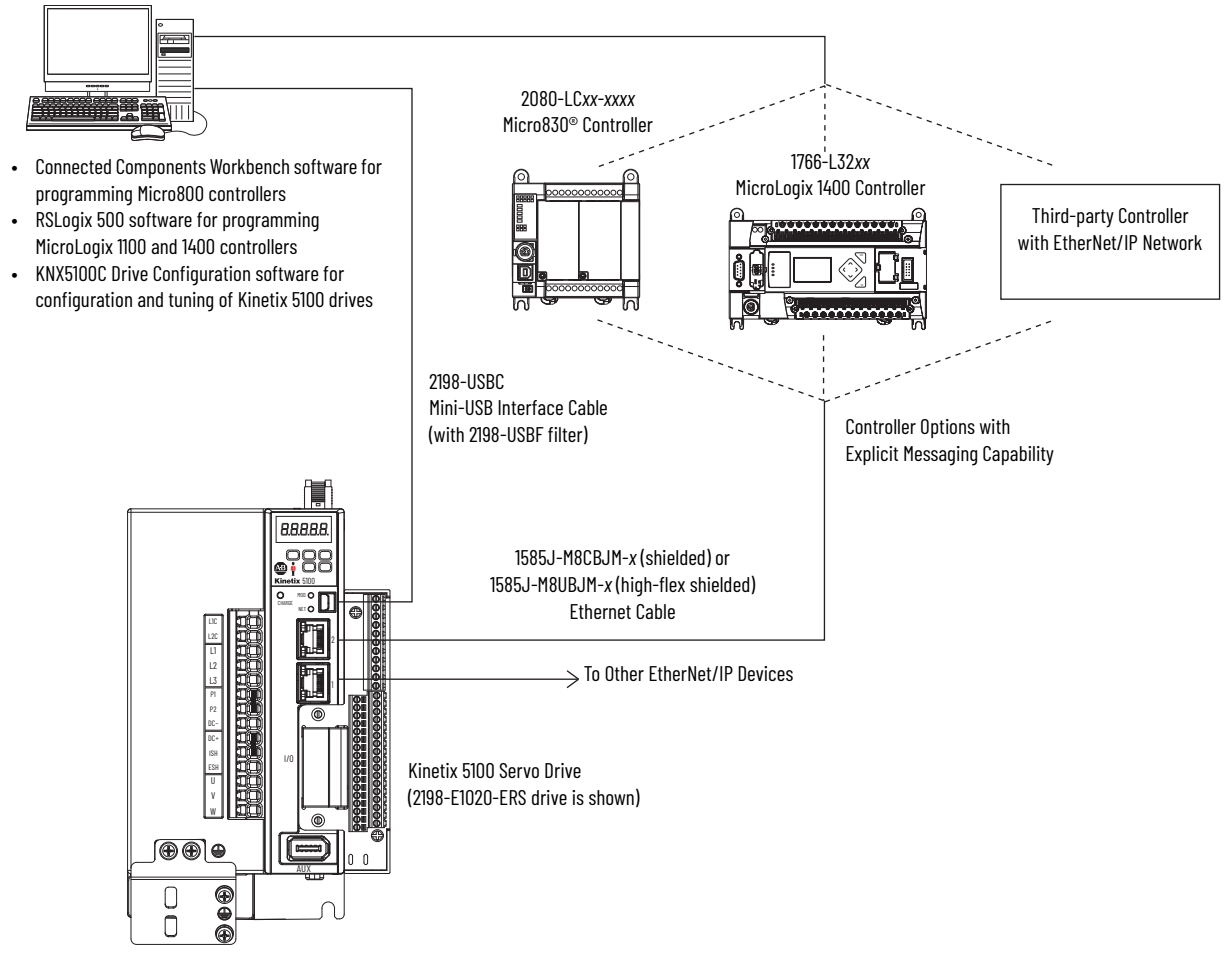
The Kinetix 5100 Servo Drive supports parameter configuration through Class 3 EtherNet/IP explicit messaging. Either MicroLogix/Micro800 or third-party controllers (must be capable of Class 3 EtherNet/IP messaging) can be used to control a Kinetix 5100 drive in this way. You must write your own logic to exchange explicit messages with Kinetix 5100 drives.

Examples of this type of messaging are available on the Sample Code Library website:

https://www.rockwellautomation.com/en-us/support/product/product-downloads/application-code-library/sample-code.html

