



Ultra3000 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.

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

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

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



WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.



ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

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

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



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



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



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

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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 Ultra™ 3000 servo drives to one that contains Kinetix® 5100 servo drives.

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.	10
Added Table 17 and Table 18 Kinetix 5100 Power Specifications (480V nom three-phase).	24 and 25
Added Table 33 Kinetix 5100 Servo Drive Control Power and Auxiliary Power Rating - 400V-class.	34
Added Figure 14 - 2098-DSD-HV030, 2098-DSD-HV050, 2098-DSD-HV100, 2098-DSD-HV150, and 2098-DSD-HV220 Ultra3000 (400V-class) Drives.	45
Added Figure 17 - Features and Indicators (catalog numbers 2198-E4020-ERS, 2198-E4030-ERS).	47
Added Figure 24 and Table 54, dimensions for Ultra3000 400V-class drives.	57
Added Figure 35 Typical Power Wiring of Ultra3000 System (2098-DSD-HVxxx-xx and -HVxxxX-xx).	69
Added Sample Code Library information to the Kinetix 5100 Drive Controlled Via Explicit Messaging section.	78

Overview

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.

Migrating from a motion control system that uses Ultra3000 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 installed and the software applied. As a result, this migration guide is not an all-inclusive document. It does not describe all redesign steps that can be required, nor does it 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.

For Kinetix 5100 servo drive module specifications not included in this publication, see the Kinetix Servo Drives Specifications Technical Data, publication [KNX-TD003](#).

Integrated Architecture Builder Software

The Integrated Architecture® Builder software can help you plan and configure a system, and migrate system architectures. For more information, see the [Control Systems Configuration Tools](#) page.

Motion Analyzer Software

Motion Analyzer software is a comprehensive motion-application sizing tool that is used for analysis, optimization, selection, and validation of your Kinetix motion control system. This online tool facilitates the machine design process, and lets you quickly design and validate new machine concepts without purchasing or installing physical equipment.

Review the performance capabilities of any replacement drive to be sure that the replacement drive can deliver the required level of peak and continuous current to the motor, and Motion Analyzer can help in the correct drive selection.

Motion Analyzer is available online at <https://motionanalyzer.rockwellautomation.com/>.

Migration Services

As products mature throughout the product lifecycle, Rockwell Automation® is there as your partner to help you get the most out of your current equipment, to help you determine your next steps, and to help you lay out a plan for the transition to newer technology.

Whether you choose to migrate all at once or use our unique, phased approach to help minimize the costs, risks, and complexities that are involved with the management of legacy products and systems, Rockwell Automation has the tools and the experience to guide you through the transition.

For more information, see the Migration Solutions Brochure, publication [MIGRAT-BR002](#).

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 6000M (Bulletin MDF), 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 servo drive family that includes section on Kinetix 5100 drives.
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.
Ultra3000 Digital Servo Drives Installation Manual, publication 2098-IN003	Information on procedures to mounting, wire, and connect the Ultra3000 digital servo drive.
Ultra3000 Servo Drives Integration Manual, publication 2098-IN005	Power-up procedures, system integration, and troubleshooting tables for the Ultra3000 digital servo drive.
Kinetix 5100 Drive Systems Design Guide, publication KNX-RM011	System design guides to select the required (drive specific) drive module, power accessory, feedback connector kit, and motor cable Cat. Nos. for your Kinetix 5100 drive and Kinetix motion control system.
Ultra3000 Drive Systems Design Guide, publication KNX-RM008	
Ethernet Design Considerations Reference Manual, publication ENET-RM002	Provides information for designing 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.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
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.
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](#).

Notes:

Migration Options

For each Ultra™3000 drive control feature, there is a suitable solution with Kinetix® 5100 servo drives, Logix 5000™ controller platforms, and the Studio 5000 Logix Designer® application.

Table 1 - Ultra3000 Drive to Kinetix 5100 Drive Migration Options

Ultra3000 drive Operation Mode	Equivalent Kinetix 5100 Drive Operation Mode
Analog Current	T mode
Analog Velocity	S mode
Analog Position	PT mode
Preset Current	T or Tz mode
Preset Velocity	S or Sz mode, or PR mode
Preset Position	PR mode
Follower	PT mode
Indexing	PR mode
Host Command	Any mode with Explicit Messaging over EtherNet/IP™ network
DeviceNet	IO mode (with Logix Add-On Instructions) using the EtherNet/IP network

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 come 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 which can be used when selecting a replacement for your Ultra3000 servo drives. Additional guidance for replacement of the Ultra3000 drive is provided in [Table 8](#) in Chapter 2 of this document.

Table 3 - Kinetix 5100 Servo Drive Cat. Nos.

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...132V, 170...253V	1 PH 1 PH,3 PH	0.4	0.2	2.60	6.5
2198-E1007-ERS	95...132V, 170...253V	1 PH 1 PH,3 PH	0.75	0.375	5.10	15.41
2198-E1015-ERS	95...132V, 170...253V	1 PH 1 PH,3 PH	1.5	0.75	7.9	23.7
2198-E1020-ERS	95...132V, 170...253V	1 PH 1 PH,3 PH	2	1	13.4	53.03
2198-E2030-ERS	170...253V	3 PH	3	-	17.9	55.95
2198-E2055-ERS	170...253V	3 PH	5.5	-	41.3	91.4
2198-E2075-ERS	170...253V	3 PH	7.5	-	49	127.49
2198-E2150-ERS	170...253V	3 PH	15	-	78	162

Table 4 - Kinetix 5100 Drive Ratings - 400V Class

Cat. No.	Input AC Voltage (V AC)	Input Phases	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

Potential Design Changes

[Table 5](#) compares environmental specifications of Ultra3000 drives and Kinetix 5100 drives. [Table 6](#) compares the drive certifications of the Ultra 3000 drives and the Kinetix 5100 drives. See [Appendix A](#) for a comparison of features and Kinetix Servo Drives Specifications Technical Data, publication [KNX-TD003](#) for complete specifications.

Table 5 - Compare Ultra3000 Drive and Kinetix 5100 Drive Environmental Specifications

Specification	Ultra3000 Servo Drives		Kinetix 5100 Servo Drives	
	Operational Range	Storage Range (Nonoperating)	Operational Range	Storage Range (Nonoperating)
Ambient Temperature	0...55 °C (32...131 °F)	-40...70 °C (-40...158 °F)	0...50 °C (32...122 °F)	-40...70 °C (-40...158 °F)
Relative Humidity	5...95% Noncondensing	5...95% Noncondensing	5...85% Noncondensing	5...95% Noncondensing
Altitude	1500 m (4921.5 ft) - Derate 3% per 300 m (984.3 ft) above 1500 m (4,921.5 ft)		1000 m (3281 ft)	
Vibration	5...2000 Hz @ 2.5 g peak, 0.0006 mm (0.015 in.) max displacement		5...55 Hz @ 0.35 mm (0.014 in.) double amplitude, continuous displacement 55...500 Hz @ 2.0 g peak constant acceleration	
Shock	15 g, 11 ms half-sine pulse		15 g, 11 ms half-sine pulse	

Table 6 - Compare Ultra3000 Drive and Kinetix 5100 Servo Drive Certifications

Ultra3000 Drive Agency Certification ⁽¹⁾	Kinetix 5100 drive Agency Certification ⁽¹⁾	Standards
cULus	cULus ⁽²⁾	Ultra3000 drive: UL Listed to U.S. and Canadian safety standards (UL 508 C File E145959). Kinetix 5100: UL standards for the U.S. UL61800-5-1, 1st edition, June 2012. CSA standard for Canada. C22.2 No. 274-13 UL File Number E59272
CE	CE	Ultra3000 drive: European Union 89/336/EEC EMC Directive compliant with EN 61800-3:2004: Adjustable Speed Electrical Power Drive Systems - Part 3; EMC Product Standard including specific test methods. European Union 73/23/EEC Low Voltage Directive compliant with: EN 60204-1: 1997 - Safety of Machinery - Electrical Equipment of Machines. EN 50178: 1997 - Electronic Equipment for use in Power Installations. Kinetix 5100 drive: 2014/30/EU, IEC/EN 61800-3: 2017 RLV, IEC/EN 61800-3, environment 2, category C3, and EN 55011 class A group 2, 2014/35/EU, IEC/EN 61800-5-1:2016, 2006/42/EC, IEC/EN 61800-5-2:2016
—	Functional Safety (FS)	Kinetix 5100 drive: IEC/EN 61508, EN ISO 13849, IEC/EN 62061, IEC/EN 61800-5-2:2016 (CAT3, SIL 2, PLd)
KC	KCC	Ultra3000 drive: Korean Registration of Broadcasting and Communications Equipment, compliant with: Article 58-2 of Radio Waves Act, Clause 3 Registration number: KCC-REM-RAA-2098-DSD Kinetix 5100 drive: Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3 • Registration number: KCC-REM-RAA-2198
—	RoHS	Kinetix 5100 drive: European Directive 2011/65/EU(1) - The Restriction of Hazardous Substances (RoHS), EN 50581:2012
—	RCM (Formerly C-Tick)	Kinetix 5100 drive: Australian Radiocommunications Act, compliant with: AS/NZS CISPR 11:2002 (Group 1, Class A); Radio Communications Act: 1992; Radio Communications (Electromagnetic Compatibility) Standard: 1998; Radio Communications (Compliance Labeling - Incidental Emissions) Notice: 1998
—	ODVA	Kinetix 5100 drive: EtherNet/IP conformance tested, EtherNet/IP Specification Volume 2, Edition 1.23, April 2017
—	China RoHS	Kinetix 5100 drive: 
—	SCCR	Kinetix 5100 drive: UL 61800-5-1 standard, short circuit test (including exception 5.2.3.6.2.1DV.2.3), and breakdown of components test
—	WEEE	Yes

(1) When product is marked, see rok.auto/certifications for Declarations of Conformity Certificates.

(2) UL has not evaluated the safe-off, Safe Torque Off, or safe speed-monitoring options in these products.

Replacement Considerations

To replace an Ultra™ 3000 drive with a Kinetix® 5100 drive can require some system design changes.

- Review the hardware and software design of the existing Ultra3000 system.
- Compare these 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 assure 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.

Before You Begin

This section contains information to help you to choose the correct Kinetix 5100 drive to replace your Ultra3000 drive.

Table 7 - Migration Considerations

Feature/Function	Ultra3000 Drive	Kinetix 5100 Drive
Rotary Motor Compatibility	Supports 1362AB, Kinetix MP, F-Series, H-Series, N-Series, Y-Series, and Kinetix TL and TLY servo motors.	Supports Kinetix MP and Kinetix TL, TLP, and TLY servo motors.
Digital Input and Registration Input	Eight digital inputs, support current sinking wiring only. Registration input can be assigned to any one of them.	Ten total digital inputs. Eight standard digital inputs and two optional high-speed inputs, support both current sinking and current sourcing wiring. Registration inputs can be assigned to digital input 9 and digital input 10.
Digital Output	Four digital outputs with current sourcing capability only.	Six digital outputs with both current sourcing and current sinking capability.
Typical Input Power Configuration and Components	Supports grounded power system (center grounded wye secondary, or corner grounded, or high leg delta secondary). Uses 2090-UXLF-x line filter for CE compliance. Ultra3000 drives also need specific fuses or circuit breakers for input protection.	Supports grounded power system (center grounded wye secondary only). 2198-DBx-F line filter is needed for CE compliance. Specific fuses or circuit breakers (can differ from those recommended for Ultra3000 drives) are required for input protection.
Safe Torque Off (STO)	Does not support the Safe Torque Off feature.	Supports the Safe Torque Off feature.
Communication	Supports serial port and the DeviceNet® communications protocol.	Supports USB interface for configuration and EtherNet/IP™ for control
Controller	Supports Logix 5000™ controllers and SLC™ controllers.	Supports the following controllers: • CompactLogix™ 5370 and CompactLogix 5380 controllers with embedded dual-port. • CompactLogix 5480. • ControlLogix® 5570 and ControlLogix 5580. MicroLogix™ 1100 and 1400 controllers. Micro800™ controllers.

Table 7 - Migration Considerations (Continued)

Feature/Function	Ultra3000 Drive	Kinetix 5100 Drive
Cable Length	Support cable lengths for motor and power up to 90 m (295.2 ft).	Drive-to-motor power and feedback cables must not exceed: • 50 m (164 ft) for axes with Kinetix MP servo motors with Hiperface encoder feedback • 50 m (164 ft) for axes with Kinetix TLP servo motors and 24-bit high-resolution serial encoder feedback • 30 m (98.4 ft) for axes with Kinetix TL and TLY servo motors and 17-bit high-resolution or incremental encoder feedback • 30 m (98.4 ft) for axes with Kinetix MP (Cat. No. MPL-Axxxx-H) servo motors and incremental encoder feedback
Physical Dimensions	—	The Kinetix 5100 drive has smaller dimensions and fits in the space of the Ultra3000 drive. The drill hole patterns differ from that of Ultra3000 drives.
Control and Auxiliary Power	Optional 5V DC (breakout board with 24V DC to 5V converter available) auxiliary power for smallest 3 drives. Optional single-phase 100...240V AC for larger drives.	200V-class 1PH 120V or 230V 400V-class 24V DC
Dual Position Loop / Aux Feedback Port	Does not support Dual position loop / Aux feedback port.	Supports Dual feedback inputs for: • Master Follower (PT mode) • Dual Loop Control (PR/PT/IO mode) • Aux Feedback (PR mode) as a Master for E-CAM function
Motor Brake	Has a dedicated relay output for operating motor brake.	Any digital output can be configured as Motor Brake. This output must include an external relay to control motor holding brake.

Design considerations:

- Verify that the existing controller is compatible with the Kinetix 5100 system (for example, DeviceNet vs. EtherNet/IP).
- Verify that your current motor is compatible.
- Verify that the feedback cable length in your existing system does not exceed the max feedback cable length or the max power cable length for the new system.
- Verify that the drive size is compatible.
- Verify that the drive dimensions are compatible.
- Verify the drive connections (and/or connectors) are acceptable or compatible.

See the technical data documents and the design guides in the [Additional Resources](#) for motor, cable, and drive combinations.

Drive Sizing

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 which replacement servo drive you select. To identify the correct replacement drive size, compare the continuous and peak output current ratings.

Most Ultra3000 drives can be replaced with a Kinetix 5100 drive of similar, or in some cases greater, output current capability. The Kinetix 5100 drives require less physical space than the Ultra3000 drives.

Other factors that affect drive replacement include:

- Drive Sizing (ratings and physical size)
- Dimensions
- Drive Interconnects and Cabling
- Communication network
- Accessories, such as shunts and line filters.

Nominal Voltage and Output Current Comparison

This section lists the Ultra3000 servo drives and the suggested Kinetix 5100 servo drives, along with the output ratings differences of the drives. Information in this migration guide is based on the drive combinations that are shown in [Table 8](#) and [Table 9](#).

Review [Table 8](#) to make sure that the replacement drive can deliver the required continuous and peak current to the motor.

Table 8 - Suggested Kinetix 5100 Replacement Drives by Output Current

Ultra3000 Drive					Kinetix 5100 Drive				
Cat. No.	Voltage Range (V)	Voltage Range Nom V rms	Continuous Output Current A rms (0-pk)	Peak Output Current A rms (0-pk)	Cat. No.	Voltage Range V rms	Voltage Range Nom V rms	Continuous Output Current A rms (0-pk)	Peak Output Current A rms (0-pk)
2098-DSD-005	88...265V 1 PH	120...240V 1 PH	1.8 (2.5)	5.3 (7.5)	2198-E1004-ERS	95...132V 1 PH 170...253V 1 PH / 3 PH	120...230V 1 PH / 3 PH	2.6 (3.7)	6.5 (9.19)
2098-DSD-010	88...265V 1 PH	120...240V 1 PH	3.5 (5)	10.6 (15)	2198-E1007-ERS	95...132V 1 PH 170...253V 1 PH / 3 PH	120...230V 1 PH / 3 PH	5.10 (7.21)	15.41 (21.79)
2098-DSD-020	88...265V 1 PH	120...240V 1 PH	7.1 (10)	21.2 (30)	2198-E1015-ERS	95...132V 1 PH 170...253V 1 PH / 3 PH	120...230V 1 PH / 3 PH	7.9 (11.17)	23.7 (33.51)
2098-DSD-030	88...265V 1 PH	120...240V 1 PH	10.6 (15)	21.2 (30)	2198-E1020-ERS	95...132V 1 PH 170...253V 1 PH / 3 PH	120...230V 1 PH / 3 PH	13.4 (18.95)	53.03 (74.98)
2098-DSD-075	88...265V 3 PH	120...240V 3 PH	24.7 (35)	53.0 (75)	2198-E2055-ERS	170...253V 3 PH	230V 3 PH	41.3 (58.40)	91.4 (129.24)
2098-DSD-150	88...265V 3 PH	120...240V 3 PH	45.9 (65)	106.0 (150)	2198-E2075-ERS	170...253V 3 PH	230V 3 PH	49.0 (69.3)	78.0 (110.3)
2098-DSD-HV030	207...528, 3 PH	230...480, 3 PH	5 (7)	9.9 (14)	2198-E4015-ERS	342...528V 3PH	3 PH, 480V	6.05 (8.56)	15.11 (21.36)
2098-DSD-HV050	207...528, 3 PH	230...480, 3 PH	7.8 (11)	15.6 (22)	2198-E4020-ERS	342...528V 3PH	3 PH, 480V	7.42 (10.49)	20.78 (29.38)
2098-DSD-HV100	207...528, 3 PH	230...480, 3 PH	16.3 (23)	32.5 (46)	2198-E4055-ERS	342...528V 3PH	3 PH, 480V	24.8 (35.07)	37.65 (53.24)
2098-DSD-HV150	207...528, 3 PH	230...480, 3 PH	24 (34)	48.1 (68)	2198-E4075-ERS	342...528V 3PH	3 PH, 480V	31 (43.84)	53.32 (75.39)
2098-DSD-HV220	207...528, 3 PH	230...480, 3 PH	33.2 (47)	66.5 (94)	2198-E4150-ERS	342...528V 3PH	3 PH, 480V	41.26 (58.35)	70.14 (99.18)

Dimension Comparison

This section compares physical dimensions of the Ultra3000 servo drives and the suggested Kinetix 5100 replacement servo drives.

Table 9 - Suggested Kinetix 5100 Replacement Drives by Dimensions

Ultra3000 Drives				Kinetix 5100 Drives			
Cat. No.	Height mm (in.)	Width mm ⁽¹⁾ (in)	Depth mm (in)	Cat. No.	Height mm (in.)	Width mm (in)	Depth mm (in)
2098-DSD-005	198.12 (7.8)	95.5 (3.76)	144.27 (5.68)	2198-E1004-ERS	170 (6.69)	35 (1.34)	178.3 (7.02)
2098-DSD-010	198.12 (7.8)	121.54 (4.79)	144.27 (5.68)	2198-E1007-ERS	180 (7.09)	50 (1.97)	188.4 (7.42)
2098-DSD-020	198.12 (7.8)	121.54 (4.79)	144.27 (5.68)	2198-E1015-ERS	180 (7.09)	50 (1.97)	188.4 (7.42)
2098-DSD-030	360.68 (14.2)	91.44 (3.6)	243.84 (9.6)	2198-E1020-ERS	180 (7.09)	95 (3.74)	208.4 (8.2)
2098-DSD-075	360.68 (14.2)	138.68 (5.46)	247.14 (9.73)	2198-E2055-ERS	273 (10.75)	120 (4.73)	209.4 (8.24)
2098-DSD-150	360.68 (14.2)	188.97 (7.44)	241.05 (9.49)	2198-E2075-ERS	312 (12.28)	141 (5.55)	225.4 (8.87)
2098-DSD-HV030	360.7 (14.2)	138.7 (5.46)	242.2 (9.54)	2198-E4015-ERS	180 (7.09)	95.0 (3.74)	208 (8.20)
2098-DSD-HV050	360.7 (14.2)	138.7 (5.46)	242.2 (9.54)	2198-E4020-ERS	260 (10.24)	110 (4.33)	204 (8.02)
2098-DSD-HV100	360.7 (14.2)	151.6 (5.97)	242.2 (9.54)	2198-E4055-ERS	273 (10.75)	120 (4.72)	209 (8.24)
2098-DSD-HV150	360.7 (14.2)	151.6 (5.97)	242.2 (9.54)	2198-E4075-ERS	312 (12.28)	141 (5.55)	225 (8.87)
2098-DSD-HV220	391.8 (15.43)	203.2 (8.0)	242.2 (9.54)	2198-E4150-ERS	390 (15.35)	186 (7.32)	281 (11.08)

(1) Widths chosen were for Ultra3000 drives -DN, and -XDN, which are larger than the -X.

AC Input Power Wiring and Fusing

This section provides information to help you determine the wiring and fusing requirements of drives. Ultra3000 servo drives are designed to operate from a grounded power system (with center grounded wye secondary, or corner grounded, or high leg delta secondary), while Kinetix 5100 drives support three-phase wye systems with a center grounded wye secondary, or a single-phase system with a neutral and a grounded input.

AC Input Power Wiring

Determine the wire length for the AC line input after the drive location and cable routing is 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 and motor power connections could be in different physical locations with different connector sizes.

[Table 10](#) shows a comparison of the connector locations of the Ultra3000 and Kinetix 5100 drives.

Table 10 - Input Power and Motor Power Connection Placement of Kinetix 5100 Drives

Kinetix 5100 Drive				Ultra3000 Drive
Kinetix 5100 Drive Cat. No.	Output Power (kW)	Input Power Connector Location	Motor Power/ Feedback Connector Location	Input Power, Motor Power, Feedback Connector Location
2198-E1004-ERS	0.40	Top	Bottom	Front
2198-E1007-ERS	0.75			
2198-E1015-ERS	1.50			
2198-E1020-ERS	2.00	Front	Front	
2198-E2030-ERS	3.00			
2198-E2055-ERS	5.50			
2198-E2075-ERS	7.50			
2198-E2150-ERS	15.00			
2198-E4004-ERS	0.40			
2198-E4007-ERS	0.75			
2198-E4015-ERS	1.50			
2198-E4020-ERS	2.00			
2198-E4030-ERS	3.00			
2198-E4055-ERS	5.50			
2198-E4075-ERS	7.50			
2198-E4150-ERS	15.00			

Circuit Breaker and Fuse Considerations

Review the fusing requirements when you change drives.

An Ultra3000 servo drive system must be protected by a device with short circuit interrupt current rating of the service capacity that is provided or a maximum of 100,000 A.

Kinetix 5100 servo drives use internal solid-state motor short-circuit protection and are rated for use on a circuit that can deliver up to 5000 A, when protected by suitable branch circuit protection.

While circuit breakers offer some convenience, there are limitations with their use. Circuit breakers do not handle high current inrush as well as fuses. Make sure that the selected components are properly coordinated and meet acceptable electrical codes including any requirements for branch circuit protection. Evaluation of the short circuit available current is critical and must be kept below the short-circuit current rating of the circuit breaker.

[Table 11](#) and [Table 12](#) list fuse and circuit breaker selections for Ultra3000 and Kinetix 5100 respectively.

Table 11 - Ultra3000 Drive Fuse and Circuit Breaker Selection

Drive Cat. No.	Drive Voltage, nom	Phase	UL Applications			IEC (non-UL) Applications
			Bussmann Fuses		Motor Protection CB, Self-protected CMC Cat. No.	Motor Protection CB Cat. No.
			Class J	Class CC		
2098-DSD-005	230V AC	Single-phase	LPJ-6SP	FNQ-R-6	—	—
2098-DSD-010		Single-phase	LPJ-10SP	FNQ-R-10		
2098-DSD-020		Single-phase	LPJ-20SP	FNQ-R-20		
2098-DSD-030		Single-phase	LPJ-30SP	FNQ-R-30		
2098-DSD-075		Three-phase	LPJ-30SP	FNQ-R-30		
2098-DSD-150		Three-phase	LPJ-60SP	N/A		
2098-DSD-xxx		Auxiliary input power	LPJ-10SP	FNQ-R-10		
2098-DSD-HV030	460V AC	Three-phase	LPJ-5SP	KTK-R-5	140M-F8E-C16	140M-F8E-C16
2098-DSD-HV050		Three-phase	LPJ-8SP	KTK-R-8	140M-F8E-C20	140M-F8E-C20
2098-DSD-HV100		Three-phase	LPJ-17-1/2SP	KTK-R-20	140M-F8E-C32	140M-F8E-C32
2098-DSD-HV150		Three-phase	LPJ-30SP	KTK-R-30	140M-F8E-C45	140M-F8E-C45
2098-DSD-HV220		Three-phase	LPJ-35SP	—	—	—

Table 12 - Kinetix 5100 Drive Fuse and Circuit Breaker Selection

Cat. No.	Voltage (Nom) and Phase	UL/CSA Application		IEC (non-UL/CSA) Application	
		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-10	1489-M2D100	10	1489-M2D100
	230V, 3 PH	KTK-R-10	1489-M3D100	10	1489-M3D100
2198-E1007-ERS	120V/230V, 1 PH	KTK-R-20	1489-M2D200	20	1489-M2D200
	230V, 3 PH	KTK-R-15	1489-M3D130	15	1489-M3D130
2198-E1015-ERS	120V/230V, 1 PH	KTK-R-30	1489-M2D300	30	1489-M2D300
	230V, 3 PH	KTK-R-25	1489-M3D200	25	1489-M3D200
2198-E1020-ERS	120V/230V, 1 PH	LPJ-40SP	1489-M2D400	50	1489-M2D400
	230V, 3 PH	LPJ-35SP	1489-M3D300	40	1489-M3D300
2198-E2030-ERS	230V, 3 PH	LPJ-50SP	1489-M3D350	60	1489-M3D350
2198-E2055-ERS	230V, 3 PH	LPJ-70SP	1489-M3D600	110	1489-M3D600
2198-E2075-ERS	230V, 3 PH	LPJ-80SP	140G-G2C3-C70	150	140G-G2C3-C70
2198-E2150-ERS	230V, 3 PH	LPJ-125SP	140G-G2C3-D12	225	140G-G2C3-D12

Table 12 - Kinetix 5100 Drive Fuse and Circuit Breaker Selection (Continued)

Cat. No.	Voltage (Nom) and Phase	UL/CSA Application		IEC (non-UL/CSA) Application (Continued)	
		Recommended Fuse Cat. No.	Recommended Circuit Breaker Cat. No.	DIN gG Fuses Rating (Amps, max)	Recommended Circuit Breaker Cat. No.
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 lists the power specifications for the Ultra3000 drive and Kinetix 5100 drives. [Table 13](#) and [Table 14](#) show power specifications and requirements for the Ultra3000 drives.

Table 13 - Ultra3000 (200V-class) Servo Drive Power Specifications

Attribute	2098-DSD-005	2098-DSD-010	2098-DSD-020	2098-DSD-030	2098-DSD-075	2098-DSD-150
AC Input Voltage ⁽¹⁾	100...240V rms, 1 PH			100...240V rms, 1 PH	100...240V rms, 3 PH	
AC Input Frequency	47...63 Hz			47...63 Hz		
AC Input Current ^{(2) (3)} rms (nom) 230V AC (0-PK) max inrush ⁽⁴⁾	5 A 100 A - Series A or B 20 A - Series C	9 A 100 A - Series A or B 20 A - Series C	18 A 100 A - Series A or B 20 A - Series C	28 A 50 A	30 A 50 A	46 A 68 A
Auxiliary AC input current 115V AC (rms) nom 230VV AC (rms) nom 115V AC (0-pk) max inrush ⁽⁴⁾ 230V AC (0-pk) max inrush	—	—	—	1.0 A 0.5 A 47 A 95 A	1.0 A 0.5 A 47 A 95 A	1.0 A 0.5 A 47 A 95 A
Continuous output current (rms)	1.8 A	3.5 A	7.1 A	10.6 A	24.7 A	45.9 A
Continuous output current (0-pk)	2.5 A	5.0 A	10 A	15 A	35 A	65 A
Peak output current (rms)	5.3 A	10.6 A	21.2 A	21.2 A	53 A	106 A
Peak output current (0-Pk)	7.5 A	15 A	30 A	30 A	75 A	150 A
Bus Capacitance	1410 μF	1880 μF	1880 μF	2820 μF	4290 μF	7520 μF
Internal Shunt resistance	—	—	—	35 ohms	16.5 ohms	9.1 ohms
Shunt on	—	—	—	420V DC		
Shunt off	—	—	—	420V DC		
Bus Overvoltage	400V DC			452V DC		

Table 13 - Ultra3000 (200V-class) Servo Drive Power Specifications (Continued)

Attribute	2098-DSD-005	2098-DSD-010	2098-DSD-020	2098-DSD-030	2098-DSD-075	2098-DSD-150
Internal shunt						
Continuous power	—	—	—	50 W	50 W	180 W
Peak power				4.5 W	10 kW	18 kW
External shunt						
Resistance	—	—	—	30 ohms (-0/+5%)	16.5 ohms (-0/+5%)	9 ohms (-0/+5%)
Continuous power				2.4 kW	4 kW	8 kW
Peak power				6 kW	10 kW	19 kW
Energy absorption capability						
115V AC input	93 J	125 J		251 J	381 J	669 J
230V AC input	38 J	51 J		139 J	211 J	370 J
Continuous power output						
115V AC input	0.25 kW	0.5 kW	1.0 kW	1.5 kW	—	—
230V AC input	0.5 kW	1.0 kW	2.0 kW	3 kW	7.5 kW	15 kW

- (1) Specification is for nominal voltage. The absolute limits are $\pm 10\%$, or 88...265V rms.
- (2) The 2098-DSD-005x-xx, 2098-DSD-010x-xx (200V - class) drives are limited to:
 Series A or B - one contactor cycle every two minutes.
 Series C - one contactor cycle every 10 s for up to two minutes, not to exceed 12 cycles in five minutes.
- (3) Power initialization requires a short period of inrush current. Dual element time delay (slow blow) fuses are recommended.
- (4) Inrush current limiting circuitry is enabled within 3 s after removal of AC line power.

