

Ultra3000 Digital Servo Drives to Kinetix 5300 Servo Drives

Catalog Numbers 2198-C1004-ERS, 2198-C1007-ERS, 2198-C1015-ERS, 2198-C1020-ERS, 2198-C2030-ERS, 2198-C2055-ERS, 2198-C2075-ERS, 2198-C4004-ERS, 2198-C4007-ERS, 2198-C4015-ERS, 2198-C4020-ERS, 2198-C4030-ERS, 2198-C4055-ERS, 2198-C4075-ERS

Allen-Bradley
by ROCKWELL AUTOMATION

Migration Guide

Original Instructions

Important User Information

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

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

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

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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).

Appendix A

Connectors and Field Connections

Appendix B

About the Servo Drive System

Appendix C

Specifications

Appendix D

Interconnect Diagrams

Appendix E

Communication Configurations

The purpose of this migration guide is to provide essential information needed to determine what hardware changes could be necessary when migrating from a motion system that contains Ultra™ 3000 (with Sercos) servo drives to the Kinetix® 5300 servo drives.

Migrating a system from an Ultra3000 servo drive to a Kinetix 5300 servo drive system requires a comprehensive design review of the entire motion control system. There are system-wide changes that are required because of the communication protocol being employed.

As a result, this migration guide is not an all-inclusive document. It does not describe all redesign steps that could 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.

You must review additional product literature (see Additional Resources on page 7) to understand the technical similarities and differences between the Ultra3000 servo drive and a Kinetix 5300 servo drive. This can help you determine the proper solution for your migration.

Pre-migration

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

The performance capabilities of any replacement drive should be reviewed to be sure that the replacement drive is capable of delivering the required level of peak and continuous current to the motor and the Motion Analyzer tool can help with the correct drive selection.

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

Controller Files – Upload and save any network files and programmable logic controller (PLC) programs.

Electrical Noise Reduction – See the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001 or Servo Drive Installation Best Practice Application Technique, publication MOTION-AT004, for information on the concept of high-frequency (HF) bonding, the ground plane principle, and electrical noise reduction.

Select a Replacement Drive

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

Ultra3000 drives can be replaced with a Kinetix 5300 drive of similar, or in some cases, greater output current capability.

In general, the Kinetix 5300 drives with similar current ratings require a smaller physical space compared to the Ultra3000 drives.

Factors that affect the redesign effort include these considerations:

- Drive sizing (ratings and physical)
- Dimension comparison
- Drive interconnects and cabling
- Accessories

Engineering Effort and Product Liability

Thoroughly review this document before you begin to evaluate the design changes required to successfully migrate your Ultra3000 servo drive to a Kinetix 5300 servo drive.

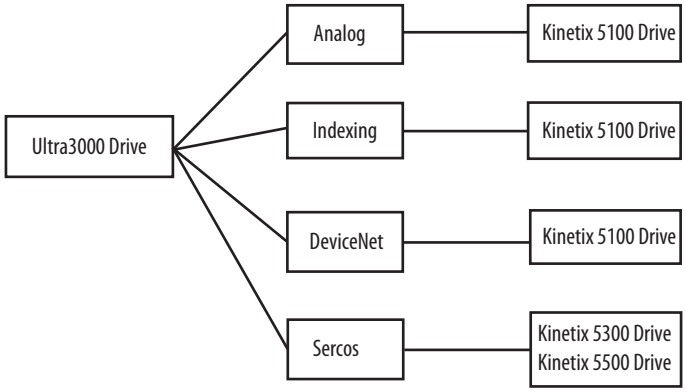
ATTENTION: Because of the variety of uses for the products described in this publication, those responsible for the application and use of these products must themselves satisfy, that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, 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.

The following sections highlight the differences between Ultra3000 and Kinetix 5300 servo drives. There can be more differences beyond these that can impact your application. Read this entire document before proceeding to qualify the Kinetix 5300 servo drive for your needs.

Migration Options

This document covers the migration of the Ultra3000 Sercos servo drive only, though it is possible to migrate from the other Ultra3000 servo drive types. For additional migration options, see Ultra3000 to Kinetix 5100 Servo Drives Migration Guide, publication 2198-RM003.

Figure 1 - Suggested Migration Options



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 VPL, VPC, VPF, VPH, and VPS; Kinetix MPL, MPM, MPF, and MPS; Kinetix TLY and TL; and Kinetix HPK rotary motors.
Kinetix Linear Motion Specifications Technical Data, publication KNX-TD002	Product specifications for Kinetix MPAS and MPMA linear stages, Kinetix MPAR and MPAI electric cylinders, and LDC-Series™ and LDL-Series™ linear motors
Kinetix Servo Drives Specifications Technical Data, publication KNX-TD003	Product specifications for Kinetix Integrated Motion over the EtherNet/IP network, Integrated Motion over Sercos interface, EtherNet/IP networking, and component servo drive families.
Kinetix Motion Accessories Specifications Technical Data, publication KNX-TD004	Product specifications for Bulletin 2090 motor and interface cables, low-profile connector kits, drive power components, and other servo drive accessory items
Integrated Motion on Sercos and EtherNet/IP Network – Analysis and Comparison, publication MOTION-AT006	Compares the similarities and differences between systems that use Serial Real-time Communication System (Sercos) interfaces and systems that use EtherNet/IP networks.
Motor Nameplate Datasheet Entry for Custom Motor Applications, publication 2198-AT002	Provides an in-depth discussion on the use of nameplate data entry for custom induction motors and permanent-magnet motors.
System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001	Information, examples, and techniques designed to minimize system failures caused by electrical noise.
Servo Drive Installation Best Practice 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.
Kinetix 5300 Single-axis EtherNet/IP Servo Drives User Manual, publication 2198-UM005	Provides installation instructions to mount, wire, and troubleshoot your Kinetix 5300 drive; and system integration for your drive/motor combination with a Logix 5000 controller (version 33.00 or later).
Kinetix 5300 Drive Systems Design Guide, publication KNX-RM012	System design guide to select the required (drive specific) drive module, power accessory, feedback connector kit, and motor cable catalog numbers for your Kinetix 5300 drive and Kinetix motion control system.
AC Line Filter Installation Instructions, publication 2198-IN003	Provides information on how to install AC line filters designed for Kinetix 5300, Kinetix 5500, and Kinetix 5700 servo drive systems
Shunt Resistor Installation Instructions, publication 2097-IN002	Provides information on how to install and wire Bulletin 2097 shunt resistors.
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.
Ultra3000 Drive Systems Design Guide, publication KNX-RM008	Reference material used to design an Ultra3000 servo drive system.
Ultra3000 Digital Servo Drives Installation Manual, publication 2098-IN003	Mounting, wiring, and connecting procedures for 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 5300 Servo Drives Installation Instructions, publication 2198-IN021	Information mount and wire the Kinetix 5300 servo drive.
Kinetix 5300 Feedback Connector Kit Installation Instructions, publication 2198-IN023	Information to install and wire the Kinetix 5300 motor feedback connector kit.
EtherNet/IP Network Devices User Manual, ENET-UM006	Describes how to configure and use EtherNet/IP devices to communicate on the EtherNet/IP network.
Ethernet Reference Manual, ENET-RM002	Describes basic Ethernet concepts, infrastructure components, and infrastructure features.
System Security Design Guidelines Reference Manual, SECURE-RM001	Provides guidance on how to conduct security assessments, implement Rockwell Automation products in a secure system, harden the control system, manage user access, and dispose of equipment.
Industrial Components Preventive Maintenance, Enclosures, and Contact Ratings Specifications, publication IC-TD002	Provides a quick reference tool for Allen-Bradley® industrial automation controls and assemblies.
Safety Guidelines for the Application, Installation, and Maintenance of Solid-state Control, publication SGI-1.1	Designed to harmonize with NEMA Standards Publication No. ICS 1.1-1987 and provides general guidelines for the application, installation, and maintenance of solid-state control in the form of individual devices or packaged assemblies incorporating solid-state components.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation® industrial system.
Product Certifications website, rok.auto/certifications.	Provides declarations of conformity, certificates, and other certification details.

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

Notes:

Servo Drive and System Considerations

Replacing an Ultra™ 3000 servo drive with a Kinetix® 5300 servo drive requires some system design changes and drive hardware changes. This chapter describes some of the primary differences and considerations. Additional chapters provide in-depth drive comparisons.

Kinetix 5300 Servo Drives

The Kinetix 5300 servo drives and Kinetix TLP servo motors provide a cost-effective motion solution. This solution delivers high performance and scalability, with motor windings that are matched to drive ratings, for optimized system sizing.

Enhancing the current midrange architecture portfolio, this motion system is designed to connect and operate with the CompactLogix™ 5380 controllers by using the Studio 5000 Logix Designer® application (version 33.00 or later) and supporting Integrated Motion on the EtherNet/IP network. With the benefits of this motion system, you can run motion applications on a single control platform by using a single network—simplifying the design, operation, and maintenance of equipment.

Kinetix 5300 Servo Drive Features

The Kinetix 5300 servo drive provides the following features:

- High performance in a smaller footprint and optimized power density
- Single-axis operation for low-cost simplicity
- Integrated motion on the EtherNet/IP network (includes dual-port Ethernet)
- Advanced tuning capabilities that provide tuningless operation, anti-slosh, and anti-sway benefits
- Safe Torque Off control, ISO-13849-1 certified, PL d, category 3
- Offerings for: 100V, 200V, and 400V-class applications
- Kinetix TLP winding options that match the drive ratings for optimized system sizing
  - 0.05...7.5 kW motor rated output power
- Bulletin 2198 and Bulletin 2097 shunt resistor options for additional energy absorption management
- Compatible with the following Allen-Bradley rotary motors

  - Kinetix MPL, MPM, MPF, and MPS 200V and 400V-class servo motors
  - Kinetix TLP 200V and 400V-class servo motors
  - Kinetix TL and TLY 200V class servo motors
- Compatible with the following Allen-Bradley linear actuators
  - LDAT-Series integrated linear thrusters with 200V or 400V operation
  - Kinetix MPAS and MPMA integrated linear stages
  - Kinetix MPAR and MPAI electric cylinders.
- Compatible with LDC-Series™ iron-core and LDL-Series™ ironless linear motors
- Support for Induction Motors with open-loop frequency control and closed-loop control
- Motor feedback connector kit (catalog number 2198-K53CK-D15M) with 15-pin connector plug for compatible motors and actuators. The kit features battery backup for Kinetix TLP, TL, and TLY multi-turn encoders

Kinetix 5300 Servo Drive Components

Kinetix 5300 servo drive systems consist of these required components:

- Any Logix controller (version 33.00 or later) with motion and EtherNet/IP capability
- One 2198-C*xxxx*-ERS servo drive
- One Kinetix TLP servo motor, or other compatible Allen-Bradley motor/actuator, or induction motor
- 2090-series motor cables for power, feedback, and brake connections
- One 1606-XL*xxx* 24V power supply for control and motor brake power
- 1585J-M8CBJM-*x* (shielded) Ethernet cables

Kinetix 5300 servo drive systems can also include any of these optional components:

- One Bulletin 2198 AC line filter (required to meet CE)
- One 2097-R*x* or 2198-R*xxx* shunt resistor
- Bulletin 2198 24V shared-bus connection system
- One 2198-K53CK-D15M feedback connector kit for flying lead cables or battery backup

For detailed Kinetix 5300 servo drive system requirements, see the Kinetix 5300 Drive Systems Design Guide, publication KNX-RM0012.

Kinetix 5300 Servo Drive Selection

For Kinetix 5300 servo drive module specifications not included in this publication, see the Kinetix Servo Drives Technical Data, publication KNX-TD003.

Table 1 - Kinetix 5300 Servo Drive Output Power and Current

Cat. No.	Frame Size	Input Voltage (1)	Continuous Output Power kW	Continuous Output Current A (rms)	Peak Output Current A (rms)
2198-C1004-ERS	1	85...132V rms single-phase 170...253V rms single-phase 170...253V rms three-phase	0.22 0.46 0.72	2.8	6.6 9.5 9.5
2198-C1007-ERS	1		0.36 0.76 1.18	4.6	9.7 15.5 15.5
2198-C1015-ERS	2		0.67 1.41 2.18	8.5	12.2 20.5 29.2
2198-C1020-ERS	2		0.97 2.02 3.13	12.2	25.0 40.6 40.6
2198-C2030-ERS	2	170...253V rms three-phase	5.02	19.6	61.0
2198-C2055-ERS	3		10.30	40.2	108.0
2198-C2075-ERS	3		12.22	47.7	127.5
2198-C4004-ERS	1	342...528V rms three-phase	0.86	1.6	5.3
2198-C4007-ERS	1		1.55	2.9	9.3
2198-C4015-ERS	2		2.78	5.2	18.0
2198-C4020-ERS	2		3.90	7.3	23.8
2198-C4030-ERS	2		6.25	11.7	34.1
2198-C4055-ERS	3		12.08	22.6	58.5
2198-C4075-ERS	3		14.70	27.5	73.5

(1) Nominal input voltage rating (110, 230, or 480V rms) is required to achieve full power.

Communication

The Ultra3000 servo drives use the Sercos interface network for communication. A Sercos interface module serves as a link between the ControlLogix/CompactLogix™ platform and the Ultra3000 servo drive system. The Ultra3000 had the option to configure and program the application with either RSLogix 5000 or Studio 5000 Logix Designer. It is possible to update the RSLogix code from the Ultra3000 to work in Studio 5000 Logix Designer. When migrating to the Kinetix 5300 servo drive, Studio 5000 Logix Designer (version 33.00 or later) is required with a compatible controller.

For Ultra3000 Sercos drives, the communication link uses the IEC 61491 SErial Real-time COmmunication System (Sercos) protocol over a fiber-optic media.

The Kinetix 5300 servo drives use the EtherNet/IP network for communicating to either a ControlLogix or CompactLogix programmable automation controller. All Kinetix 5300 servo drives include dual-port EtherNet/IP connectivity with motion in a Studio 5000 Logix Designer application that is version 33.00 or later.

Supported Ethernet topologies include linear, ring, and star.

For more information on Ethernet design considerations, see these publications:

- Scalability - The Best Approach to Change, publication IA-WP002
- EtherNet/IP Design, Commissioning, and Troubleshooting Quick Reference, publication IASIMP-QR023
- Integrated Motion on EtherNet/IP Configuration Drawing with Notes, publication IASIMP-QR019
- Integrated Motion on Sercos and EtherNet/IP Network – Analysis and Comparison, publication MOTION-AT006
- See the Knowledgebase Technote: Qualifying Logic for MSO

See Appendix E for communication configurations.

Controller, Ethernet Cards, and Switches

The following table lists the compatible hardware for Integrated Motion on EtherNet/IP systems.