Keyword: Kinetix 5100

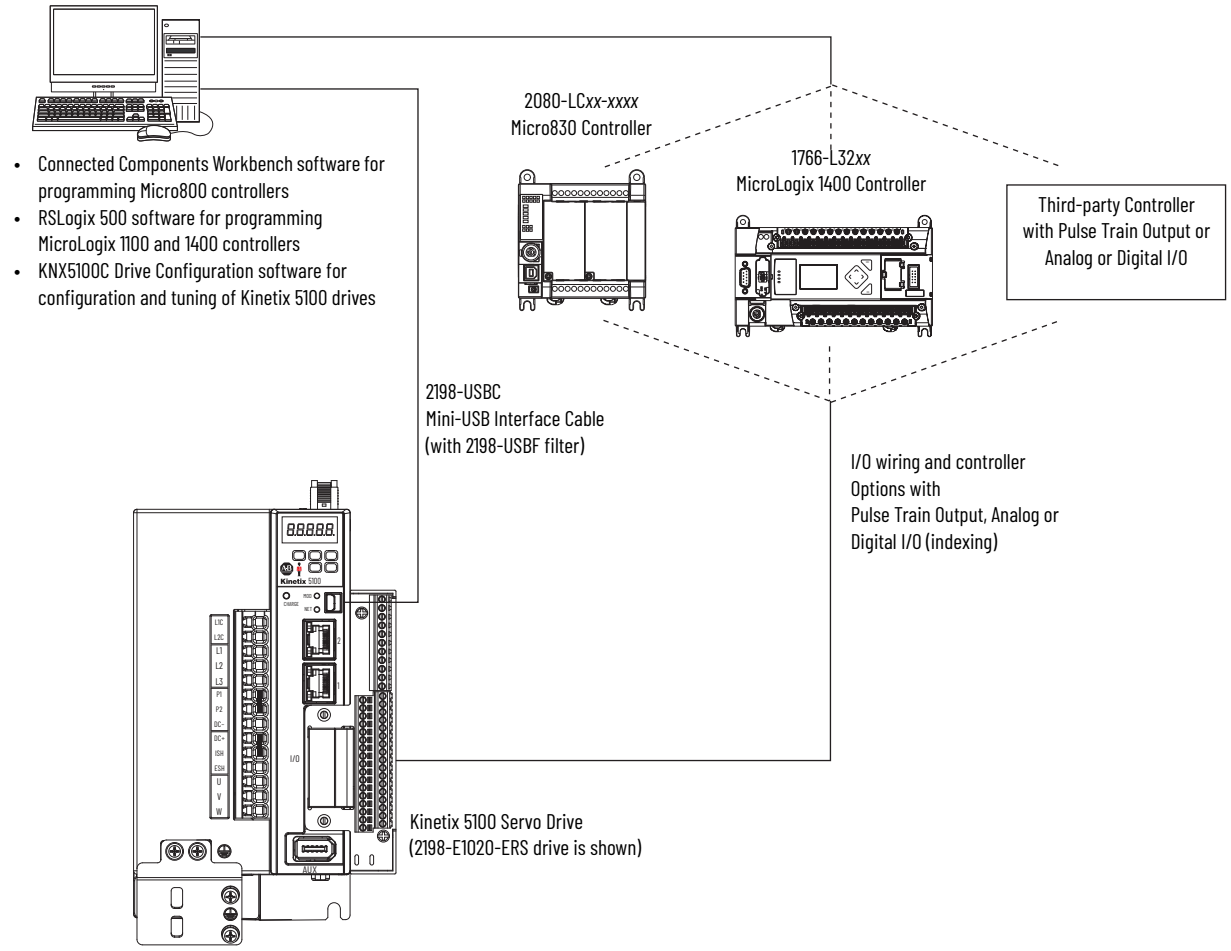
Figure 34 - Kinetix 5100 Controlled Via Explicit Messaging



Kinetix 5100 Drive Controlled Via Pulse Train/ Analog/ Digital I/O

The Kinetix 5100 servo drives support standalone motion control via pulse train, analog input, digital I/O (index or preset torque/speed).

Figure 35 - Kinetix 5100 Controlled Via Pulse Train/ Analog/ Digital I/O



Application Conversion

This section provides application examples to migrate Kinetix® 300 drives to Kinetix 5100 servo drives.

MotionView OnBoard software is used to configure the Kinetix 300 drives.

KNX5100C software is used to configure the Kinetix 5100 Servo Drives. Both drives can provide simple standalone motion without requiring a controller.

Depending on the controller used in the applications, software is required to program the controller for controlling both the Kinetix 300 drive or Kinetix 5100 drives. The software used depending on the situation is Studio 5000® (for ControlLogix®, CompactLogix™), Connected Component Workbench™ (for Micro800™-Series controller), or RSLogix 500® (for MicroLogix™ controllers).

When used in I/O mode, the Kinetix 5100 uses a Logix controller programmed with the Studio 5000 Logix Designer® application, along with Add-on Profiles (AOP) which include the ability to:

- get and set a defined set of parameters through a class 1 IO message using IO assemblies that are defined as part of the profile.
- use Kinetix AOIs (Add On Instructions) to execute drive functions that emulate integrated motion instructions.

The following examples show the MotionView software interface followed by the KNX5100C software interface and describes the differences between how they are used to configure the different scenarios shown.