Table 14 - Ultra3000 (400V-class) Drives Power Specifications

Attribute	2098-DSD-HV030	2098-DSD-HV050	2098-DSD-HV100	2098-DSD-HV150	2098-DSD-HV220
AC input voltage ⁽¹⁾⁽²⁾	230...480V rms, three-phase				
AC input Frequency	47...63 Hz				
Main AC input current ⁽³⁾⁽⁴⁾					
460V AC (rms) nom	4 A	7 A	14 A	20 A	28 A
460V AC (rms) max inrush	6 A	6 A	6 A	6 A	6 A
Auxiliary AC input current					
230V AC (rms) nom	0.55 A				
360V AC (rms) nom	0.35 A				
480V AC (rms) nom	0.25 A				
230V AC (0-pk) max inrush ⁽⁵⁾	47 A				
480V AC (0-pk) max inrush ⁽⁵⁾	68 A				
Continuous output current (rms)	5.0 A	7.8 A	16.3 A	24.0 A	33.2 A
Continuous output current (0-pk)	7.0 A	11 A	23 A	34 A	47 A
Peak output current (rms)	9.9 A	15.6 A	32.5 A	48.1 A	66.5 A
Peak output current (0-pk)	14 A	22 A	46 A	68 A	94 A
Bus capacitance	470 μ F		705 μ F	940 μ F	1880 μ F
Internal shunt resistance	120 Ω		40 Ω	25 Ω	20 Ω
Shunt on					
230V AC input	400V DC				
480V AC input	800V DC				
Shunt off					
230V AC input	375V DC				
480V AC input	750V DC				
Bus overvoltage					
230V AC input	410V DC				
480V AC input	810V DC				
Internal shunt					
Continuous power	100 W		200 W	200 W	400 W
Peak power	5.3 kW		16 kW	25.6 kW	32 kW
External shunt					
Resistance (-0/+5%)	120 Ω		40 Ω	25 Ω	20 Ω
Continuous power	3 kW		10 kW	15 kW	22 kW
Peak power	5.3 kW		16 kW	25.6 kW	32 kW
Energy absorption capability					
230V AC input with 230V motor	15 J		22 J	29 J	59 J
230V AC input with 460V motor	129 J		194 J	259 J	517 J
480V AC input	55 J		82 J	109 J	219 J
Continuous power output					
230V AC input	1.5 kW		5.0 kW	7.5 kW	11 kW
480V AC input	3.0 kW		10 kW	15 kW	22 kW

(1) Specification is for nominal voltage. The absolute limits are $\pm 10\%$, or 207...264V rms and 324...528V rms.

(2) The 2098-DSD-HVxxx-xx drives can be powered with 230V rms and used with motors designed for 230V operation. In such cases, the voltage levels used for shunting and DC bus overvoltage limits are adjusted to be compatible with the voltage limit of the motor.

The 2098-DSD-HVxxx-xx drives can be powered with 480V rms and used with motors designed for 480V operation. In such cases, the voltage levels used for shunting and DC bus overvoltage limits are adjusted to be compatible with the voltage limit of the motor.

(3) The 2098-DSD-HVxxx-xx (400V-class) drives are limited to three contactor cycles per minute.

(4) Power initialization requires a short period of inrush current (processor controlled via soft start circuitry). Dual element time delay (slow blow) fuses are recommended.

(5) 400 μ s half wave sine.

[Table 15](#) and [Table 16](#) list power specifications and requirements for the Kinetix 5100 drives.

Table 15 - Kinetix 5100 Drive 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, 1 PH (120V nom) 170...253V rms, 1 PH (200...230V nom) 170...253V rms, 3 PH (230V nom)			
AC input frequency	47...63 Hz			
Main AC input current ⁽¹⁾				
rms (nom) 120V input (1 PH)	4.08 A	7.88 A	12.22 A	18.40 A
max inrush (0-pk) 120V input	0.84 A	0.76 A	0.76 A	2.56 A
rms (nom) 230V input (1 PH)	4.79 A	8.85 A	14.41 A	21.36 A
max inrush (0-pk) 230V input	1.40 A	1.32 A	1.36 A	4.40 A
rms (nom) 230V input (3 PH)	2.84 A	5.20 A	7.87 A	11.57 A
max inrush (0-pk) 230V input	1.44 A	1.40 A	1.44 A	4.64 A
Control power input voltage	95...132V rms, 120V AC nom, 1 PH, with 120V AC input power 170...253V rms, 200...230V AC nom, 1 PH, with 200...230V AC input power			
Control power input current				
rms (nom) 120V input	0.34 A	0.38 A	0.38 A	0.63 A
max inrush (0-pk)	15.80 A	18.20 A	19.20 A	19.20 A
rms (nom) 230V input	0.20 A	0.22 A	0.22 A	0.35 A
max inrush (0-pk)	37.0 A	37.40 A	39.80 A	32.40 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			
Internal shunt off	370V @230V AC input			
Internal shunt resistor	100 Ω	100 Ω	100 Ω	20 Ω
Internal shunt power	5 W	14 W	14 W	20 W
Undervoltage threshold	70V @120V AC input 150V @230V AC input			
Overvoltage	410V @120V AC input 410V @230V AC input			
Bus capacitance	540 μ F	1680 μ F	1680 μ F	2160 μ F
Capacitive energy absorption	6.24 J	19.40 J	19.40 J	24.95 J
Short-circuit current rating	5000 A (rms) symmetrical			

(1) Kinetix 5100 drive modules are limited to one AC mains power cycles per minute.

(2) Peak RMS current that is allowed for up to 1.8 seconds.

Table 16 - Kinetix 5100 Drive Input Power Specifications (three-phase)

Attribute	2198-E2030-ERS	2198-E2055-ERS	2198-E2075-ERS	2198-E2150-ERS
AC input voltage	170...253V rms, 3 PH (230V nom)			
AC input frequency	47...63 Hz			
Main AC input current ⁽¹⁾ rms (Nom) 230V input (3 PH) max inrush (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
Control power input voltage	170...253V rms, 200...230V AC nom, 1 PH, with 200...230V AC input power			
Control power input current rms (Nom) 230V input max inrush (0-pk)	0.35 A 36.40 A	0.46 A 32.80 A	0.48 A 40.0 A	0.92 A 37.0 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	410V @230V AC input			
Bus capacitance	2160 μ F	4100 μ F	7000 μ F	13,500 μ F
Capacitive energy absorption	24.95 J	47.36 J	69.30 J	155.93 J
Short-circuit current rating	5000 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 17 - 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)	1.49 A	2.31 A	5.009 A	6.29 A
Max inrush (0-pk) 380V input	5.66 A	5.66 A	5.66 A	9.43 A
Nom (rms) 480V input (three-phase)	1.34 A	2.08 A	4.38 A	4.94 A
Max inrush (0-pk) 480V input	7.15 A	7.15 A	7.15 A	11.91 A
Control power input voltage	21.6...26.4V DC 24V DC nom			
Control power input current @ 24V DC ⁽²⁾	1.27 A _{DC}			1.40 A _{DC}
Control power in-rush current @ 24V DC	4.14 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	760V			
Internal shunt off				
Internal shunt resistor	80 Ω			–
Internal shunt power	10 W			–
Bus undervoltage	282V			
Bus overvoltage	820V			
Bus capacitance	165 μ F		235 μ F	470 μ F
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 18 - 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)	9.96 A	16.825 A	23.664 A	36.855 A
Max inrush (0-pk) 380V input	9.43 A	9.43 A	9.43 A	28.28 A
Nom (rms) 480V input (three-phase)	7.91 A	13.35 A	18.78 A	29.25 A
Max inrush (0-pk) 480V input	11.91 A	11.91 A	11.91 A	35.73 A
Control power input voltage	21.6...26.4V DC, 24V DC nom			
Control power input current @ 24V DC ⁽²⁾	1.77 A _{DC}	2.03 A _{DC}		4.43 A _{DC}
Control power in-rush current @ 24V DC	4.97 A _{DC}	3.24 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	760V			
Internal shunt off				
Internal shunt resistor	-	-	-	-
Internal shunt power	-	-	-	-
Bus undervoltage	282V			
Bus overvoltage	820V			
Bus capacitance	560 μ F	1120 μ F	1640 μ F	2500 μ F
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.

I/O Availability and Specifications

All Ultra3000 drives and Kinetix 5100 drives have a comprehensive set of digital I/O and analog I/O. Use this section to verify if the I/O functionality is comparable.

Digital Inputs

[Table 19](#) compares the digital inputs of the Ultra3000 drives and the Kinetix 5100 drives.

Table 19 - Digital Inputs Comparison

Features	Ultra3000 (Non-Sercos) Drives	Kinetix 5100 Drives
Inputs	Eight inputs	Ten total (eight standard inputs, two optional high-speed inputs)
DC common terminations	1	1
Number of Pre-selectable indexes (using binary weighted digital inputs)	64	99
Multiple input assignment	Yes	Yes (via software programming)
De-bounce for inputs	Yes, can be assigned to any input	Yes
Registration Input	Yes, can be assigned to any input	Yes, can be assigned to two high-speed inputs (Input 9 and Input 10)
Overtravels contact type	N.C. only	Can be N.O. or N.C.
Default assignment for digital inputs/outputs	None	Yes

Kinetix 5100 drives have eight inputs with configurable functions and two high-speed inputs. The standard digital inputs on Kinetix 5100 drives have the same physical characteristics. [Table 20](#) and [Table 21](#) compare the digital inputs physical characteristics between Ultra3000 and Kinetix 5100 drives.

Table 20 - Digital Inputs Characteristics Comparison

Specification	Ultra3000 Drives	Kinetix 5100 Drives
Digital Input response (delay)	100 μ s	Standard inputs: 1 ms High speed inputs: 3 μ s
Digital Input scan time	1 ms	Standard inputs: 500 μ s max High speed inputs: 1 μ s

Table 21 - Digital Inputs Voltage and Current Comparison (IEC61131-2 Type 1 compliant for Kinetix 5100 Drive)

Parameter	Description	Ultra3000 Drive		Kinetix 5100 Drive	
		Min	Max	Min	Max
ON state voltage	Voltage applied to the input, with respect IOCOM, to guarantee an ON state	10.8V	26.4V	15V	26.4V
ON state current	Current flow to guarantee an ON State	3.0 mA	12.0 mA	2.0 mA	6.0 mA
OFF state voltage	Voltage applied to the input, with respect IOCOM, to guarantee an OFF state	-1.0V	2.0V	-1.0V	5.0V

Ultra3000 and Kinetix 5100 Drives Dedicated Functionality Inputs

For Ultra3000 non-Sercos drives, each digital input configuration parameter can assign one or more functions to the corresponding digital input. Assigning a function causes that function to become active when the associated Digital Input becomes active. If no functions are assigned by a digital input configuration parameter, then the corresponding digital input is unassigned.

The supported digital input functionality for Ultra3000 drives is shown in the first column of [Table 22](#). There is not a direct correlation with the functionality for the Kinetix 5100 drive - they are shown side by side for convenience.

The Kinetix 5100 drive digital inputs are assigned to specific functions by using the KNX5100C software. Input 9 and Input10 are available as high-speed digital inputs and registration functionality is available at these inputs only. For details on all supported digital inputs for the Kinetix 5100 drive, see the Kinetix 5100 EtherNet/IP Indexing Servo Drives Users Manual, publication [2198-UM004](#).



The supported Digital Input functionality for Kinetix 5100 drives is shown in the second column of [Table 22](#). There is not a direct correlation with the functionality for the Ultra3000 drive - they are shown side by side for convenience.

Table 22 - Supported Digital Input Functionality

Ultra3000 Drive	Kinetix 5100 Drive
Enable Drive	Servo is activated (SON, Drive Enable)
Home Sensor	Fault Reset (ARST)
Registration	Gain Switching (GAINUP)
Positive Hardware Overtravel	Clear pulse counter (CCLR)
Negative Hardware Overtravel	Zero Speed Clamp (ZCLAMP)
Define Home Position	Command Input Reverse Control (CMDINV)
Disable Serial Input	Command triggered (CTRG)
Start Homing	Torque limit (TRQLM)
Pause Homing	Latch Function of Analog Position Command (VPL)
Abort Homing	Speed Limit Enable (SPDLM)
Pause Index	Position Selection (POS0 ... POS6)
Abort Index	Absolute Mode (ABSE)
Define Position	Set up or Clear Absolute System Coordinates (ABSC)
Preset Select 0 ... Preset Select 5	ABSQ Always Input
Integrator Inhibit	Speed Selection (SPD0, SPD1)
Follower Enable	Torque Command (TCM0, TCM1)
Forward Enable	Speed and Position Selection (S-P)
Reverse Enable	Speed and Torque Mode Switching (S-T)
Operation Mode Override	Torque and Position Selection (T-P)
Position Strobe	Emergency stop (EMGS)
Reset Drive	Reverse Inhibit Limit Clockwise (NL CWL)
Start Index	Forward Inhibit Limit Counter Clockwise (PL CCWL)
Remove Command Offset	Homing Origin (ORGP)
Fault Reset	Return to Homing Origin (SHOM)
—	PT and PR Mode Switching (PT-PR)

Table 22 - Supported Digital Input Functionality (Continued)

Ultra3000 Drive	Kinetix 5100 Drive (Continued)
—	E-Cam Alignment (ALGN)
—	E-Cam Engaging Control (CAM)
—	Forward Jog Input (JOGU)
—	Event Trigger Command 1...4 (EV1...EV4)
—	E-Gear Ratio (Numerator) Selection1, 2 (GNUM0, GNUM1)
—	External Pulse Inhibit (INHP)
—	Motor Stop (STP)
—	Profile Quick Stop (PFQS)
—	Servo On with holding brake (DSO)

As shown in [Figure 1](#), the Ultra3000 drives have eight optically isolated, active high, current sourcing 12-24V DC digital inputs. The Kinetix 5100 drives, which are shown in [Figure 2](#), use digital inputs that are optically isolated and sink up to 24V DC. You can design the inputs for PNP sourcing or NPN sinking.

Figure 1 - Ultra3000 Digital Input Circuit

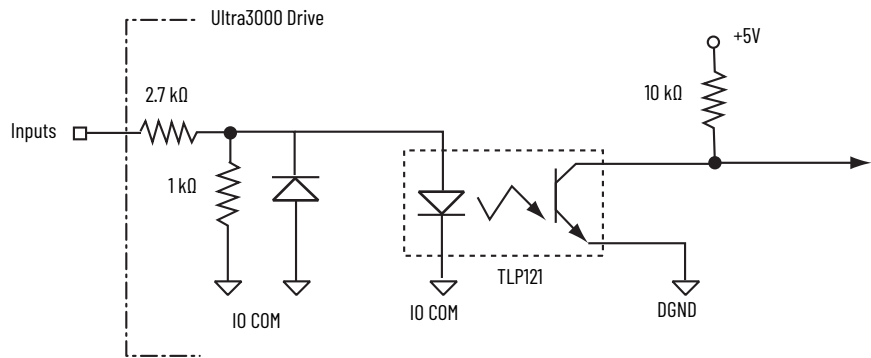
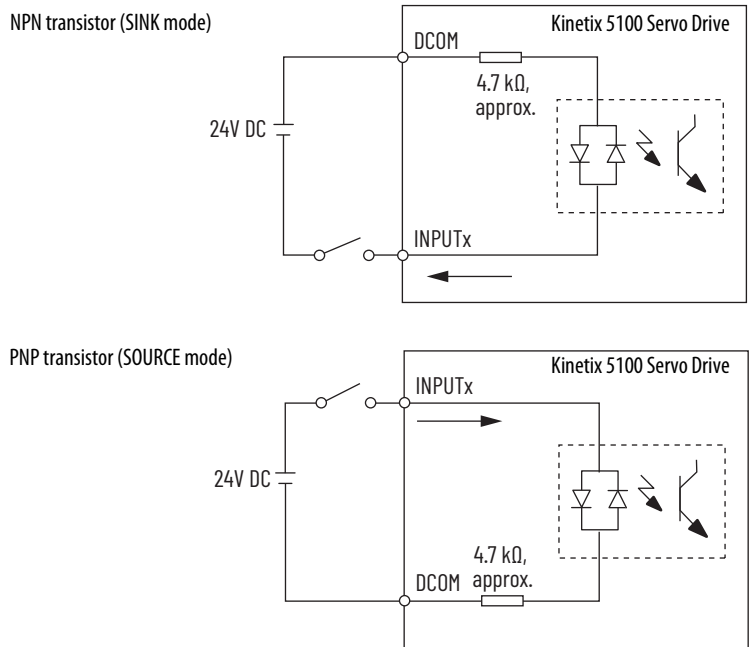


Figure 2 - Kinetix 5100 Drive Digital Input Circuit



Digital Outputs

The Ultra3000 servo drives (non-Sercos) have four optically isolated transistor outputs that can be assigned to various functions through software. Additionally, the Ultra3000 drive has one relay output with normally open contacts. When brake control is assigned to the relay output, it can directly control a motor holding brake.

Kinetix 5100 drives have six outputs that can be assigned to various functions through software. There is no relay output. Any standard digital outputs (with additional external circuit) can be used to energize the motor holding brake. The Kinetix 5100 drive requires an external relay. See the Kinetix 5100 EtherNet/IP Indexing Servo Drives User Manual, publication [2198-UM004](#) for more information on how to configure and use the holding brake.

[Table 23](#) compares the digital outputs of the two drives.

Table 23 - Digital Outputs Comparison

Features	Ultra3000 (Non-Sercos) Drives	Kinetix 5100 Drives
Outputs	5 (4 outputs + 1 relay output)	6 outputs
Brake output assignment	Programmable	Programmable, transistor type
Use common 24V DC power to Energize outputs	Yes	Capability to use separate 24V DC power
Configurable output assignment	Yes	Yes

[Table 24](#) and [Table 25](#) compare the digital output physical characteristics between Ultra3000 and Kinetix 5100 drives.

Table 24 - Digital Outputs Characteristics Comparison

Specification	Ultra3000 Drives	Kinetix 5100 Drives
Digital outputs pass through delay	100 μ s	1 ms max
Digital outputs scan time	1 ms	250 μ s max

Table 25 - Digital Outputs Parameters Comparison

Parameter	Description	Ultra3000 Drive		Kinetix 5100 Drive	
		Min	Max	Min	Max
ON state current	Current flow when the output transistor is ON	—	50 mA	—	40 mA
OFF state current	Current flow when the output transistor is OFF	—	0.1 mA	—	0.1 mA
ON state voltage	Voltage across the output transistor when ON	—	1.5V	—	1.5V @ 40 mA
OFF state voltage	Voltage across the output transistor when OFF	—	50V	—	30V

As shown in [Figure 3](#), for the Ultra3000 drives, there are four optically isolated 12-24V DC digital outputs, active high, current sourcing. The Ultra3000 does not have default assignments for digital outputs. The Kinetix 5100 drives have digital outputs that are optically isolated and you can design the outputs for open collector or open emitter.

Figure 3 - Ultra3000 Digital Output Circuit

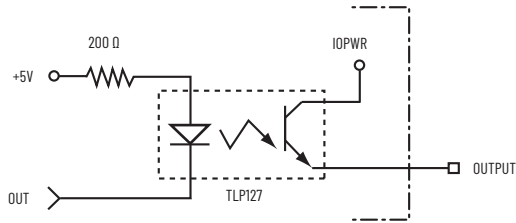
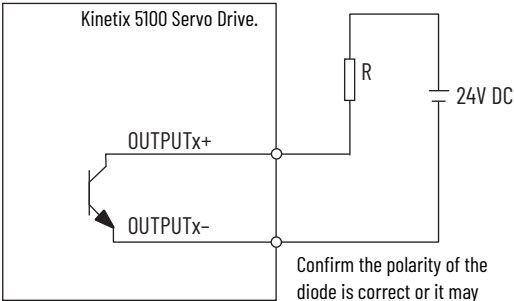
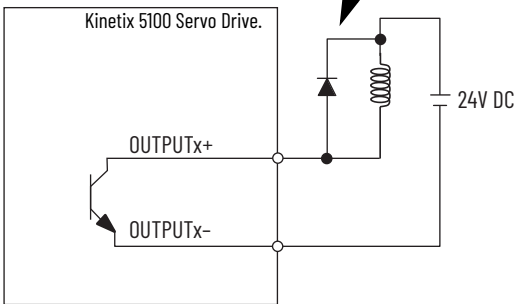


Figure 4 - Kinetix 5100 Drive Digital Output Circuits

The servo drive applies external power supply and the load is resistive.



The servo drive applies external power supply and the load is inductive.



Analog Inputs

This section describes analog inputs for Ultra3000 (Non-Sercos) and Kinetix 5100 servo drives. Table 26 compares the analog inputs of these two drives.

Table 26 - Analog Inputs Parameters Comparison

Parameter	Ultra3000 Drives	Kinetix 5100 Drives
Analog Inputs Resolution	14 bits	15 bits min
Analog Inputs Impedance	20 kΩ	Approx. 12 kΩ typical
Analog Inputs Voltage	-10...+10V	-10...+10V
Analog Inputs Scan Time	0.0625 ms	0.0625 ms max
Offset Error	50 mV	50 mV max
Gain Error	1%	1% max
Propagation Delay	100 μS	100 μS max

The Ultra3000 drive analog COMMAND input can receive a position, velocity, or current command signal. A 14-bit A/D converter digitizes the signal. The characteristics of this input are shown in Figure 5.

Kinetix 5100 servo drives support two analog input pins (COMMAND1 and COMMAND2) as shown in [Figure 6](#). The analog COMMAND1 (T-REF) input receives a torque reference signal and the COMMAND2 (V-REF) input receives a position or speed command signal. A 16-bit A/D converter digitizes the signal, however, the effective resolution is 15 bit due to noise. For details see the Kinetix 5100 EtherNet/IP Indexing Servo Drives Users Manual, publication [2198-UM004](#).

Figure 5 - Ultra3000 Analog Input Circuit

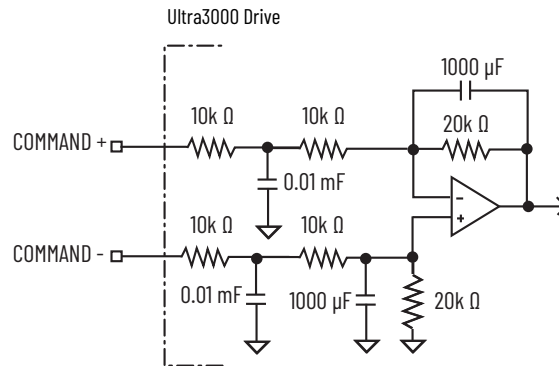
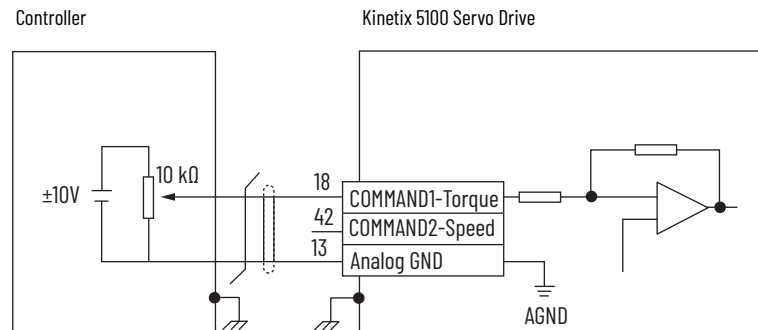


Figure 6 - Kinetix 5100 Drive Analog Input Circuit



When using Ultra3000 drives, the ILIMIT input limits drive current when used. If ILIMIT input is not used, current is only limited by using Ultraware software.

Kinetix 5100 servo drives do not provide the ILIMIT input for output current limiting. The current command can be limited by using internal parameters ID128...ID130 (P1.012...P1.014) internal torque limits 1...3 in PT, PR, and S mode. Digital inputs can be used to provide a binary weighted, pre-programmed Torque Limit. See the Kinetix 5100 EtherNet/IP Indexing Servo Drives Users Manual, publication [2198-UM004](#), for more details.

Analog Output

This section describes analog outputs for Ultra3000 (Non-Sercos) and Kinetix 5100 servo drives. [Table 27](#) compares the analog outputs of these drives.

Table 27 - Analog Outputs Parameters Comparison

Parameter	Ultra3000 Drive	Kinetix 5100 Drive
Analog Outputs Resolution	8 bits	10 bits min
Analog Outputs Current max	2 mA	1 mA
Analog Outputs Voltage	-10...+10V	Configurable as either -8...+8V DC, or -10...+10V DC
Analog Outputs Scan Time	-	0.25 ms max
Offset Error	500 mV	100 mV max
Gain Error	10%	5% max
Bandwidth	50 Hz	50 Hz min

The Ultra3000 uses one programmable analog output. The Kinetix 5100 servo drive provides two programmable analog outputs (MON1 and MON2) which are single-ended based on the analog ground.

Figure 7 - Ultra3000 Drive Analog Outputs Circuit

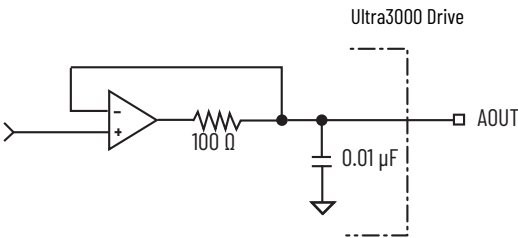
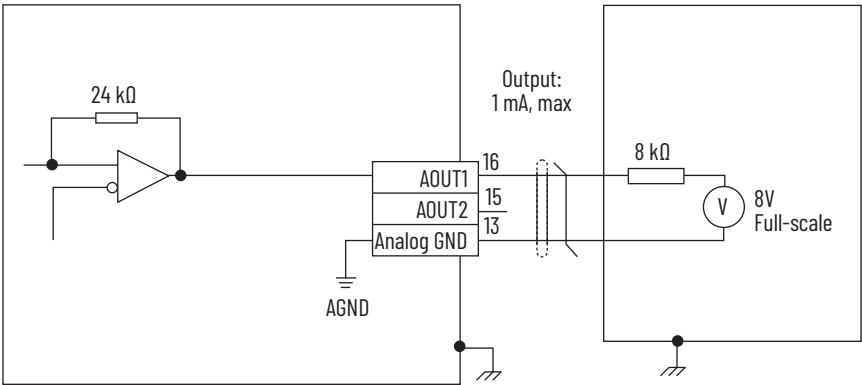


Figure 8 - Kinetix 5100 Drive Analog Output Circuit



The Ultra3000 drive analog outputs can be configured using Ultraware software. The Kinetix 5100 drive analog outputs can be configured using parameters or KNX5100C software.

With the Kinetix 5100 drive, you can select the data to be monitored via parameter ID 103 (Po.003) AOMonitorSelection. The first 5 settings for the Kinetix 5100 drive in [Table 28](#) show the different configurations that can be used with MON1/MON2 analog outputs. For details see the Kinetix 5100 EtherNet/IP Indexing Servo Drives Users Manual, publication [2198-UM004](#).

 [Table 28](#) shows the analog output values for the Ultra3000 and the Kinetix 5100 drives. They are listed in one table for ease of reading; they are not equivalent settings.

Table 28 - Ultra3000 Drive and Kinetix 5100 Drive Analog Output Values

Ultra3000 Drive (Available functions for analog outputs)	Kinetix 5100 Drives (Available functions for analog outputs)	
	Mon1 and MON2 Setting Value ⁽¹⁾	Description
Current Average	0	Motor speed (full output range ⁽²⁾ / max speed)
Current Command	1	Motor torque (full output range ⁽²⁾ / max torque)
Current Feedback	2	Pulse command frequency (full output range ⁽²⁾ / 4.5 MHz)
Position Command	3	Speed command (full output range ⁽²⁾ / max speed command)
Position Error	4	Torque command (full output range ⁽²⁾ / max torque command)
Position Feedback	5	BUS voltage (full output range ⁽²⁾ / 450V)
Velocity Command	6	P1.101 Preset Analog Output Value 1
Velocity Error	7	P1.102 Preset Analog Output Value 2
Velocity Feedback	—	—

(1) ID 103 (P0.003)

(2) +/-8V or +/-10V depending on configuration

Control and Auxiliary Power Specifications

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

The Ultra3000 servo drives (2098-DSD-005, -010, and -020) use an external +5V power supply in applications where it is necessary to maintain logic power when the main power is removed. The +24V DC I/O supply (IOPWR) allows use of a drive-mounted breakout board with 24V DC to 5V DC converter (2090-U3CBB-DM12). All other Ultra3000 servo drives have other auxiliary power requirements.