Table 2 - EtherNet/IP Compatible Hardware for Integrated Motion

Hardware	Cat. No.	Description
Controllers	Bulletin 1769 Bulletin 5069	Integrated Motion on the EtherNet/IP network in CompactLogix 5370, CompactLogix 5380, and CompactLogix 5480 controllers and Integrated Safety in Compact GuardLogix® 5370 controllers. Linear, Device Level Ring (DLR), and star topology is supported.
Ethernet Communication	1756-EN2T module 1756-EN2TR module 1756-EN3TR module 1756-EN4TR module	EtherNet/IP network communication modules for use with ControlLogix 5570, ControlLogix 5580, GuardLogix 5570, and GuardLogix 5580 controllers. Linear, Device Level Ring (DLR), and star topology is supported.
Ethernet Switches	Stratix® 8300 Layer 3 Modular Managed Ethernet Switches Stratix 8000 Modular Managed Ethernet Switches Stratix 6000 Fixed Managed Ethernet Switches Stratix 5700 Managed Industrial Ethernet Switches Stratix 2000 Unmanaged Ethernet Switches	

Compatible Motors and Actuators

Verify that your existing motor is compatible with the Kinetix 5300 servo drive family. Kinetix 5300 servo drives are compatible with the following motors:

- Kinetix TLP servo motors
- Kinetix MP motors and actuators
- Kinetix TL and TLY servo motors
- LDAT-Series linear thrusters
- LDC-Series and LDL-Series linear motors
- Third-party and applicable Encompass partner permanent magnet and induction motors. Refer to Motor Nameplate Datasheet Entry for Custom Motor Applications, publication 2198-AT002 for more information.

Table 3 - Motor Feedback Device Options

Motor Feedback Device Option	Feedback Type		Description	Feedback Connector
Motor Feedback	Hiperface	High-resolution single-turn and multi-turn, absolute	Applies to Kinetix MPL, MPM, MPF, MPS (-M/S or -V/E); Kinetix MPAS (ballscrew), MPAR, MPAI, linear actuators; and LDAT-Series (- xDx) linear thrusters.	15-pin Motor Feedback (MFB)
	Nikon		Applies to Kinetix TLP motors.	
	Tamagawa		Applies to Kinetix TL (-B) and TLY motors.	
	Digital AqB	Incremental	Applies to Kinetix MPL (-H) rotary motors, Kinetix MPAS (direct-drive) linear actuators, LDAT-Series (-xBx) linear thrusters, Kinetix TLY (-H) servo motors, and Kinetix LDL-series™/ LDC-Series™ linear motors.	
	Digital AqB with UVW			
	Sine/Cosine			
	Sine/Cosine with UVW			
Auxiliary Feedback and Digital Input (1)	Digital AqB	Incremental	Applies to Digital AqB encoders.	20-pin Auxiliary Feedback Connector

(1) The auxiliary feedback connector allows configuration of Digital AqB as a load feedback device or a half-axis (feedback only).

Cable Lengths

Verify that the feedback cable length in your current Ultra3000 servo drive system does not exceed the maximum cable lengths for the Kinetix 5300 servo drives. The maximum cable lengths for the Kinetix 5300 servo drives are:

- Ethernet cable lengths connecting drive-to-drive, drive-to-controller, or drive-to-switch must not exceed 100 m (328 ft). Complete a careful evaluation of your Ethernet media when using a CIP motion solution. For more information, see Guidance for Selecting Cables for EtherNet/IP Networks, publication ENET-WP007.
- Registration and digital input cables greater than 30 m (98.4 ft) must be shielded.
- The length of the power and feedback cables for the Kinetix 5300 drives cannot exceed 50 m (164 ft), although in some cases maximum cable length is less. The maximum drive-to-motor power and feedback cable length depends on the AC input power, motor type, and feedback type.

For more information on cable lengths, see Appendix C and Drive Interconnects and Cable Considerations on page 32.

Physical Dimensions

The physical sizes of the drive families are different (see Dimension Comparison on page 21). In most cases, the Kinetix 5300 servo drives are smaller and fit into the existing space of the compatible Ultra3000 drives; however, you must verify the physical size of the Kinetix 5300 servo drive.

Control and Auxiliary Power

The control and auxiliary power feature lets the drive maintain logic power when main power is removed. This allows communication between the controller and the drive to continue and to maintain position feedback (aside from absolute feedback).

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

All other Ultra3000 servo drives have other auxiliary power requirements. See Appendix C, Control and Auxiliary Specifications, for more information.

The Kinetix 5300 servo drive requires 24V DC input power for control circuitry. You must review your control power scheme including 24V power supply requirements. See Appendix C for more information on control power specifications.

Table 4 - Control Power Input Power Specifications

Attribute	Frame 1	Frame 2	Frame 3
Input voltage	21.6...26.4V DC		
Control power AC input current Nom @ 24V DC (1) Inrush, max	 400 mA 1.8 A	 900 mA 2.4 A	 1.7 A 3.0 A

(1) Plus motor brake connector (MBRK+) current.

Circuit Protection

Sizing for protective devices, such as fuses and circuit breakers, can be different between Ultra3000 servo drives and Kinetix 5300 servo drives. Verify that you have chosen the correct sizes when selecting and installing a Kinetix 5300 servo drive. For more information, see Circuit Breaker and Fuse Considerations.

Control Signals

Digital Inputs – The Ultra3000 servo drive includes six digital inputs. They are Enable, Home, Reg1, Reg2, OT+, and OT-. All Ultra3000 drives require an isolated external 12-24V power supply for proper operation of the digital I/O. The Kinetix 5300 includes four configurable digital inputs available for the machine interface on the digital input connector and six configurable functions to choose from in the Studio 5000 Logix Designer® application (version 33.00 or later). Configurable functions are Enable, Home, Registration 1, Registration 2, Positive Overtravel, and Negative Overtravel. Digital inputs require a 24V DC @ 15 mA supply. These are sinking inputs that require a sourcing device. A common and cable shield connection is provided on the connector for digital inputs.

Digital Outputs – The Ultra3000 servo drive includes one digital output (Drive Ready) and one relay output (brake).

Motor Brake – The brake option is a spring-set holding brake that releases when voltage is applied to the brake coil in the motor.

The Ultra3000 servo drive includes a relay output which can be used for motor brake control. On Sercos drives, relay output pins CN1-43 and CN1-44 are dedicated to motor brake control. The Ultra3000 requires a customer-supplied 24V power supply to drive the motor parking-brake through a relay.

The Kinetix 5300 servo drive has a dedicated motor brake circuit which can be wired directly to a motor brake rated 2.25A and below, or it can be used to drive an interposing relay. Motor power and brake connections are made at the motor power and motor brake power connectors on the front of the drive.

The solid-state brake circuit provides current-overload protection and brake overvoltage protection.

When replacing a Ultra3000 with a Kinetix 5300, do not wire a customer supplied power supply to the motor brake circuit of the Kinetix 5300 drive. Instead, either wire the motor brake circuit directly to the motor brake, or use the 24V supplied by the Kinetix 5300 motor brake connector to drive an interposing relay.

Aux Feedback Port – The Kinetix 5300 drives support auxiliary feedback signals from TTL incremental feedback devices on the 20-pin digital inputs connector and auxiliary feedback connector.

Motor feedback and auxiliary feedback can be used in the following applications:

- Motor feedback
- Feedback-only axis (leader-follower applications)

Load feedback (dual-loop control)

Safe Torque Off Safety Features

Kinetix 5300 servo drives are capable of safely turning off the inverter power transistors in response to a monitored digital input, according to Category 0 Stop behavior. These drives support parallel input terminals for cascading to adjacent drives over duplex wiring. The hardwired STO function meets the requirements of Performance Level d PL (d) and safety category 3 (CAT 3) per ISO 13849-1 and SIL CL2 per IEC 61508, IEC 61800-5-2, and IEC 62061.

For applications that do not require the safety function, you must install jumper wires to bypass the Safe Torque Off feature.

For the Safe Torque Off connector pinout, installation, and wiring information, see the related chapter in the Kinetix 5300 Servo Drives User Manual, publication 2198-UM005.

Drive Accessories

Ultra3000 servo drive accessories include the drive-mounted breakout boards, panel-mounted breakout boards, 2090 AC line filters, 2090 shunt modules, resistive brake module (RBM), and external auxiliary encoders.

The AC line filters required to meet CE compliance for Kinetix 5300 are different than those needed by the Ultra3000. Kinetix 5300 servo drive accessories include AC line filters and Bulletin 2097 and 2198 external shunt resistors. See Accessories on page 41.

Notes:

Servo Drive and System Comparisons

There are a number of different factors that affect the selection of a replacement servo drive and the system redesign effort. They include the following:

- Drive Replacement
- Dimension Comparison
- AC Input Power Wiring and Fusing
- Interconnects and Cabling
- Typical System Layout
- Accessories

This chapter provides a side-by-side comparison of both servo drive families to help in the evaluation and selection of the correct components in the migration process.

Drive Replacement

This section lists the Ultra™ 3000 servo drives and the suggested Kinetix® 5300 replacement servo drives, along with the output ratings and dimension differences of the drives. Information in this migration guide is based on the drive combinations shown.

Output Current Comparison

IMPORTANT The performance capabilities of the replacement drive should be reviewed to ensure that the replacement drive delivers the required level of peak and continuous current to the motor.

Table 5 - Ultra3000 Drives by Output Current

Ultra3000 Servo Drive				
Cat. No.	**Voltage Range** V_{rms}	**Voltage nom**	**Continuous Output Current** A_{rms} (A_{0-Pk})	**Peak Output Current** A_{rms} (A_{0-Pk})
2098-DSD-005	88...265, single-phase	single-phase, 110V or 230V	1.8 (2.5)	5.3 (7.5)
2098-DSD-010	88...265, single-phase	single-phase, 110V or 230V	3.5 (5.0)	10.6 (15.0)
2098-DSD-020	88...265, single-phase	single-phase, 110V or 230V	7.1 (10.0)	21.2 (30.0)
2098-DSD-030	88...265, single-phase	single-phase, 110V or 230V	10.6 (15.0)	21.2 (30.0)
2098-DSD-075	88...265, three-phase	three-phase, 110V or 230V	24.7 (35.0)	53.0 (75.0)

Table 5 - Ultra3000 Drives by Output Current (Continued)

Ultra3000 Servo Drive				
Cat. No.	**Voltage Range** V_{rms}	**Voltage nom**	**Continuous Output Current** A_{rms} (A_{0-Pk})	**Peak Output Current** A_{rms} (A_{0-Pk})
2098-DSD-150	88...265, three-phase	three-phase, 110V or 230V	45.9 (65.0)	106.1 (150.0)
2098-DSD-HV030	207...528, three-phase	three-phase, 230V or 480V	5.0 (7.0)	9.9 (14.0)
2098-DSD-HV050	207...528, three-phase	three-phase, 230V or 480V	7.8 (11.0)	15.6 (22.0)
2098-DSD-HV100	207...528, three-phase	three-phase, 230V or 480V	16.3 (23.0)	32.5 (46.0)
2098-DSD-HV150	207...528, three-phase	three-phase, 230V or 480V	24.0 (34.0)	48.1 (68.0)
2098-DSD-HV220	207...528, three-phase	three-phase, 230V or 480V	33.2 (47.0)	66.5 (94.0)

Table 6 - Kinetix 5300 Servo Drives by Output Current

Kinetix 5300 Servo Drive				
Cat. No.	**Voltage Range**	**Voltage nom**	**Continuous Output Current** A_{rms} (A_{0-Pk})	**Peak Output Current** A_{rms} (A_{0-Pk})
2198-C1004-ERS	85...132V	single-phase, 110V	2.8 (4.0)	6.6 (13.4)
2198-C1007-ERS			4.6 (6.5)	9.7 (21.9)
2198-C1015-ERS			8.5 (11.7)	12.2 (41.3)
2198-C1020-ERS			12.2 (17.3)	25.0 (57.4)
2198-C1004-ERS	170...253V	single-phase, 230V	2.8 (4.0)	9.5 (13.4)
2198-C1007-ERS			4.6 (6.5)	15.5 (21.9)
2198-C1015-ERS			8.5 (12.0)	20.5 (41.3)
2198-C1020-ERS			12.2 (17.3)	40.6 (57.4)
2198-C1004-ERS	170...253V	three-phase, 230V	2.8 (4.0)	9.5 (13.4)
2198-C1007-ERS			4.6 (6.5)	15.5 (21.9)
2198-C1015-ERS			8.5 (12.0)	29.3 (41.3)
2198-C1020-ERS			12.2 (17.3)	40.6 (57.4)
2198-C2030-ERS	170...253V	three-phase, 230V	19.6 (27.7)	60.1 (86.3)
2198-C2055-ERS			40.2 (56.9)	108.0 (152.7)
2198-C2075-ERS			47.7 (67.5)	127.5 (180.3)
2198-C4004-ERS	342...528V	three-phase, 480V	1.5 (2.1)	5.1 (7.2)
2198-C4007-ERS			2.9 (4.1)	9.3 (13.2)
2198-C4015-ERS			5.2 (7.4)	18.0 (25.5)
2198-C4020-ERS			7.3 (10.3)	23.8 (33.7)
2198-C4030-ERS			11.7 (16.5)	34.1 (48.3)
2198-C4055-ERS			22.6 (32.0)	58.5 (82.7)
2198-C4075-ERS			27.5 (38.9)	73.5 (103.9)

Dimension Comparison

The following table provides a comparison of the dimensions of the drives.

Table 7 - Suggested Kinetix 5300 Replacement Drives by Dimensions

Ultra3000 Servo Drive (with Sercos)				Kinetix 5300 Servo Drive				Dimension Differences		
Model	**Height** mm (in)	**Width** mm (in)	**Depth** mm (in)	**Model**	**Height** mm (in)	**Width** mm (in)	**Depth** mm (in)(1)	**Height** (2) mm (in)	**Width** (2) mm (in)	**Depth** (2) mm (in)
2098-DSD-005	198.12 (7.8)	95.5 (3.76)	144.27 (5.68)	2198-C1004-ERS	215 (8.46)	50 (1.97)	265 (10.43)	16.88 (0.66)	-45.5 (-1.79)	120.73 (4.75)
2098-DSD-010		121.54 (4.79)		2198-C1007-ERS				16.88 (0.66)	-71.54 (-2.82)	120.73 (4.75)
2098-DSD-020				2198-C1015-ERS				16.88 (0.66)	-71.54 (-2.82)	120.73 (4.75)
2098-DSD-030	360.7 (14.2)	91.44 (3.6)	243.84 (9.6)	2198-C1020-ERS				-145.7 (-5.74)	-41.44 (-1.63)	21.16 (0.83)
2098-DSD-075		138.68 (5.41)	247.14 (9.73)	2198-C2030-ERS 2198-C2055-ERS	265 (10.43)	55 (2.16)		-95.7 (-3.77)	-83.68 (-3.25)	17.86 (0.7)
2098-DSD-150		188.97 (7.44)	241.05 (9.49)	2198-C2055-ERS 2198-C2075-ERS				-95.7 (-3.77)	-133.97 (-5.28)	23.95 (0.94)
2098-DSD-HV030		138.7 (5.46)	242.2 (9.54)	2198-C4015-ERS				-95.7 (-3.77)	-133.97 (-5.28)	23.95 (0.94)
2098-DSD-HV050				2198-C4020-ERS				-95.7 (-3.77)	-83.7 (-3.3)	22.8 (0.89)
2098-DSD-HV100		151.6 (5.97)		2198-C4030-ERS 2198-C4055-ERS				-95.7 (-3.77)	-96.6 (-3.81)	22.8 (0.89)
2098-DSD-HV150				2198-C4055-ERS 2198-C4075-ERS				-95.7 (-3.77)	-96.6 (-3.81)	22.8 (0.89)
2098-DSD-H220		203.2 (8.0)		2198-C4075-ERS	294 (11.57)	85.2 (3.35)		-66.7 (-2.63)	-118 (-4.65)	22.8 (0.89)

(1) Dimension includes the 2198-K53CK-D15M connector kit. Dimension without the connector kit is 204 mm (8.03 cm)
(2) A minus sign denotes that the height, width, or depth of the Kinetix 5300 servo drive is shorter, narrower, or shallower than the comparable Ultra3000 servo drive.