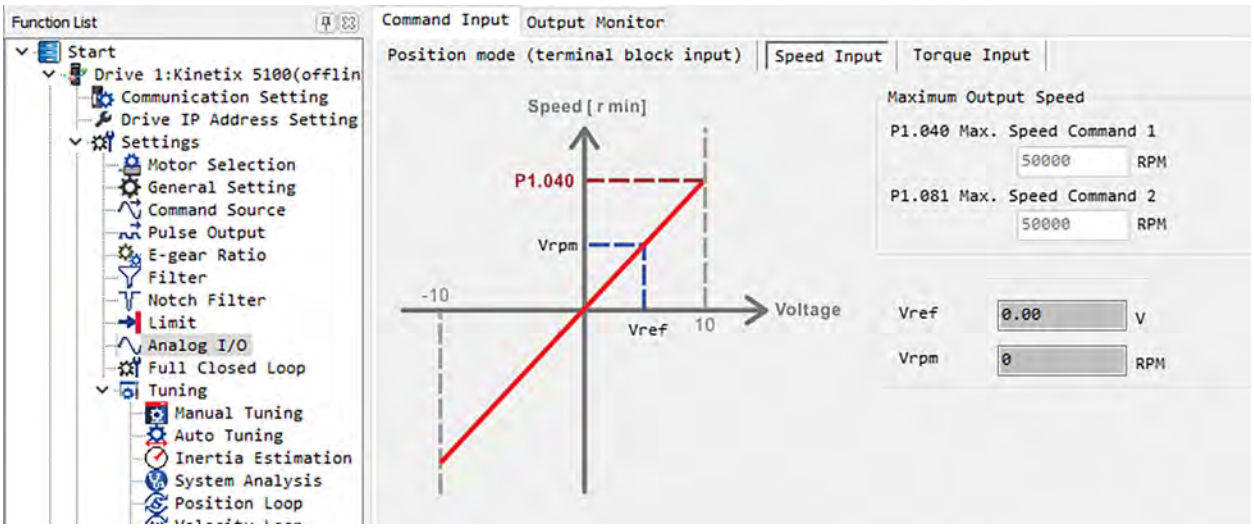
Scenario 1: Analog Command to Analog Command

Figure 36 is an example of the Properties window for Analog Velocity Input and Analog Current Input in MotionView for the Kinetix 300 servo drive. Use the wiring from Table 45 on page 41 to determine the wiring pins to use for the Analog Command mode.

Figure 36 - Analog I/O in MotionView

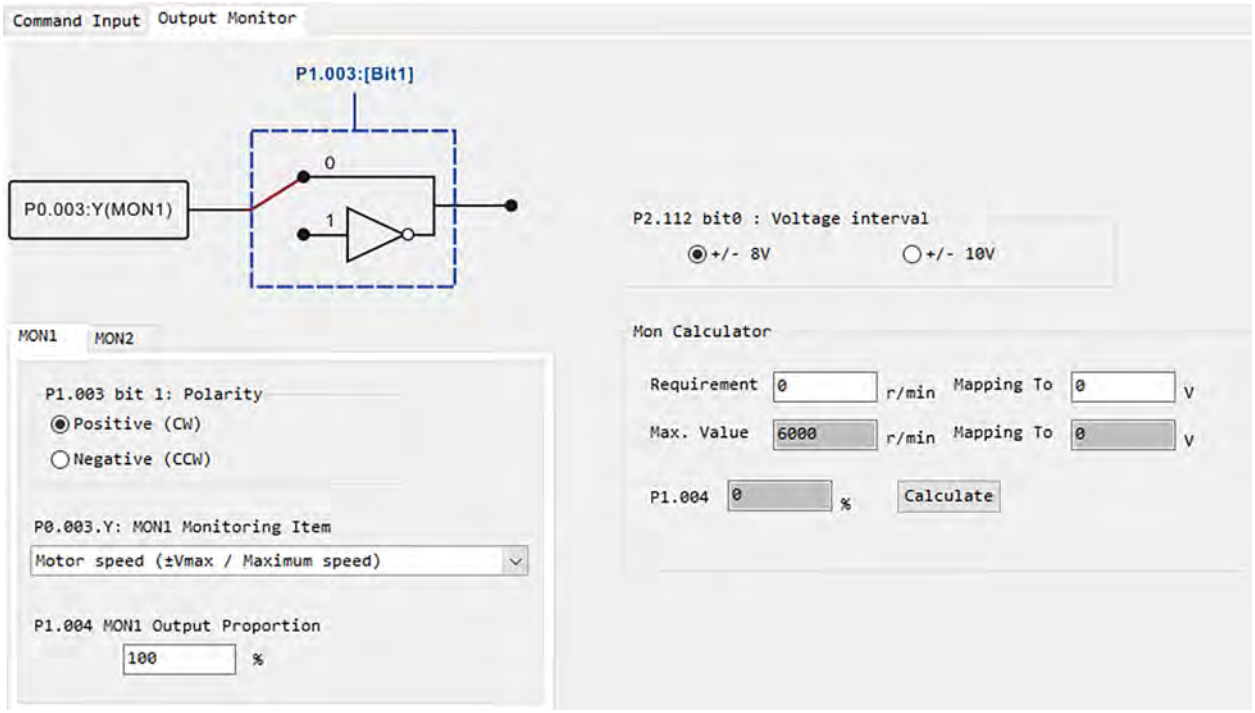
As in MotionView, KNX5100C software provides Analog Speed Input and Analog Torque Input in the Analog I/O tab. KNX51000C software also provides Analog Position Input in this window. You can set the Analog Speed, Analog Torque, or Analog Position Command using the respective tabs shown in Figure 37.