Table 29 - Ultra3000 Drives +24V DC Control Power Supply Specification

Parameter	Description	Min	Max
Input voltage range	Input voltage range of the external power supply for drive-mounted breakout boards with 24V DC to 5V DC converter.	18V DC	30V DC
Input current	Input current draw from the external power supply for the drive-mounted breakout boards with 24V DC to 5V DC converter.	—	400 mA

Table 30 - Ultra3000 Drives 5V Control Power Supply Specifications

Parameter	Description	Min	Max
Voltage	Voltage tolerance of the external logic supply.	5.1V DC	5.25V DC
Current	Current output capability of the external +5V DC power supply.	1.5 A	—

Table 31 - Ultra3000 Drive Auxiliary Power Specification (230V)

Specification	2098-DSD-030	2098-DSD-075	2098-DSD-150
Auxiliary AC input current			
115V AC (rms) nom	1.0 A	1.0 A	1.0 A
230V AC (rms) nom	0.5 A	0.5 A	0.5 A
115V AC (0-pk) max inrush	47 A	47 A	47 A
230V AC (0-pk) max inrush	95 A	95 A	95 A

The Kinetix 5100 drive requires a control power supply shown in [Table 32](#) and [Table 33](#). Depending on the voltage class of the drive, the control power is either be a phase from the incoming power (non-400V-class) or 24V DC (400V-class)

Table 32 - 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 400V-class drives require 24V DC control power.

Table 33 - 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 34](#) compares different motors that are supported by Ultra3000 servo drives and Kinetix 5100 servo drives. Only the Kinetix MP and TL/TLY motors are supported by Ultra3000 drive and Kinetix 5100 drive. For more information on supported motors and feedback, see the Kinetix 5100 EtherNet/IP Indexing Servo Drives Users Manual, publication [2198-UM004](#).

Table 34 - Motor Supported by Ultra3000 and Kinetix 5100 Drives

Servo Motor	Ultra3000 Drives	Kinetix 5100 Drives
Kinetix MP	Yes	Yes ⁽¹⁾
1326AB-Series (M2L/S2L)	Yes	-
F-Series	Yes	-
H-Series	Yes	-
N-Series	Yes	-
Y-Series	Yes	-
Kinetix TL and TLY servo motors (Tamagawa serial feedback/TTL incremental feedback)	Yes ⁽²⁾	Yes ⁽³⁾
Kinetix TLP	-	Yes

(1) Excludes Kinetix MPL motors with resolvers.

(2) Yes to TLY-Axxx-H, but not TL.

(3) Yes to TL-Axxx-B, TLY-Axxx-B, and TLY-Axxx-H

Feedback Devices

The Kinetix 5100 drives and the Ultra3000 drives accept motor feedback signals from Hiperface absolute high-resolution encoders and generic TTL incremental encoders, by using the motor feedback (MFB) connector.

In addition, the Kinetix 5100 drives accept motor feedback signals from 24-bit high-resolution absolute single-turn and multi-turn (multi-turn requires battery back-up) encoders that are used in Kinetix TLP motors. The Kinetix 5100 drives accept motor feedback signals from 17-bit absolute encoders that are used in Kinetix TL and TLY motors.

For more information on the Kinetix 5100 drive compatible feedback encoders, see the Kinetix 5100 Ethernet/IP Indexing Servo Drives User Manual, publication [2198-UM004](#).

For more information on the Ultra3000 drives compatible feedback encoders, see the Ultra3000 Drive Systems Design Guide, publication [KNX-RM008](#).

Accessories

This section describes required and optional accessories for Ultra3000 and Kinetix 5100 servo drives.

Drive accessories that are shared between Ultra3000 drives and Kinetix 5100 drives include the following:

- 2090-Series motor power and feedback cables
- 2198-K51CK-D15M feedback connector kit that is required for wiring feedback cables with flying leads

Application accessories such as shunts and line filters, can impact drive replacement, so they are covered in this section.

Other Ultra3000 drive accessories, for example, panel-mounted breakout boards, resistive brake module (RBM), and external auxiliary encoders are not shared with Kinetix 5100 servo drives.

Required Drive Accessories

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

Table 35 - Ultra3000 Drive Required Drive Accessories

Drive Accessory	Cat. No.	Description
24V DC power supply	1606-XLxxx	12...24V DC for control and I/O power.
Drive-mounted breakout boards (required for flying lead cables)	2090-UXBB-DM15 ⁽¹⁾	Motor feedback (CN2) connections.
	2090-UXBB-DM09	Serial interface (CN3) connections.
	2090-U3BB2-DM44	I/O (CN1) connections. These kits apply to all Ultra3000 drives (Cat. No. 2098-DSD-005, 2098-DSD-010, and 2098-DSD-020) in applications where 5V DC control power (if necessary) is user-supplied.
	2090-U3CBB-DM44	I/O (CN1) connections. These kits apply to only 2098-DSD-005, 2098-DSD-010, and 2098-DSD-020 drives in applications where a 24...5V DC converter for control power is required.
Serial interface cable	2090-UXPC-D09xx	Ultra3000 drive serial interface to personal computer.
Motor power and feedback cables ⁽²⁾		See the specific drive/motor combination for the motor cables required for your system.

(1) Accessory can be shared with Kinetix 5100 servo drive.

(2) Motor Power and feedback cable for Kinetix MP servo motor (Bulletin -2090) can be shared with Kinetix 5100 servo drive.

Table 36 - Kinetix 5100 Drive Required Drive Accessories

Accessory	Cat. No.	Description
24V DC power supply	1606-XLxxx	12...24V DC for I/O power
Communication Cable	2198-USBC	Mini USB cable (for connecting a Kinetix 5100 drive to a personal computer)
	2198-USBF	USB cable filter to remove nuisance noise issues when connecting Kinetix 5100 drives to a personal computer with KNX5100C software
Feedback Connector kit	2198-K51CK-D15M	For wiring flying lead feedback cable to Motor Feedback Port of the Kinetix 5100 drive
I/O Connector kit	2198-TBIO	Terminal blocks for wiring I/O signals to PLC s and other devices
Motor Power and Feedback Cables	-	See the specific drive/motor combination for the motor cable required for your system

Optional Drive Accessories - Ethernet Cable

A 1585J series Ethernet cable(1585J-M8CBJM-x, 1585J-M8UBJM-x, 1585J-M8CB-x) is required when a Kinetix 5100 drive is controlled via Ethernet (either in IO mode or via Explicit Messaging).

Optional Drive Accessories - Shunt Resistors

The Ultra3000 drives (2098-DSD-005, 2098-DSD-010, 2098-DSD-020) have no internal shunting capability. These drives support the active shunt module. All other Ultra3000 drive models have internal shunting capability and support a passive shunt module (external shunt resistor).

- Active shunts are used to provide shunt capability (the shunt absorbs excessive regenerative energy on the DC bus) for the drive.
- Passive shunts (shunt resistors) are used when drives have NO internal shunt resistor or the internal shunt resistor power is not enough.

Table 37 - Ultra3000 Drive Shunt Resistor Specification

Ultra3000 Drive Cat. No.	Shunt Module Cat. No.	Specifications						
		Shunt Type	Drive Voltage	Resistance Ω	Peak Power kW	Peak Current A	Continuous Power W	Shipping Weight kg (lb)
2098-xxx-005 2098-xxx-010 2098-xxx-020	2090-UCSR-A300	Active	230V AC	36	4.0	10.5	300	1.51 (3.3)
2098-xxx-030	9101-1183			30	5.9	14.0	200	—
2098-xxx-075 2098-xxx-150	2090-UCSR-P900			18	10.0	23.3	900	4.08 (9.0)
2098-DSD-HV030, 2098-DSD-HV050	2090-SR120-09		400V	120	5.3	6.7		3.63 (8.0)
2098-DSD-HV100	2090-SR040-09	40		16.0	20.0	3.63 (8.0)		
	2090-SR040-18	40			20.0	1800	8.6 (19.0)	

All Kinetix 5100 servo drives have internal shunt IGBT. However, only 2198-E1004-ERS...2198-E2030-ERS and 2198-E4004...2198-E4015 drives have an internal shunt resistor. The DC+ to ISH terminal jumper connects the internal shunt resistor.

Bulletin 2198-Rxxx and 2097-Rx shunt resistors are external modules that provide additional shunt capacity for applications when the internal shunt capacity of the drive is exceeded. Catalog number 2198-R031 is made of resistor coils that are housed inside an enclosure. Catalog numbers 2198-R004, 2097-R6, and 2097-R7 are shunt resistors without an enclosure. [Figure 9](#), [Figure 10](#), [Figure 11](#), [Table 38](#), and [Table 39](#) describe shunt resistor specifications and dimensions.

These dimensions apply to units with an enclosure.

Figure 9 - Product Dimensions: Catalog Number 2198-R031

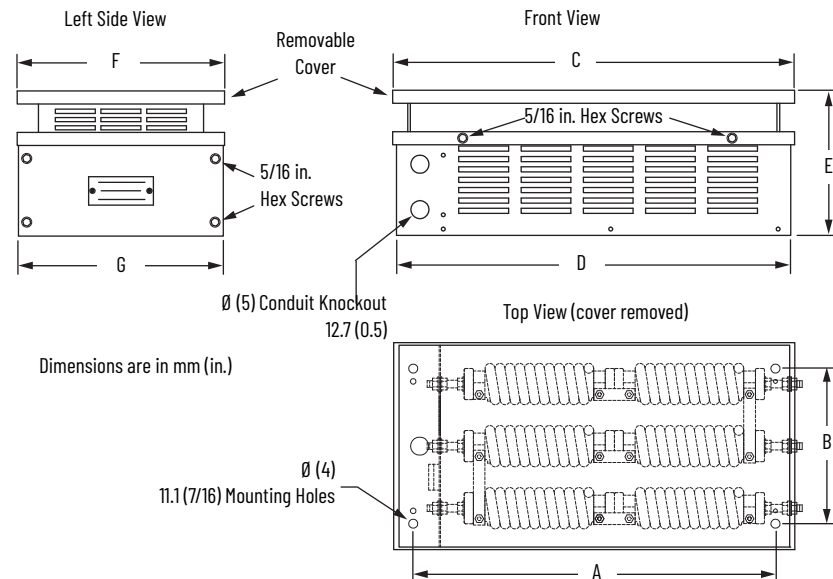


Table 38 - 2198-R031 Shunt Resistor Dimensions

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)

These dimensions apply to units without an enclosure.

Figure 10 - Product Dimensions: Catalog Number 2198-R004

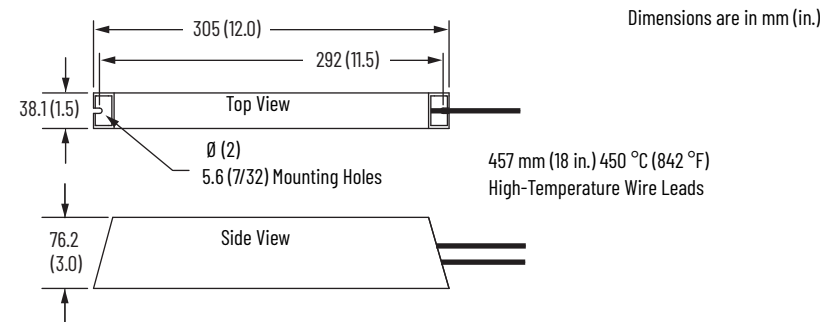


Figure 11 - Product Dimensions: Catalog Numbers 2097-R6 and 2097-R7

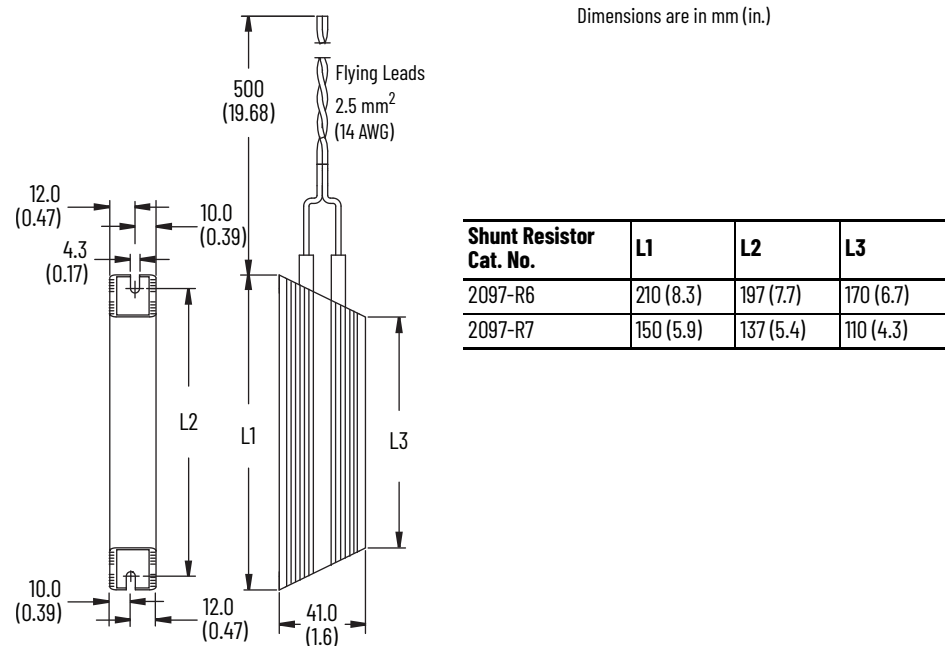


Table 39 - 2198-Rx and 2097-Rx Shunt Resistor Specification

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)

See the Kinetix 5700 Passive Shunt Modules Installation Instructions, publication [2198-IN011](#) for information on installing the shunt modules.

Optional Drive Accessories - AC Line Filters

An AC line filter is a key component in achieving CE standards compliance. The Kinetix 5100, and Ultra3000 drives do not use the same line filters. Once you select the Kinetix 5100 drive for your application, choose the line filter that is appropriate for that particular drive. This section describes the specifications for the line filters used for each drive.

Table 40 - Ultra3000 Drives AC Line Filter Selection

Drive Family	Drive Cat. No.	AC Line Filter Cat. No.	Motor Cables > 30 m (98.4 ft)
Ultra3000 drive	2098-xxx-005	2090-UXLF-106	2090-UXLF-110
	2098-xxx-010	2090-UXLF-110	2090-UXLF-110
	2098-xxx-020	2090-UXLF-123	2090-UXLF-123
	2098-xxx-030	2090-UXLF-136	2090-UXLF-132
	2098-xxx-075	2090-UXLF-336	2090-UXLF-HV330
	2098-xxx-150	2090-UXLF-350	2090-UXLF-HV350
	2098-DSD-HV030, 2098-DSD-HV050, 2098-DSD-HV100, 2098-DSD-HV150	2090-UXLF-HV323	2090-UXLF-HV323
	2098-DSD-HV220	2090-UXLF-HV330	2090-UXLF-HV330

Table 41 - AC Line Filter Specifications

AC Line Filter Cat. No.	Voltage	Phase	Specifications (1) (2)				
			Current A @ 50 °C (122 °F)	Power Loss W	Leakage Current mA	Weight approx kg (lb)	Operating Temperature
2090-UXLF-106	250V AC 50/60 Hz	1 PH	6	3.5	2.26	0.3 (0.66)	-25...+85 °C (-13...+185 °F)
2090-UXLF-110			10	2.7	45	0.95 (2.0)	
2090-UXLF-123			23	10	90	1.6 (3.5)	
2090-UXLF-132			32	20	90		
2090-UXLF-136			36	-	200	1.75 (3.9)	
2090-XXLF-TC116			16	-	87	0.80 (1.7)	-25...+100 °C (-13...+212 °F)
2090-UXLF-336		3 PH	36	-	138	2.7 (5.9)	-25...+85 °C (-13...+185 °F)
2090-UXLF-350			50	25	138		

(1) For all filters, 90% relative humidity.

(2) For all filters, 10...200 Hz @ 1.8 g vibration.

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

Table 42 - Kinetix 5100 Drives AC Line Filter Catalog Numbers

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-DB324-F
2198-E1015-ERS		
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	-	
2198-E4075-ERS	-	2198-B433-F
2198-E4150-ERS	-	2198-DBR40

(1) 2198-E2xxx-ERS and 2198-E4xxx-ERS servo drives do not support single-phase operation.

Table 43 - Kinetix 5100 Drives 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	11.0	4.9	52.9	1.05 (2.314)	0...50 °C (32...122 °F)
2198-DB127-F	1 PH, 50/60 Hz	27.0	15.5	54.9	1.80 (3.968)	
2198-DB310-F	253V AC	10.0	14.0	3.9	1.10 (2.425)	
2198-DB324-F	3 PH, 50/60 Hz	24.0	29.0	9.3	1.95 (3.968)	
2198-DB335-F	253V AC	34.8	30.0	5.8	2.90 (6.393)	
2198-DB356-F	3 PH, 50/60 Hz	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 the Ultra3000 and Kinetix 5100 servo drives respectively, and gives different communication configurations of the Kinetix 5100 drive.

Ultra3000 Servo Drive Configuration Port

The Ultra3000 drive uses one serial port that implements the standard NRZ asynchronous serial format, and supports RS-232, RS-422, and RS-485 communication standards. The connector pinout dedicates separate pins for the RS-232 and RS-422/ RS-485 signals, so that the communication standard can be changed by using another cable.

The Ultra3000 drive uses Ultraware software for configuration via the serial port.

Kinetix 5100 Servo Drive Configuration Port

The Kinetix 5100 drives include one mini-USB port for connecting the personal computer and allows you to configure the servo drive with the KNX5100C software. The 2198-USBC cable is a Type B Mini-USB port that is compatible with USB 2.0. This cable with 2198-USBF filter is required to make the connection to a personal computer.

You can configure Kinetix 5100 drives with KNX5100C software via the mini-USB port.

Ultra3000 Servo Drive Control Port

The Ultra3000 servo drives use MODBUS communication over RS232/RS422/RS485 or DeviceNet for controlling the drive. A DeviceNet interface module serves as a link between the ControlLogix/CompactLogix platform and the Ultra3000 servo drive system.

Kinetix 5100 Servo Drive Control Port

The Kinetix 5100 servo drives use an EtherNet/IP network for communicating to either a ControlLogix or CompactLogix programmable automation controller, by using a Class 1 EtherNet/IP connection (with a pre-defined Add-On-Profile) or Class 3 connection by 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 these publications:

- Ethernet Reference Manual, publication [ENET-RM002](#).
- Scalability - The Best Approach to Change, publication [IA-WP002A](#).
- EtherNet/IP Design, Commissioning, and Troubleshooting Quick Reference Drawings, publication [IASIPM-QR023](#).
- EtherNet/IP Configuration Drawing, publication [IASIMP-QR019D](#).

Configuration and Programming Software

Ultraware software is used to configure and program the Ultra3000 drives. For information on how to use Ultraware software, see the Ultraware Software User Manual, publication [2098-UM001](#).

KNX5100C software is used to configure the drive. For information on how to use KNX5100C software, see the Kinetix 5100 User Manual, publication [2198-UM004](#). Depending on the controller used in the application, Studio 5000 Logix Designer application (for ControlLogix, CompactLogix), Connected Components Workbench™ software (for Micro800-Series controllers), or RSLogix 500® software (for MicroLogix controllers) is required to program the controller for controlling the Kinetix 5100 drives. For information on how to use these programs, see the corresponding controller user manuals.

Notes:

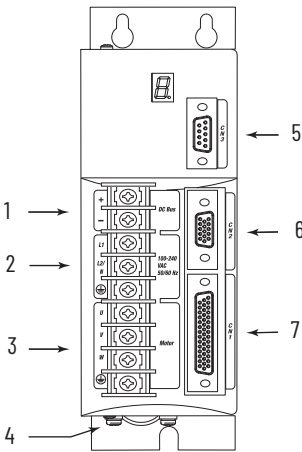
Connectors and Indicators

This chapter shows connectors and indicators for the Ultra™ 3000 servo drives and the Kinetix® 5100 servo drives.

Ultra3000 Servo Drive Connector Data

Use these illustrations to identify the connectors and indicators for Ultra3000 servo drives.

Figure 12 - Ultra3000 Servo Drive Front Panel Connections (Catalog Numbers 2098-DSD-005, -005X, -010, -010X, -020, and -020X)

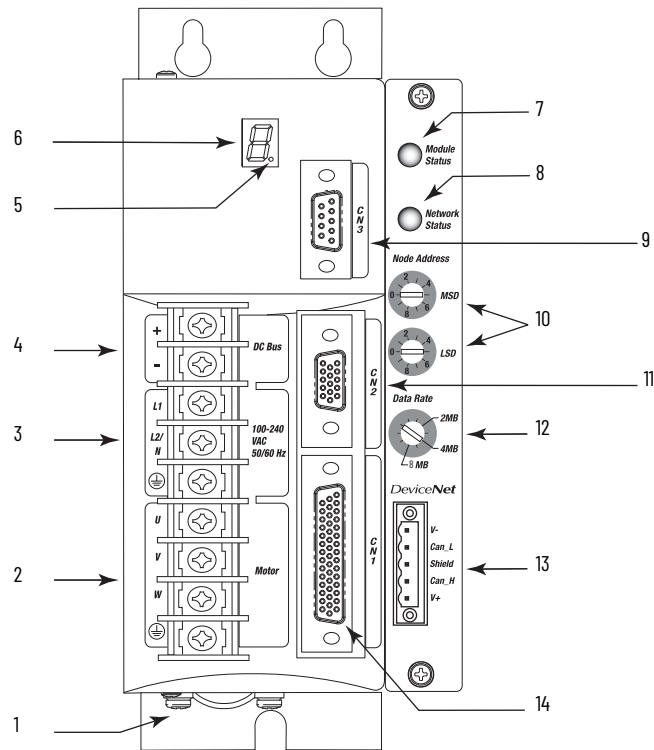


Ultra3000 Drive, Front View
(230V [500 W, 1 kW, and 2 kW] drive is shown)

Table 44 - Ultra3000 Servo Drive Front Panel Connections Descriptions
(Cat. Nos. 2098-DSD-005, -005x, -010, -010x, -020, and -020x)

Item	Description
1	DC bus connections for active shunt resistor kit
2	AC input power connections
3	Motor power connections
4	Motor power cable shield clamp
5	CN3 9-pin serial port connector
6	CN2 15-pin motor feedback connector
7	CN1 44-pin user I/O connector

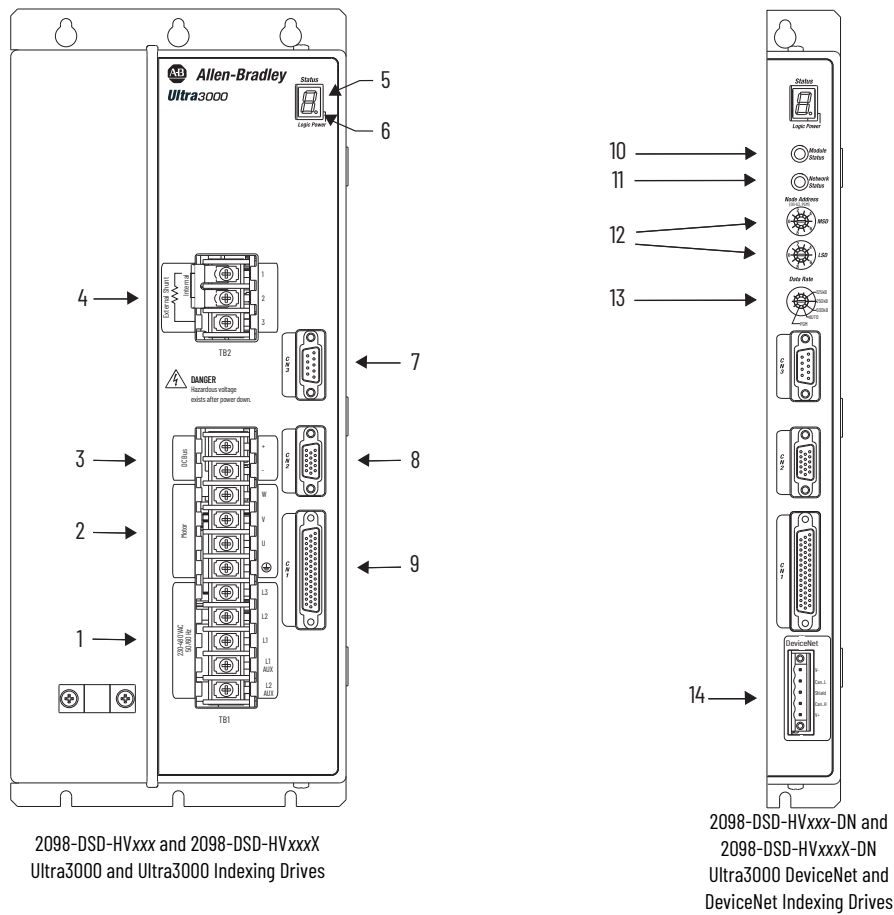
Figure 13 - Ultra3000 Servo Drive Front Panel Connections (Catalog Numbers 2098-DSD-005-DN, -005X-DN, -010-DN, -010X-DN, -020-DN, and -020X-DN)



Item	Description
1	Motor Power Cable Shield Clamp
2	Motor Power Connections
3	AC Input Power Connections
4	DC Bus Connections for Active Shunt Resistor Kit
5	Logic Power Status Indicator
6	Seven Segment Status LED
7	Module Status Indicator

Item	Description
8	Network Status Indicator
9	CN3 9-pin Serial Port Connector
10	Node Address Switches
11	CN2 15-pin Motor Feedback Connector
12	Data Rate Switch
13	DeviceNet interface connector
14	CN1 44-pin User I/O Connector

Figure 14 - 2098-DSD-HV030, 2098-DSD-HV050, 2098-DSD-HV100, 2098-DSD-HV150, and 2098-DSD-HV220 Ultra3000 (400V-class) Drives



Item	Description
1	AC input power connections
2	DC bus connections for active shunt resistor kit
3	Motor power connections
4	Passive shunt resistor connections
5	Seven-segment fault status indicator
6	Logic power
7	CN3 9-pin serial port connector

Item	Description
8	CN2 15-pin motor feedback connector
9	CN1 44-pin user I/O connector
10	Module status indicator
11	Network status indicator
12	Node address switches
13	Data rate switch
14	DeviceNet interface connector

Kinetix 5100 Servo Drive
Connector Data

Use these illustrations to identify the connectors and indicators for Kinetix® 5100 servo drives.