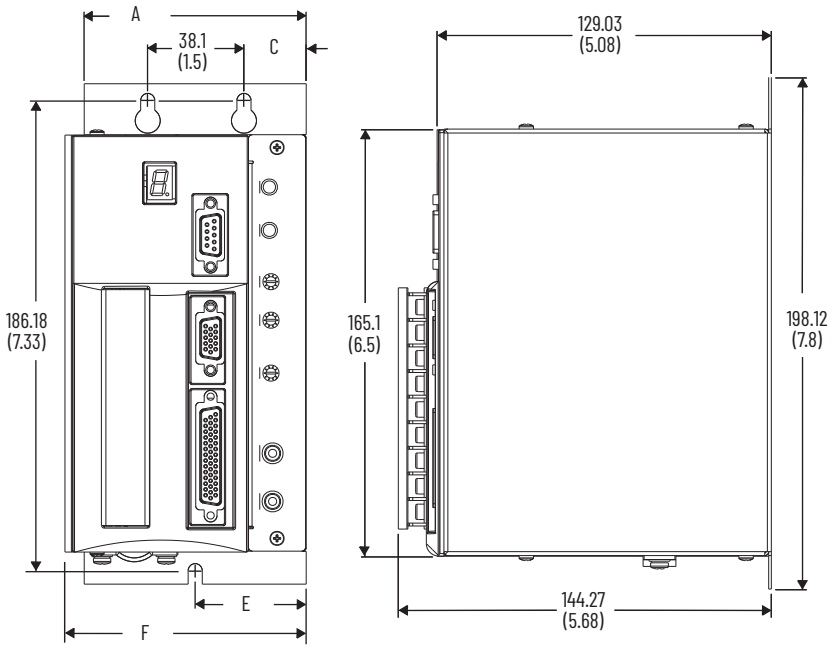
Dimension Drawings

This section provides drive dimensions to assist you in determining the space that is needed to install the drives.

Ultra3000 (240V) Drive Dimensions

In Figure 2, *-xxx* is replaced by -005, -010, or -020 to represent the Ultra3000 500 W, 1 kW, and 2 kW drives respectively.

Figure 2 - Ultra3000 (240V) Dimensions (Catalog number 2098-DSD-*xxx*-SE)



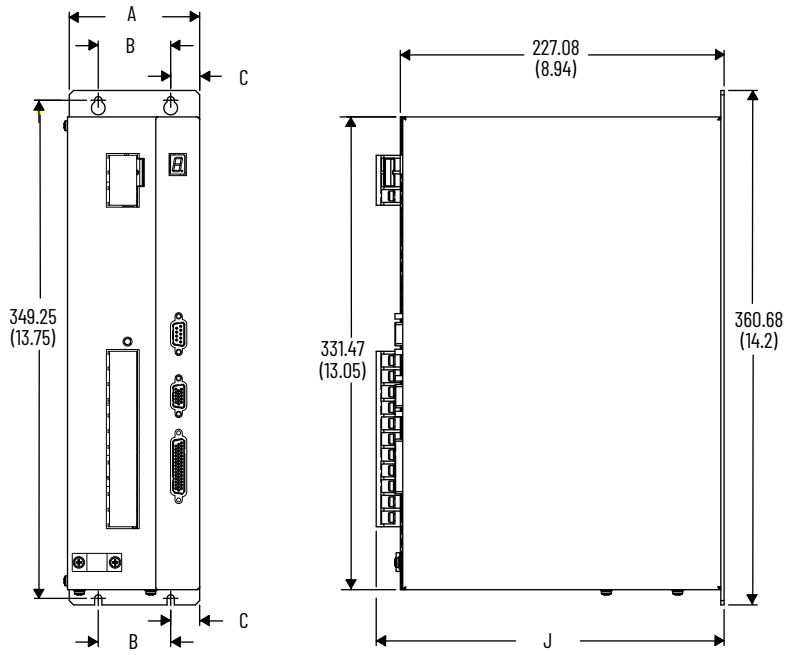
Dimensions are in mm (in.)

Table 8 - Ultra3000 (240V) Dimensions 2098-DSD-*xxx*-SE

Ultra3000 Servo Drive Cat. No.	**A** mm (in.)	**C** mm (in.)	**E** mm (in.)	**F** mm (in.)
2098-DSD-005-SE	87.88 (3.46)	24.64 (0.97)	43.94 (1.73)	95.5 (3.76)
2098-DSD-010-SE 2098-DSD-020-SE				121.54 (4.79)

In Figure 3, *-xxx* is replaced by -030, -075, or -150 to represent the Ultra3000 3 kW, 7.5 kW, and 15 kW drives respectively.

Figure 3 - Ultra3000 (240V) Dimensions (Catalog number 2098-DSD-*xxx*-SE)



Dimensions are in mm (in.)

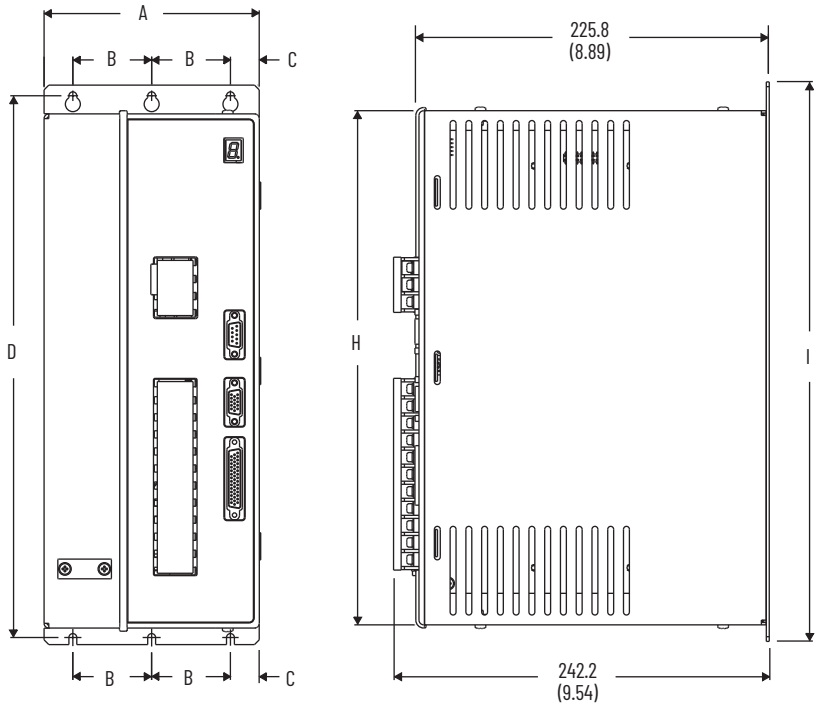
Table 9 - Ultra3000 (240V) Dimensions 2098-DSD-*xxx*-SE

Ultra3000 Servo Drive Cat. No.	**A** mm (in.)	**B** mm (in.)	**C** mm (in.)	**J** mm (in.)
2098-DSD-030-SE	91.44 (3.6)	50.8 (2.0)	20.32 (0.8)	243.84 (9.6)
098-DSD-075-SE	138.68 (5.41)	88.9 (3.5)	24.89 (0.96)	247.14 (9.73)
2098-DSD-150-SE	188.97 (7.44)	139.7 (5.5)	24.6 (0.97)	241.05 (9.49)

Ultra3000 (460V) Drive Dimensions

In Figure 4, *xxx* is replaced by 030, 050, 100, 150, or 220 to represent the Ultra3000 3 kW, 5 kW, 10 kW, 15 kW, and 22 kW drives respectively.

Figure 4 - Ultra3000 (460V) Dimensions (Catalog number 2098-DSD-HV*xxx*-SE)



Dimensions are in mm (in.)

Table 10 - Ultra3000 (460V) Dimensions 2098-DSD-HV*xxx*-SE

Ultra3000 Servo Drive Cat. No.	**A** mm (in.)	**B** mm (in.)	**C** mm (in.)	**D** mm (in.)	**H** mm (in.)	**I** mm (in.)
2098-DSD-HV030-SE 2098-DSD-HV050-SE	138.7 5.46)	50.8 (2.0)	18.5 (0.73)	349.3 (13.75)	331.5 (13.05)	360.7 (14.2)
2098-DSD-HV100-SE 2098-DSD-HV150-SE	151.6 (5.97)		25 (0.99)			
2098-DSD-HV220-SE	203.2 (8.0)	76.2 (3.0)	25.4 (1.0)	380.4 (14.98)	362.6 14.26)	391.8 (15.43)

Kinetix 5300 Servo Drive Dimensions

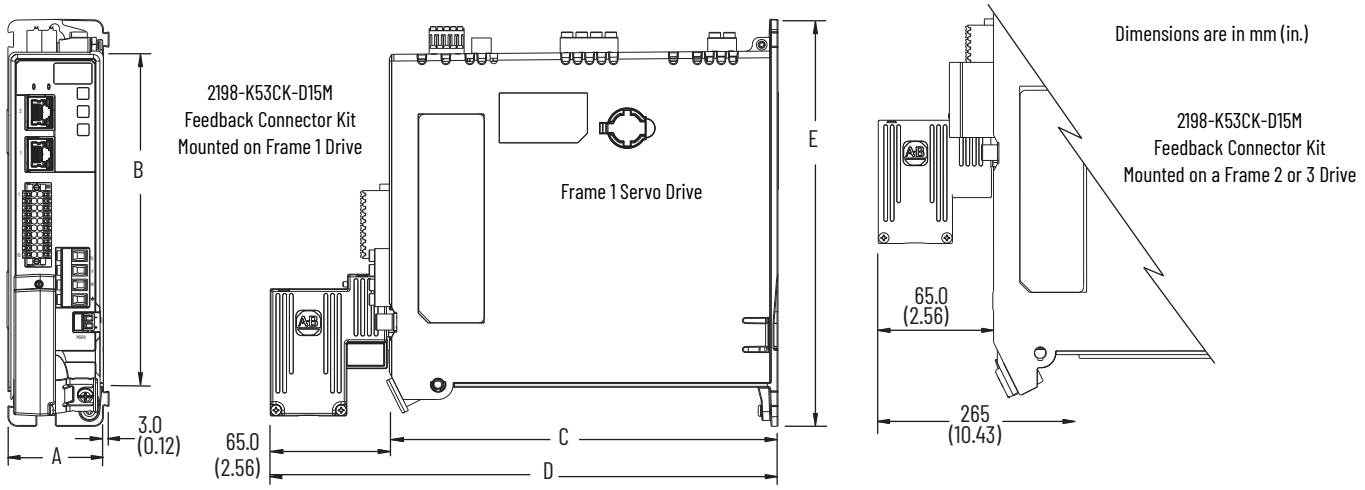


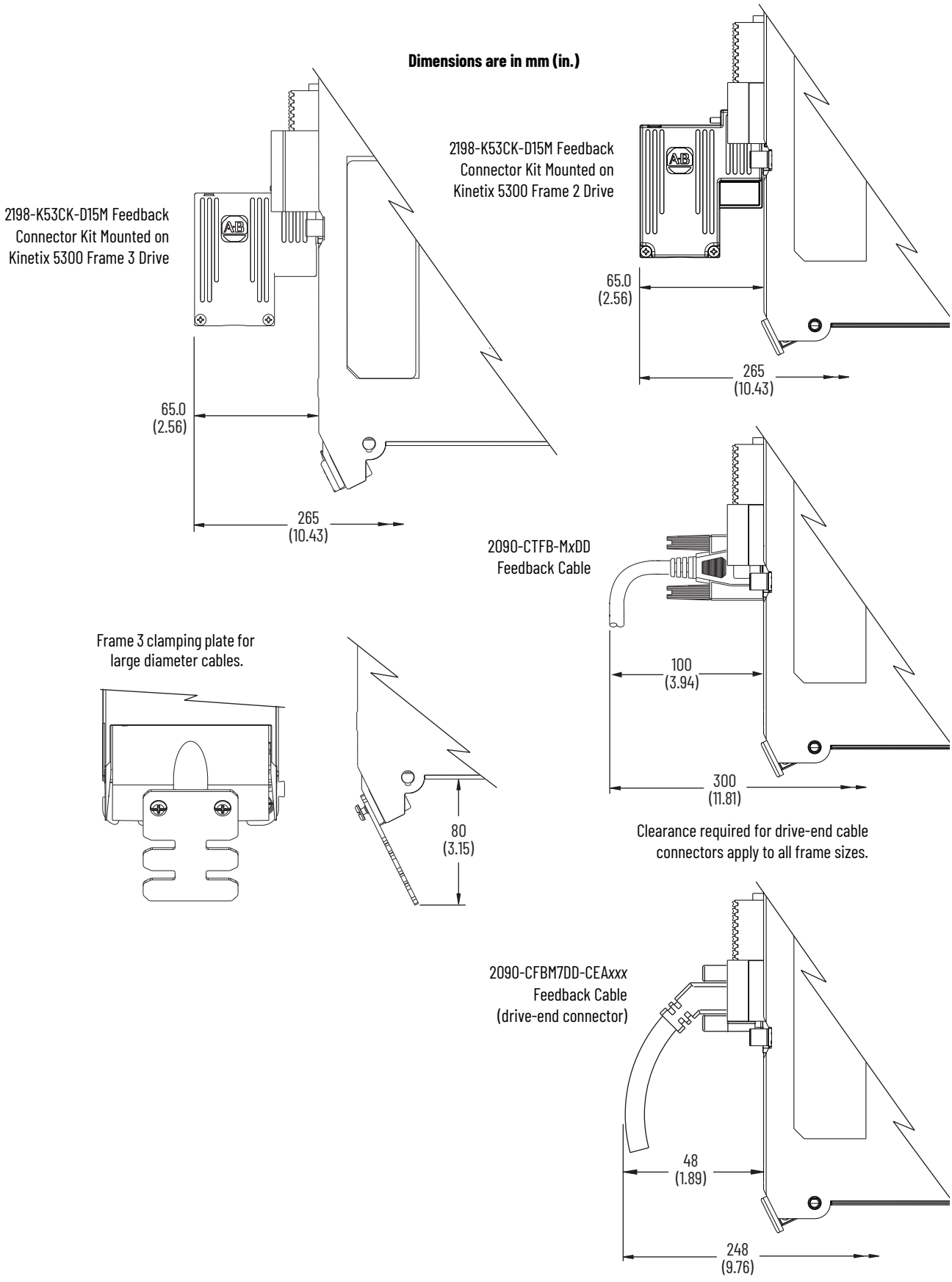
Table 11 - Kinetix 5300 Servo Drive Dimensions

Kinetix 5300 Drive Cat. No.	Frame	A mm (in.)	B mm (in.)	C mm (in.)	D mm (in.)	E mm (in.)	Drill Hole Patterns[1]	
							F mm	G mm
2198-C1004-ERS	1	50 (1.97)	175 (6.89)	204 (8.03)	265 (10.43)	215 (8.46)	193.68	4.51
2198-C1007-ERS								
2198-C4004-ERS								
2198-C4007-ERS								
2198-C1015-ERS	2	55 (2.16)	225 (8.86)			265 (10.43)	243.84	5.00
2198-C1020-ERS								
2198-C2030-ERS								
2198-C4015-ERS								
2198-C4020-ERS								
2198-C4030-ERS								
2198-C2055-ERS	3	85.2 (3.35)	250 (9.84)			294 (11.57)	273.70	0.0
2198-C2075-ERS								
2198-C4055-ERS								
2198-C4075-ERS								

(1) Hole spacing is measured in millimeters and not converted to inches to avoid errors due to rounding. Refer to Kinetix 5300 Single-axis EtherNet/IP Servo Drives User Manual, publication 2198-UM005.