Figure 37 - Analog I/O Window in KNX5100C Software



KNX5100C software also allows a way to monitor the status of the incoming Analog Command or other parameters (for example, motor speed, DC bus voltage and others) for an online drive in the Monitoring Output tab, which is shown in Figure 38.

Figure 38 - Monitoring Output Window of Analog I/O in KNX5100C Software



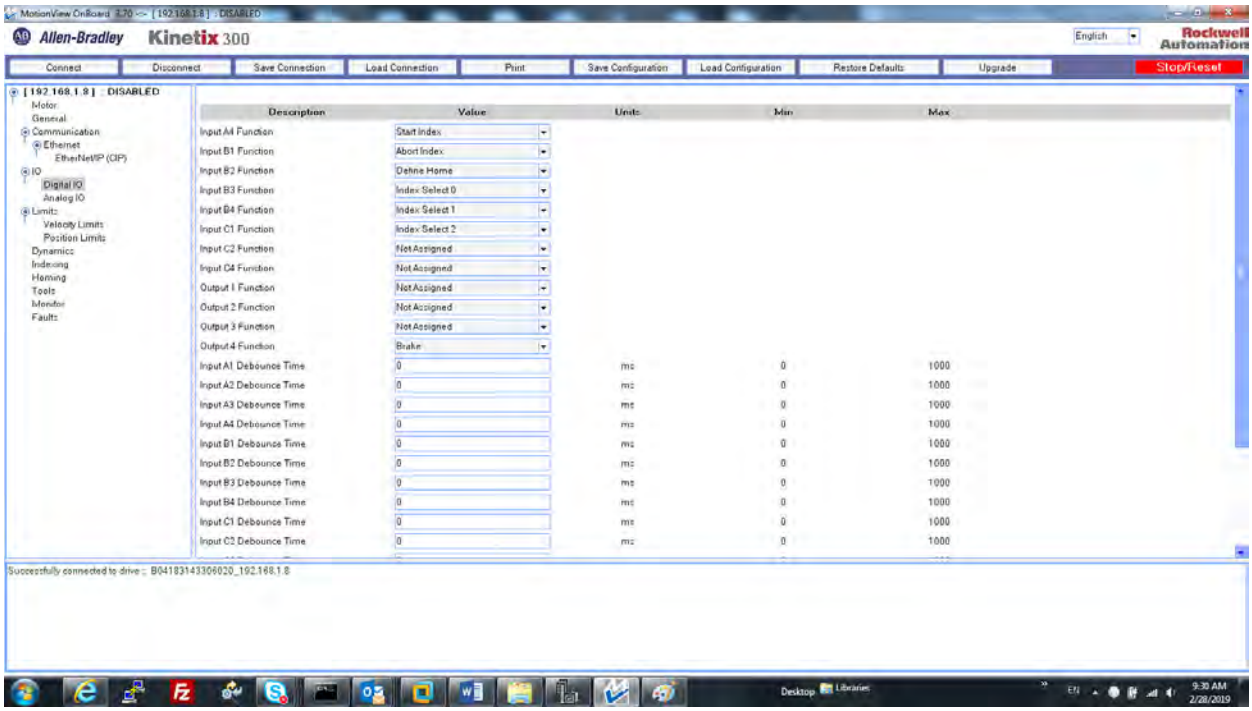
Scenario 2: Indexing to Position Register (PR) Mode

Figure 39 is an example of the Properties window for Indexing in MotionView for the Kinetix 300 servo drive.