Figure 15 - Features and Indicators (Catalog numbers 2198-E1004-ERS, 2198-E1007-ERS, and 2198-E1015-ERS)

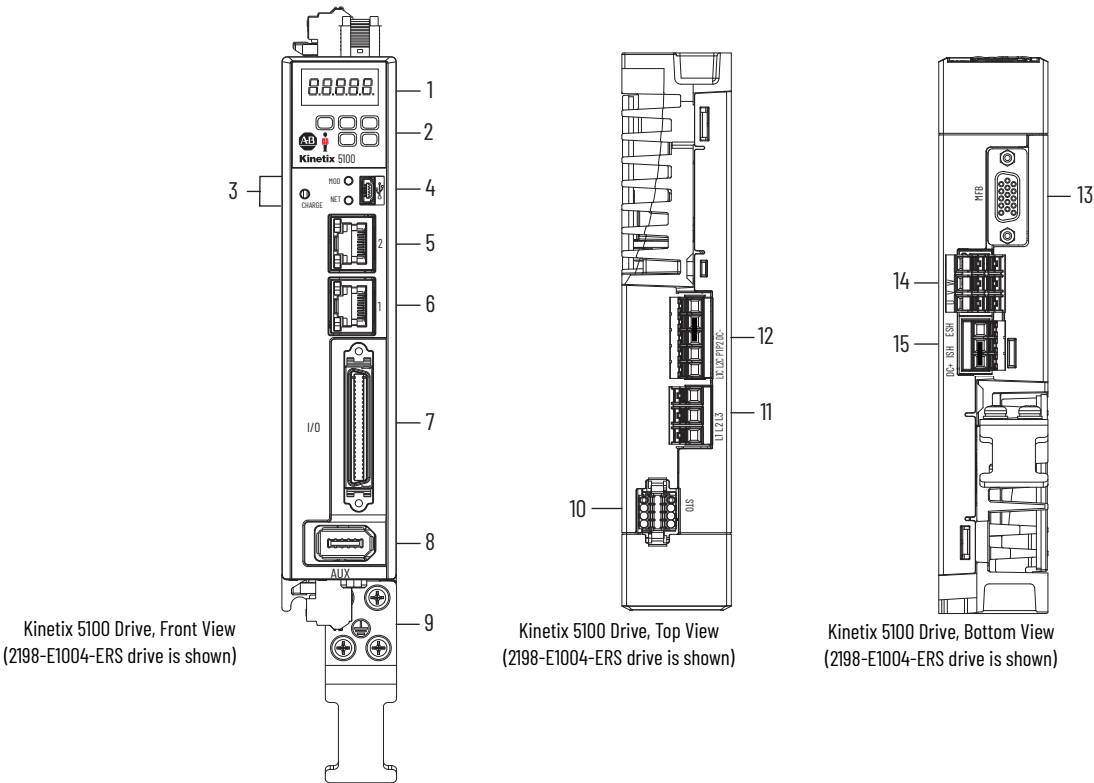


Table 45 - Features and Indicators Description (Cat. Nos. 2198-E1004-ERS, 2198-E1007-ERS, and 2198-E1015-ERS)

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) connections
13	Motor feedback (MFB) connector
14	Motor power output terminals
15	Shunt resistor terminals

Figure 16 - Features and Indicators (catalog numbers 2198-E1020-ERS, 2198-E2030-ERS, 2198-E4004-ERS, 2198-E4007-ERS, 2198-E4015-ERS)

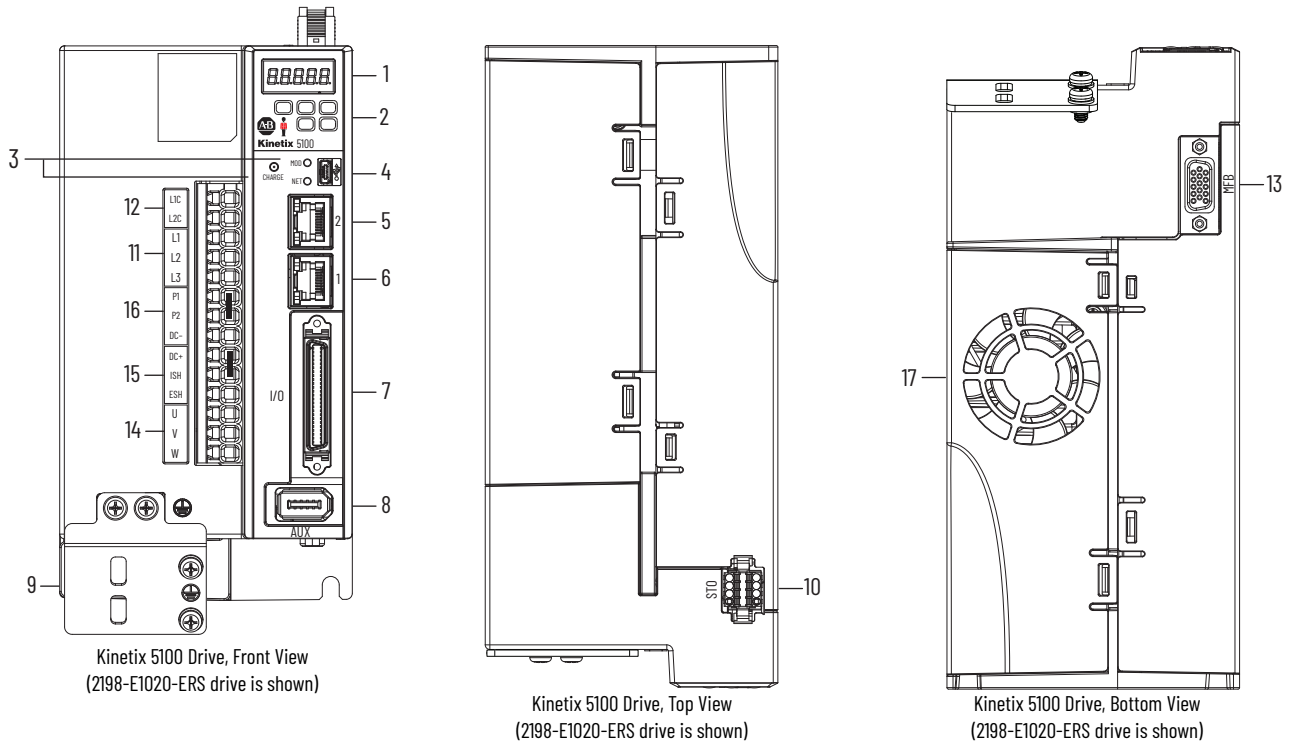


Figure 17 - Features and Indicators (catalog numbers 2198-E4020-ERS, 2198-E4030-ERS)

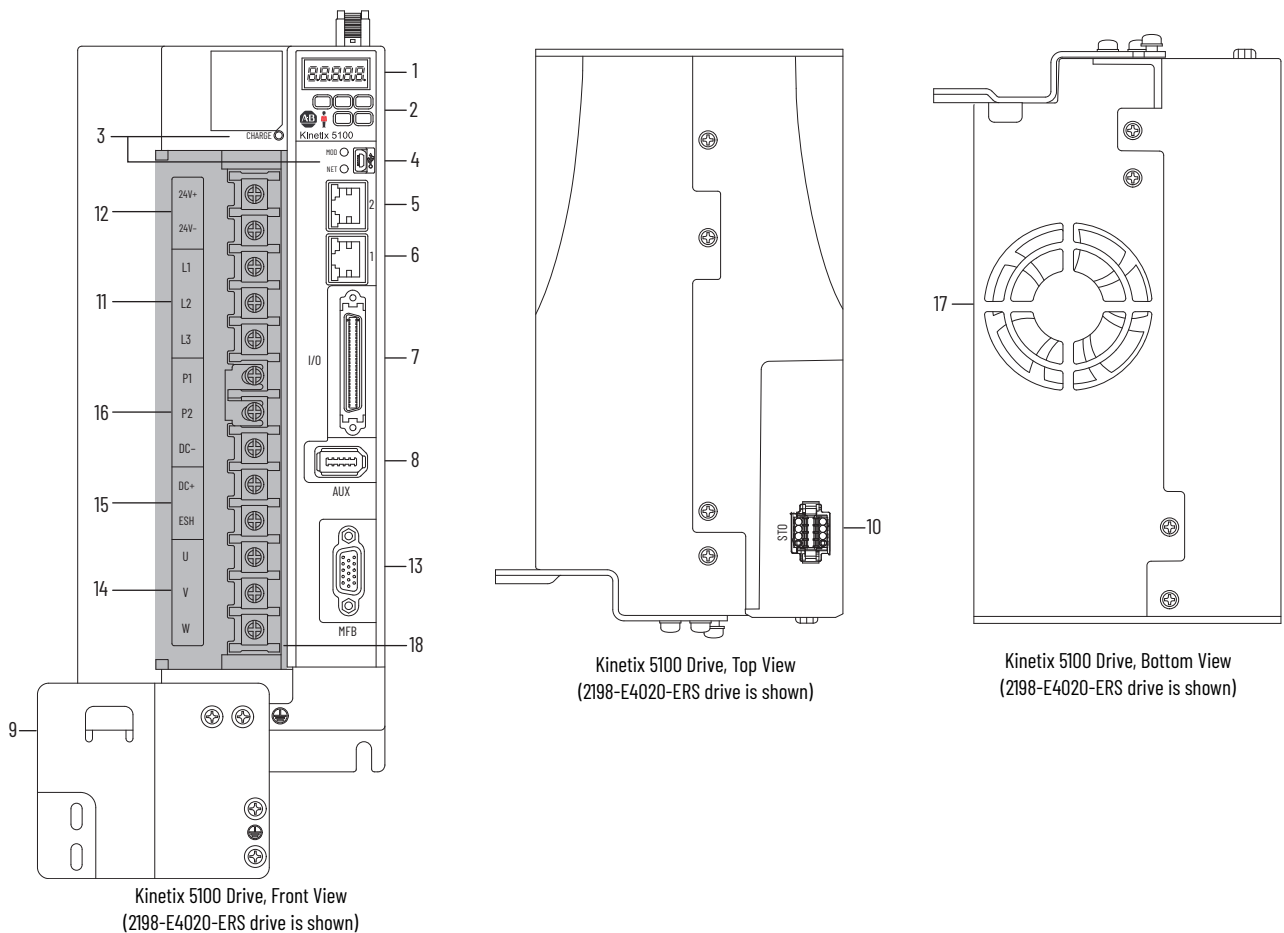


Figure 18 - Features and Indicators
(catalog numbers 2198-E2055-ERS, 2198-E2075-ERS, 2198-E2150-ERS, 2198-E4055-ERS, 2198-E4075-ERS, and 2198-E4150-ERS)

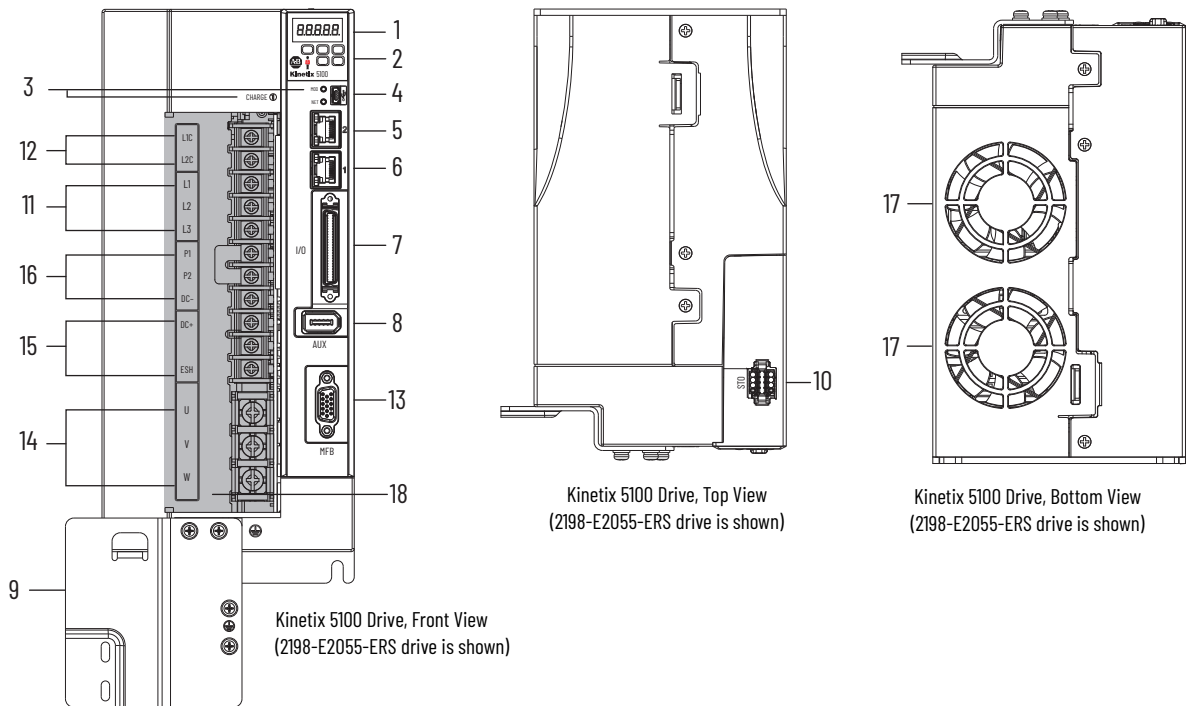


Table 46 - Features and Indicators Description (Cat. Nos. 2198-E2055-ERS, 2198-E2075-ERS, 2198-E2150-ERS, 2198-E4055-ERS, 2198-E4075-ERS, and 2198-E4150-ERS)

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

This section describes the I/O connectors on the Ultra3000 and Kinetix 5100 drives. The Ultra3000 drive uses a 44-pin I/O connector shown in [Figure 19](#), and the Kinetix 5100 uses a 50-pin I/O connector, shown in [Figure 20](#). For locations of the I/O connector on an Ultra3000 drive see [Figure 12](#) and [Figure 13](#). For the locations of I/O connectors on a Kinetix 5100 drive, see [Figure 15](#), [Figure 16](#), and [Figure 18](#). For descriptions of the signals on each pin, see [Table 47](#).

Figure 19 - Ultra3000 Drive 44-Pin I/O Connector Pin Assignments

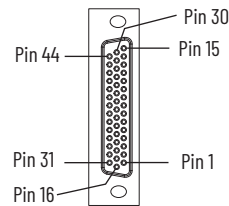


Figure 20 - Kinetix 5100 Drive 50 Pin I/O Connector Pin Assignment

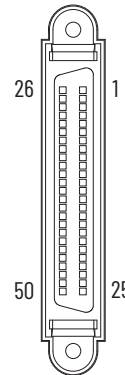


Table 47 compares the I/O connector pinouts for the Ultra3000 drive (CN1 connector) and Kinetix 5100 servo drives (I/O connector).

Table 47 - I/O Connector Assignment Comparison

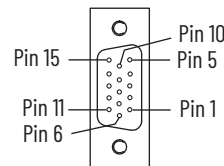
Ultra3000 Servo Drives			Kinetix 5100 Servo Drives		
CN1 Pin	Description	Signal	I/O Pin	Description	Signal
1	Auxiliary Encoder Power Out (+5V)	EPWR	1	Digital output	OUTPUT4+
2	Common	ECOM	2	Digital output	OUTPUT3-
3	Auxiliary Logic Power In (+5V)	AUXPWR	3	Digital output	OUTPUT3+
4	Auxiliary Encoder CH A+	AX+	4	Digital output	OUTPUT2-
5	Auxiliary Encoder CH A-	AX-	5	Digital output	OUTPUT2+
6	Auxiliary Encoder CH B+	BX+	6	Digital output	OUTPUT1-
7	Auxiliary Encoder CH B-	BX-	7	Digital output	OUTPUT1+
8	Auxiliary Encoder CH I+	IX+	8	Digital Input	INPUT4
9	Auxiliary Encoder CH I-	IX-	9	Digital Input	INPUT1
10	Unbuffered Motor Encoder CH A+	AM+	10	Digital Input	INPUT2
11	Unbuffered Motor Encoder CH A-	AM-	11	Common terminal for digital inputs, which are connected to +24V DC or 0V	DCOM
12	Unbuffered Motor Encoder CH B+	BM+	12	Analog input signal ground	ACOM
13	Unbuffered Motor Encoder CH B-	BM-	13	Analog input signal ground	ACOM
14	Unbuffered Motor Encoder CH I+	IM+	14	Not in use	-
15	Unbuffered Motor Encoder CH I-	IM-	15	Analog monitor output 2	AOUT2
16	Buffered Motor Encoder CH A+	AMOUT+	16	Analog monitor output 1	AOUT1
17	Buffered Motor Encoder CH A-	AMOUT-	17	Not in use	-
18	Buffered Motor Encoder CH B+	BMOUT+	18	Analog torque input	COMMAND1
19	Buffered Motor Encoder CH B-	BMOUT-	19	Analog input signal ground	ACOM
20	Buffered Motor Encoder CH I+	IMOUT+	20	Not in use	-
21	Buffered Motor Encoder CH I-	IMOUT-	21	Encoder A+ pulse output	AMOUT+
22	Common	ACOM	22	Encoder A- pulse output	AMOUT-
23	Programmable Analog Output	AOUT	23	Encoder B- pulse output	BMOUT-
24	Analog Current Limit Input	ILIMIT	24	Encoder Z- pulse output	ZMOUT-
25	Command +	COMMAND+	25	Encoder B+ pulse output	BMOUT+
26	Command -	COMMAND-	26	Digital output	OUTPUT4-
27	I/O Common	IOCOM	27	Digital output	OUTPUT5-
28	I/O Common	IOCOM	28	Digital output	OUTPUT5+
29	I/O Power	IOPWR	29	Digital input	INPUT9
30	I/O Power	IOPWR	30	Digital input (High-Speed Input)	INPUT8
31	Digital Input 1	INPUT1	31	Digital input (High-Speed Input)	INPUT7
32	Digital Input 2	INPUT2	32	Digital input	INPUT6
33	Digital Input 3	INPUT3	33	Digital input	INPUT5
34	Digital Input 4	INPUT4	34	Digital input	INPUT3
35	Digital Input 5	INPUT5	35	External power input of BX+/BX- for single-end operation	BPWR
36	Digital Input 6	INPUT6	36	B+/DIR+/CCW+	BX+
37	Digital Input 7	INPUT7	37	B-/DIR-/CCW-	BX-
38	Digital Input 8	INPUT8	38	Digital input	INPUT10
39	Digital Output 1	OUTPUT1	39	External power input of AX+/AX- for single-end operation	APWR
40	Digital Output 2	OUTPUT2	40	Digital output	OUTPUT6-

Table 47 - I/O Connector Assignment Comparison (Continued)

41	Digital Output 3	OUTPUT3	41	A-/Step-/CW-	AX-
42	Digital Output 4	OUTPUT4	42	Analog position and speed command input (+)	COMMAND2
43	Normally Open Relay Output+	BRAKE+	43	A+/Step+/CW+	AX+
44	Normally Open Relay Output-	BRAKE-	44	Analog input signal ground	AGND
—	—	—	45	Not in use	—
—	—	—	46	Digital output	OUTPUT6+
—	—	—	47	Not in use	—
—	—	—	48	Encoder Z pulse open-collector output	OCZMOUT
—	—	—	49	—	—
—	—	—	50	Encoder Z+ pulse output	ZMOUT+

Motor Feedback Connectors

This section describes the motor feedback connectors for the Ultra3000 drives and the Kinetix 5100 drives. Both drives use 15-pin connectors as shown in [Figure 21](#). See [Figure 12](#) and [Figure 13](#) for locations of the Motor Feedback connector on Ultra3000 drives. See [Figure 15](#), [Figure 16](#), and [Figure 18](#) for the locations of the motor feedback connector on Kinetix 5100 drives. [Table 48](#) describes and compares the signals that can be on the pins for each type of drive.

Figure 21 - 15-Pin Motor Feedback Connector Pin Assignments

[Table 48](#) compares the motor feedback connector pinouts for the Ultra3000 drive (CN2 connector) and Kinetix 5100 servo drives (MFB connector).

Table 48 - Motor Feedback Connectors Assignment Comparison

Pin ⁽¹⁾	Ultra3000 Drives		Kinetix 5100 Drives				
	Description	Signal	Description	Signal			
				Hiperface (all compatible motors)	Nikon (Kinetix TLP)	Tamagawa (Kinetix TL/ TLY-B)	Digital AqB with UVW (all compatible motors)
1	Channel A+ / sine differential input+	AM+	Sine Differential Input + A Differential Input +	MTR_SIN+	—	—	MTR_AM+
2	Channel A- / sine differential input-	AM-	Sine Differential Input - A Differential Input -	MTR_SIN-	—	—	MTR_AM-
3	Channel B+ / cosine differential input+	BM+	Cosine Differential Input + A Differential Input +	MTR_COS+	—	—	MTR_BM+
4	Channel B- / cosine differential input-	BM-	Cosine Differential Input - A Differential Input -	MTR_COS-	—	—	MTR_BM-
5	Channel I+ / Index pulse+	IM+	Data Differential Input/Output + Index Differential Input +	MTR_DATA+	MTR_T+	MTR_DATA+ (TLY-B) MTR_SD+ (TL-B)	MTR_IM+
6	Common	ECOM	Encoder Common	MTR_ECOM	MTR_ECOM	MTR_ECOM	MTR_ECOM
7	N/C / Encoder power (+9V) ⁽²⁾	EPWR +9V	Encoder 9V Power Output	MTR_EPWR9V	—	—	—
8	Commutation channel S3	S3	Hall Commutation S3 Input	—	—	—	MTR_S3
9	Positive overtravel limit	+LIMIT	—	—	—	—	—

Table 48 - Motor Feedback Connectors Assignment Comparison (Continued)

Pin ⁽¹⁾	Ultra3000 Drives		Kinetix 5100 Drives				
	Description	Signal	Description	Signal			
				Hiperface (all compatible motors)	Nikon (Kinetix TLP)	Tamagawa (Kinetix TL/ TLY-B)	Digital AqB with UVW (all compatible motors)
10	Channel I- / Index pulse-	IM-	Data Differential Input/Output - Index Differential Input -	MTR_DATA-	MTR_T-	MTR_DATA- (TLY-B) MTR_SD- (TL-B)	MTR_IM-
11	Thermostat	TS	Motor Thermostat ⁽³⁾	MTR_TS	-	-	-
12	Commutation channel S1	S1	Hall Commutation S1 Input	-	-	-	MTR_S1
13	Commutation channel S2	S2	Hall Commutation S1 Input	-	-	-	MTR_S2
14	Encoder power (+5V)	EPWR_5V	Encoder 5V Power Output ⁽⁴⁾	MTR_EPWR5V	MTR_EPWR5V	MTR_EPWR5V	MTR_EPWR5V
15	Negative overtravel limit	-LIMIT	—	-	-	-	-

(1) CN2 on Ultra3000 drives. MFB on Kinetix 5100 drives.
(2) +9V encoder capability only available on standard-size Ultra3000 drive (Cat. No. 2098-DSD-030 or larger).
(3) Not applicable unless motor has integrated thermal protection.
(4) Kinetix 5100 drive encoder power supply uses either 5V or 9V DC based on encoder/motor used.

Auxiliary Feedback

The Ultra3000 drives support auxiliary encoder operation. A 9-pin connector shown in [Figure 22](#) is used to wire an auxiliary encoder on the Ultra3000 drive. The Kinetix 5100 drive supports auxiliary encoder operation. The 10-pin Firewire AUX connector shown in [Figure 23](#), is used to wire an auxiliary encoder. See [Figure 12](#) and [Figure 13](#) for locations of the auxiliary feedback connector on Ultra3000 drives. See [Figure 15](#), [Figure 16](#), and [Figure 18](#) for the locations of the auxiliary feedback connector on Kinetix 5100 drives

Figure 22 - 9-Pin Ultra3000 Drive Auxiliary Feedback Connector Pin Assignments

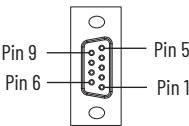
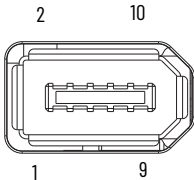


Figure 23 - 10-pin Kinetix 5100 drive Auxiliary Feedback Connector Pin Assignment



[Table 49](#) compares the auxiliary feedback connector pinouts for the Ultra3000 drive (CN1 connector) and Kinetix 5100 servo drives (AUX connector):

Table 49 - Auxiliary Feedback Connector Assignment Comparison

Ultra3000 Drives			Kinetix 5100 Drives		
CN1 Pin ⁽¹⁾	Description	Signal	AUX Pin#	Signal (Generic TTL Incremental)	Description
1	Auxiliary Encoder Power Out (+5V)	EPWR	1	MTR_AM+	A Differential Input +
2	Common	ECOM	2	MTR_AM-	A Differential Input -
3	—	—	3	MTR_BM+	B Differential Input +
4	Auxiliary Encoder CH A+	AX+	4	MTR_BM-	B Differential Input -
5	Auxiliary Encoder CH A-	AX-	5	MTR_IM+	Index Differential Input +
6	Auxiliary Encoder CH B+	BX+	6	MTR_IM-	Index Differential Input -
7	Auxiliary Encoder CH B-	BX-	7	MTR_ECOM	Encoder Common
8	Auxiliary Encoder CH I+	IX+	8	MTR_EPWR5V	Encoder 5V Power Output
9	Auxiliary Encoder CH I-	IX-	9	Reserved	Reserved
—	—	—	10	Reserved	Reserved

(1) CN1 Connector on the Ultra3000 drive is a 44-pin connector.

Notes:

Dimensions, Cables, and Wiring

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

Ultra3000 Drive (230V) Dimensions

In [Figure 24](#), -xxx is replaced by -005, -010 or 020 to represent the Ultra™ 3000 drive 500 W, 1 kW, and 2 kW drives respectively.

Figure 24 - Ultra3000 (230V) Dimensions in mm (in.) for -005, -010, -020
(Catalog numbers 2098-DSD-xxx, 2098-DSD-xxxX, 2098-DSD-xxx-DN, and 2098-DSD-xxxX-DN)

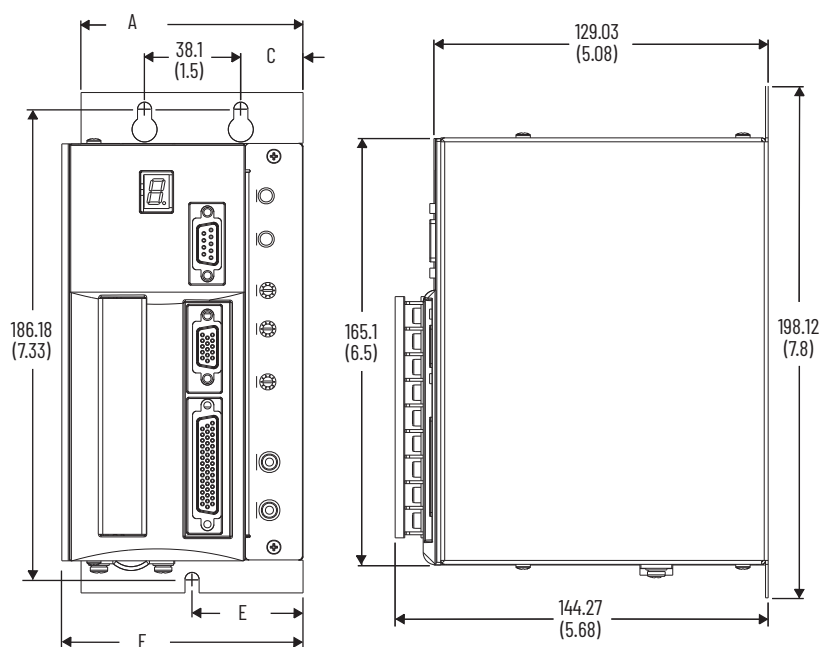


Table 50 - Ultra3000 Drive Dimensions

Ultra3000 Drive Cat. No.	A mm (in.)	C mm (in.)	E mm (in.)	F mm (in.)
2098-DSD-005 2098-DSD-005X	65.02 (2.56)	13.26 (0.52)	32.77 (1.29)	72.64 (2.86)
2098-DSD-010 2098-DSD-010X 2098-DSD-020 2098-DSD-020X				98.1 (3.89)
2098-DSD-005-DN 2098-DSD-005X-DN				95.5 (3.76)
2098-DSD-010-DN 2098-DSD-010X-DN 2098-DSD-020-DN 2098-DSD-020X-DN				121.54 (4.79)

In [Figure 25](#), -xxx is replaced by -030, -075, or 150 to represent the Ultra3000 3 kW, 7.5 kW, and 15 kW drives respectively.

Figure 25 - Ultra3000 (230V) Dimensions in mm (in.) for -030, -075, -150 (Catalog Numbers 2098-DSD-xxx, 2098-DSD-xxxX, 2098-DSD-xxx-DN, and 2098-DSD-xxxX-DN)

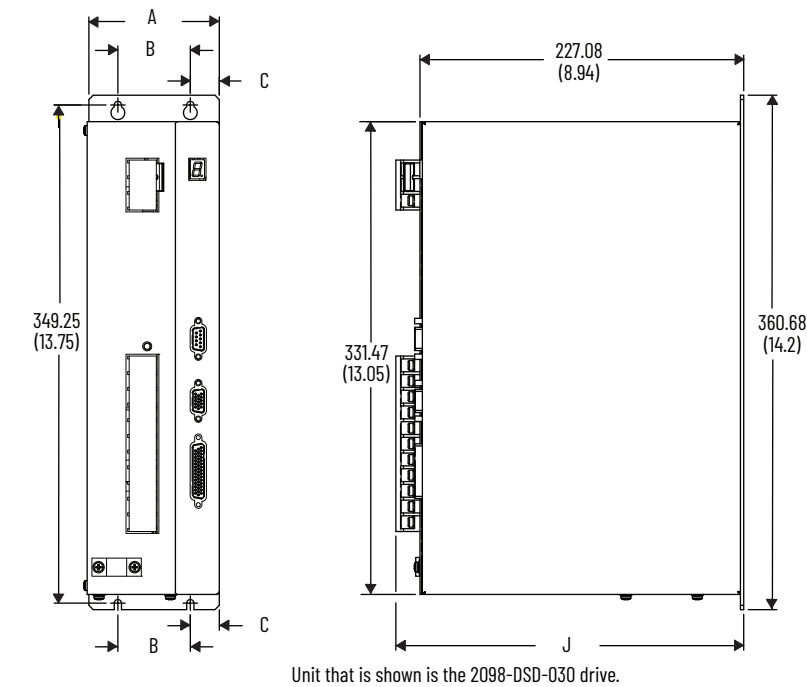
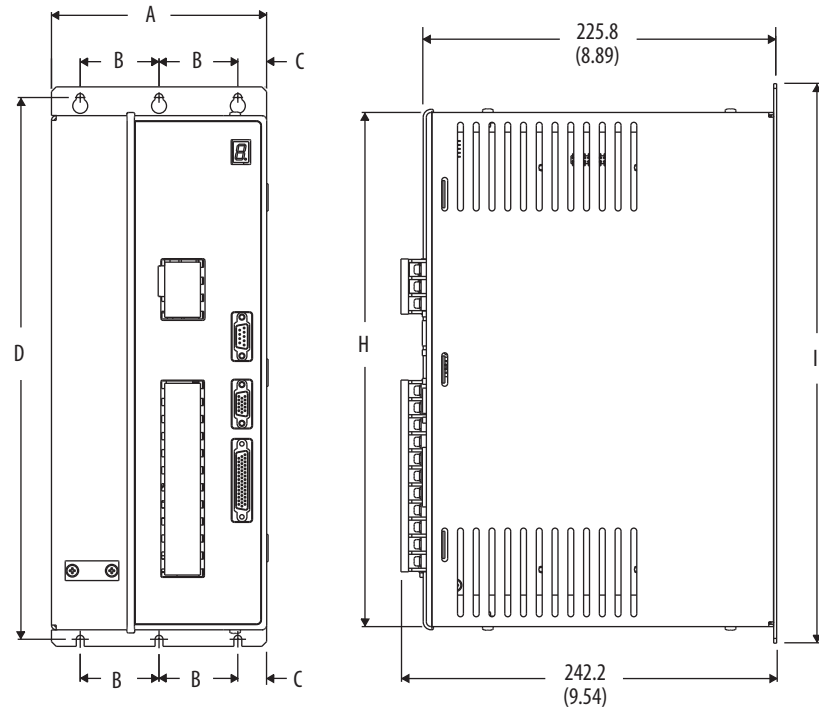


Table 51 - Ultra3000 (230V) Dimensions in mm (in.) for -030, -075, -150 (Catalog Numbers 2098-DSD-xxx, 2098-DSD-xxxX, 2098-DSD-xxx-DN, and 2098-DSD-xxxX-DN)

Ultra3000 Drive	A mm (in.)	B mm (in.)	C mm (in.)	J mm (in.)
2098-DSD-030 2098-DSD-030X 2098-DSD-030-DN 2098-DSD-030X-DN	91.44 (3.6)	50.8 (2.0)	20.32 (0.8)	243.84 (9.6)
2098-DSD-075 2098-DSD-075X 2098-DSD-075-DN 2098-DSD-075X-DN	138.68 (5.41)	88.9 (3.5)	24.89 (0.96)	247.14 (9.73)
2098-DSD-150 2098-DSD-150X 2098-DSD-150-DN 2098-DSD-150X-DN	188.97 (7.44)	139.7 (5.5)	24.6 (0.97)	241.05 (9.49)

In [Figure 26](#), xxx is replaced by 030, 050, 100, 150, or 220 to represent the Ultra3000 3, 5, 10, 15, and 22 kW drives respectively.