Figure 5 - Kinetix 5300 Drives with Connector Kit Accessories (Frames 2 and 3)

Dimensions are in mm (in.)



AC Input Power Cable Length and Fuse Protection

This section provides information to assist you in determining the wiring and fusing requirements of the drives.

AC Input Power Cable Lengths

In general, the recommended drive replacement should not require changes in wiring length. However, the routing can need to change as the input power on the Kinetix 5300 servo drive is located on the top of the drive, while the same connection is located on the front of the Ultra3000 servo drive.

See Appendix A, Connectors and Field Connections for a comparison of the Ultra3000 servo drive and Kinetix 5300 servo drive terminals.

Figure 6 - Ultra3000 Servo Drive Input Power Example

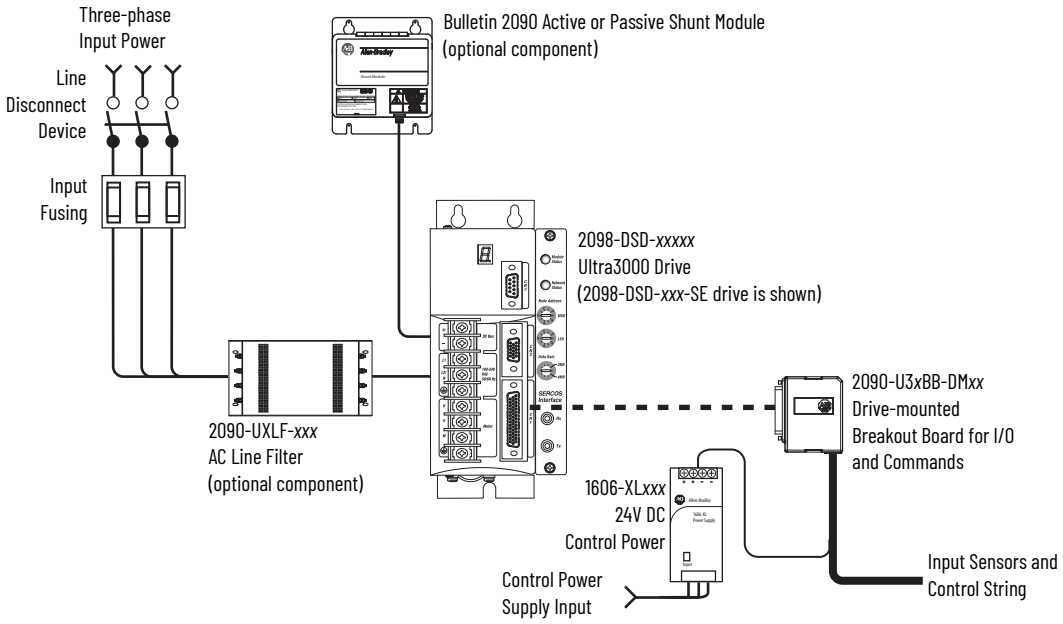


Figure 7 - Kinetix 5300 Servo Drive Input Power Example

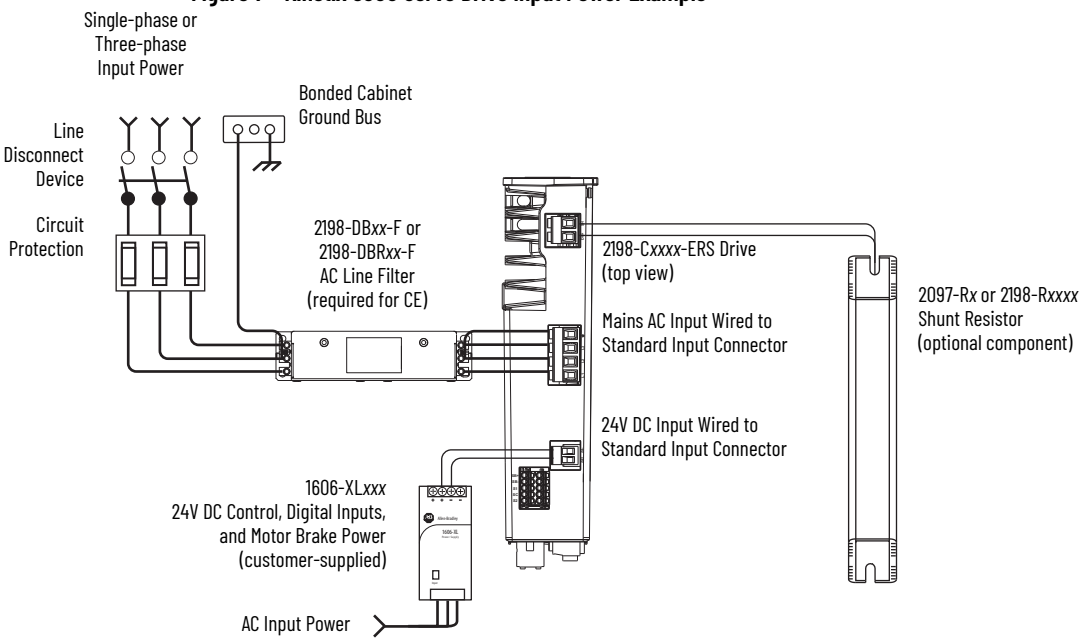


Figure 8 - Typical Kinetix 5300 Installation without 24V Shared-bus Connectors

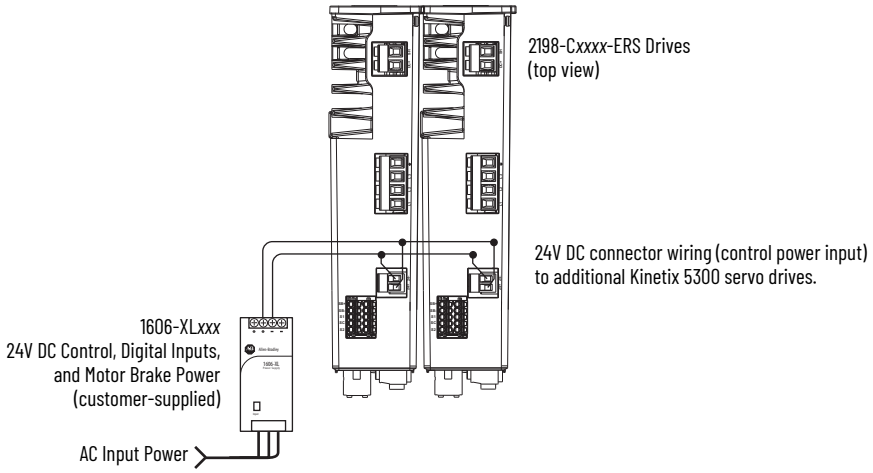
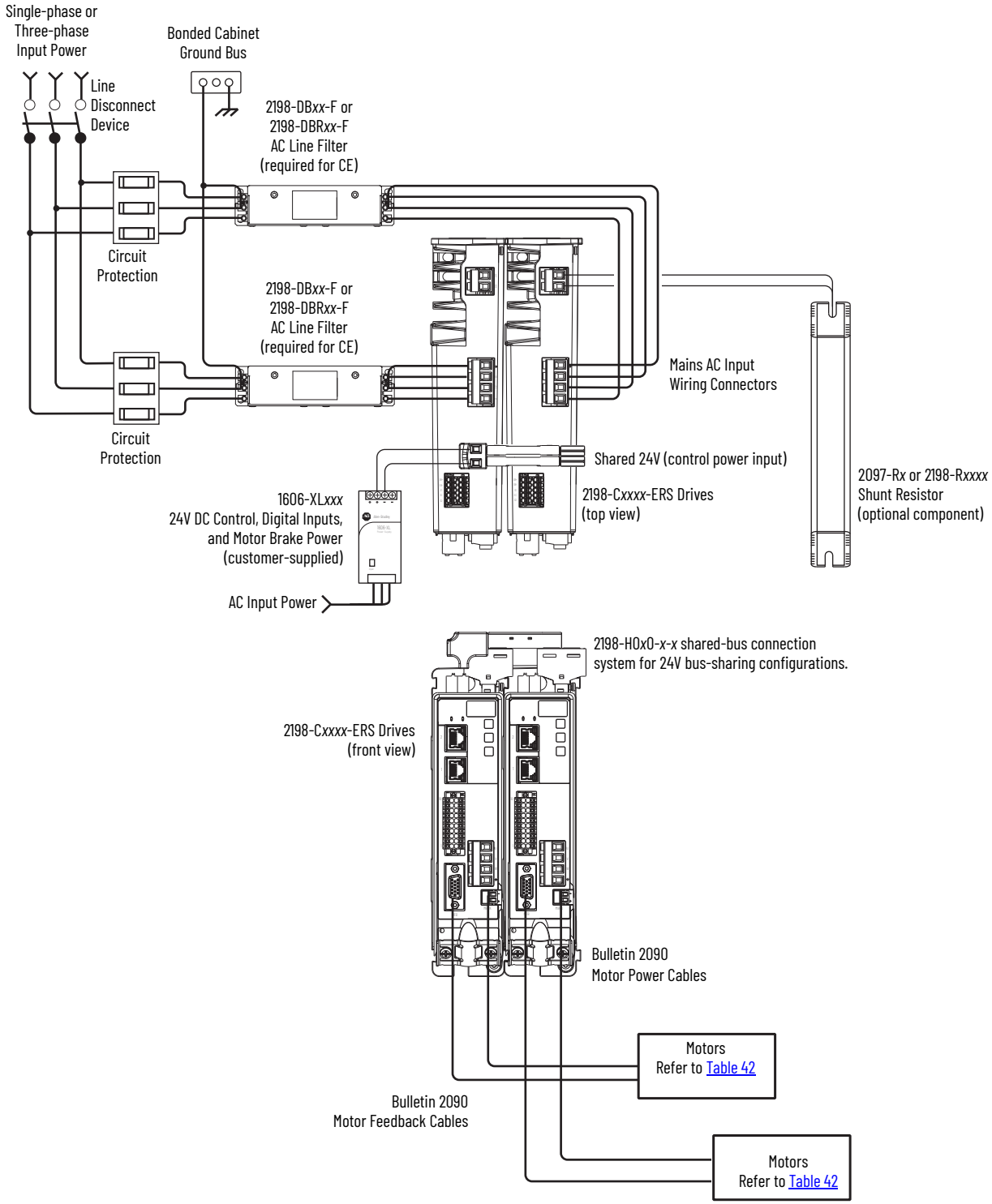


Figure 9 - Kinetix 5300 Installation with 24V Shared-bus Connectors



Circuit Breaker and Fuse Considerations

Review the fusing requirements when changing drives.

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

The Kinetix 5300 servo drives use internal solid-state motor short-circuit protection and, when protected by suitable branch circuit protection, are rated for use on a circuit capable of delivering up to 200,000 A (fuses, UL applications), 10,000 A (miniature circuit breakers), or 65,000 A (molded-case circuit breakers).

See the Kinetix 5300 Servo Drives User Manual, publication 2198-UM005 for the wiring diagrams.

ATTENTION: Do not use circuit protection devices on the output of an AC drive as an isolating disconnect switch or motor overload device. These devices are designed to operate on sine-wave voltage and the drives PWM waveform does not allow it to operate properly. As a result, damage to the device occurs.

Make sure that the selected components are properly coordinated and meet acceptable 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.

Ultra3000 Servo Drive Main Input Power Fuse and Circuit Breaker Specifications

The Ultra3000 could have used class CC, G, J, L, R, or T class fuses, with current ratings as indicated in the table. Table 12 lists fuse examples that are recommended for use with the Ultra3000 (230V and 460V) drives.

Table 12 - Ultra3000 Servo Drive Main Input Power Fuse and Circuit Breaker Specifications

Ultra3000 Sercos Servo Drive Cat. No.	Input Voltage	Voltage Type	Recommended Fuse	
			Class CC (1)	Class J (1)
2098-DSD-005	240V	Input Power	FNQ-R-6	LPJ-6SP
2098-DSD-010			FNQ-R-10	LPJ-10SP
2098-DSD-020			FNQ-R-20	LPJ-20SP
2098-DSD-030			FNQ-R-30	LPJ-30SP
2098-DSD-075			FNQ-R-30	LPJ-30SP
2098-DSD-150			–	LPJ-60SP
2098-DSD-*xxx*		Auxiliary Input Power	FNQ-R-10	LPJ-10SP
2098-DSD-HV030	480V	Input Power	KTK-R-5	LPJ-5SP
2098-DSD-HV050			KTK-R-8	LPJ-8SP
2098-DSD-HV100			KTK-R-20	LPJ-17-1/2SP
2098-DSD-HV150			KTK-R-30	LPJ-30SP
2098-DSD-HV220			–	LPJ-35SP
2098-DSD-HV*xxx*		Auxiliary Input Power	FNQ-R-10	LPJ-10SP

(1) Bussmann Fuse

Table 13 lists circuit breaker examples recommended for use with the Ultra3000 (460V) drives.