Figure 39 - Indexing Window in MotionView

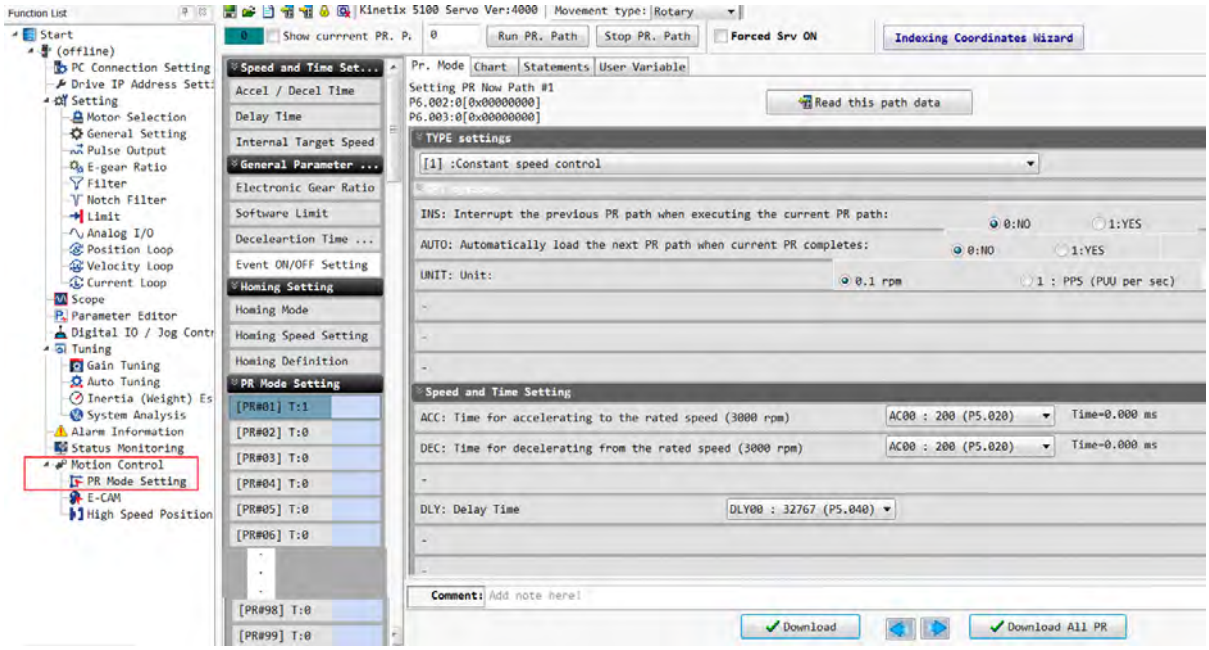
Figure 40 shows the Properties window for Digital Input that is used for Indexing in MotionView for the Kinetix 300 drive.

Figure 40 - Digital I/O Window in MotionView



In MotionView software with Kinetix 300 drives, you can configure up to 32 indexes.

Figure 41 - PR Mode Setting Window in KNX5100C Software



Like the Kinetix 300 drive, the Kinetix 5100 drive PR mode provides the indexing control operation by executing preconfigured motion commands (Homing and Indexing) through Digital Inputs.

In Kinetix 5100 drives you can use KNX5100C software to configure up to 99 different command types with one specific command for homing. Position Register (PR) commands contain indexing, but the command has additional capabilities. In PR mode, these different command types include homing, Point-to-Point position command, speed command, jump command, write command, and arithmetic operation commands. Except for arithmetic operations, the properties and corresponding data of each PR command are set by KNX5100C software.

In the Kinetix 300 drive, the motion commands are triggered by DI.StartIndex, DI.DefineHome, and DI.IndexSelect0 to DI.IndexSelect5.

In the Kinetix 5100, the motion commands are triggered by the DI.CTRG and DI.POS0 to DI.POS6.

When using the Digital I/O control panel in KNX5100C software, you are provided with: start and stop execution of the index command, start and stop homing, enable or disable a drive, and index execution monitoring without digital input wiring.

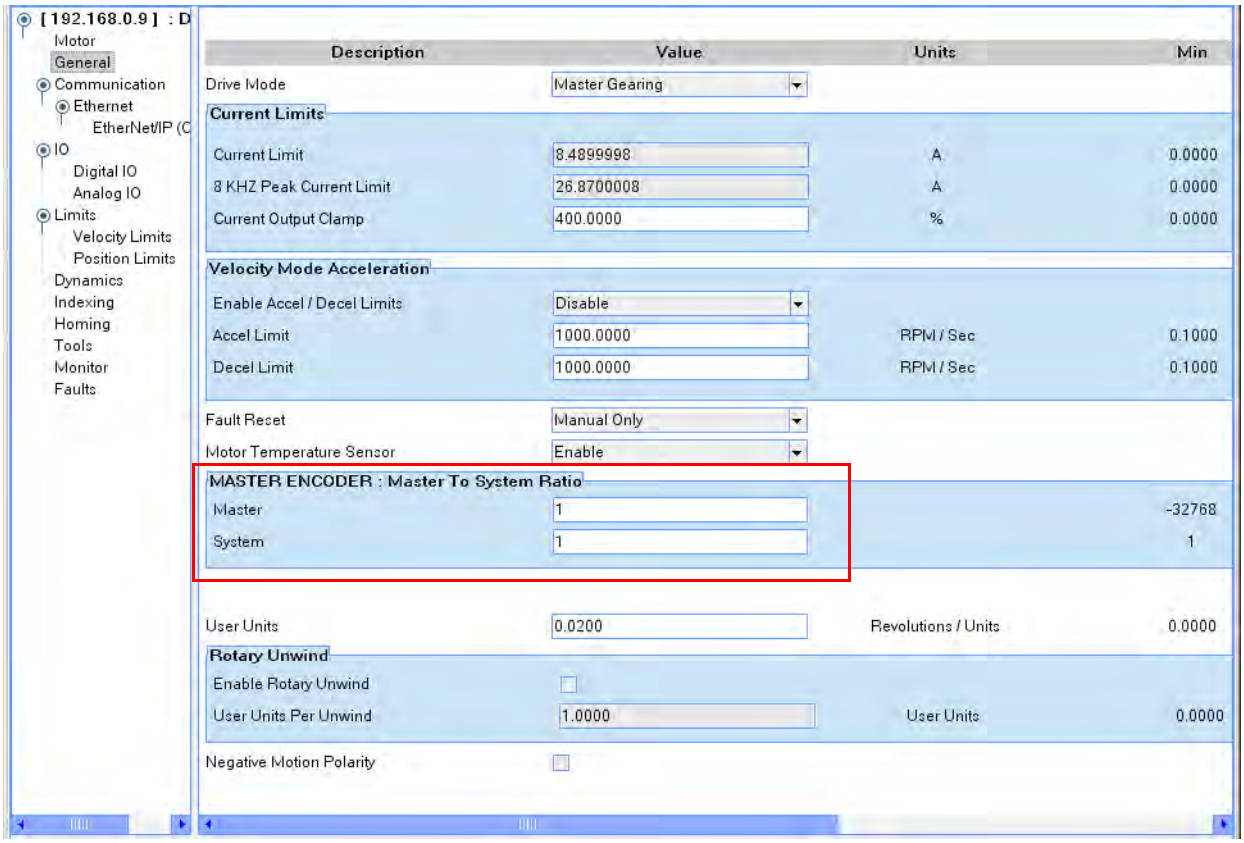
Scenario 3: Master / Gearing mode to PT mode