Figure 26 - 2098-DSD-HVxxx, 2098-DSD-HVxxxX, 2098-DSD-HVxxx-SE, 2098-DSD-HVxxx-DN, 2098-DSD-HVxxxX-DN Dimensions



Unit shown is the 2098-DSD-HV030.

Table 52 - Ultra3000 (400V) Dimensions in mm (in.) for 2098-DSD-HVxxx, 2098-DSD-HVxxxX, 2098-DSD-HVxxx-SE, 2098-DSD-HVxxx-DN, 2098-DSD-HVxxxX-DN

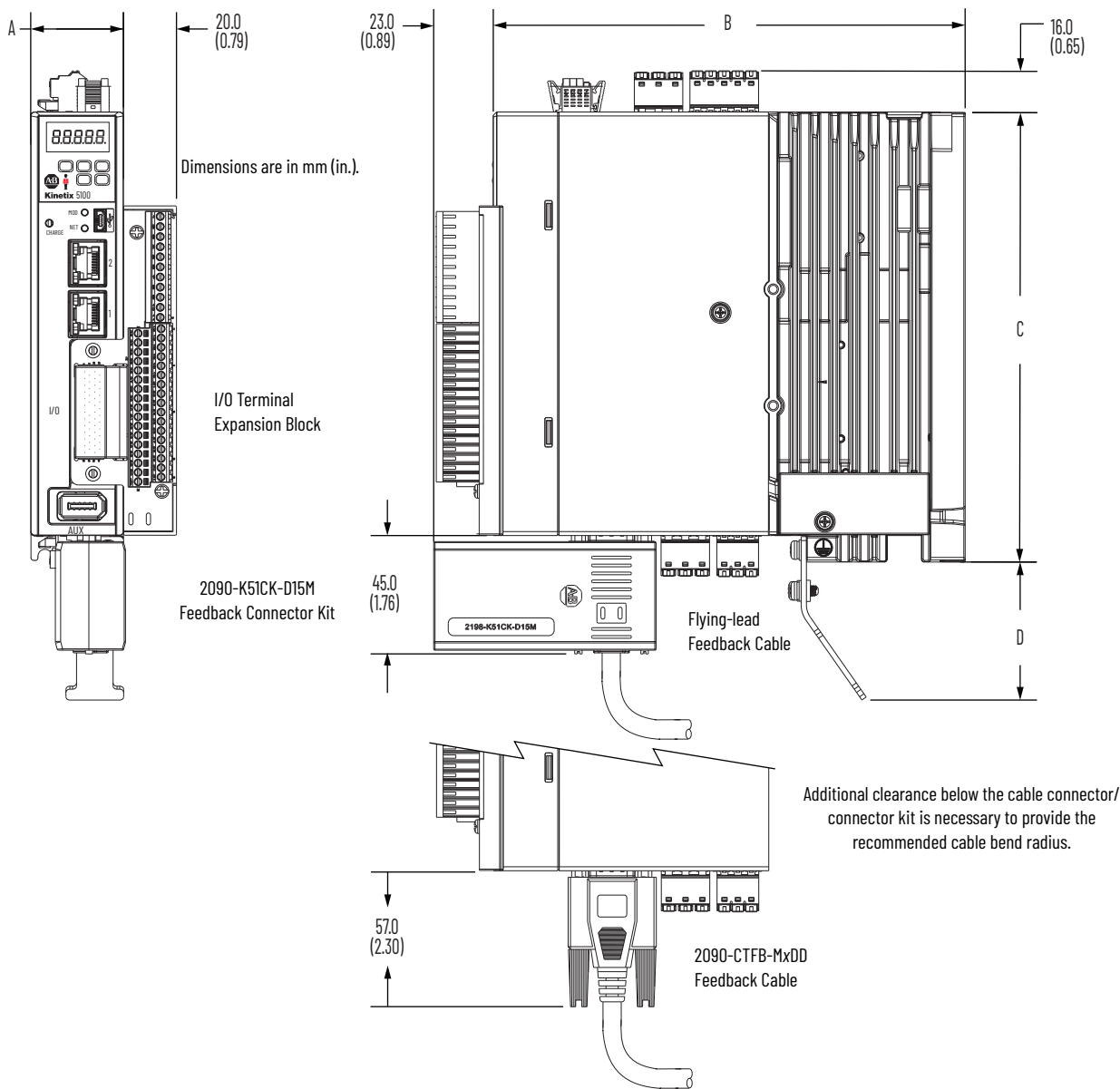
Ultra30040 Drives ⁽¹⁾ Cat. No.	A mm (in.)	C mm (in.)	B mm (in.)	D mm (in.)	H mm (in.)	I mm (in.)
2098-DSD-HV030x, 2098-DSD-HV030-xx, 2098- DSD-HV050x, 2098-DSD-HV050-xx	138.7 (5.46)	18.5 (0.73)	50.8 (2.0)	349.3 (13.75)	331.5 (13.05)	360.7 (14.2)
2098-DSD-HV100x, 2098-DSD-HV100-xx, 2098- DSD-HV150x, 2098-DSD-HV150-xx	151.6 (5.97)	25 (0.99)				
2098-DSD-HV220x, 2098-DSD-HV220-xx	203.2 (8.0)	25.4 (1.0)	76.2 (3.0)	380.4 (14.98)	362.6 (14.26)	391.8 (15.43)

(1) The x represents the indexing (X) option. The -xx represents the Sercos interface (SE) or DeviceNet interface (DN) option. Sercos interface is not available with the DeviceNet interface option.

Kinetix 5100 Drive Dimensions

The Kinetix® 5100 drive dimensions are shown in [Figure 27](#), [Figure 28](#), and [Figure 29](#).

Figure 27 - 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 28 - Catalog Numbers 2198-E1020-ERS, 2198-E2030-ERS, 2198-E4004-ERS, 2198-E4007-ERS, and 2198-E4015-ERS

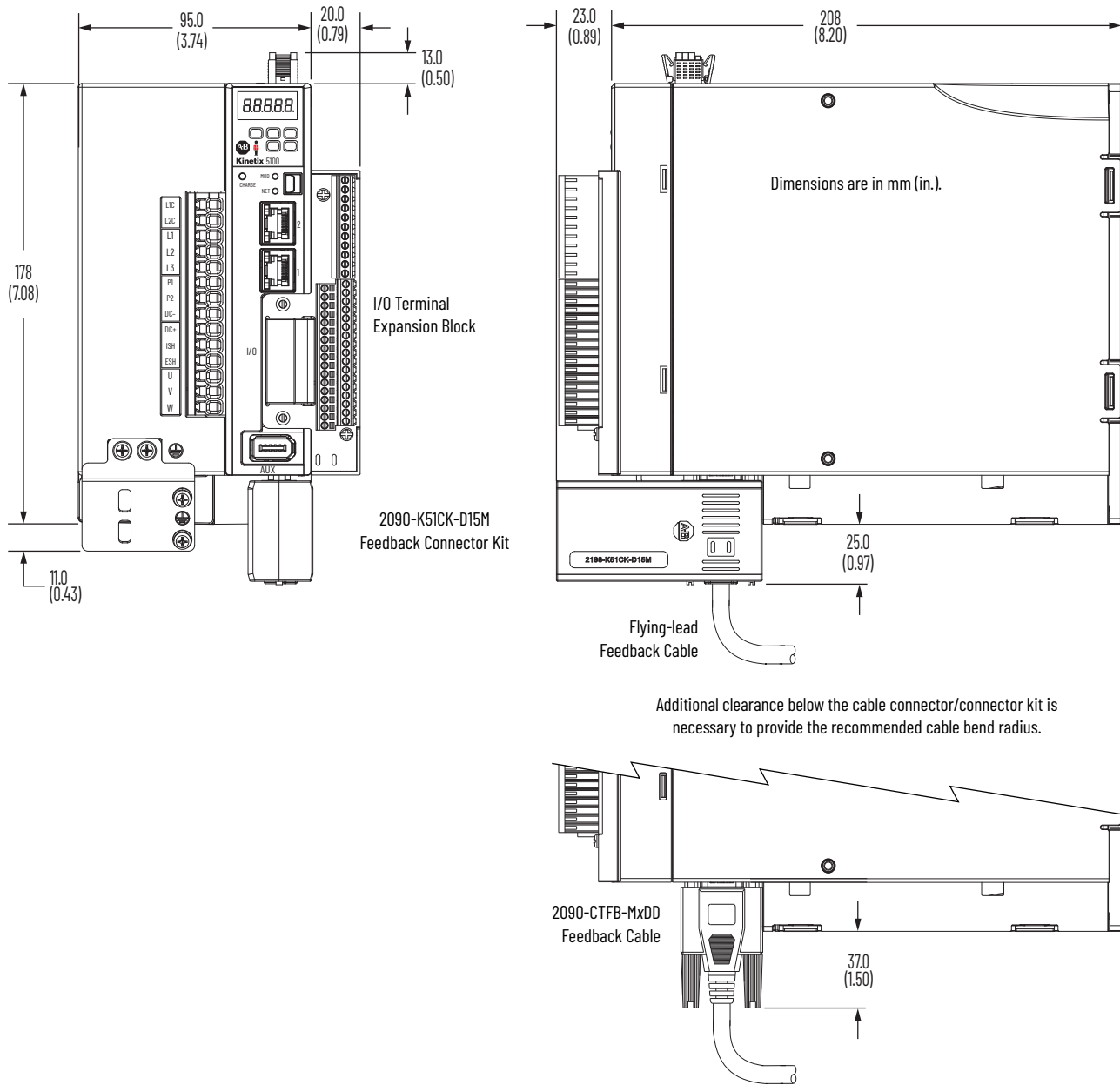
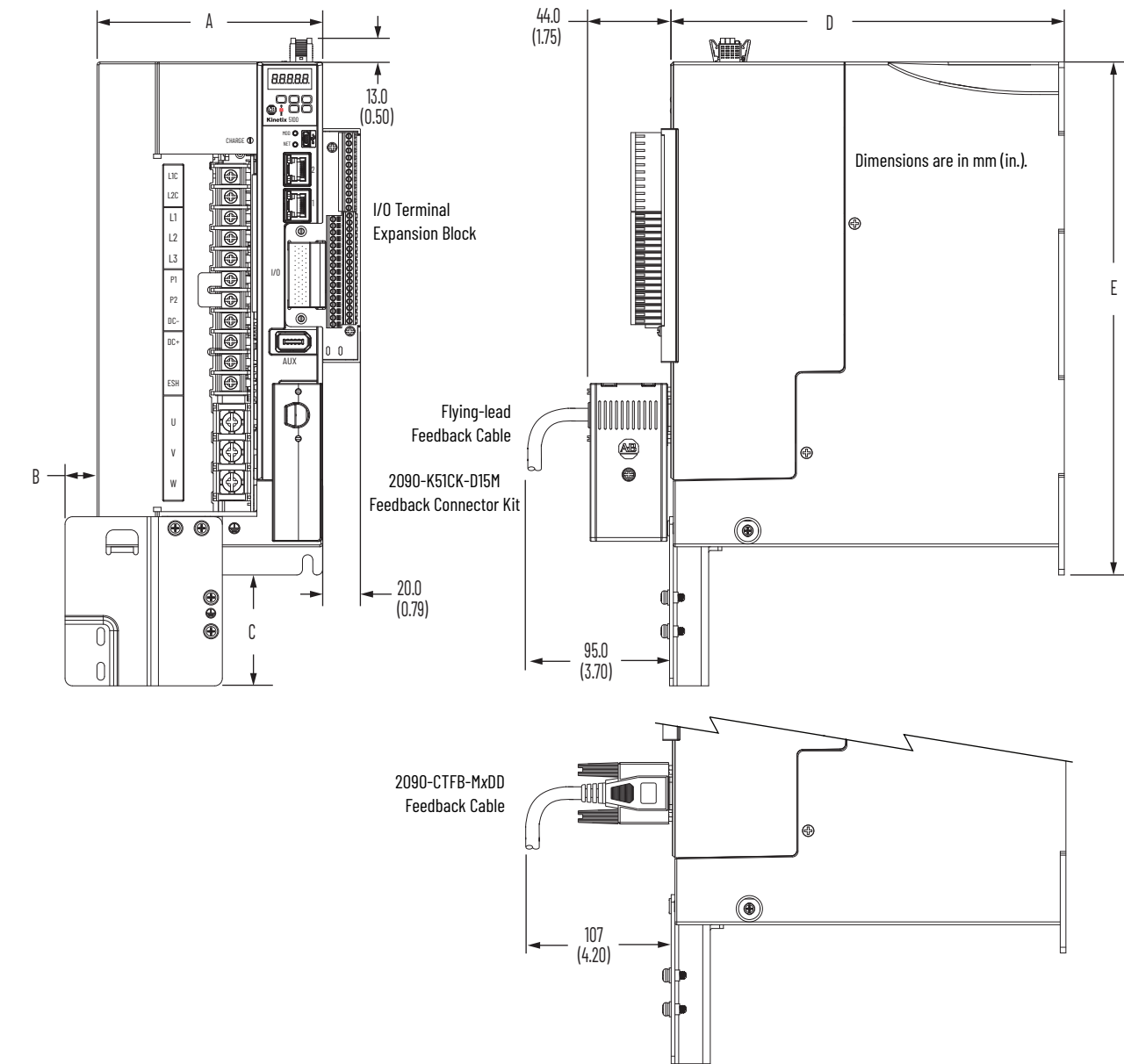


Figure 29 – Catalog Numbers 2198-E4020-ERS, 2198-E4030-ERS, 2198-E2055-ERS, 2198-E4055-ERS, 2198-E2075-ERS, 2198-E4075-ERS, 2198-E2150-ERS, and 2198-E4150-ERS



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)
2198-E4150-ERS						

Cables

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

Motor Power and Feedback Cables

Kinetix MP motors are supported by the Ultra3000 drives and Kinetix 5100 drives. As a result, the Kinetix MP motors (Hiperface feedback and TTL incremental feedback only) power cable and feedback cable (2090-Series) used for Ultra3000 drives can be used with Kinetix 5100 drives.

When migrating your Ultra3000 servo drive system, do not exceed the maximum cable lengths for the Kinetix 5100 servo drives. The length of the power and feedback cables for the Kinetix 5100 drives cannot exceed specified distances that are shown here.

Table 53 - Kinetix 5100 Drives Maximum Cable Lengths (200V-class) Motors

Compatible Motor and Actuator Cat. No.	Feedback Type	Cable Length, max m (ft)	
TLP-Axxx-xxx-D	Nikon (24-bit) absolute high-resolution, multi-turn and single-turn	50 (164)	
MPL-A15xxx-V/Ex7xAA MPL-A2xxx-V/Ex7xAA	Hiperface, absolute high-resolution, multi-turn and single-turn		
MPL-A3xxx-S/Mx7xAA MPL-A4xxx-S/Mx7xAA MPL-A45xxx-S/Mx7xAA MPL-A5xxx-S/Mx7xAA			
MPM-Axxxx-S/M MPF-Axxxx-S/M MPS-Axxxx-S/M			
MPL-A15xxx-Hx7xAA MPL-A2xxx-Hx7xAA	Incremental		30 (98.4)
MPL-A3xxx-Hx7xAA MPL-A4xxx-Hx7xAA MPL-A45xxx-Hx7xAA			
TLY-Axxxx-B TL-Axxxx-B		Tamagawa (17-bit) absolute high-resolution, multi-turn	
TLY-Axxxx-H			

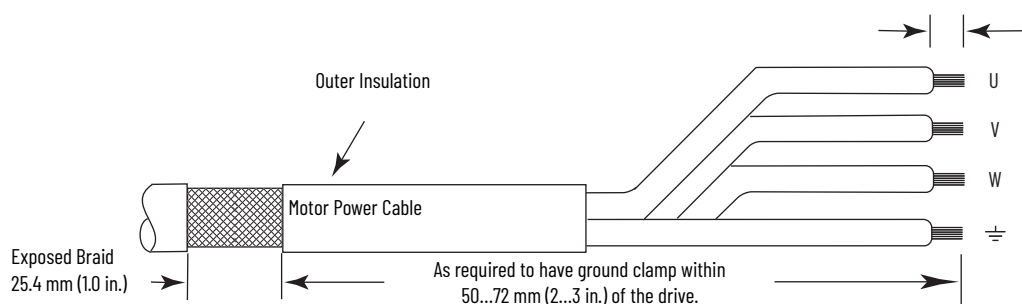
Table 54 - Kinetix 5100 Drives Maximum Cable Lengths (400V-class) Motors

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-B15xxx-V/Ex7xAA MPL-B2xxx-V/Ex7xAA		50 (164)	20 (65.6)
MPL-B3xxx-S/Mx7xAA MPL-B4xxx-S/Mx7xAA MPL-B45xxx-S/Mx7xAA MPL-B5xxx-S/Mx7xAA MPL-B6xxx-S/Mx7xAA MPL-B8xxx-S/Mx7xAA MPL-B9xxx-S/Mx7xAA	HiPerface, absolute high-resolution, multi-turn and single-turn	50 (164)	
MPM-Bxxxx-S/M MPF-Bxxxx-S/M MPS-Bxxxx-S/M			
MPL-B15xxx-Hx7xAA MPL-B2xxx-Hx7xAA	Incremental	30 (98.4)	20 (65.6)
MPL-B3xxx-Hx7xAA MPL-B4xxx-Hx7xAA MPL-B45xxx-Hx7xAA		30 (98.4)	

Performance was tested at this length and meets CE requirements.

If you are using a custom power cable, verify that the capacity of the new cable can handle the current to the actuator.

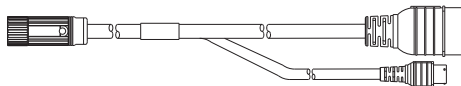
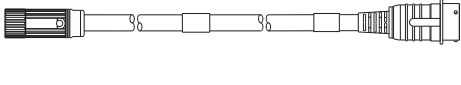
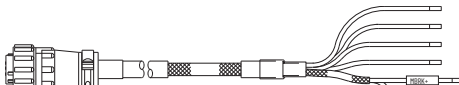
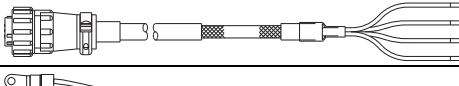
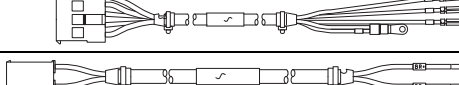
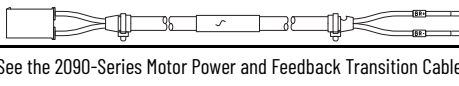
Cable shield and lead preparation is provided with most Allen-Bradley® cable assemblies. Follow these guidelines if your motor power cable shield and wires require preparation.

Figure 30 - Cable Shield and Lead Preparation**Table 55 - Motor Power (MP) Connector**

Kinetix MP or Kinetix TLP Servo Motor	Terminal
U = Brown	U
V = Black	V
W = Blue	W
$\perp$ = Green/Yellow	

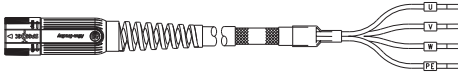
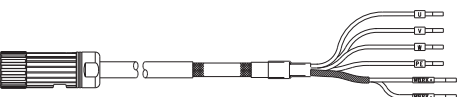
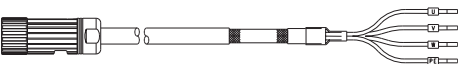
The current motor power cabling system can be used for the Kinetix MP motors that are supported by both the Kinetix 5100 drives and the Ultra3000 drives. The motor power cables are interchangeable and depend on the actuator used.

Table 56 - Power/Brake Cable Descriptions (standard, non-flex)

Standard Cable Cat. No.	Description	Cable Configuration	Motor/Actuator Connector
		Motor/Actuator End Drive End	
2090-CPBM7DF-xxAAxx	Drive-end flying leads (DF) Power/brake wires (PB)		SpeedTec DIN (M7) Kinetix MP Motors
2090-CPWM7DF-xxAAxx	Drive-end flying leads (DF) Power wires only (PW)		
2090-XXNPMF-xxSxx	Drive-end flying leads Power/brake wires		Threaded DIN (M4) Kinetix MP Motors
2090-CPBM4E2-xxTR	Drive-end bayonet(E2), transition(TR) cable ⁽¹⁾ Motor-end threaded DIN (M4) Power/brake wires (PB)		
2090-CPWM4E2-xxTR	Drive-end bayonet(E2), transition(TR) cable ⁽¹⁾ Motor-end threaded DIN (M4) Power wires only (PW)		
■ 2090-CPBM6DF-16AAxx	• Drive-end flying-leads (DF) • Power/brake wires (PB)		Circular Plastic (M6)
■ 2090-CPWM6DF-16AAxx	• Drive-end flying-leads (DF) • Power wires only (PW)		
■ 2090-DANPT-16Sxx	• Drive-end flying-leads • Power wires only		Rectangular Plastic
■ 2090-DANBT-18Sxx	Drive-end flying-lead brake wires		

(1) Threaded DIN connector (motor end) and bayonet connector for 2090-XXNFMF-Sxx cable. See the 2090-Series Motor Power and Feedback Transition Cables in the Kinetix Motion Accessories Technical Data, publication [KNX-TD004](#).

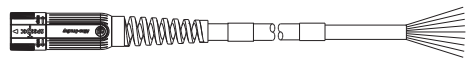
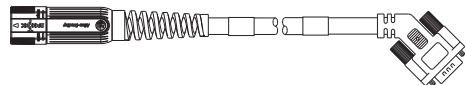
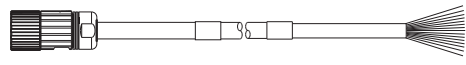
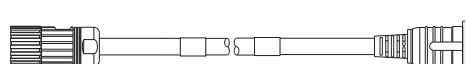
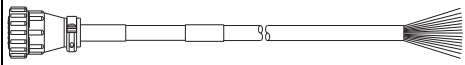
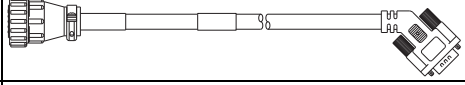
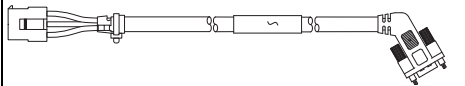
Table 57 - Power/Brake Cable Descriptions (Continuous-Flex)

Continuous-flex Cable Cat. No.	Description	Cable Configuration		Motor/Actuator Connector
		Motor/Actuator End	Drive End	
2090-CPBM7DF-xxAFxx	Drive-end flying leads (DF) Power/brake wires (PB)			SpeedTec DIN (M7) MP Motors
2090-CPWM7DF-xxAFxx	Drive-end flying leads (DF) Powerwires only(PW)			
2090-CPBM7E7-xxAFxx	Drive-end (male) connector, extension (E7) ⁽¹⁾ Motor-end SpeedTec DIN cable plug (M7)			
2090-CPBM4DF-xxAFxx	Drive-end flying leads (DF) Power/brake wires (PB)			Threaded DIN (M4) MP Motors
2090-CPWM4DF-xxAFxx	Drive-end flying leads (DF) Powerwires only(PW)			

(1) SpeedTec DIN connector (motor end) and male connector for extending SpeedTEc or threaded DIN cable. See the 2090-Series Motor Power and Feedback Transition Cables in the Kinetix Motion Accessories Technical Data, publication [KNX-TD004](#).

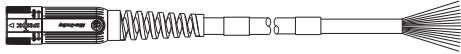
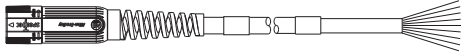
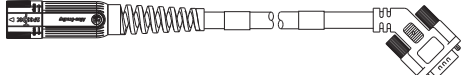
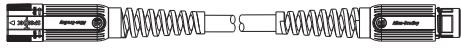
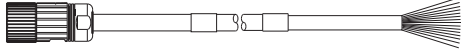
The current motor encoder cabling system can be used for the Kinetix MP motors that are supported by both the Kinetix 5100 drives and the Ultra3000 drives.

Table 58 - Feedback Cable Descriptions (standard, non-flex cable)

Standard Cable Cat. No.	Description	Cable Configuration		Motor/Actuator Connector
		Motor/Actuator End	Drive End	
2090-CFBM7DF-CEAxx	- Drive-end flying leads (DF) - High-resolution or resolver applications (CE)			SpeedTec DIN (M7)
2090-CFBM7DD-CEAxx	- Drive-end 15-pin connector (DD) - High-resolution or resolver applications (CE)			
2090-XXNFMF-Sxx	- Drive-end flying leads - High-resolution or incremental applications			Threaded DIN (M4)
2090-CFBM4E2-CATR	- Drive-end bayonet (E2), transition (TR) cable⁽¹⁾ - Motor-end threaded DIN (M4) - All feedback types (CA)			
2090-CFBM6DF-CBAAxx	- Drive-end flying-leads (DF) - High-resolution, battery backup or Incremental applications (CB)			Circular Plastic (M6)
2090-CFBM6DD-CCAxx	- Drive-end 15-pin connector (DD) - Incremental applications only (CC)			
2090-DANFCT-Sxx	- Drive-end 20-pin connector - High-resolution applications			Rectangular Plastic

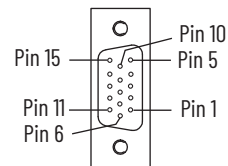
(1) Threaded DIN connector (motor end) and bayonet connector for 2090-XXNFMF-Sxx cable. See the 2090-Series Motor Power and Feedback Transition Cables in the Kinetix Motion Accessories Specifications Technical Data, publication [KNX-TD004](#).

Table 59 - Feedback Cable Descriptions (continuous-flex cable)

Standard Cable Cat. No.	Description	Cable Configuration	Motor/Actuator Connector
		Motor/Actuator End Drive End	
2090-CFBM7DF-CDAFxx	- Drive-end flying leads (DF) - High-resolution or incremental applications (CD)		SpeedTec DIN (M7)
2090-CFBM7DF-CEAFxx	- Drive-end flying leads (DF) - High-resolution or resolver applications (CE)		
2090-CFBM7DD-CEAFxx	- Drive-end 15-pin connector (DD) - High-resolution or resolver applications (CE)		
2090-CFBM7E7-CDAFxx 2090-CFBM7E7-CEAFxx	- Drive-end (male) connector, extension (E7)⁽¹⁾ - Motor-end SpeedTec DIN cable plug (M7)		
2090-CFBM4DF-CDAFxx	- Drive-end flying leads - High-resolution or incremental applications		Threaded DIN (M4)

(1) SpeedTec DIN connector (motor end) and male connector for extending SpeedTec or threaded DIN cable. See the SpeedTec DIN Continuous-flex Extension Cables in the Kinetix Motion Accessories Technical Data, publication [KNX-TD004](#).

The [Figure 31](#) shows the pin orientation for 15-pin motor feedback connector.

Figure 31 - Pin Orientation for 15-pin Motor Feedback (MF) Connector

Factory-made cables with premolded connectors are designed to minimize electromagnetic interference (EMI). We recommend factory-made cables (over hand-built cables) to improve system performance. Feedback cables with premolded connectors that are used with the Kinetix MP motors work with both the Ultra3000 and Kinetix 5100 drives, with no modification. Feedback cable with flying leads can be connected to the Kinetix 5100 drive MFB port with the connector kit, cat. no. 2198-K51CK-D15M.

For further cable specifications, 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.

Network Cable

Ethernet cable of type CAT5E or CAT6, shielded for connecting drive-to-drive, drive-to-controller, or drive-to-switch must not exceed 100 m (328 ft). For more information, see Guidance for Selecting Cables for EtherNet/IP Networks, publication [ENET-WP007](#).

Mini-USB Cable

The 2198-USBC mini-USB cable is the recommended USB cable to connect the drive to the PC. Using the 2198-USBF filter is required to reduce the vulnerability to electrical noise between the personal computer (running KNX5100C software) and the Kinetix 5100 drive.