Table 13 - Ultra3000 (460V) Servo Drive Main Input Power Fuse and Circuit Breaker

Ultra3000 Sercos Servo Drive Cat. No.	Input Voltage	Circuit Breaker
2098-DSD-HV030	480V	140M-F8E-C16
2098-DSD-HV050		140M-F8E-C20
2098-DSD-HV100		140M-F8E-C32
2098-DSD-HV150		140M-F8E-C45
2098-DSD-HV220		–

Kinetix 5300 Servo Drive Main Input Power Fuse and Circuit Breaker Specifications

The Kinetix 5300 servo drive fuse and circuit breaker selection are dependent on input power configurations.

Table 14 - Kinetix 5300 UL/CSA Circuit Protection Specifications

Drive Cat. No.	AC Input Voltage, nom	Bussmann Fuses Cat. No.	Molded Case CB Cat. No.
2198-C1004-ERS	200...230V AC three-phase	KTK-R-6	140U-D6D3-B40
2198-C1007-ERS		KTK-R-10	140U-D6D3-B80
2198-C1015-ERS		KTK-R-15	140U-D6D3-C12
2198-C1020-ERS		KTK-R-25	140U-D6D3-C20
2198-C2030-ERS		KTK-R-30	140U-D6D3-C30
2198-C2055-ERS		LPJ-50SP	140G-G6C3-C50
2198-C2075-ERS		LPJ-60SP	140G-G6C3-C60
2198-C4004-ERS	380...480V AC three-phase	KTK-R-3	140U-D6D3-B20
2198-C4007-ERS		KTK-R-6	140U-D6D3-B40
2198-C4015-ERS		KTK-R-12	140U-D6D3-B80
2198-C4020-ERS		KTK-R-15	140U-D6D3-C12
2198-C4030-ERS		KTK-R-25	140U-D6D3-C15
2198-C4055-ERS		LPJ-30SP	140U-D6D3-C30
2198-C4075-ERS		LPJ-35SP	140U-D6D3-C30
2198-C1004-ERS	100...120V AC single-phase	KTK-R-6	140U-D6D2-B40
2198-C1007-ERS		KTK-R-10	140U-D6D2-B80
2198-C1015-ERS		KTK-R-15	140U-D6D2-C12
2198-C1020-ERS		KTK-R-25	140U-D6D2-C20
2198-C1004-ERS	200...230V AC single-phase	KTK-R-6	140U-D6D2-B40
2198-C1007-ERS		KTK-R-10	140U-D6D2-B80
2198-C1015-ERS		KTK-R-15	140U-D6D2-C12
2198-C1020-ERS		KTK-R-25	140U-D6D2-C20

Table 15 - Kinetix 5300 IEC (non-UL/CSA) Circuit Protection Specifications

Drive Cat. No.	AC Input Voltage, nom	DIN gG Fuses Amps, max	Miniature CB Cat. No.	Molded Case CB Cat. No.
2198-C1004-ERS	200...230V AC three-phase	6	1489-M3C060	140U-D6D3-B40
2198-C1007-ERS		10	1489-M3C100	140U-D6D3-B80
2198-C1015-ERS		16	1489-M3C160	140U-D6D3-C12
2198-C1020-ERS		25	1489-M3C250	140U-D6D3-C20
2198-C2030-ERS		32	1489-M3C400	140U-D6D3-C30
2198-C2055-ERS		40	–	140G-G6C3-C50
2198-C2075-ERS		50	–	140G-G6C3-C60
2198-C4004-ERS	380...480V AC. three-phase	2	1489-M3C030	140U-D6D3-B20
2198-C4007-ERS		6	1489-M3C060	140U-D6D3-B40
2198-C4015-ERS		12	1489-M3C100	140U-D6D3-B80
2198-C4020-ERS		16	1489-M3C130	140U-D6D3-C12
2198-C4030-ERS		25	1489-M3C200	140U-D6D3-C15
2198-C4055-ERS		32	1489-M3C350	140U-D6D3-C30
2198-C4075-ERS		32	1489-M3C400	140U-D6D3-C30
2198-C1004-ERS	100...120V AC single-phase	6	1489-M2C060	140U-D6D2-B40
2198-C1007-ERS		10	1489-M2C100	140U-D6D2-B80
2198-C1015-ERS		16	1489-M2C160	140U-D6D2-C12
2198-C1020-ERS		25	1489-M2C250	140U-D6D2-C20
2198-C1004-ERS	200...230V AC single-phase	6	1489-M2C060	140U-D6D2-B40
2198-C1007-ERS		10	1489-M2C100	140U-D6D2-B80
2198-C1015-ERS		16	1489-M2C160	140U-D6D2-C12
2198-C1020-ERS		25	1489-M2C250	140U-D6D2-C20

Drive Interconnects and Cable Considerations

This section provides information to assist you in determining the interconnects and cabling requirements of the drives.

Ultra3000 Servo Drives Motor/Actuator and Cable Compatibility

See Table 16 for the catalog number of the motor power cable for your Ultra3000 servo drive.

Table 16 - Ultra3000 Servo Drive Motor Power and Feedback Cables

Motor	Motor Power Cables	Feedback Cables
MPL-A/B*xxxx*-V/E MPL-A/B*xxxx*-S/M	2090-CPxM7DF-xxAAxx / xxAFxx	2090-CFBM7DF-CEAAxx 2090-CFBM7DD-CEAAxx 2090-CFBM7DF-CERAxx (standard) or 2090-CFBM7DF-CEAFxx 2090-CFBM7DD-CEAFxx 2090-CFBM7DF-CDAFxx (continuous-flex)
MPM-A/Bxxxx-S/M MPF-A/Bxxxx-S/M MPS-A/Bxxxx-S/M		
MPAR-A/B*xxxxx*-V MPAI-A/B*xxxxx*		
MPAS-A/B*xxxxx*-V (ballscrew)		
MPL-A/B*xxxx*-H		2090-XXNFMF-Sxx (standard) or 2090-CFBM7DF-CDAFxx (continuous-flex)
MPAS-A/B*xxxx*-ALM (direct drive)		
LDC-C*xxxxxx*-xH LDL-*xxxxxxx*-xH		
TLY-A*xxxx*-B	2090-CPWM6DF-16AAxx (standard, non-flex) without brake 2090-CPBM6DF-16AAxx (standard, non-flex) with brake	2090-CFBM6DF-CBAAxx (standard) 2090-CFBM6DD-CCAAxx (standard)
TLY-A*xxxx*-H		

Ultra3000 Servo Drive Feedback Connector

Factory-made cables with premolded connectors are designed to minimize EMI and are recommended over hand-built cables to improve system performance. However, other options are available for building your own feedback and I/O cables. See Table 17 for the available options.

Table 17 - Ultra3000 Feedback Connectors

Drive Connector	Connector Option		Option Cat. No.
CN1 I/O Connector	44-pin drive-mounted breakout board with 24V to 5V auxiliary power converter		2090-U3CBB-DM44
	12-pin drive-mounted breakout board with 24V to 5V auxiliary power converter for Sercos interface applications		2090-U3CBB-DM12
	44-pin panel-mounted breakout board kit		2090-U3BK-D44*xx*
	44-pin, drive-mounted breakout board		2090-U3BB2-DM44
	44-pin (high-density D-shell) drive connector kit		2090-U3CK-D44
	Single-axis flying lead to 1756-M02AE module or 1784-PM02AE PCI card		2090-U3CC-D44*xx*
	Two-axis pre-wired to 1756-M02AE module		2090-U3AE-D44*xx*
CN2 Feedback Connector	Premolded cable at drive and motor end		2090-UXNFBx*x*-S*xx*
	Flying lead cable at drive end (2090-XXNF*xx*-S*xx*)	15-pin drive-mounted breakout board	2090-UXBB-DM15
		15-pin panel-mounted breakout board kit	2090-UXBK-DM15*xx*
		15-pin (high-density D-shell) drive connector kit	2090-UXCK-D15
CN3 Serial Connector	PC serial connector to premolded drive connector		2090-UXPC-DM09
	9-pin drive-mounted breakout board		2090-UXBB-DM09
	9-pin (high-density D-shell) drive connector kit		2090-UXCK-D09

See Table 18 for catalog numbers of the legacy motor power and feedback cables that are available for specific motor/feedback combinations.

Table 18 - Ultra3000 Legacy Motor Power and Feedback Cables

Motor Series	Using this Type of Motor Feedback	Motor Power Cables		Feedback Cable	
		Available Cables	When Universal Cable are not Available	Premolded	Flying Lead (1)
F-Series	Incremental encoder	2090-XXNPHF-16S*xx* 2090-XXNPHF-14S*xx*	2090-UXNPAHF-10S*xx* 2090-UXNPAHF-8S*xx*	2090-UXNFBHF-S*xx*	2090-XXNFHF-S*xx*
H-Series		2090-XXNPH-16S*xx* 2090-XXNPHF-14S*xx*	2090-UXNPAHF-10S*xx* 2090-UXNPAHF-8S*xx* 2090-UXNPAH-6S*xx*		
N-Series		2090-XXNPN-16S*xx*	–	2090-UXNFBN-S*xx*	2090-XXNFN-S*xx*
Y-Series		2090-XXNPY-16S*xx*	–	2090-UXNFBY-S*xx*	2090-XXNFY-S*xx*

(1) Requires 2090-UXBB-DM15 drive-mounted breakout board, 2090-UXBK-D15xx breakout board kit, or 2090-UXCK-D15 mating connector kit.

Kinetix 5300 Servo Drives Servo Motor/Actuator and Cable Compatibility

Most compatible Allen-Bradley® motors and actuators have separate power/brake and feedback cables. Some Kinetix TLP and TL motors have separate brake cables too. The motor power/brake cable shield attaches to the cable clamp on the drive and the conductors attach to the motor power and motor brake connector plugs.

IMPORTANT The maximum drive-to-motor power and feedback cable length depends on the AC input power, motor type, and feedback type. Drive-to-motor cables must not exceed 50 m (164 ft). See the Kinetix 5300 Servo Drives User Manual, publication 2198-UM005 for specifications by frame size.

Table 19 - Kinetix TLP Motor and Cable Combinations

Rotary Motor (200V-class) (1) Cat. No.	Motor Power/Brake Cable	Feedback Cable Cat. No.	Brake Cat. No.
TLP-A046-*xxx*, TLP-A070-*xxx*, TLP-A090-*xxx*, (2) TLP-A100-*xxx*	2090-CTP*x*-MADF-18A*xx* (standard) or 2090-CTP*x*-MADF-18F*xx* (continuous-flex)	2090-CTFB-MADD-CFA*xx* (standard) or 2090-CTFB-MADD-CFF*xx* (continuous-flex)	Not applicable. Brake conductors are included in the power cable.
TLP-A115-100, (3) TLP-A145-050, TLP-A145-100	2090-CTP*x*-MCDF-16A*xx* (standard) or 2090-CTP*x*-MCDF-16F*xx* (continuous-flex)	2090-CTFB-MFDD-CFA*xx* (standard) or 2090-CTFB-MFDD-CFF*xx* (continuous-flex)	
TLP-A115-200, TLP-A145-090, TLP-A145-150, TLP-A145-250	2090-CTP*x*-MCDF-12A*xx* (standard) or 2090-CTP*x*-MCDF-12F*xx* (continuous-flex)		
TLP-A200-200, TLP-A200-300, TLP-A200-350 (4)	2090-CTP*x*-MDDF-12A*xx* (standard) or 2090-CTP*x*-MDDF-12F*xx* (continuous-flex)		
TLP-A200-450	2090-CTP*x*-MDDF-08A*xx* (standard) or 2090-CTP*x*-MDDF-08F*xx* (continuous-flex)		
TLP-A200-550, TLP-A200-750 (5)	2090-CTPW-MEDF-06A*xx* (standard) or 2090-CTPW-MEDF-06F*xx* (continuous-flex)		2090-CTBK-MBDF-20A*xx* (standard) or 2090-CTBK-MBDF-20F*xx* (continuous-flex)

(1) The TLP-A046...TLP-A100 frame on-motor cables include 18 AWG conductors that are compatible with 2090-CTP*x*-MADF-18*xxx* cable conductors.
(2) For TLP-A090-*xxx* motors, use 2090-CTP*x*-MADF-16*xxx* motor power/brake cable to comply with NFPA 79 requirements.
(3) For TLP-A115-100 motors, use 2090-CTP*x*-MCDF-12*xxx* motor power/brake cable to comply with NFPA 79 requirements.
(4) For TLP-A200-350 motors, use 2090-CTP*x*-MDDF-08*xxx* motor power/brake cable to comply with NFPA 79 requirements.
(5) Only these motors have separate brake connectors and brake cables. All other motors have brake wires included with the motor power/brake connector.

Table 20 - Kinetix MP, LDAT-Series, LDC/LDL-Series™ Motor Power Cable Compatibility

Motor/Actuator Cat. No.	Motor Power Cat. No. (1) (with brake wires)	Motor Power Cat. No. (1) (without brake wires)
MPL-A/B15*xxx*-*xx*7xAA, MPL-A/B2*xxx*-*xx*7xAA, MPL-A/B3*xxx*-*xx*7xAA, MPL-A/B4*xxx*-*xx*7xAA, MPL-A/B45*xxx*-*xx*7xAA, MPL-A/B5*xxx*-*xx*7xAA, MPL-B6*xxx*-*xx*7xAA	2090-CPBM7DF-*xx*AA*xx* (standard) or 2090-CPBM7DF-*xx*AF*xx* (continuous-flex)	2090-CPWM7DF-*xx*AA*xx* (standard) or 2090-CPWM7DF-*xx*AF*xx* (continuous-flex)
MPM-A/B*xxxx*, MPF-A/B*xxxx*, MPS-A/B*xxxx*		
MPAS-A/B*xxxx*1-V05SxA, MPAS-A/B*xxxx*2-V20SxA MPAI-A/B*xxxx*, MPAR-A/B3*xxx*, MPAR-A/B1xxx, and MPAR-A/B2*xxx* (series B)		
MPAS-B*xxxxx*-ALM*x*2C LDAT-S*xxxxxx*-x*D*x LDAT-S*xxxxxx*-x*B*x LDC-C*xxxxxx* LDL-*xxxxxxx*	–	

(1) See the Kinetix Motion Accessories Specifications Technical Data, publication KNX-TD004, for cable specifications.

Table 21 - Kinetix TL and TLY Motor Power/Brake Cable Compatibility

Motor/Actuator Cat. No.	Motor Power Cat. No. (1) (with brake wires)	Motor Power Cat. No. (1) (without brake wires)	Brake Cat. No. (1)
TLY-A*xxxx*	2090-CPBM6DF-16AA*xx* (standard)	2090-CPWM6DF-16AA*xx* (standard)	Not applicable. Brake conductors are included in the power cable.
TL-A*xxxx*	–	2090-DANPT-16S*xx*	2090-DANBT-18S*xx*

(1) See the Kinetix Motion Accessories Specifications Technical Data, publication KNX-TD004, for cable specifications.