The Kinetix 300 servo drive provides a Gearing mode that allows you to connect a master TTL encoder signal for electronic gearing between that master signal and this drive (slave).

The Kinetix 300 servo drive provides the Step and Direction mode and allows you to connect a step and direction signal pair for position control.

Figure 42 shows the Properties window for Master To System Ratio in MotionView for Kinetix 300 servo drives.

Figure 42 - Master To System Ratio in MotionView

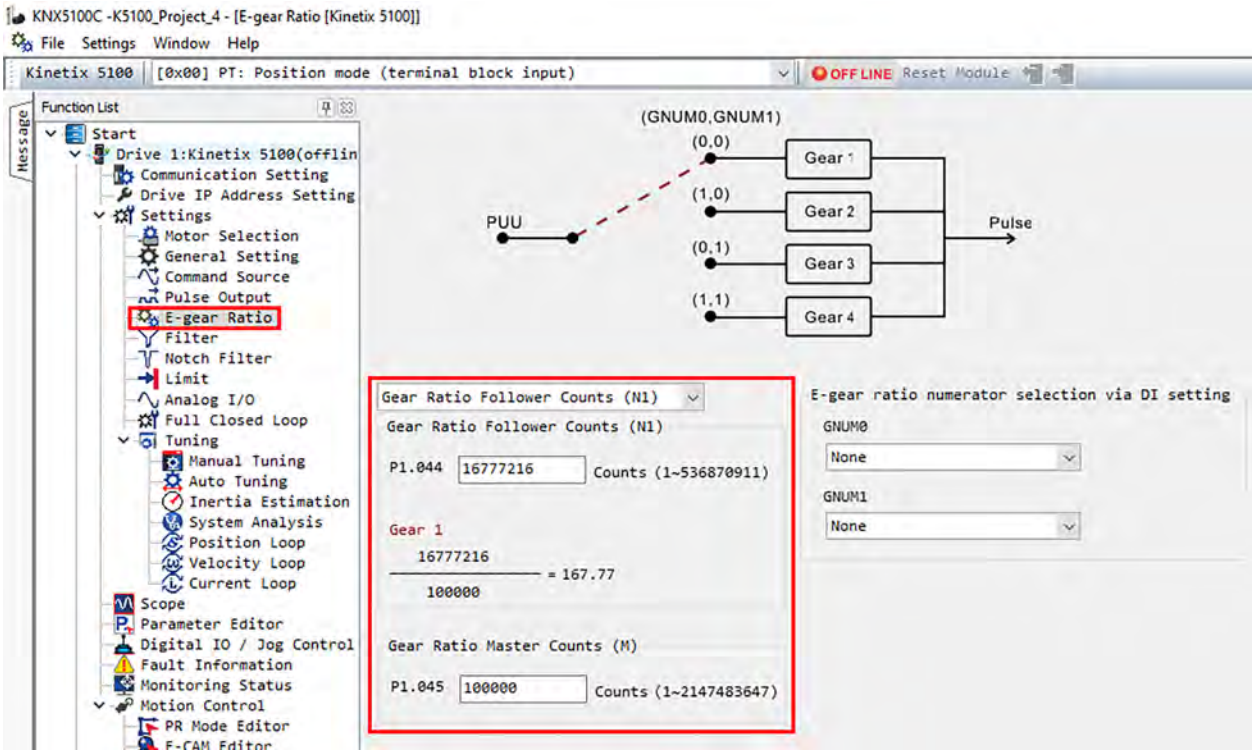


The Kinetix 5100 drive uses PT mode for similar functionality.