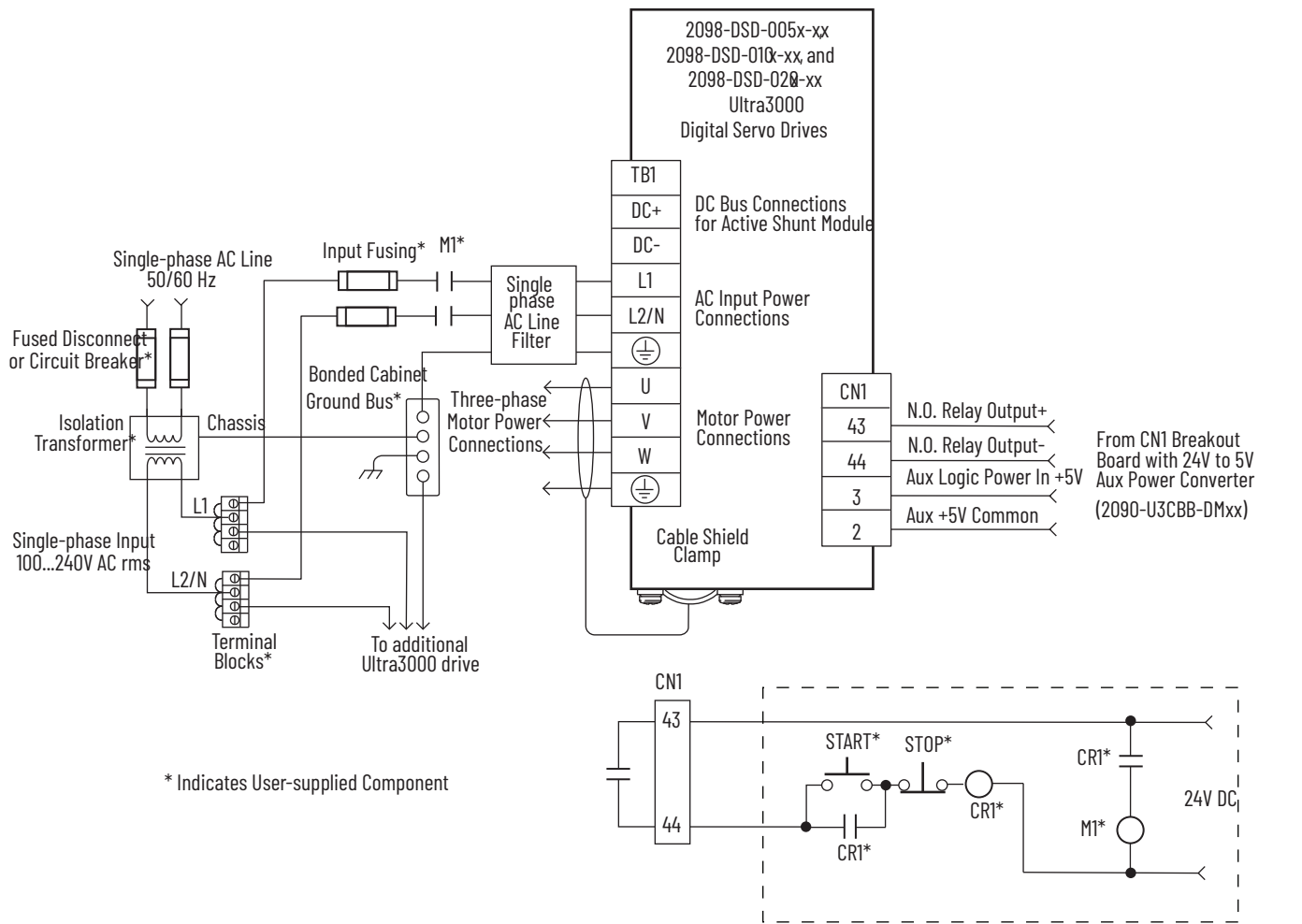
Power Wiring

This section provides power wiring examples to assist you in comparing the power wiring for the Ultra3000 servo drive and the Kinetix 5100 drive systems.

Ultra3000 Servo Drive Power Wiring Examples

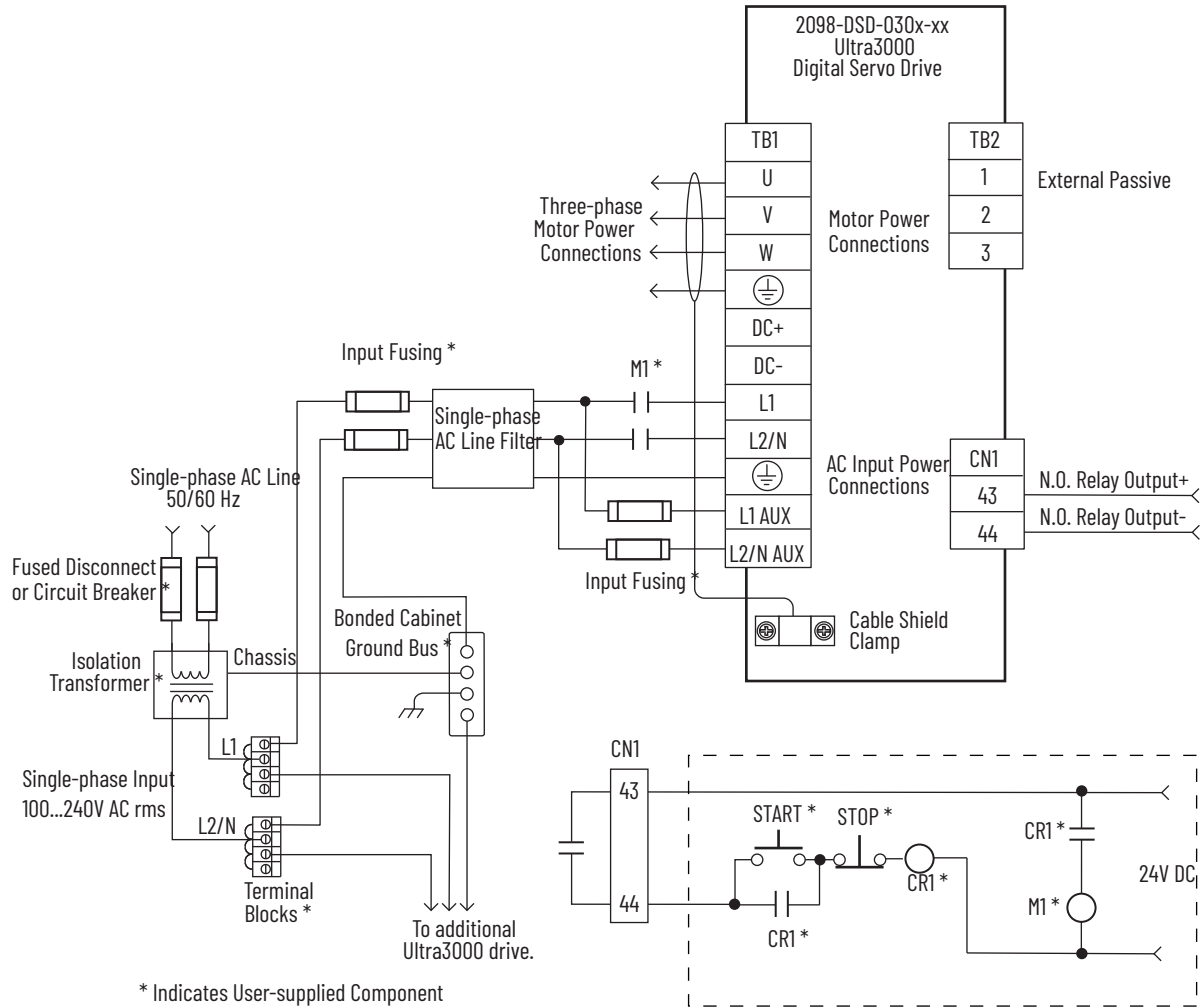
Figure 32 is the power wiring diagram with 24V DC control string for 2098-DSD-005x-xx, 2098-DSD-010x-xx, and 2098-DSD-020x-xx Ultra3000 drives (non-Sercos). To avoid a separate 5V DC auxiliary logic power supply, the 24V to 5V converter breakout board (catalog number 2090-U3CBB-DMxx) is used to wire the control interface (CN1) connector.

Figure 32 - Typical Power Wiring on Ultra3000 (230V) System (2098-DSD-005x-xx, 2098-DSD-010x-xx, and 2098-DSD-020x-xx)



[Figure 33](#) is the power wiring diagram with 24V DC control string for the 2098-DSD-030x-xx drive (non-Sercos).

Figure 33 - Typical Power Wiring on Ultra3000 (230V) System (2098-DSD-030x-xx)



[Figure 34](#) is the power wiring diagram with 24V DC control string for 2098-DSD-075x-xx and 2098-DSD-150x-xx Ultra3000 drives (non-Sercos).

Figure 34 - Typical Power Wiring on Ultra3000 (230V) System (2098-DSD-075x-xx and 2098-DSD-150-x-xx)

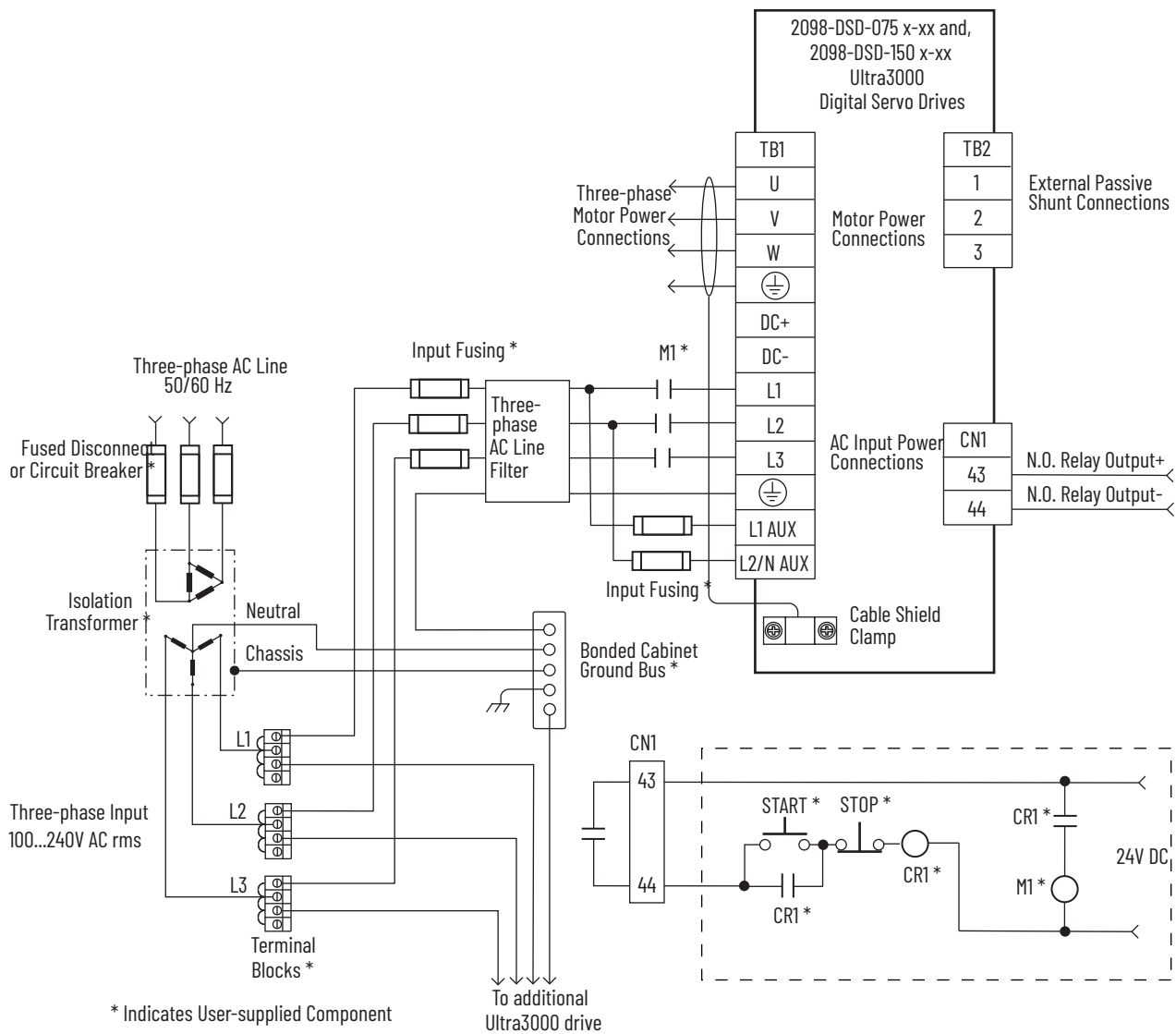


Figure 35 is the power wiring diagram with 24V DC control string for the 2098-DSD-HVxxx-xx drives.

Figure 35 - Typical Power Wiring of Ultra3000 System (2098-DSD-HVxxx-xx and -HVxxxX-xx)

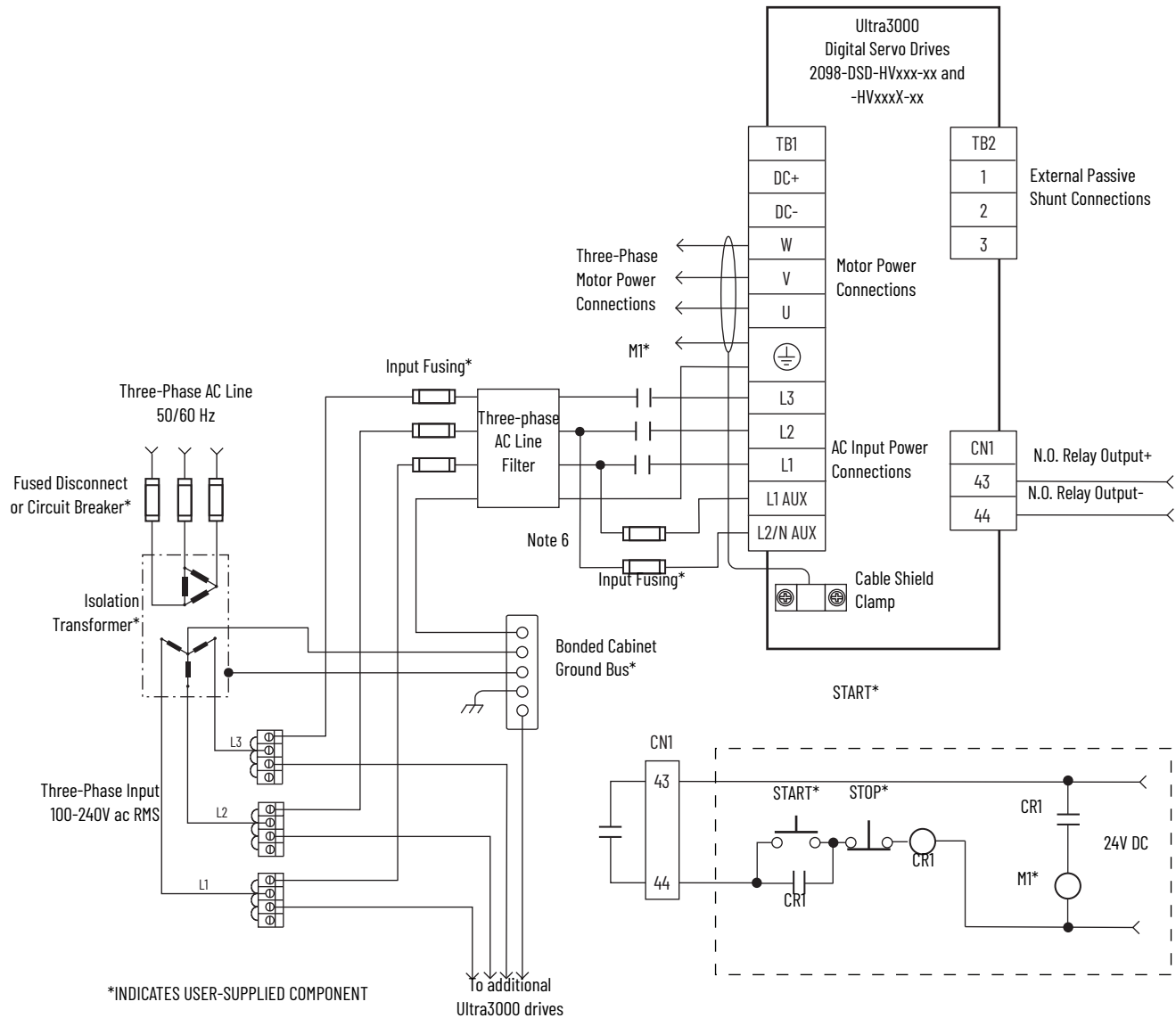


Table 60 - Connectors and Terminal Blocks Detail

Symbol	Description
L1, L2, L3	Main power input connector
L1C, L2C, P1, P2, DC-	Control power input and DC bus connector (200V class drive)
U, V, W	Motor power output connector
	Ground terminals
DC+, ISH, ESH	Shunt Resistor Connector
I/O	Input/Output signal connector-PLC and I/O functions

Pay attention to the followings when wiring:



ATTENTION: When the power is off, do not touch L1, L2, L3 and U, V, W, P1, P2, DC- and DC+, ISH, or ESH because there may be hazardous voltage present. You must wait until the Charge light is off.

- Separate L1, L2, L3, L1C, L2C, and U, V, W from other wires. The interval should be at least 30 cm (11.8 in.).



ATTENTION: To avoid damaging the drive, do not apply any external capacitors.

Table 61 - Recommended Wire Gauge for Mating Connectors

Servo Drive	Power Wiring - Wire Diameter (AWG)			
	U,V,W	DC+, ISH, ESH	L1, L2, L3,	L1C, L2C
2198-E1004-ERS	24...12	24...12	24...12	24...12
2198-E1007-ERS	24...12	24...12	24...12	24...12
2198-E1015-ERS	24...12	24...12	24...12	24...12
2198-E1020-ERS	24...10	24...10	24...10	24...10
2198-E2030-ERS	24...10	24...10	24...10	24...10
2198-E2055-ERS	14...4	18...8	18...8	18...8
2198-E2075-ERS	14...4	18...8	18...8	18...8
2198-E2150-ERS	14...4	14...4	14...4	14...4

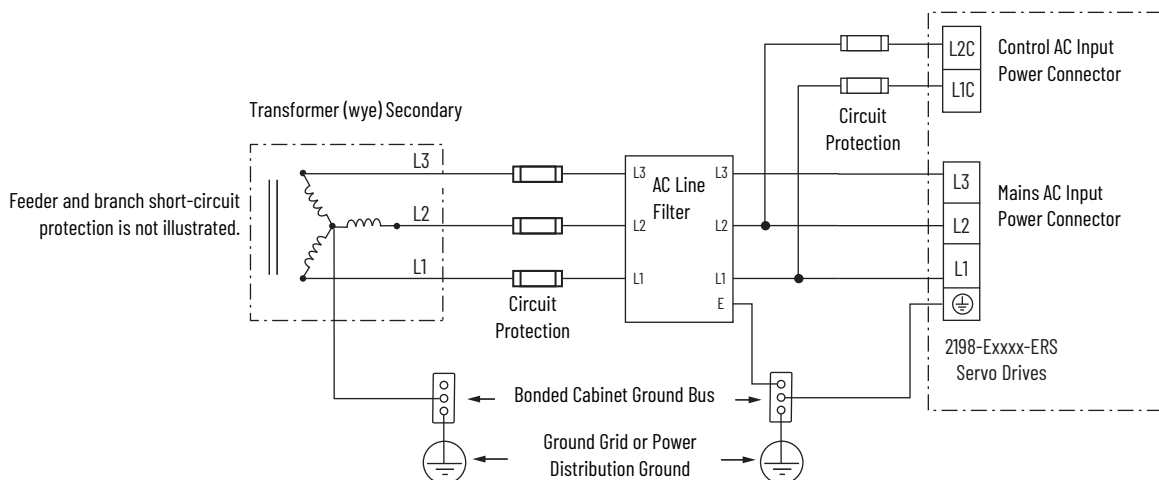
Kinetix 5100 Servo Drive Power Wiring Examples

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

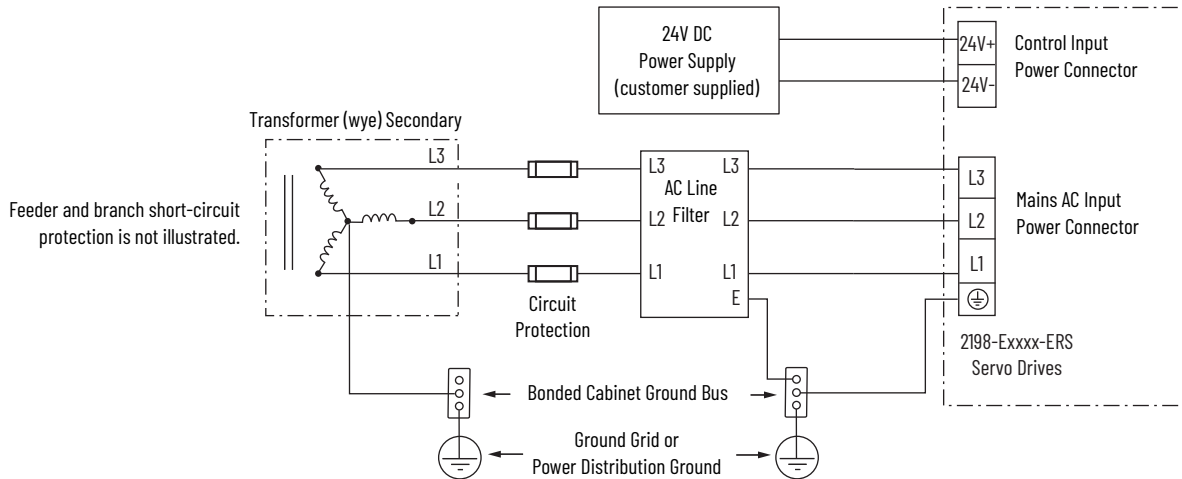
This example illustrates grounded three-phase power that is wired to three-phase Kinetix 5100 drives when phase-to-phase voltage is within drive specifications. You must supply input power components. The three-phase AC line filter is wired as shown in [Figure 36](#).

Figure 36 - Kinetix 5100 Drive Three-phase (200...230V) Grounded Power Configuration (wye secondary)



ATTENTION: For the 230V Kinetix 5100 drives to meet proper voltage creepage and clearance requirements, each phase voltage to ground must be less than or equal to 253V AC rms. This means that the power system must use center-grounded wye secondary configuration for 230V AC mains.

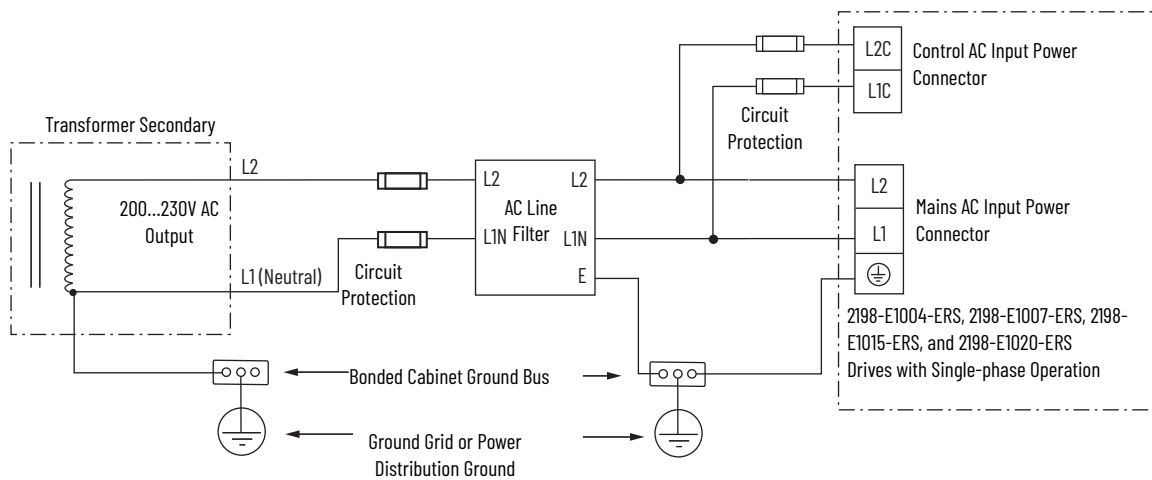
Figure 37 - Kinetix 5100 Drive Three-phase (380...480V) Grounded Power Configuration (wye secondary)



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

These examples illustrate grounded single-phase power that is wired to single-phase Kinetix 5100 drives when phase-to-phase voltage is within drive specifications.

Figure 38 - 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 39 - Kinetix 5100 Drive Single-phase (120V) Grounded Power Configuration

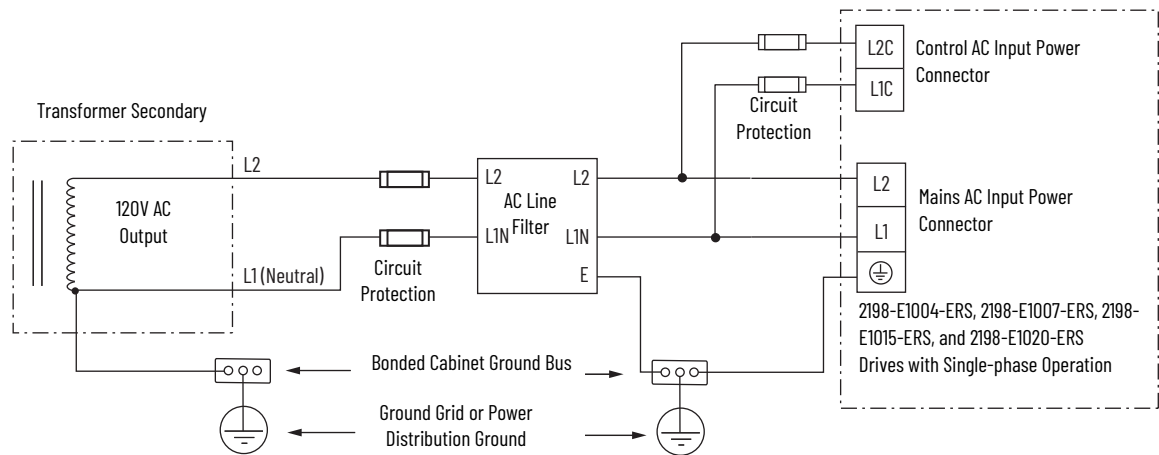
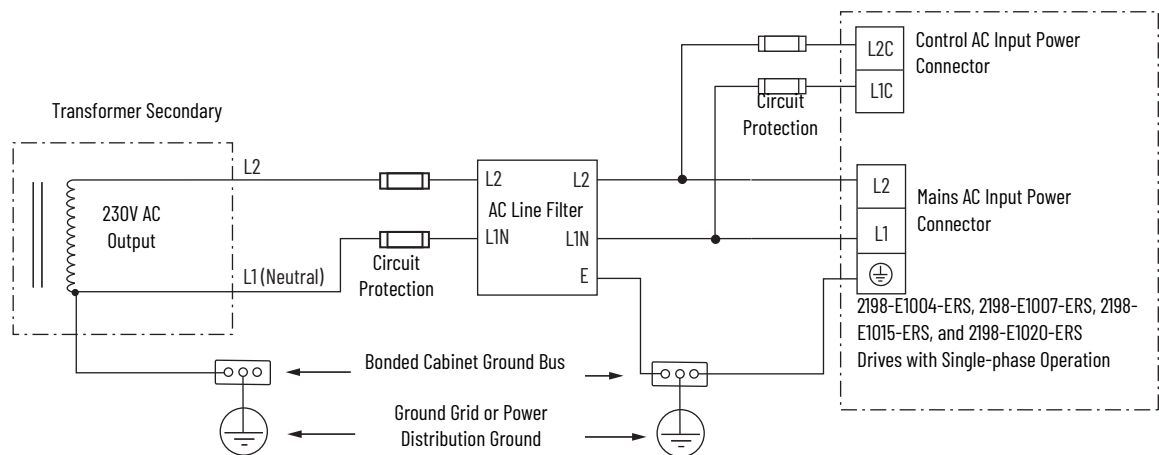


Figure 40 - Kinetix 5100 Drive Single-phase (230V) Grounded Power Configuration



System Architecture

This section lists the typical system components and compares some configurations of Ultra™ 3000 and Kinetix® 5100 drives.

Table 62 - Kinetix 5100 Drive System Overview

Kinetix 5100 System Component	Cat. No.	Description
Kinetix 5100 Servo Drive	2198-Exxxx-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-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-XLxxx	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 configure 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 62 - 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-CxAxx	Motor feedback cables for Kinetix TLY servo motors.
	2090-CPxM6DF-16Axx	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-CEAxx	Motor feedback cables for Kinetix MP servo motors with Hiperface encoders.
	2090-CPxM7DF-xxAxx	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	

The Ultra3000 servo drive is designed to provide a Kinetix Integrated Motion solution for applications with output power requirements between 0.5...22 kW (1.8...32.2 A).