See Kinetix 5300 Servo Drives User Manual, publication 2198-UM005 for motor power and brake connector specifications.

Table 22 - Legacy Motor Power Cables

Motor Cable	Description	Motor Power Cat. No.
Standard	Power/brake, threaded	2090-XXNPMF-*xx*S*xx*
	Power-only, bayonet	2090-XXNPMP-*xx*S*xx*
Continuous-flex	Power/brake, threaded	2090-CPBM4DF-*xx*AF*xx*
	Power-only, threaded	2090-CPWM4DF-*xx*AF*xx*
	Power-only, bayonet	2090-XXTPMP-*xx*S*xx*

Table 23 - Induction Motor Power Cable Specifications

Cable Manufacturer	Cable Series	Voltage Rating	Temperature Rating	Cable Length, max
Belden	29505-29507	1000V	90 °C (194 °F)	50 m (164 ft)
Lapp Group	ÖLFEX VFD XL			
SAB	VFD XLPE TR			

All of the current and legacy feedback cables listed below are compatible with the 2198-K53CK-D15M connector kit.

Table 24 - Motor Feedback Cable Compatibility

Motor/Actuator Cat. No.	Feedback Cable Cat. No.
MPL-A/B15*xxx*-V/Ex7xAA, MPL-A/B2*xxx*-V/Ex7xAA MPL-A/B3*xxx*-S/Mx7xAA, MPL-A/B4*xxx*-S/Mx7xAA MPL-A/B45*xxx*-S/Mx7xAA, MPL-A/B5*xxx*-S/Mx7xAA MPL-B6*xxx*-S/Mx7xAA, MPL-B8*xxx*-S/Mx7xAA, MPL-B9*xxx*-S/Mx7xAA	2090-CFBM7DF-CEAA*xx* 2090-CFBM7DD-CEAA*xx* 2090-CFBM7DF-CERA*xx* (standard) or 2090-CFBM7DF-CEAF*xx* 2090-CFBM7DD-CEAF*xx* 2090-CFBM7DF-CDAF*xx* (continuous-flex)
MPM-A/B*xxxx*-S/M MPF-A/B*xxxx*-S/M MPS-A/B*xxxx*-S/M	
MPAR-A/B1*xxxx*-V and MPAR-A/B2*xxxx*-V (series B) MPAR-A/B3*xxxx*-M MPAI-A/B*xxxxx*M3	
MPAS-A/B*xxxx*1-V05SxA (ballscrew) MPAS-A/B*xxxx*2-V20SxA (ballscrew)	
LDAT-S*xxxxxx*-xD*x*	
MPL-A/B15*xxx*-Hx7xAA MPL-A/B2*xxx*-Hx7xAA MPL-A/B3*xxx*-Hx7xAA MPL-A/B4*xxx*-Hx7xAA MPL-A/B45*xxx*-Hx7xAA	2090-XXNFMF-S*xx* (standard) or 2090-CFBM7DF-CDAF*xx* (continuous-flex)
MPAS-A/B*xxxx*-ALMx2C (direct drive)	
LDAT-S*xxxxxx*-xB*x*	
LDC-C*xxxxxx*-*x*H LDL-*xxxxxxx*-*x*H	
TLP-A046-*xxx*, TLP-A070-*xxx*, TLP-A090-*xxx*, TLP-A100-*xxx*	2090-CTFB-MADD-CFA*xx* (standard) or 2090-CTFB-MADD-CFF*xx* (continuous-flex)
TLP-A115-*xxx*, TLP-A145-*xxx*, TLP-A200-*xxx*, TLP-A235-*xxx*	2090-CTFB-MFDD-CFA*xx* (standard) or 2090-CTFB-MFDD-CFF*xx* (continuous-flex)
TLY-A*xxxx*-B	2090-CFBM6DF-CBAA*xx* (standard) 2090-CFBM6DD-CCAA*xx* (standard)
TLY-A*xxxx*-H	
TL-A*xxxx*-B	2090-DANFCT-S*xx* (standard)

Table 25 - Legacy Motor Feedback Cables

Motor Cable	Description	Feedback Cable Cat. No.
Standard	Encoder feedback, threaded	2090-XXNFMF-S*xx* 2090-UXNFBMF-S*xx*
	Encoder feedback, bayonet	2090-UXNFBMP-S*xx*
		2090-XXNFMP-S*xx*
Continuous-flex	Encoder feedback, bayonet	2090-XXTFMP-S*xx*
	Encoder feedback, threaded	2090-CFBM4DF-CDAF*xx*

Refer to Kinetix 5300 Servo Drives User Manual, publication 2198-UM005 for motor feedback cable specifications.

Digital I/O

This section describes digital inputs for Ultra3000 and Kinetix 5300 servo drives.

Ultra3000 Servo Drive Digital Inputs

The digital inputs on the Ultra3000 servo drive have the following characteristics and specifications.

Table 26 - Ultra3000 Drives Digital Input Characteristics

Specification	Description
I/O response	100 µs
Digital I/O firmware scan period	1 ms

Table 27 - Ultra3000 Drives Digital Input Parameters

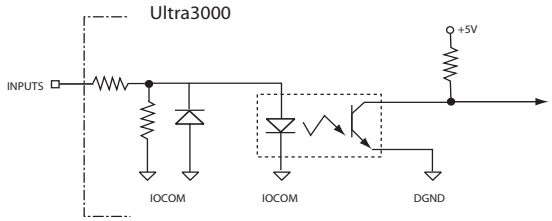
Parameter	Description	Min	Max
ON state voltage	Voltage applied to the input, with respect to IOCOM, to guarantee an ON state.	10.8V	26.4V
ON state current	Current flow to guarantee an ON State.	3.0 mA	12.0 mA
OFF state voltage	Voltage applied to the input, with respect to IOCOM, to guarantee an OFF state.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

Table 28 - Ultra3000 Sercos Drives Dedicated Functionality Inputs

Pin	Signal	Description
CN1-31	ENABLE	Drive Enable Input, an active state enables the power electronics to control the motor.
CN1-32	HOME	Home Sensor, an active state indicates to a homing sequence that the sensor has been seen.
CN1-33 CN1-34	REG1 REG2	Registration Sensor, a transition is used to record position values.
CN1-37 CN1-38	OT_POS OT_NEG	Overtravel Input, an inactive state indicates that a position limit has been exceeded. An active state occurs when 24V is removed from the input.

For the Ultra3000 drives, there are eight optically isolated digital inputs. All digital inputs have the same configuration, as shown in the following figure.

Figure 10 - Ultra3000 Drive Digital Input Circuit



Ultra3000 Servo Drive Outputs

The digital output and relay output on the Ultra3000 servo drive have the following characteristics and specifications.

Table 29 - Ultra3000 Drives Digital Outputs

Parameter	Description	Min	Max
ON state current	Current flow when the output transistor is ON	–	50 mA
OFF state current	Current flow when the output transistor is OFF	–	0.1 mA
ON state voltage	Voltage across the output transistor when ON	–	1.5V
OFF state voltage	Voltage across the output transistor when OFF	–	50V

Figure 11 - Transistor Output Hardware Configuration

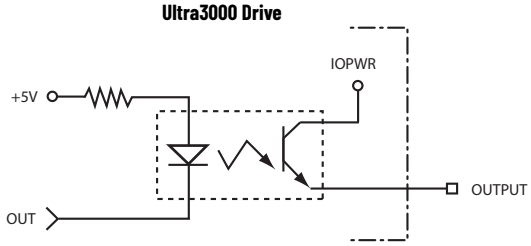
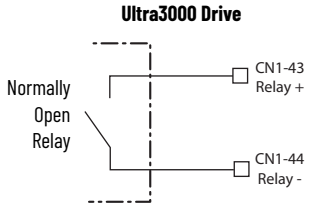


Table 30 - Relay Output Specifications

Parameter	Description	Min	Max
ON state current	Current flow when the relay is closed	–	1 A
ON state resistance	Contact resistance when the relay is closed	–	1 Ω
OFF state voltage	Voltage across the contacts when the relay is open	–	30V

Figure 12 - Relay Output Configuration



Kinetix 5300 Servo Drive Digital Inputs

Four digital inputs are available for the machine interface on the I/O connector and six configurable functions can be chosen from in the Studio 5000 Logix Designer® application (version 33.00 or later). Digital inputs require a 24V DC @ 15 mA supply. These are sinking inputs that require a sourcing device. A common and cable shield connection is provided on the I/O connector for digital inputs.

Although any input can be configured as a registration input, only two inputs can be assigned at any time.

IMPORTANT To improve registration input EMC performance, see the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.

Table 31 - Kinetix 5300 Drive Configurable Functions

Default Configuration	Description
Digital input1 = Enable Digital input2 = Home Digital input3 = Registration 1 Digital input4 = Registration 2	0 = Unassigned
	1 = Enable
	2 = Home
	3 = Registration 1
	4 = Registration 2
	5 = Positive overtravel
	6 = Negative overtravel

Table 32 - Understanding Kinetix 5300 Digital Input Functions

Function	Description
Enable	A 24V DC input is applied to this terminal to move the AxisCipDrive from Start-Inhibited to Stopped State.
Home	An active state indicates to a homing sequence that the referencing sensor has been seen. Typically, a transition of this signal is used to establish a reference position for the machine axis.
Registration 1	An inactive-to-active transition (also known as a positive transition) or active-to-inactive transition (also known as a negative transition) is used to latch position values for use in registration moves.
Registration 2	
Positive overtravel Negative overtravel	The positive/negative limit switch (normally closed contact) inputs for each axis require 24V DC (nominal).

Table 33 - Kinetix 5300 Digital Input Specifications

Attribute	Value
Input current (typical)	2.5 mA
Input ON voltage range (typical)	15...26.4V DC
Input OFF voltage, max	5V DC
Digital input type according to IEC 61131-2	24V DC Type 1
External power supply	24V DC ±10% PELV
Input protection	Optically isolated, reverse voltage protected
Registration accuracy	±3 µs
Registration repeatability	1.0 µs

Typical System Layout

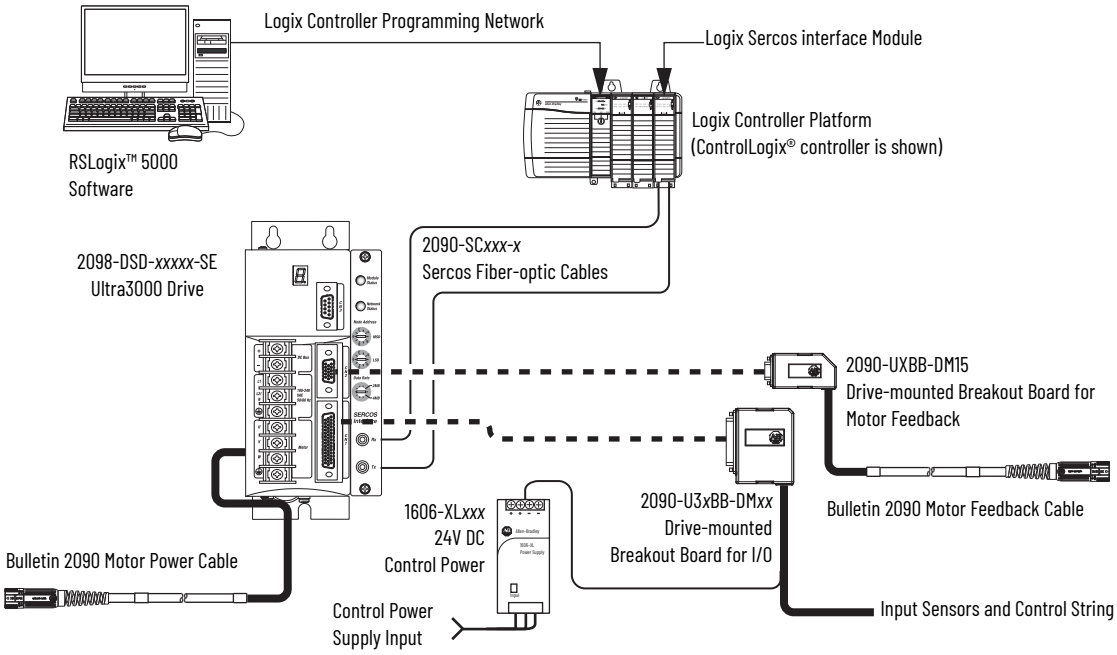
This section provides system examples for Ultra3000 and Kinetix 5300 servo drives.

Before designing the system layout, review Communication in Chapter 1, Integrated Motion on Sercos and EtherNet/IP Network – Analysis and Comparison, publication MOTION-AT006, and the Knowledgebase Technote: Qualifying Logic for MSO.

Ultra3000 Servo Drive System Example

This system example illustrates how the required drive modules and accessories are used in a typical system.