The Kinetix 5100 servo drive can use a Master TTL signal from either the I/O terminal block or the AUX (Auxiliary Feedback) connector. Consider that the Master signal can be a standalone encoder or another Kinetix 5100 servo drive using the buffered encoder outputs.

The E-Gear Ratio defines the gearing relationship. The Numerator and Denominator are used to specify the ratio between Master and Slave counts. The E-Gear parameters are shown in Figure 43. The Kinetix 5100 servo drive provides four selectable gear ratios that can be switched by using digital inputs.

Figure 43 - Gear Ratio Window in KNX5100C Software



You can configure the operation mode (PT Mode) of the drive and select the Command Source for the Master input in KNX5100C software.

The PTO inputs of the Kinetix 300 or the Kinetix 5100 servo drives can be differential or single ended. Differential inputs are preferred.

Table 55 - PTO Input Compatibility Between Kinetix 300 drives and Kinetix 5100 drives

Attribute	Kinetix 300 drive	Kinetix 5100
Recommended voltage	5 … 24V DC	5V DC for differential signal, 21.6…26.4V DC for single-ended signal
Input frequency (max)	2 MHz (differential signal)	4 MHz (differential signal) 200 kHz (single-ended signal)
Pulse width	500 ns	125 ns (differential signal) 2.5 us (single-ended signal)

The Kinetix 5100 drive also provides the ability to filter pulse input and to reject high-frequency noise. Using a filter width that is four times smaller than the actual pulse width is recommended. The supported filter widths are shown in Table 56.

Table 56 - Pulse Input Filter Supported on Kinetix 5100 Drives

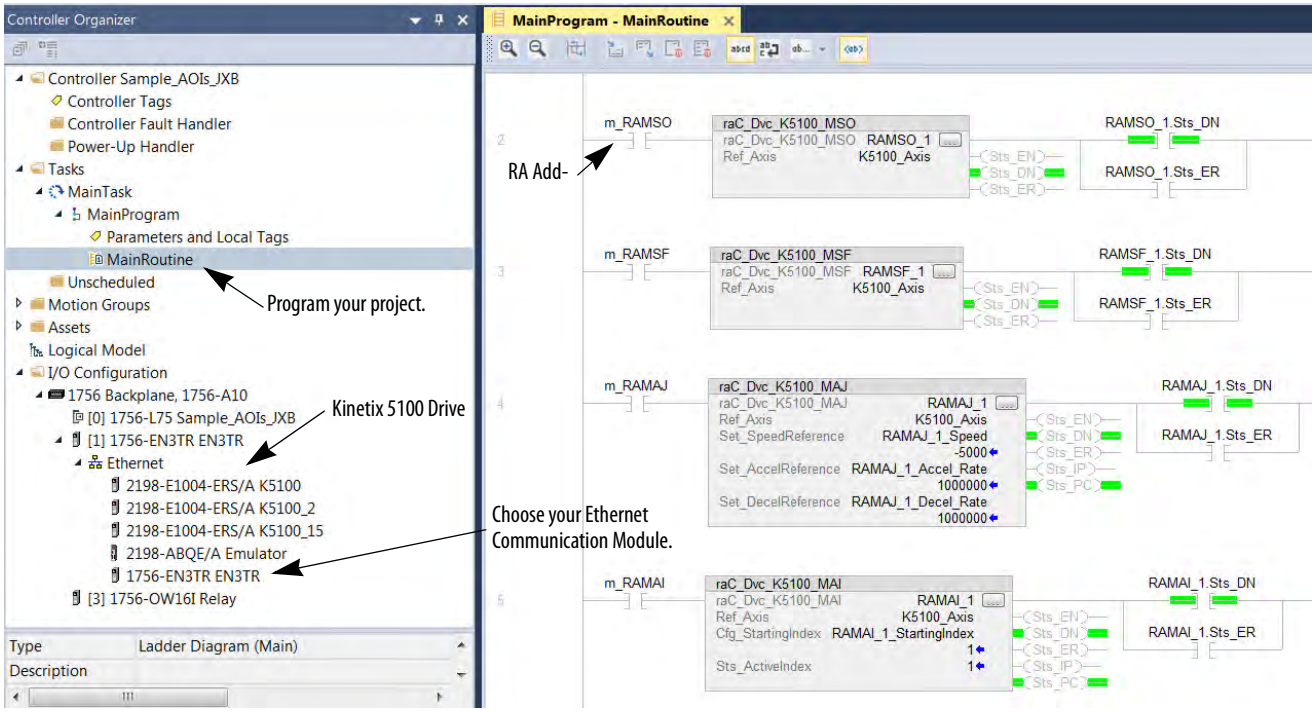
Filter Width	Filter Width	Filter Width	Filter Width	Filter Width	Filter Width
No filter	0.6 µs	1.1 µs	2 µs	7 µs	12 µs
0.2 µs	0.7 µs	1.2 µs	3 µs	8 µs	13 µs
0.3 µs	0.8 µs	1.3 µs	4 µs	9 µs	14 µs
0.4 µs	0.9 µs	1.4 µ	5 µs	10 µs	15 µs
0.5 µs	1 µs	1.5 µs	6 µs	11 µs	

Scenario 4: EtherNet/IP External Reference to I/O Mode

The Kinetix 300 drive uses the Ethernet/IP™ reference mode to allow an external controller to issue commands to the drive. The Kinetix 5100 drive uses I/O mode to allow an external controller to issue commands to the drive. If the controller is programmed with Studio 5000 Logix Designer, the control of the drive can use a Class 1 connection including an Add-On-Profile (AOP) with Add-On Instructions (AOI) that mimic native Logix CIP Motion™ Instructions.