Table 63 - Typical Ultra3000 Servo Drive System

Ultra3000 Drive System Component	Cat. Nos.	Description
Ultra3000 Drives	2098-DSD-xxx and -xxxX	Ultra3000 drive and Ultra3000 drive with indexing available with 500 W, 1 kW, 2 kW, 3 kW, 7.5 kW, and 15 kW continuous output and 230V input power.
	2098-DSD-HVxxx, and -HVxxxX	Ultra3000 drive and Ultra3000 drive with indexing available with 3 kW, 5 kW, 10 kW, 15 kW, and 22 kW continuous output and 460V input power.
Ultra3000-SE Sercos interface Drives	2098-DSD-xxx-SE	Ultra3000 drive with Sercos interface available with 500 W, 1 kW, 2 kW, 3 kW, 7.5 kW, and 15 kW continuous output and 230V input power.
	2098-DSD-HVxxx-SE	Ultra3000 drive with Sercos interface available with 3 kW, 5 kW, 10 kW, 15 kW, and 22 kW continuous output and 460V input power.
Ultra3000-DN DeviceNet Drives	2098-DSD-xxx-DN and -xxxX-DN	Ultra3000 drive with DeviceNet and Ultra3000 drive with indexing DeviceNet available with 500 W, 1 kW, 2 kW, 3 kW, 7.5 kW and 15 kW continuous output with 230V input power.
	2098-DSD-HVxxx-DN and -HVxxxX-DN	Ultra3000 drive with DeviceNet and Ultra3000 drive with indexing DeviceNet available with 3 kW, 5 kW, 10 kW, 15 kW, and 22 kW continuous output with 460V input power.
ControlLogix/SoftLogix Platforms	1756-MxxSE module 1784-PM16SE PCI card	The Sercos interface module/PCI card serves as a link between the ControlLogix/SoftLogix platform and Ultra3000 drive system. The communication link uses the IEC 61491 Serial Real-time Communication System (Sercos) protocol over a fiber-optic cable.
RSLogix 5000® software	9324-RLD300ENE	RSLogix 5000 supports programming, commissioning, and maintaining the Logix family of controllers.
Ultraware Software	2098-UWCPRG	The Ultra3000 Analog and DeviceNet drives are configured using Ultraware software.
Servo Motors	Kinetix MP, 1326AB, F-, H-, N-, and Y-Series	The Kinetix MP (Low Inertia, Integrated Gear, and Food Grade) 230V and 460V, 1326AB (M2L/S2L) 460V, and F-, H-, N-, and Y-Series 230V motors are available for use with the Ultra3000 drives.
Cables	Motor Power, Feedback, and Brake cables	Motor power, feedback, and brake cables include integral molded, bayonet style, quick connect/ quick-release connectors at the motor. Power and brake cables have flying leads on the drive end and straight connectors that connect to servo motors. Standard feedback cables have angled connectors (45°) on the drive end and straight connectors that connect to servo motors.
	Fiber-optic cables	Sercos fiber-optic cables are available in enclosure only, PVC, nylon, and glass with connectors at both ends.

Table 63 - Typical Ultra3000 Servo Drive System (Continued)

Ultra3000 Drive System Component	Cat. Nos.	Description
Cables	2090-CFBM6Dx-CxAxx	Motor feedback cables for Kinetix TLY servo motors.
	2090-CPxM6DF-16Axx	Motor power/brake cables for Kinetix TLY servo motors.
	2090-CFBM7DF-CEAxx	Motor feedback cables for Kinetix MP servo motors with Hiperface encoders.
	2090-CPxM7DF-xxAxx	Motor power/brake cables for Kinetix MP servo motors.
	2090-XXNMF-Sxx 2090-CFBM7DF-CDAFxx	Standard and continuous-flex feedback cables that include additional conductors for use with incremental encoders.
AC Line Filters	2090-UXLF-xxx	AC line filters with 6 A, 10 A, 23 A, 32 A, 36 A, and 50 A are available for Ultra3000 (230V) drive systems.
	2090-UXLF-HVxxx	AC line filters with 23 A, 30 A, and 50 A are available for Ultra3000 (460V) drive systems.
External Shunt Modules	2090-UCSR-xxxx, 9101-1183, and 2090-SRxxx-xx	External shunt modules are available when the Ultra3000 drive internal shunt capability is exceeded.

This system examples in [Figure 41](#), [Figure 42](#), and [Figure 43](#) illustrate how the required drive modules and accessories are used in a typical Ultra3000 servo drive system.

Figure 41 - Ultra3000 Servo Drive System Architecture (Serial Interface)

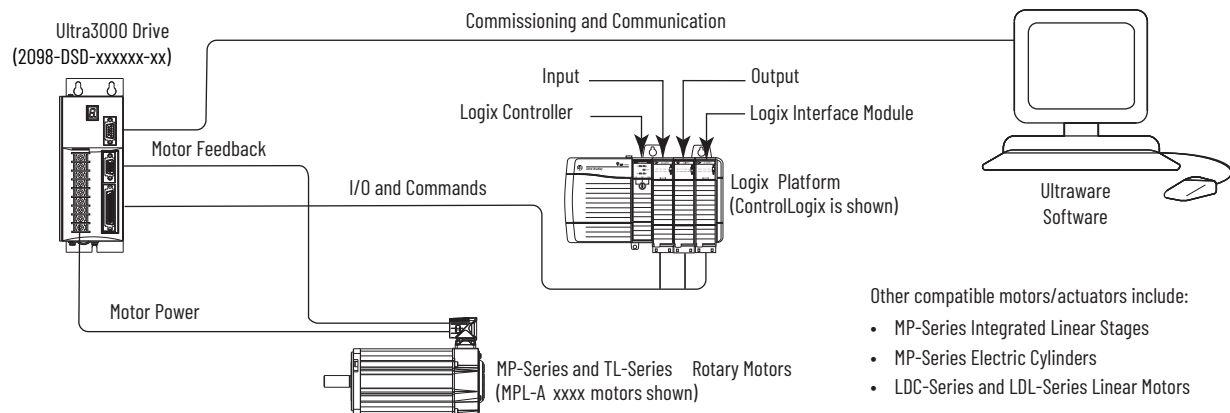


Figure 42 - Ultra3000 Servo Drive System Architecture (DeviceNet Interface)

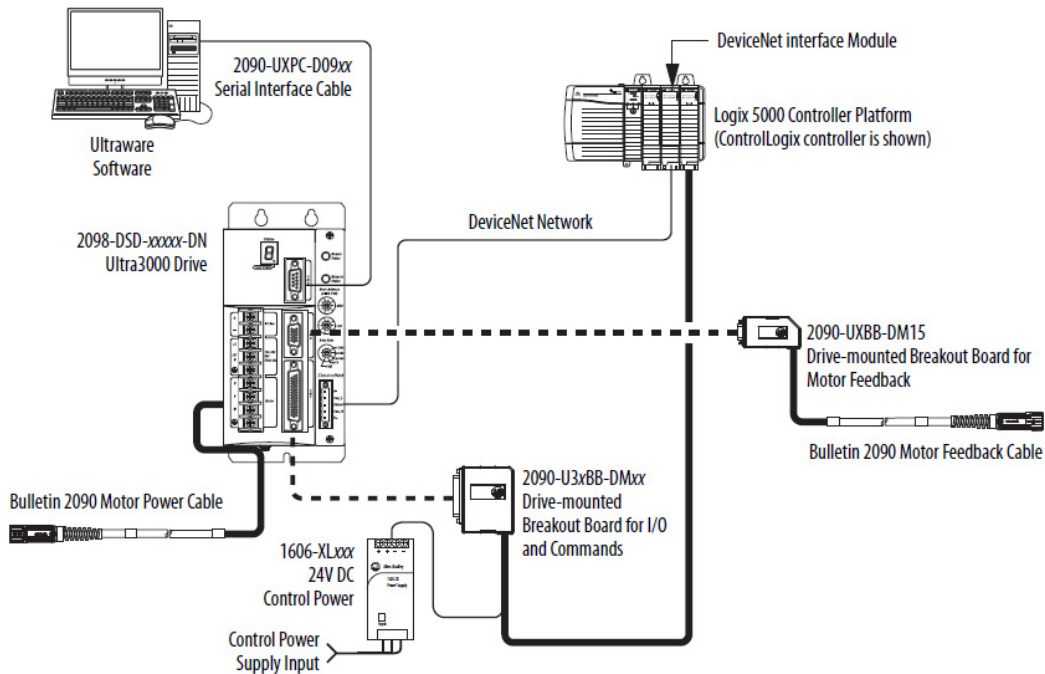
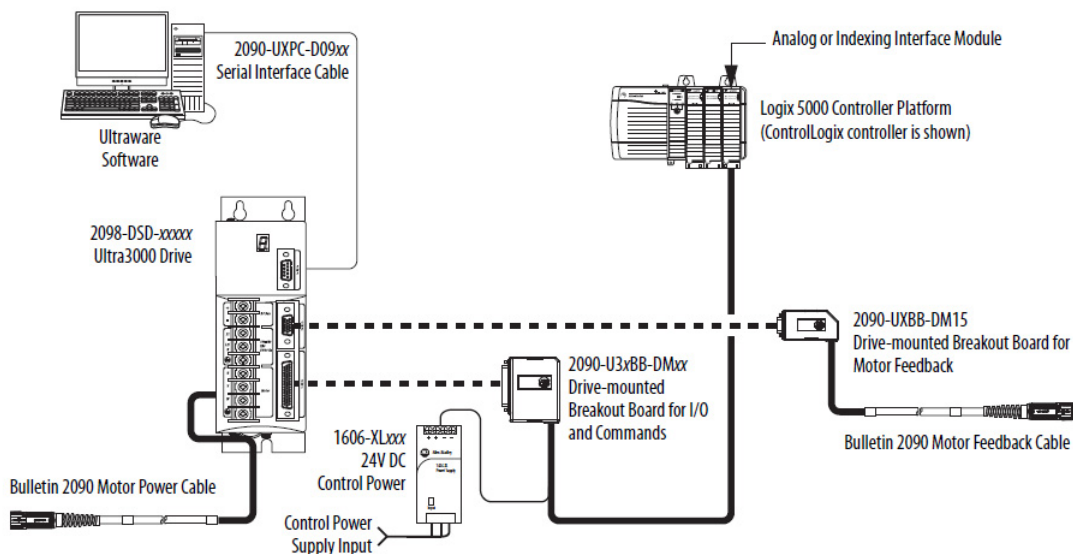


Figure 43 - Ultra3000 Servo Drive System Architecture (Analog or Indexing)



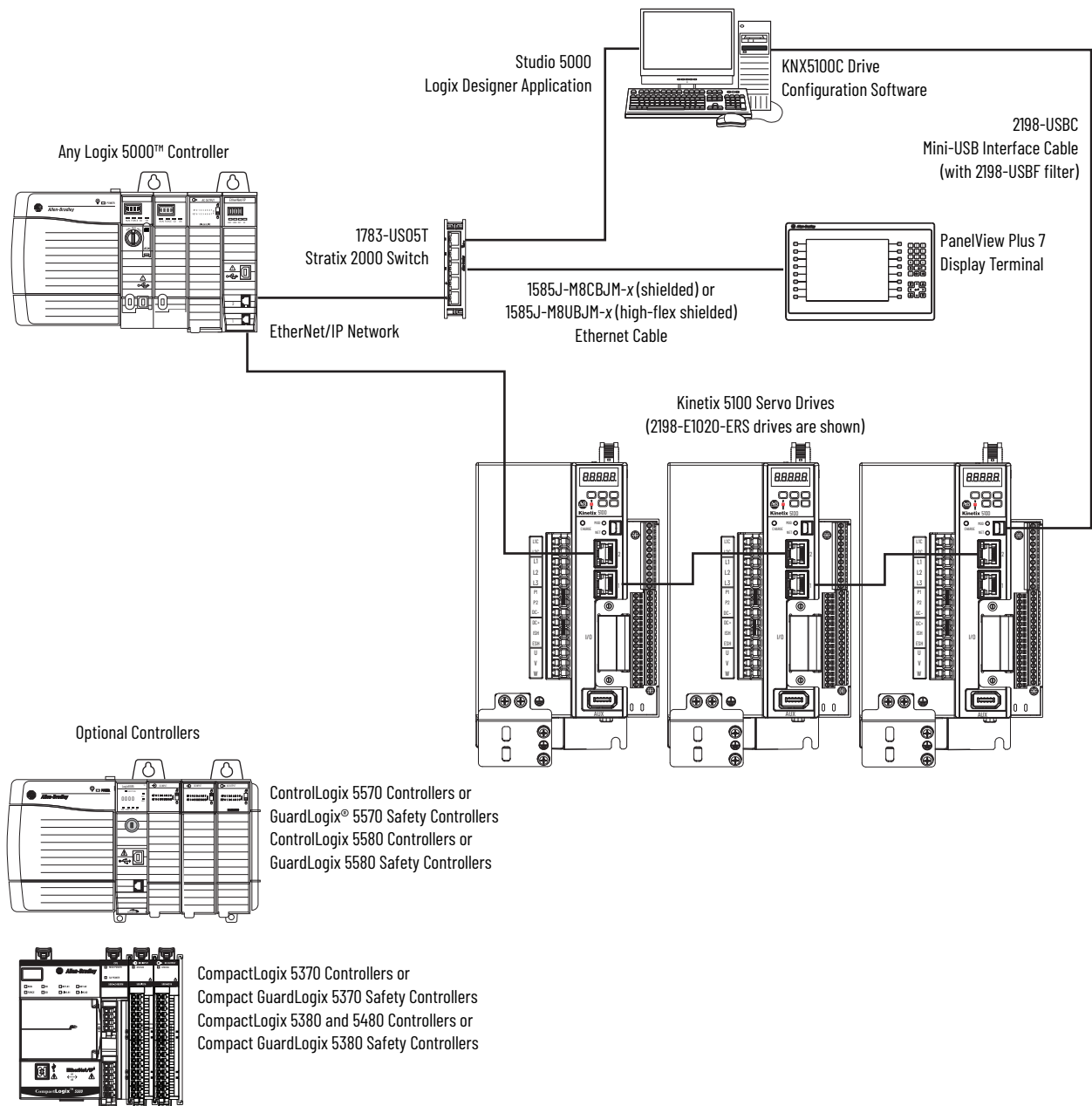
Kinetix 5100 Drive System Architecture

This section shows typical Kinetix 5100 servo drive systems. Kinetix 5100 drives work with different controllers and can receive commands from many different sources.

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) which can replace the Ultra3000 drive controlled through a DeviceNet interface. It provides Add-On Instructions that emulate native Logix motion instructions for Studio 5000-based programming.

Figure 44 - Kinetix 5100 Drive Controlled Via Motion Control Add-On Instruction



Kinetix 5100 Drive Controlled Via Explicit Messaging

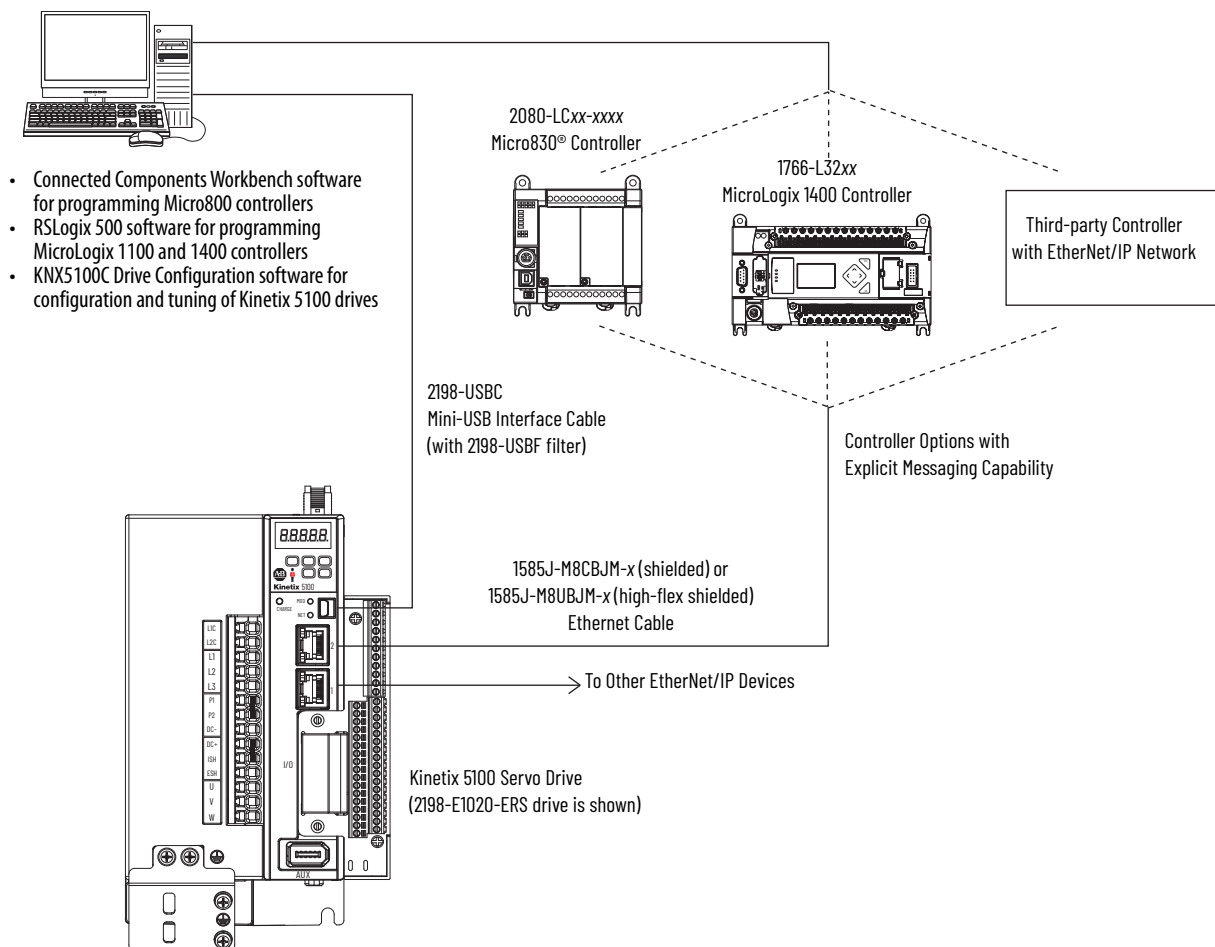
The Kinetix 5100 Servo Drive supports parameter configuration through Class 3 EtherNet/IP explicit messaging, which can replace the Ultra3000 drive controlled through host commands. Either MicroLogix/Micro800 or third-party controllers (must be capable of Class 3 EtherNet/IP messaging) can be used to 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

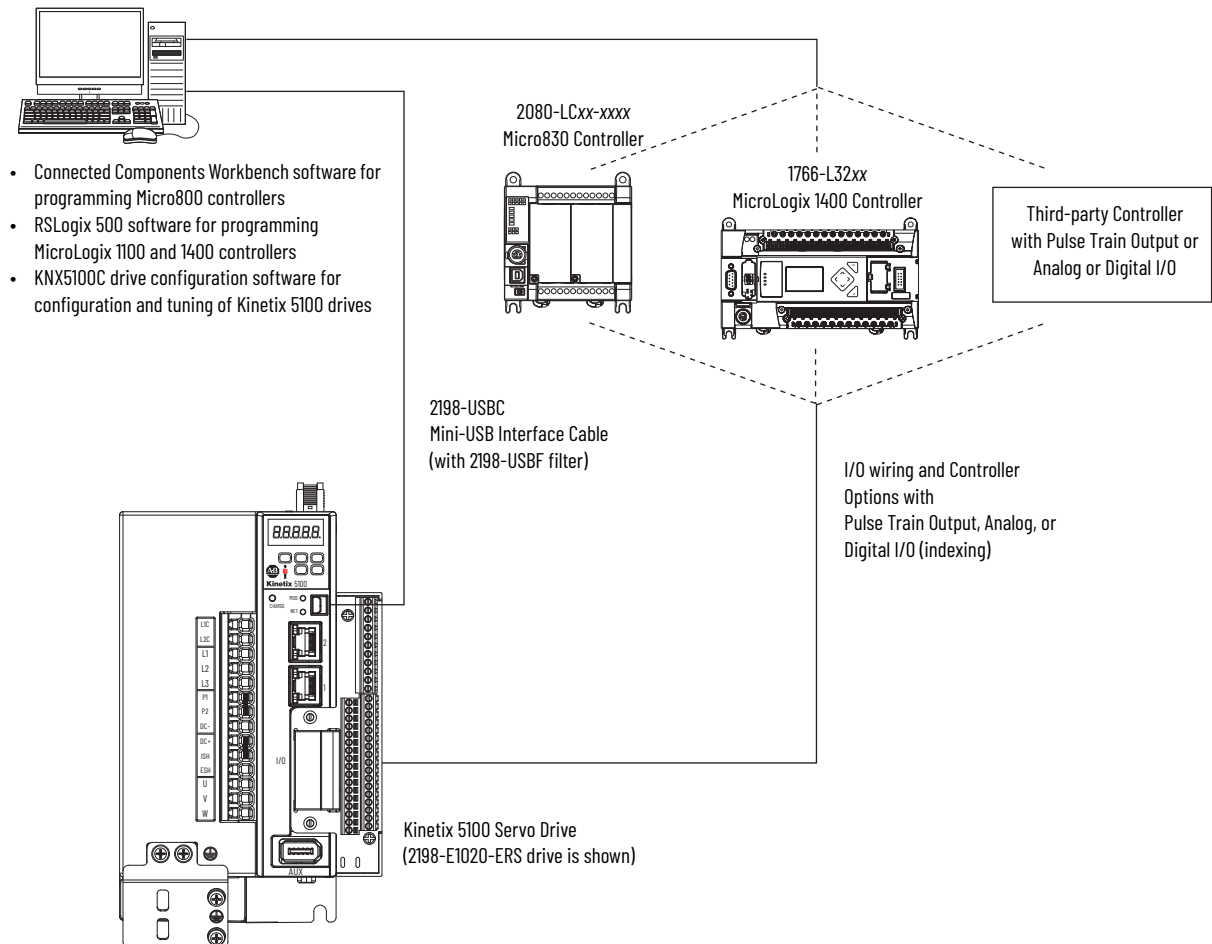
Figure 45 - Kinetix 5100 Drive Controlled Via Explicit Messaging



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), which can replace the Ultra3000 drive controlled with pulse train, analog, indexing respectively.

Figure 46 - Kinetix 5100 Drive Controlled Via Pulse Train/ Analog/ Digital I/O



Notes:

Application Conversion

This chapter provides application examples to migrate Ultra™ 3000 drives to Kinetix® 5100 drives.

Ultraware software is used to configure the Ultra3000 drives. For information on how to use the Ultraware software, see the Ultraware Software User Manual, publication [2098-UM001](#).

KNX5100C software is used to configure the drives. Depending on the controller used, Studio 5000 Logix Designer® application (for ControlLogix®, CompactLogix™), Connected Components Workbench™ (for Micro800-Series controllers), or RSLogix 500® software (for MicroLogix™ controller) is required to program the controller for controlling the Kinetix 5100 drives.

The Kinetix 5100 drive uses a Logix controller that is programmed with the Logix Designer application, along with Add-on Profiles (AOP) which include the ability to:

- get and set a defined set of drive parameters through a Class 1 I/O message using IO assemblies that are defined as part of the AOP.

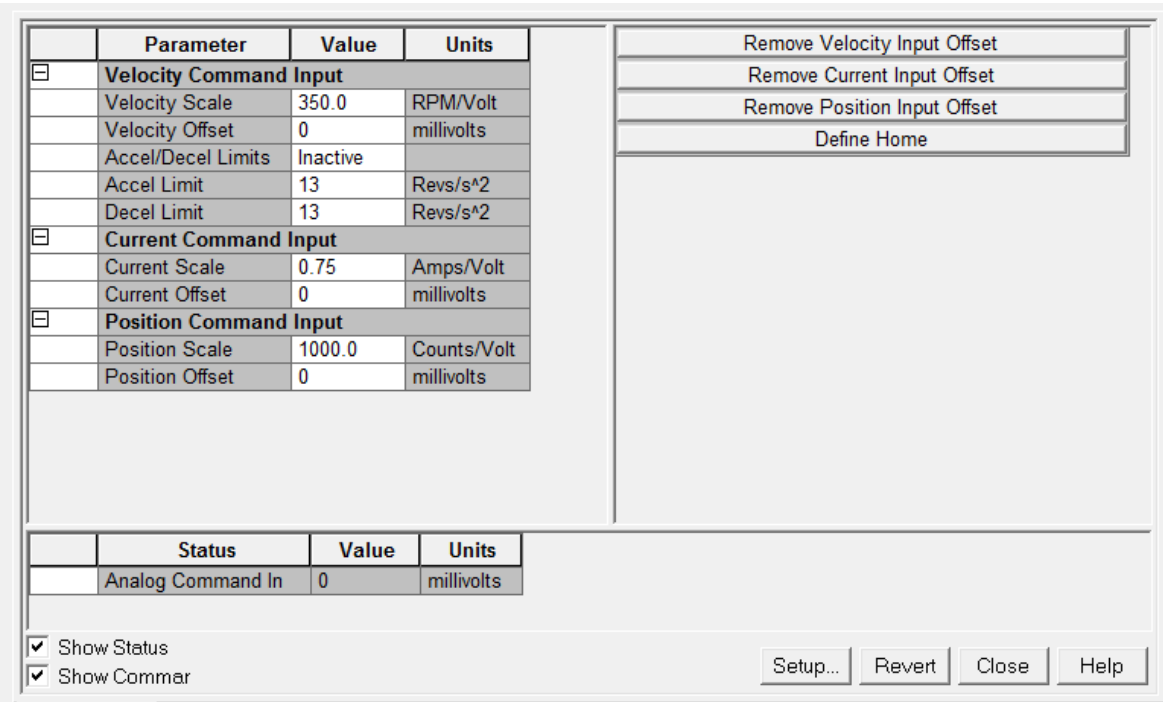
For information on how to use KNX5100C software, see the Kinetix 5100 User Manual, publication [2198-UM004](#).

The following examples show the Ultraware software interface followed by the KNX5100C software interface and describe the differences between how they are used to configure the feature.

Scenario 1: Analog
Command to Analog
Command

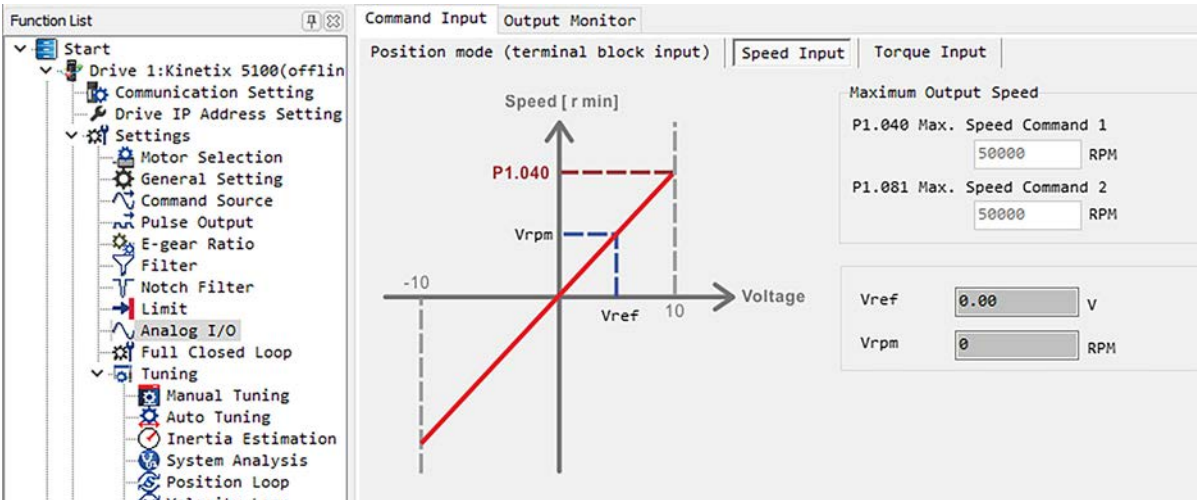
The Analog Input tab in Ultraware software is shown in [Figure 47](#).

Figure 47 - Analog Input Tab in Ultraware



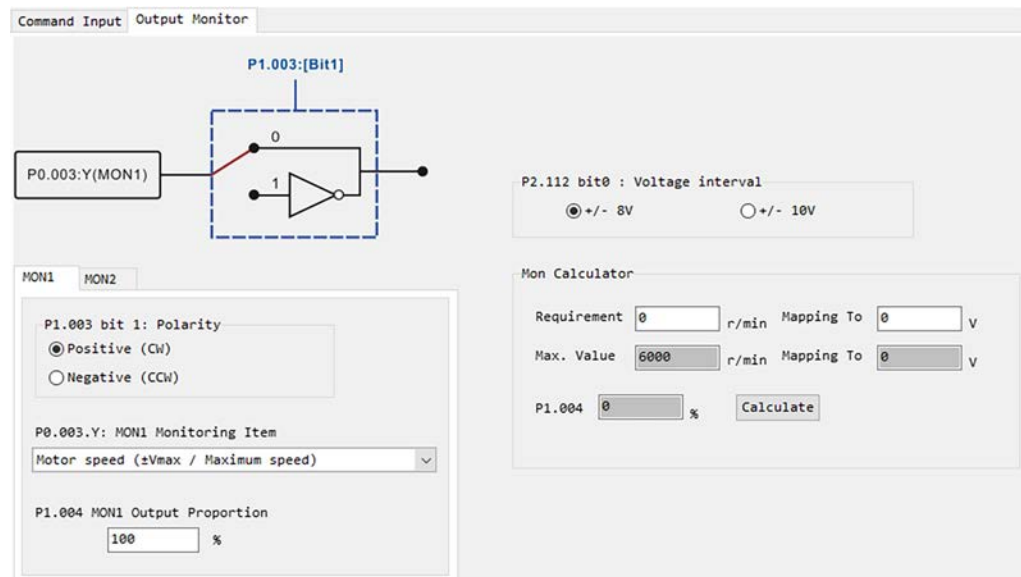
Like Ultraware, KNX5100C software also provides an Analog Speed Input, Analog Torque Input, and Analog Position Input in the Analog I/O tab. You can set the Analog Speed, Analog Torque, or Analog Position Command using the respective tabs shown in [Figure 48](#). To operate Kinetix 5100 drives with the Analog Command, the drive operation mode must be set at T (analog torque), S (analog speed), or PT (analog position) mode (command source ID167 set as Analog Input) respectively.