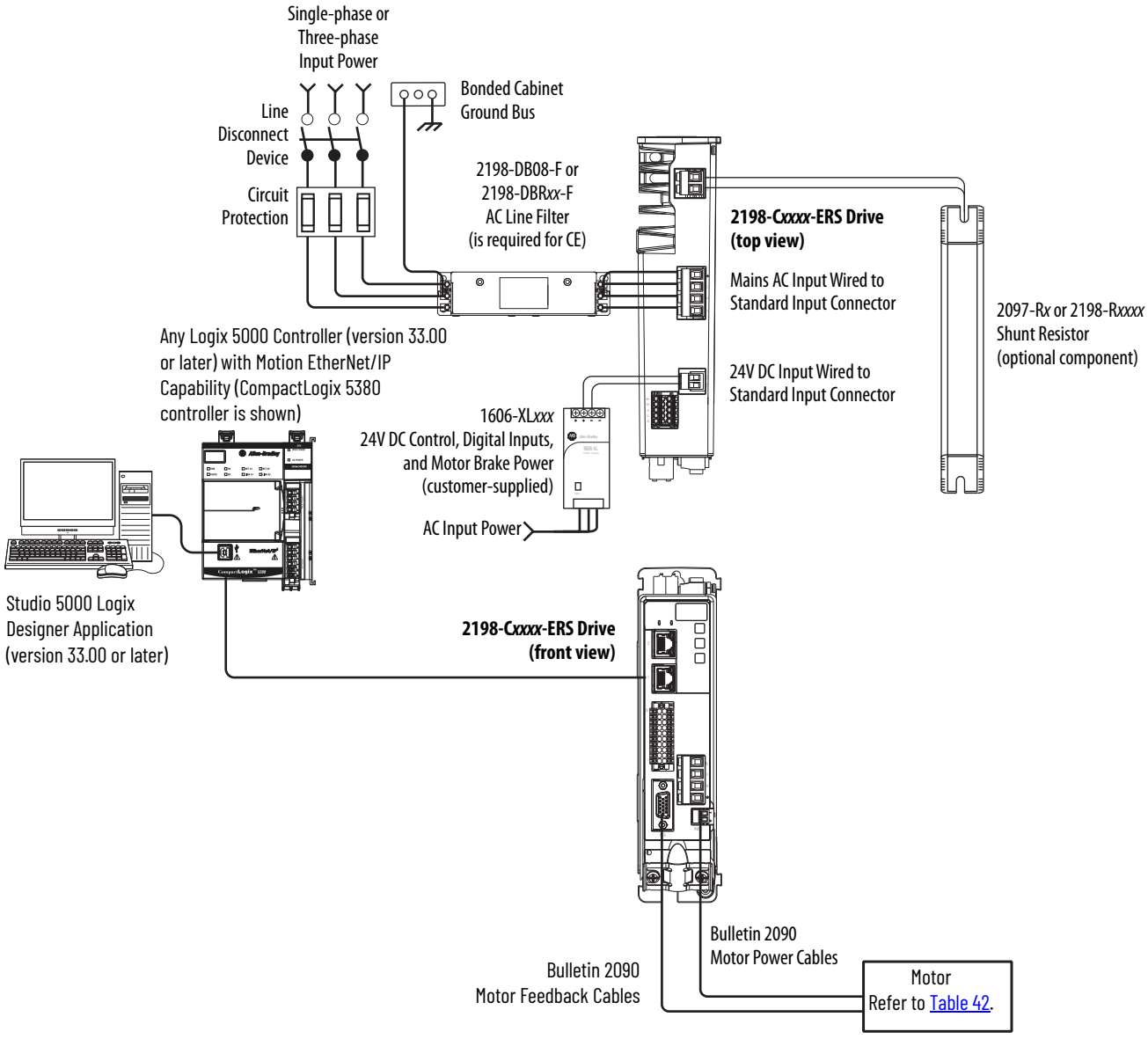
Figure 13 - Ultar3000 Sercos Servo Drive System Example



Kinetix 5300 Servo Drive System Example

This example control system uses a single Kinetix 5300 servo drive.

Figure 14 - Typical Kinetix 5300 Single-axis Installation



See Appendix E for additional communication configurations.

Accessories

This section describes required and optional accessories for Ultra3000 and Kinetix 5300 servo drives.

Ultra3000 Servo System Accessories

Ultra3000 servo systems require controllers and Sercos modules. See Table 41 on page 55 for additional information.

Table 34 - Ultra3000 Sercos Required Accessories

Drive Accessory	Description	Cat. No.
24V power supply	12...24V DC for control power and motor brakes.	1606-XL*xxx*
Drive-mounted breakout boards (required for flying lead cables)	Motor feedback (CN2) connections.	2090-UXBB-DM15
	Serial interface (CN3) connections.	2090-UXBB-DM09
	I/O (CN1) connections. These kits apply to all Ultra3000 drives (catalog numbers 2098-DSD-005, 2098-DSD-010, and 2098-DSD-020) in applications where 5V DC control power (if necessary) is user-supplied.	2090-U3BB-DM12 (1)
		2090-U3BB2-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.	2090-U3CBB-DM12 (1)
		2090-U3CBB-DM44
Sercos fiber-optic cables	Plastic, in-cabinet duty.	2090-SCEP*x-x*
	Plastic, on-machine duty.	2090-SCNP*x-x*
	Plastic, outdoor, and conduit duty.	2090-SCVP*x-x*
	Glass, outdoor, and conduit duty.	2090-SCVG*x-x*
Motor power and feedback cables	See the specific drive/motor combination for the motor cables required for your system.	

(1) The 12-pin board is intended for use with Sercos drives, but can be used in non-Sercos applications with minimal I/O requirements.

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

Table 35 - Ultra3000 Sercos Optional Drive Accessories

Drive Accessory	Description	Cat. No.
Drive to 1756-M02AE module interface cable	Single-axis (CN1) flying lead drive to Logix module cable.	2090-U3CC-D44*xx*
	Two-axis (CN1) pre-wired drive to Logix module cable.	2090-U3AE-D44*xx*
Drive-mounted breakout board for serial interface (applies to flying lead cables as an alternative to serial interface cable)	9-pin (CN3) breakout board for serial interface.	2090-UXBB-DM09
Panel-mounted breakout boards (applies to flying lead cables as an alternative to drive-mounted breakout boards)	DIN rail-mounted terminal block and cable for 15-pin (CN2) motor feedback connections.	2090-UXBK-D15*xx*
	DIN rail-mounted terminal block and cable for 44-pin (CN1) I/O connections.	2090-U3BK-D44*xx*
2090 AC line filters	AC line conditioning for EMC. Applies to 200V-class drives.	2090-UXLF-*xxx*
	AC line conditioning for EMC. Applies to 400V-class drives.	2090-UXLF-HV*xxx*
2090 shunt modules	Applies to 2098-DSD-HV030, 2098-DSD-HV050, and 2098-DSD-HV100 drives. (1)	2090-SR*xxx-xx*
	Applies to 2098-DSD-075 and 2098-DSD-150 drives.	2090-UCSR-P900
	Applies to 2098-DSD-030 drives.	9101-1183
	Applies to 2098-DSD-005, 2098-DSD-010, and 2098-DSD-020 drives.	2090-UCSR-A300
Resistive brake module (RBM)	Physically and electrically separate the drive power output from its corresponding motor.	2090-XB*xxx-xx*

Table 35 - Ultra3000 Sercos Optional Drive Accessories (Continued)

Drive Accessory	Description	Cat. No.
RBM interface cables	Motor power, RBM to drive.	2090-UXNRB-10F1P3
		2090-UXNRB-8F1P4
		2090-UXNRB-6F1P5
External auxiliary encoder	Allen-Bradley sine/cosine and incremental external encoders.	Bulletin 842A, 844D, 845H, and 845T

(1) See Rockwell Automation Encompass™ partners for 2098-DSD-HV150 and 2098-DSD-HV220 passive shunt solutions.

Kinetix 5300 Servo System Accessories

The Kinetix 5300 drives include an internal shunt resistor that is connected to the drive at the factory. External shunt resistors (Bulletin 2198-R*xxx* or 2097-R*x* shunt resistors) can be used to provide additional shunt capacity for applications when the internal shunt capacity of the drive is exceeded. Catalog numbers 2198-R014 and 2198-R031 are composed of resistor coils that are housed inside an enclosure. Catalog numbers 2097-R6, 2097-R7, and 2198-R001, 2198-R002, 2198-R004 are shunt resistors without an enclosure.

The Kinetix 5300 connector kit is included with the drive. Replacement kits are also available.

The Kinetix 5300 servo drives have a variety of optional drive accessories. For details on which accessories are available with each drive, refer to the Kinetix Motion Accessories Specifications Technical Data, publication KNX-TD004.

Kinetix 5300 Servo systems require controllers, Ethernet switches, and EtherNet/IP cards, see Table 2 on page 14 for additional information.

Table 36 - Kinetix 5300 Drive System Accessories

Accessory (1)	Description	Cat. No.
Low-profile Feedback Connector kit (required for flying-lead cables)	Motor feedback connector kit with 15-pin connector plug and battery backup is required for absolute position. Supports Kinetix MP, TL, TLP, TLY, LDC, LDL, and LDAT-Series rotary and linear motors and linear actuators	2198-K53CK-D15M
Motor Power and Feedback Cables	Refer to the specific drive/motor combination for the motor cables required for your system	–
Ethernet Cables (2)	Ethernet cables are available in standard lengths; Shielded cable is recommended	1585J-M8CBJM-*x*, 1585J-M8UBJM-*x*
24V DC Shared-bus Connector Kits (zero-stack tab / cutout) (3)	Input wiring connectors and DC bus T-connector for frame 1 and 2 servo drives	2198-H040-*x*-*x*
	Input wiring connectors and DC bus T-connector for frame 3 servo drives	2198-H070-*x*-*x*
External Shunt Resistor (3)	External passive shunts are available to provide additional shunt capacity for applications where the internal shunt capacity is exceeded	2097-R*x* and 2198-R*xxx*
AC Line Filters (3)	These line filters are required to meet CE requirements	2198-DB08-F 2198-DBR*xx*-F

(1) Refer to the Kinetix Servo Drives Specifications Technical Data, publication KNX-TD003, for detailed descriptions and specifications of these drive accessories.
(2) Where *x* equals the cable length in meters.
(3) This is an optional accessory. The AC line filters required to meet CE compliance for the Kinetix 5300 are different than those required by the Ultra3000.

Notes:

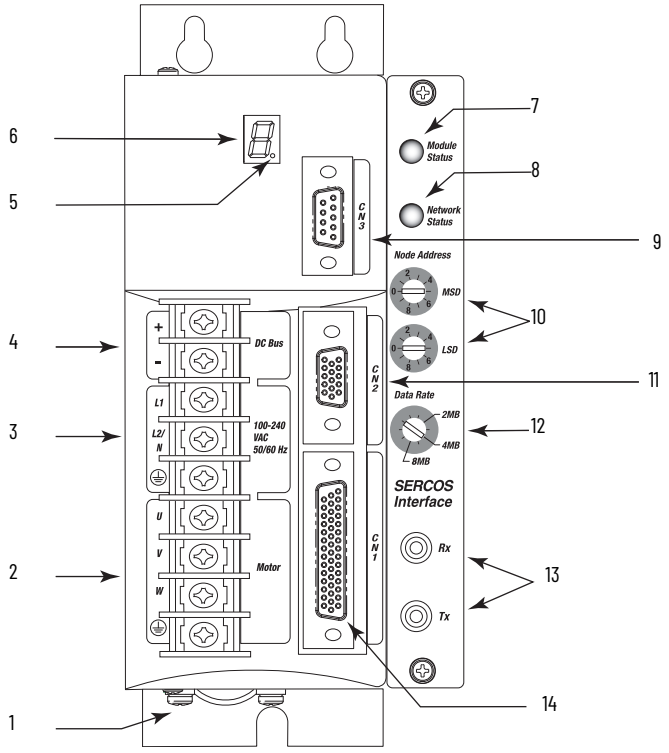
Connectors and Field Connections

Connector Locations

Use these illustrations to identify the connectors and indicators for the Ultra™ 3000 and Kinetix® 5300 servo drives.

Ultra3000 Servo Drive Connector Data

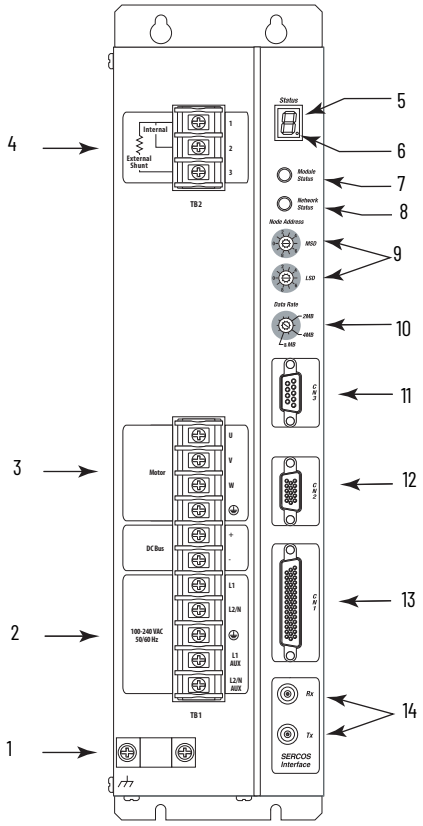
Figure 15 - Ultra3000 Servo Drive Front Panel Connections for Cat. No. 2098-DSD-005-SE, -010-SE, and -020-SE



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 Indicator
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	Sercos Interface Receive (Rx) and Transmit (Tx) Connectors
14	CN1 44-pin User I/O Connector

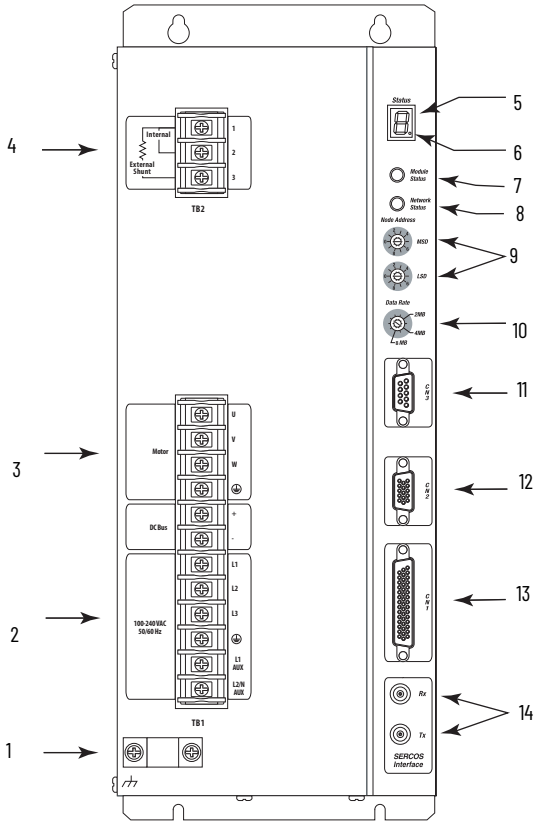
Figure 16 - Ultar3000 Servo Drive Front Panel Connections for Cat. No. 2098-DSD-030



Item	Description
1	Motor Power Cable Shield Clamp
2	AC Input Power Connections
3	Motor Power Connections
4	Passive Shunt Resistor Connections
5	Seven Segment Status Indicator
6	Logic Power Status Indicator
7	Module Status Indicator

Item	Description
8	Network Status Indicator
9	Node Address Switches
10	Data Rate Switch
11	CN3 9-pin Serial Port Connector
12	CN2 15-pin Motor Feedback Connector
13	CN1 44-pin User I/O Connector
14	Sercos interface Receive (Rx) and Transmit (Tx) Connectors

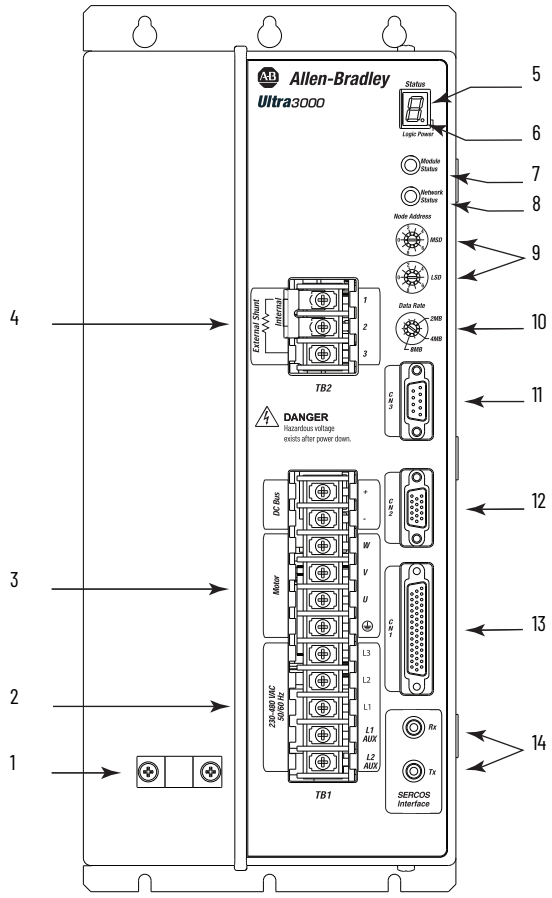
Figure 17 - Ultar3000 Servo Drive Front Panel Connections for Cat. No. 2098-DSD-075 and -150