See Figure 44 for an example of an Add-On Instruction project in the Logix Designer application.

Figure 44 - Kinetix 5100 Add-On Instruction Project in the Logix Designer Application



See the Kinetix 5100 Single-axis Ethernet/IP Servo Drives User Manual, publication 2198-UM004 for more details on Add-On Instruction.

Feature Comparison

The following table compares the hardware and features of the Kinetix® 300 drives and the Kinetix 5100 drives.

Table 57 - Feature Comparison Chart

Features	Kinetix 300 Drives	Kinetix 5100 Drives	Notes. Items with asterisks (*) have more information in this column.
Controller required	No	No	–
120V...240V operation	Yes	Yes	–
Internal shunt resistor available	No	Yes*	*Kinetix 5100 drive: Internal or external, depending on the drive.
Control Power available	Yes*	Yes**	*Kinetix 300 drive: 24V DC. **Kinetix 5100 drive: 400V-class - 24V DC, 200V-class: 115/240V AC single phase.
Safe Torque Off	Yes	Yes	–
Digital inputs control indexing	Yes	Yes	–
Dedicated Auxiliary feedback encoder connector	No	Yes	–
Master Gearing Encoder Inputs (terminal block Inputs)	Yes	Yes	–
Hardware limits	Yes	Yes	–
Analog input for current limit	No	No	–
Multiple assignments for inputs	No	Yes*	*Kinetix 5100 drive: Not natively. Can use Digital I/O status to evaluate I/O in PR mode.
Watch window output assignment	No	Yes*	*Kinetix 5100 drive: Not natively. Can be programmed within PR mode.
Registration index (index on reg input)	Yes	Yes	–
Registration latch (capture position)	No	Yes*	*Kinetix 5100 drive: Available in PR mode (capture/compare).
MicroLogix™/SLC™ controller compatible	Yes	Yes	–
Hardware enable required	Yes	Yes*	*Kinetix 5100: I/O mode does not require a hardware enable input.
Selectable modes of operation via digital inputs	No	Yes*	*Kinetix 5100: Can change modes with dual or multi-mode changes and digital inputs.
Buffered encoder outputs (selectable freq)	Yes*	Yes	*Kinetix 300 drive has fixed frequency encoder outputs.
Holding brake support	Yes	Yes*	*Kinetix 5100 drive: Configurable in KNX5100C software.
Dual Loop Control	No	Yes*	*PT, PR mode and IO position mode
Multiple Types of Motor Supported	Yes	Yes*	* Kinetix MP Motor, TLP Motor, TL and TLY Motor
Dual-port Ethernet with DLR support	No	Yes	–
Non-Integrated Motion Drive (EIP Stand-Alone)	Yes	Yes	–
Drive software configuration required	Yes	Yes*	*Kinetix 5100 drive: KNX5100C Software using USB Interface
Ability to home the drive	Yes	Yes	–
Rotary mode support	Yes	Yes*	*Kinetix 5100 drive: Not natively, uses the Indexing Coordinate System. See the Kinetix 5100 Single-axis EtherNet/IP Servo Drives User Manual, publication 2198-UM004 for more details.
Current limiting ability	Yes	Yes	–
Positioning via analog input	No	Yes	–
Operation mode override	No	Yes	–
Soft limits	Yes	Yes	–
Slew rate for gearing	No	No	–
Selectable modes of operation	Yes	Yes	–
Pause index directly	No	Yes*	*Kinetix 5100 - not natively. Programming is required.

Table 57 - Feature Comparison Chart (Continued)

Features	Kinetix 300 Drives	Kinetix 5100 Drives	Notes. Items with asterisks (*) have more information in this column.
Offline software	No	Yes	–
Start next Index on input	Yes	Yes*	*Kinetix 5100 - not natively. Programming is required.
Batch Count	Yes	Yes*	*Kinetix 5100 - not natively. Programming is required.
Homing, Active/Switch/Marker	Yes	Yes	–
Homing, Absolute	Yes	Yes	–
Home to Torque Limit	No	Yes	–
Define Home current position	Yes	Yes	–
Stop (Abort) Indexing	Yes	Yes	–

Notes:

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, and product notification updates.	rok.auto/support
Knowledgebase	Access Knowledgebase articles.	rok.auto/knowledgebase
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

Documentation Feedback

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Waste Electrical and Electronic Equipment (WEEE)

At the end of life, this equipment should be collected separately from any unsorted municipal waste.

Rockwell Automation maintains current product environmental information on its website at rok.auto/pec.

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