Figure 48 - Analog I/O Window in KNX5100C Software



KNX5100C software also provides a way to monitor the status of the incoming Analog Command for an online drive in the column Monitoring Output.

Figure 49 - Monitoring Output Window of Analog I/O in KNX5100C Software

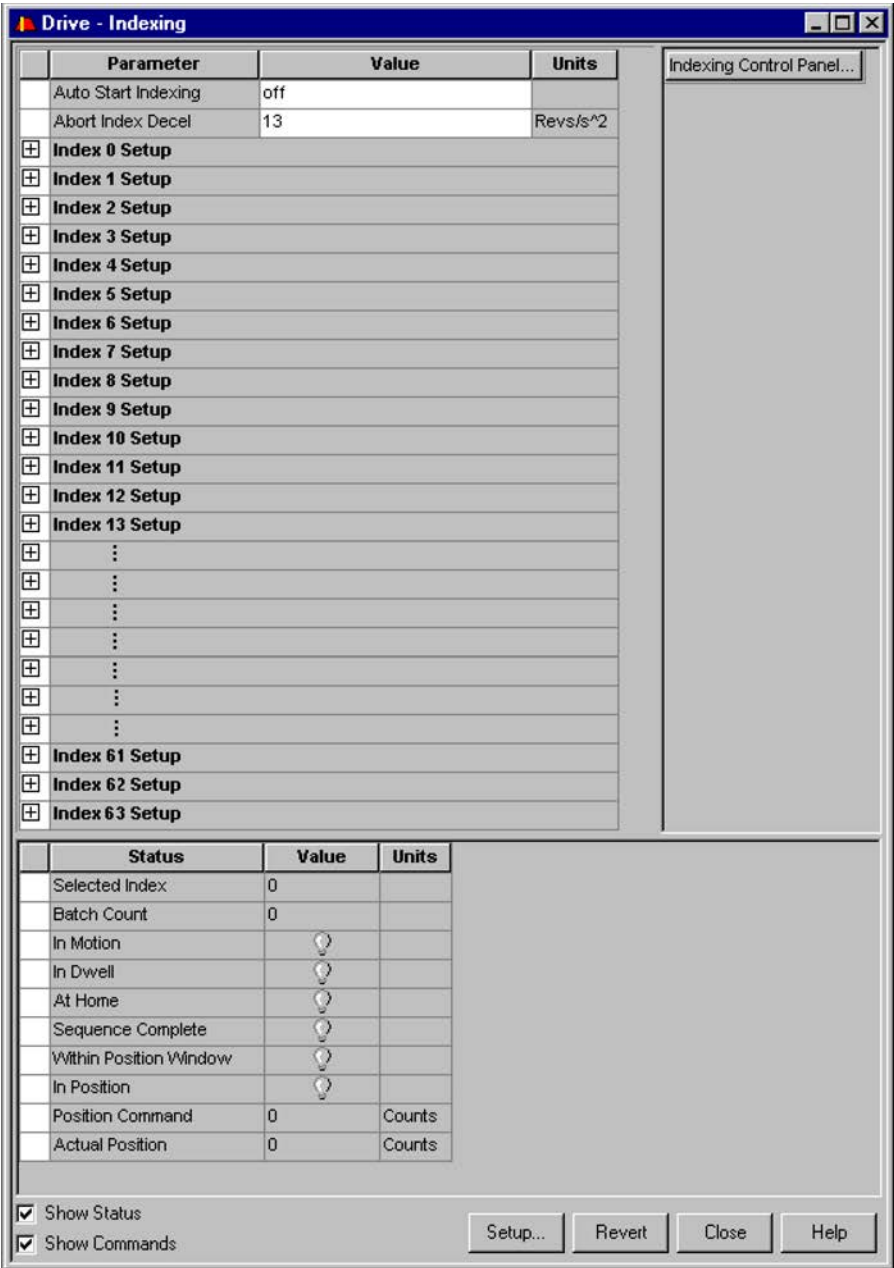


Ultraware software can execute commands that remove Velocity, Current, and Position Input Offsets for an online drive. KNX5100C software does not support this feature.

Scenario 2: Indexing to PR Mode

The Properties window for Indexing branch of Indexing mode looks like this in Ultraware software.

Figure 50 - Indexing Branch of Indexing Mode in Ultraware



In Ultraware software, you can configure up to 64 indexes.

The Ultra3000 drives can support move types including:

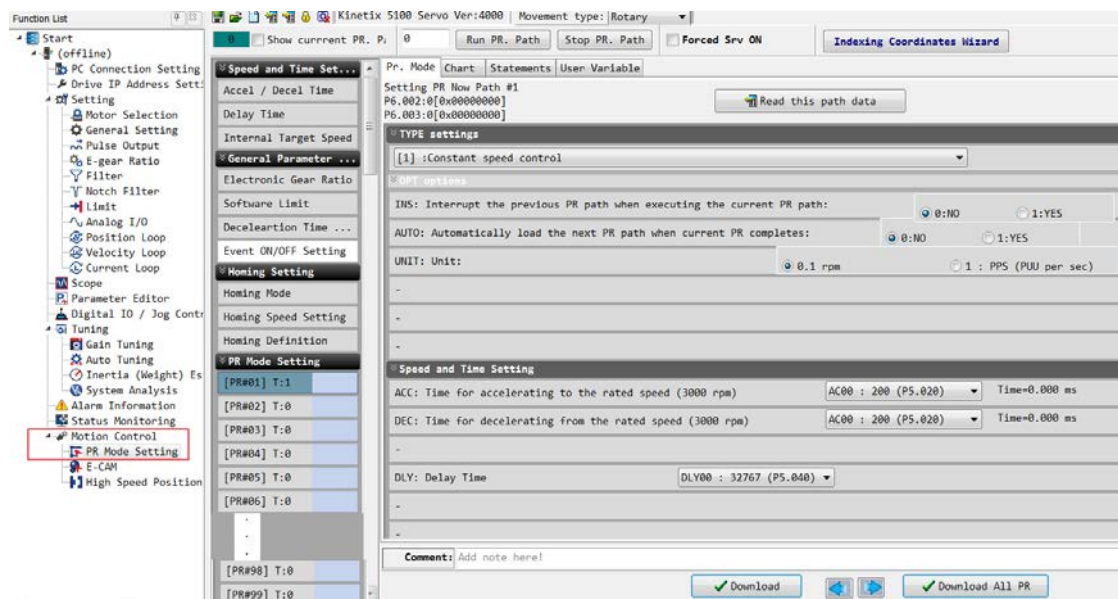
- Absolute
- Incremental
- Jog
- Registration

KNX5100C software provides up to 99 configurable programs, called program registers (PR), and 1 specific command for homing. In PR mode, command settings include:

- Homing
- Constant speed control
- Point-to-point Indexing command
- Jump to specified path
- Write Parameters or Data Array
- Statement (the ability to do arithmetic operations) based on drive conditions

Except for arithmetic operations, the property and corresponding data of each PR command are both set by using KNX5100C software.

Figure 51 - PR Mode Setting Window in KNX5100C Software



Like Ultraware software, KNX5100C software gives you the ability to:

- start and stop execution of the PR command
- start and stop homing
- enable or disable a drive
- monitor the execution of a PR command

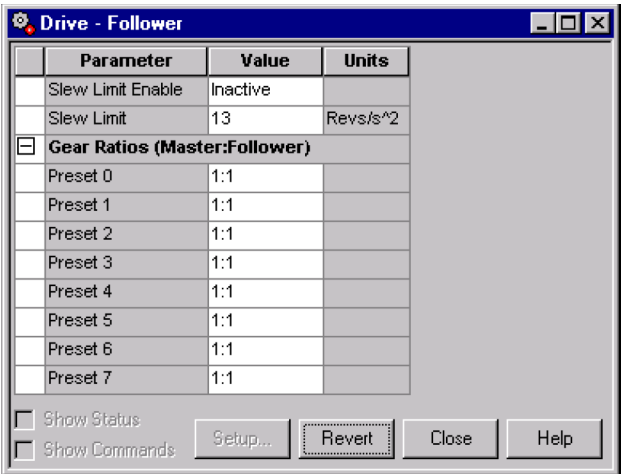
With the Kinetix 5100 drive, a PR command controls drive operation by executing preconfigured motion commands [ID397 (P6.000)...ID596 (P7.099)]. The beginning of the PR command is triggered by the DI.CTRG (oxo8) signal. You can program the 99 registers first before switching the drive to servo-on state and use the DI.POS0 ... DI.POS6 signals as a binary weighted PR command selection. When using I/O mode, the Add-On Instructions are used to initiate PR commands.

See the Kinetix 5100 EtherNet/IP Indexing Servo Drives Users Manual, publication [2198-UM004](#) for more details on homing and the use of the PR command.

Scenario 3: Master/
Follower Mode to PT Mode

The Properties window for the Followers branch of Follower-Auxiliary Encoder mode looks like this in Ultraware.

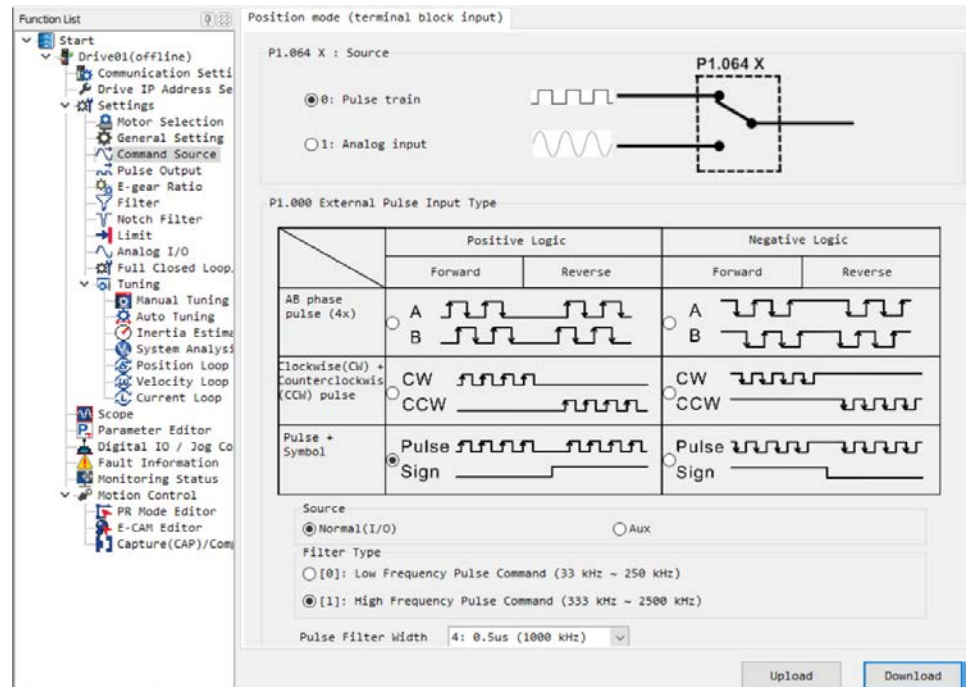
Figure 52 - Follower Branch in Ultraware



In PT mode, the Kinetix 5100 drive provides functionality similar to the Master/Follower mode of the Ultra3000. In PT mode, the servo drive is able to receive a command either from pulse train inputs on the I/O connector or from the Auxiliary feedback input. Valid encoder signals consist of AB phase (TTL incremental feedback) and can be wired to either the PT inputs of the I/O connector (these terminals double as PTO command input signals) or the Aux feedback input. The motor follows the input pulses based on the E-Gear ratio used. The Numerator and Denominator are used to specify the ratio between Master/Follower counts. The E-Gear parameters are shown in [Figure 53](#). The Kinetix 5100 servo drive provides four selectable gear ratios that can be switched by using digital inputs. For details, see the Kinetix 5100 EtherNet/IP Indexing Servo Drives Users Manual, publication [2198-UM004](#).

PT command configuration mode in KNX5100C software is shown in [Figure 53](#).

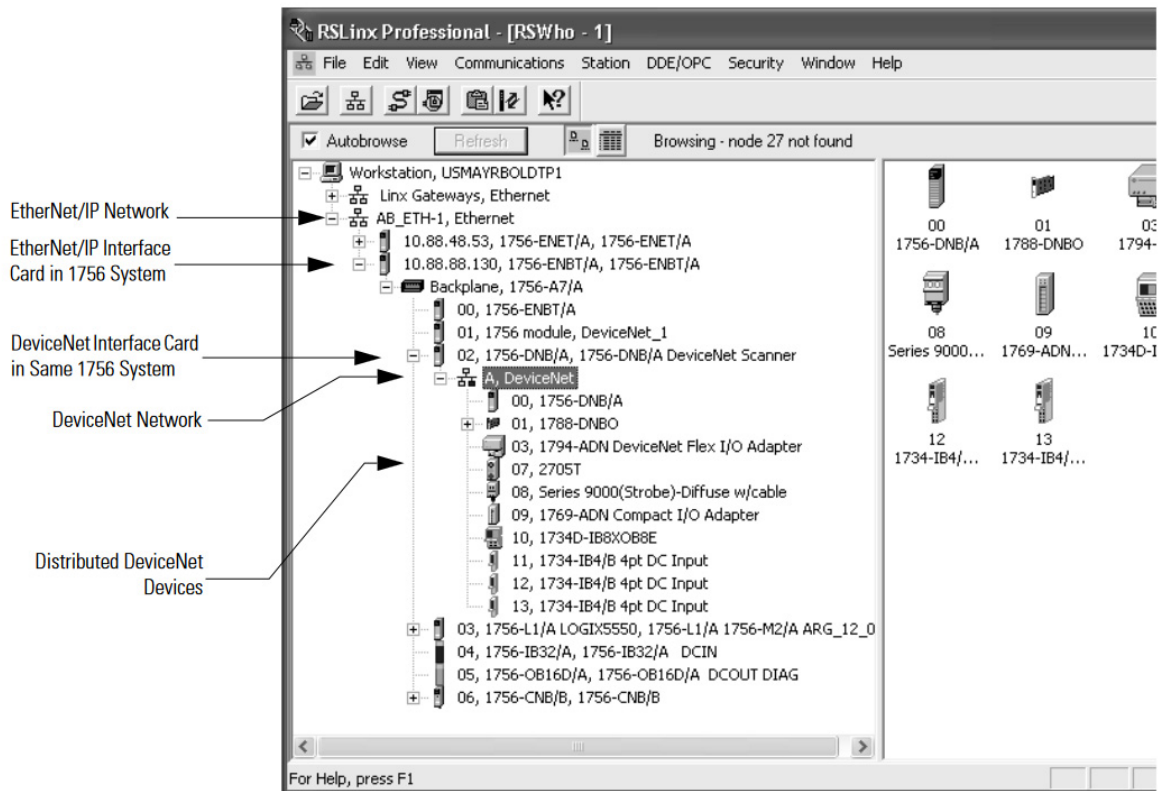
Figure 53 - PT Mode Window in KNX5100C Software



Scenario 4: DeviceNet to I/O Mode

[Figure 50](#) shows the Ultra3000 drive as part of the DeviceNet network. The Logix Designer application is used for programming the Logix 5000 controller. The RSNetWorx™ for DeviceNet software is used to configure the DeviceNet network. This is not required with the Kinetix 5100 drive.

Figure 54 - Ultra3000 DeviceNet Drive in RSLinx® Software



See the DeviceNet Network Configuration User Manual, publication [DNET-UM004](#) for more details.

Kinetix 5100 uses I/O Mode when migrating Ultra3000 with DeviceNet communication. In I/O mode, the Kinetix 5100 Add-on Profile (AOP) in the Logix Designer application provides the Input and Output assemblies for motion control (position, velocity, torque, and indexing). Additionally, pre-defined Add-On Instructions are provided to emulate Logix 5000 controller motion instructions for application programming.

The configuration and Add-On Instruction example are shown in [Figure 55](#) and [Figure 56](#).

Figure 55 - Kinetix 5100 Drive in RSLinx Classic Software

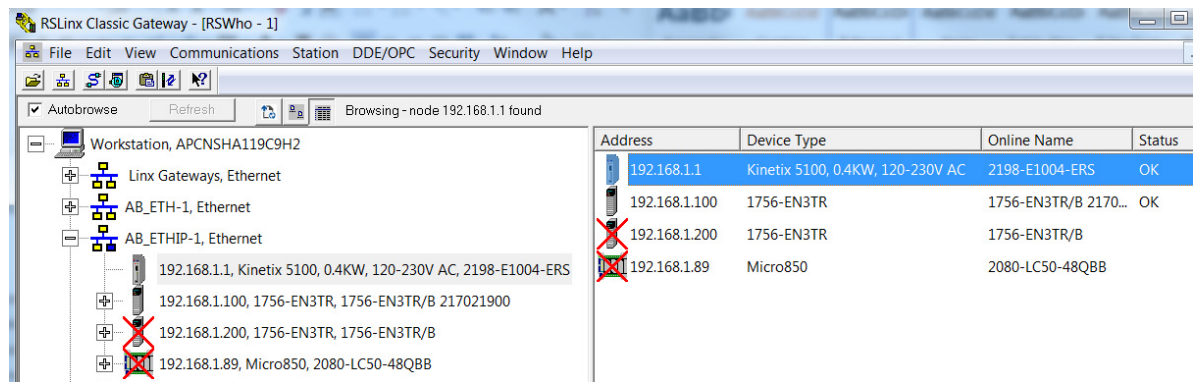
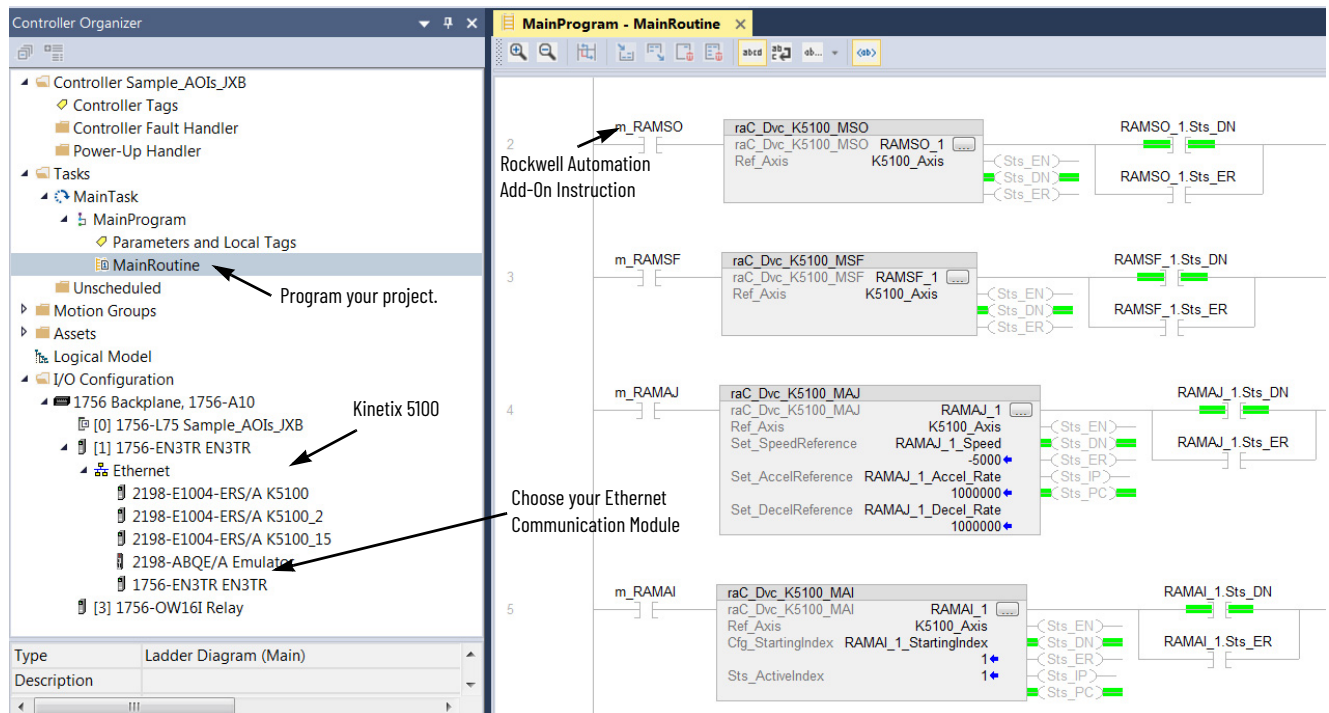


Figure 56 - Kinetix 5100 Drive Add-On Instruction Logic Used in the Logix Designer Application



Scenario 5: Host Command to Explicit Messaging

The Kinetix 5100 drive uses the Ethernet/IP™ network (Class 3 explicit message only) for parameter configuration or editing while the drive is running. The use of Explicit Messaging provides similar functionality to host commands on the Ultra3000 drive. You can use Explicit Messaging to perform a number of tasks, such as parameter configuration, motion control, resetting the drive, and more.

This example shows how to replace the indexing function through the host commands of the Ultra3000 drive by using Explicit Messaging on the Kinetix 5100 drive:

1. Make sure that the control mode is 0x01 (PR mode) by doing the following:
 - Use explicit message 'Get Attribute Single (14), Class 15, Instance 117, Attribute 1' to get the control mode from the drive.
 - If the control mode is not 0x01, then use the explicit message 'Set Attribute Single(16), Class 15, Instance 117, Attribute 1, UINT Value (0x01)' to change the control mode to PR mode.
 - The control mode parameter change is valid after the power cycle, so use the explicit message 'Reset (5), Class 1, Instance 1' to reset the drive.
2. Configure the system parameters (see the Kinetix 5100 EtherNet/IP Indexing Servo Drives Users Manual, publication [2198-UM004](#), for more details about these parameters)
 - Use explicit message 'Set Attribute Single (16), Class 15, Instance 151, Attribute 1, UDINT Value (for example, 16777216)' to set the Gear Ratio of Master Counts.
 - Use explicit message 'Set Attribute Single (16), Class 15, Instance 152, Attribute 1, UDINT Value (for example, 2000)' to set the Gear Ratio of Follower Counts.
 - Use explicit message 'Set Attribute Single (16), Class 15, Instance 234, Attribute1 UDINT Value (for example, 10000000)' to set the Indexing Coordinates Scale.
 - Use explicit message 'Set Attribute Single (16), Class 15, Instance 242, Attribute1 UINT Value (for example 0x0000)' to set the Absolute System Setting. Like the control mode, a reset is needed for the change of this parameter to take effect.
3. Configure the PR command
 - Define the Home Setting (for example, deceleration time of first homing and second homing is 200 ms, delay time is 0 ms, acceleration time is 200 ms, and stop after homing complete) by explicit message 'Set Attribute Single (16), Class 15, Instance 397, Attribute 1, UDINT Value (0x00000000)'.
 - Define the Home Position by explicit message 'Set Attribute Single (16), Class 15, Instance 398, Attribute 1, UDINT Value (for example, 0)'.
 - Set the Home Mode (for example, look for Z pulse in forward direction and define it as home) by explicit message 'Set Attribute Single (16), Class 15, Instance 297, Attribute 1, UINT Value (0x04)'.
 - Set PR Command1 Setting (for example, constant speed control) by explicit message 'Set Attribute Single (16), Class 15, Instance 399, Attribute 1, UDINT Value (0x00000001)'.
 - Set PR Command1 Data (speed command: 300 RPM) by explicit message 'Set Attribute Single (16), Class 15, Instance 400, Attribute 1, UDINT Value (3000, unit is 0.1 RPM)'.
 - Set PR Command2 Setting (for example, positioning control) by explicit message 'Set Attribute Single (16), Class 15, Instance 401, Attribute 1, UDINT Value (0x00000002)'.

- Set PR Command2 Data (position command: 4000) by explicit message 'Set Attribute Single (16), Class 15, Instance 402, Attribute 1, UDINT Value (4000)'.
4. Execute the Indexing function by doing the following:
- Set the drive to Servo On by explicit message 'Set Attribute Single (16), Class 15, Instance 215, Attribute 1, INT Value (1)'.
 - Set the drive to Servo Off by explicit message 'Set Attribute Single (16), Class 15, Instance 215, Attribute 1, INT Value (-1)'.
 - Trigger Homing by explicit message 'Set Attribute Single (16), Class 15, Instance 300, Attribute 1, UINT Value (0)'.
 - Trigger PR Command1 by explicit message 'Set Attribute Single (16), Class 15, Instance 300, Attribute 1, UINT Value (1)'.
 - Stop the PR Command by explicit message 'Set Attribute Single (16), Class 15, Instance 300, Attribute 1, UINT Value (1000)'.
 - Get the status of PR Command by explicit message 'Get Attribute Single (14), Class 15, Instance 300, Attribute 1'.

Notes:

Feature Comparison

Table 64 compares the features of the Ultra™ 3000 drives to the Kinetix® 5100 drives.

Table 64 - Feature Comparison

Features	Ultra3000 Drives			Kinetix 5100 Drives	Notes. Items with asterisks(*) have more information in this column.
	Analog	Indexer (-X)	DeviceNet (-DN)		
Controller used	No	No	Yes	Yes*	*Depending on control mode for Kinetix 5100 drives
120...230V operation	Yes	Yes	Yes	Yes	—
Internal shunt available	*	*	*	Yes**	* No for small Ultra3000 drives (under 2 kW), yes for larger Ultra3000 drives **Internal or External - drive dependent
Control Power available (converted to 5V)	Yes*	Yes*	Yes*	Yes**	*Ultra3000 drive: 24 to 5V DC converter required. **Kinetix 5100: 400V-class: 24V DC, 200V-class: 115/240V AC single phase
Safe Torque Off	No	No	No	Yes	—
Digital inputs control indexing	No	Yes	Yes	Yes	—
Dedicated Auxiliary feedback encoder connector	No	No	No	Yes	—
Master Gearing encoder inputs (terminal block inputs)	Yes	Yes	Yes	Yes	—
Hardware limits	No	Yes	Yes	Yes	—
Analog input for current limit	Yes	Yes	Yes	No	—
Multiple assignments for inputs	Yes	Yes	No	Yes*	*Not native, can use Digital I/O status to evaluate I/O in PR mode.
Soft limits	No	Yes	Yes	Yes	—
Watch window output assignment	Yes	Yes	Yes	Yes*	* Not directly, programmable within PR mode
Registration index (index on reg input)	No	Yes	Yes	Yes	—
Registration latch (capture position)	No	No	No	Yes*	*Available in PR mode (Capture/Compare)
MicroLogix™/SLC™ controller compatible	*	Yes	Yes	Yes	*Stepper mode only
Hardware enable required	No	No	No	Yes*	* I/O mode does not require a hardware enable input
Selectable modes of operation via digital inputs	Yes	Yes	Yes	Yes*	* Kinetix 5100: can change modes with dual or multi-mode changes and digital inputs.
Buffered encoder outputs (selectable freq)	Yes	Yes	Yes	Yes	—
Holding brake support	Yes	Yes	Yes	Yes*	*Configurable in KNX5100C software
Dual Loop Control	No	No	No	Yes*	*PT, PR mode and IO position mode
Multiple Motors Supported	Yes	Yes	Yes	Yes*	* Kinetix MP Motor, TLP Motor, TL and TLY Motor
Dual-port Ethernet with DLR support	No	No	No	Yes	—
Non-Integrated Motion Drive (Ethernet/IP Standalone)	No	No	No	Yes	—
Drive configuration software required	Yes	Yes	Yes	Yes	—
Ability to home the drive	No	Yes	Yes	Yes	—

Table 64 - Feature Comparison (Continued)

Features	Ultra3000 Drives			Kinetix 5100 Drives	Notes. Items with asterisks(*) have more information in this column.
	Analog	Indexer (-X)	DeviceNet (-DN)		
Rotary mode support	Yes	Yes	Yes	Yes*	* Not natively, uses Indexing Coordinate System, see the Kinetix 5100 EtherNet/IP Indexing Servo Drives User Manual, publication 2198-UM004 for more details.
Current limiting ability	Yes	Yes	Yes	Yes	—
Positioning via analog input	No	Yes	Yes	Yes	—
Operation mode override	No	Yes	Yes	Yes	—
Slew rate for gearing	No	Yes	No	No	—
Selectable modes of operation	Yes	Yes	Yes	Yes	—
Pause index directly	No	Yes	Yes	Yes*	* Not natively, programming required
Offline software	Yes	Yes	Yes	Yes	—
Start next Index on input	No	Yes	Yes	Yes*	* Not natively, programming required
Batch Count	No	Yes	No	Yes*	* Not natively, programming required
Homing, Active/Switch/Marker	Yes	Yes	Yes	Yes	—
Homing, Absolute	Yes	Yes	Yes	Yes	—
Home to Torque Limit	No	No	No	Yes	—
Define Home current position	Yes	Yes	Yes	Yes	—
Stop Indexing	Yes	Yes	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

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

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Publication 2198-RM003B-EN-P - November 2020

Supersedes Publication 2198-RM003A-EN-P - February 2020

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