Item	Description
1	Motor Power Cable Shield Clamp
2	AC Input Power Connections
3	Motor Power Connections
4	Passive Shunt Resistor Connections
5	Seven Segment Status Indicator
6	Logic Power Status Indicator
7	Module Status Indicator

Item	Description
8	Network Status Indicator
9	Node Address Switches
10	Data Rate Switch
11	CN3 9-pin Serial Port Connector
12	CN2 15-pin Motor Feedback Connector
13	CN1 44-pin User I/O Connector
14	Sercos interface Receive (Rx) and Transmit (Tx) Connectors

Figure 18 - Ultra3000 Servo Drive Front Panel Connections for Cat. No. 2098-DSD-HVxxx-SE

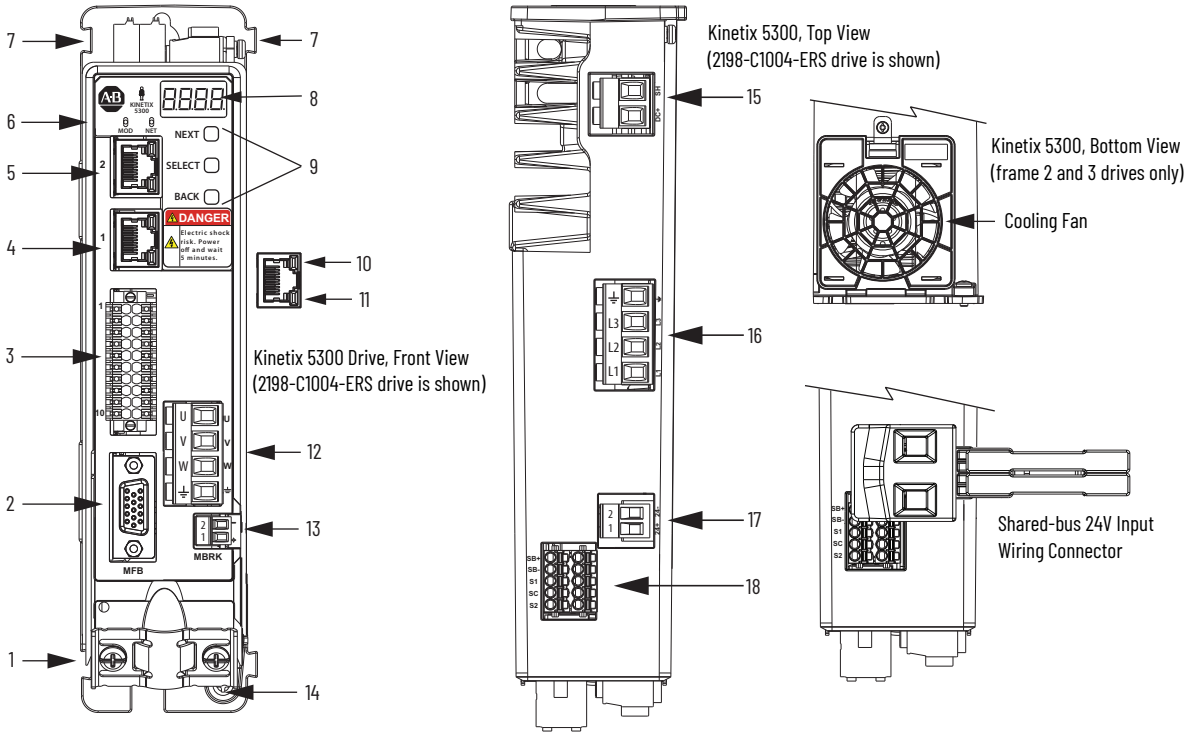


Item	Description
1	Motor Power Cable Shield Clamp
2	AC Input Power Connections
3	Motor Power Connections
4	Passive Shunt Resistor Connections
5	Seven Segment Status Indicator
6	Logic Power Status Indicator
7	Module Status Indicator

Item	Description
8	Network Status Indicator
9	Node Address Switches
10	Data Rate Switch
11	CN3 9-pin Serial Port Connector
12	CN2 15-pin Motor Feedback Connector
13	CN1 44-pin User I/O Connector
14	Sercos Interface Receive (Rx) and Transmit (Tx) Connectors

Kinetix 5300 Servo Drive Connector Data

Figure 19 - Drive Features and Indicators



Item	Description
1	Motor Cable Shield Clamp
2	Motor Feedback (MFB) Connector
3	Digital Inputs and Auxiliary Feedback Connector
4	Ethernet (PORT1) RJ45 Connector
5	Ethernet (PORT2) RJ45 Connector
6	Module and Network Status Indicators

Item	Description
7	Zero-stack Mounting Tab/Cutout
8	Four-character Status Display
9	Navigation Pushbuttons
10	Link Speed Status Indicators
11	Link/Activity Status Indicators
12	Motor Power Connector

Item	Description
13	Motor Brake Connector
14	Ground Terminal
15	Shunt Resistor Connector
16	AC Mains Input Power Connector
17	24V Control Input Power Connector
18	Safe Torque Off (STO) Connector

Input and Motor Power Connector Pinouts

These tables compare the input power, control/auxiliary power, motor power, and shunt resistor connector pinouts for the Ultra3000 and Kinetix 5300 servo drives.

Table 36 - Single-phase Connectors

Ultra3000 Servo Drives (Cat. No. 2098-DSD-005, -010, -20, and -030)			Kinetix 5300 Servo Drives		
Connector	**Signal**	**Terminal**	**Connector**	**Signal**	**Terminal**
DC Bus Connections	DC+	+	—	—	—
	DC-	-		—	—
Single-phase Input Power	L1	L1	Single-phase Input Power	L1	L1
	L2/N	L2/N		L2/N	L2
	—	—		—	—
	Ground	⏚		Ground	⏚

Table 36 - Single-phase Connectors (Continued)

Ultra3000 Servo Drives (Cat. No. 2098-DSD-005, -010, -20, and -030)			Kinetix 5300 Servo Drives		
Connector	**Signal**	**Terminal**	**Connector**	**Signal**	**Terminal**
Motor	U	U	Motor Power	U	U
	V	V		V	V
	W	W		W	W
	Chassis Ground	⏚		Chassis Ground	⏚
Control/Auxiliary Power (1)	L1	L1 Aux	24V Input Power	24V +	1
	L2/N	L2/N Aux		24V - (com)	2
Shunt Resistor	—	—	Shunt Resistor	SH (2)	—
	—	—		DC+ (2)	—
—	—	—	Motor Brake	MBRK+	1
—	—	—		MBRK -	2

(1) Auxiliary power for the Ultra3000 is only available for 2098-DSD-030.
(2) Pin numbering is not used on the shunt connector. Shunt connections to the 2-pin connector is arbitrary.

Table 37 - Three-phase Connectors

Ultra3000 Servo Drives (Cat. No. 2098-DSD-075, -150, and 2098-DSD-HVxxx)				Kinetix 5300 Servo Drives		
Connector	**Connector**	**Signal**	**Terminal**	**Connector**	**Signal**	**Terminal**
Motor	TB1	U	U	Motor Power	U	U
		V	V		V	V
		W	W		W	W
		Chassis Ground	⏚		Chassis Ground	⏚
DC Bus Connections	TB1	DC+	+	—	—	—
		DC-	-		—	—
Three-phase Input Power	TB1	L1	L1	Three-phase Input Power	L1	L1
		L2	L2		L2	L2
		L3	L3		L3	L3
		Ground	⏚		Ground	⏚
Control/Auxiliary Power	TB1	L1	L1 Aux	24V Input Power	24V +	1
		L2	L2/N Aux		24V - (com)	2
Shunt Resistor	TB2	Internal/ External	1	Shunt Resistor	SH (1)	—
		Internal	2		DC+ (2)	—
		External	3		—	—

(1) Pin numbering is not used on the shunt connector. Shunt connections to the 2-pin connector is arbitrary.

Motor Feedback

The table compares the feedback connector pinouts for the Ultra3000 and Kinetix 5300 servo drives:

- Ultra3000 servo drive CN2 connector
- Kinetix 5300 servo drive MFB connector

Table 38 - Motor Feedback Connector Pinouts

Ultra3000 Servo Drives [1]			Kinetix 5300 Servo Drives		
CN2 Pin	**Description**	**Signal**	**Signal**	**Description**	**MFB Pin**
1	Channel A+ / sine differential input+	AM+	MTR_SIN+ MTR_AM+	Sine differential input + AM differential input +	1
2	Channel A- / sine differential input-	AM-	MTR_SIN– MTR_AM–	Sine differential input– AM differential input–	2
3	Channel B+ / cosine differential input+	BM+	MTR_COS+ MTR_BM+	Cosine differential input + BM differential input +	3
4	Channel B- / cosine differential input-	BM-	MTR_COS– MTR_BM–	Cosine differential input – BM differential input –	4
5	Channel I+ / Index pulse+	IM+	MTR_DATA+ MTR_IM+	Data differential input/output + IM differential input +	5
6	Common	ECOM	MTR_ECOM	Encoder common	6
7	Reserved [1]	–	MTR_EPWR9V [2]	Encoder 9V power output	7
8	Commutation channel S3	S3	MTR_S3	Hall commutation S3 input	8
9	Positive overtravel limit	+LIMIT	–	Reserved	9
10	Channel I- / Index pulse-	IM-	MTR_DATA- MTR_IM–	Data differential input/output – IM differential input –	10
11	Thermostat	TS	MTR_TS	Motor thermostat (normally closed) [3]	11
12	Commutation channel S1	S1	MTR_S1	Hall commutation S1 input	12
13	Commutation channel S2	S2	MTR_S2	Hall commutation S2 input	13
14	Encoder power (+5V)	EPWR_5V	MTR_EPWR5V [2]	Encoder 5V power output	14
15	Negative overtravel limit	-LIMIT	–	Reserved	15

(1) +9V encoder capability only available on standard-size Ultra3000 drive (catalog number 2098-DSD-030 or larger).
(2) Determine which power supply your encoder requires and connect to only the specified supply. Do not make connections to both supplies.
(3) Not applicable unless motor has integrated thermal protection.

I/O Connector and Auxiliary Feedback Pinouts

The table compares the I/O connector pinouts for the Ultra3000 and Kinetix 5300 servo drives:

- Ultra3000 CN1 connector
- Kinetix 5300 servo drive digital inputs and auxiliary feedback connector

Table 39 - I/O Connector Pinouts

Ultra3000 Servo Drives [1]			Kinetix 5300 Servo Drives		
CN1 Pin	**Description**	**Signal**	**Signal**	**Description**	**I/O Pin**
1	Auxiliary Encoder Power Out (+5V)	EPWR	IN1	24V current-sinking fast input #1.	1
2	Common	ECOM	COM	I/O common for customer-supplied 24V supply.	2
3	Reserved	–	IN2	24V current-sinking fast input #2.	3
4	Auxiliary A+/Step+/CW+	AX+	COM	I/O common for customer-supplied 24V supply.	4
5	Auxiliary A-/Step-/CW-	AX-	SHIELD	I/O cable shield termination point.	5
6	Auxiliary B+/Dir+/CCW+	BX+	AUX_AM+	AM Differential Input +	6
7	Auxiliary B-/Dir-/CCW-	BX-	AUX_BM+	BM Differential Input +	7
8	Auxiliary Encoder Ch I+	IX+	AUX_IM+	IM Differential Input +	8

Table 39 - I/O Connector Pinouts (Continued)

Ultra3000 Servo Drives (1)			Kinetix 5300 Servo Drives		
CN1 Pin	**Description**	**Signal**	**Signal**	**Description**	**I/O Pin**
9	Auxiliary Encoder Ch I-	IX-	AUX_EPWR_5V	Encoder 5V power output	9
10	Unbuffered Motor Encoder Ch A+	AM+	SHIELD	Auxiliary feedback cable shield termination point.	10
11	Unbuffered Motor Encoder Ch A-	AM-	IN3	24V current-sinking fast input #3.	11
12	Unbuffered Motor Encoder Ch B+	BM+	COM	I/O common for customer-supplied 24V supply.	12
13	Unbuffered Motor Encoder Ch B-	BM-	IN4	24V current-sinking fast input #4.	13
14	Unbuffered Motor Encoder Ch I+	IM+	COM	I/O common for customer-supplied 24V supply.	14
15	Unbuffered Motor Encoder Ch I-	IM-	SHIELD	I/O cable shield termination point.	15
16	Buffered Motor Encoder Ch A+	AMOUT+	AUX_AM-	AM Differential Input –	16
17	Buffered Motor Encoder Ch A-	AMOUT-	AUX_BM-	BM Differential Input –	17
18	Buffered Motor Encoder Ch B+	BMOUT+	AUX_IM-	IM Differential Input –	18
19	Buffered Motor Encoder Ch B-	BMOUT-	AUX_COM	Auxiliary common	19
20	Buffered Motor Encoder Ch I+	IMOUT+	SHIELD	Auxiliary feedback cable shield termination point.	20
21	Buffered Motor Encoder Ch I-	IMOUT-	–	–	–
22	Common	ACOM	–	–	–
23	Programmable Analog Output	AOUT	–	–	–
24	Analog Current Limit Input	ILIMIT	–	–	–
25	Command +	COMMAND+	–	–	–
26	Command -	COMMAND-	–	–	–
27	I/O Common	IOCOM	–	–	–
28	I/O Common	IOCOM	–	–	–
29	I/O Power	IOPWR	–	–	–
30	I/O Power	IOPWR	–	–	–
31	Digital Input 1	INPUT1	–	–	–
32	Digital Input 2	INPUT2	–	–	–
33	Digital Input 3	INPUT3	–	–	–
34	Digital Input 4	INPUT4	–	–	–
35	Digital Input 5	INPUT5	–	–	–
36	Digital Input 6	INPUT6	–	–	–
37	Digital Input 7	INPUT7	–	–	–
38	Digital Input 8	INPUT8	–	–	–
39	Digital Output 1 (2)	OUTPUT1	–	–	–
40	Digital Output 2	OUTPUT2	–	–	–
41	Digital Output 3	OUTPUT3	–	–	–
42	Digital Output 4	OUTPUT4	–	–	–
43	Normally Open Relay Output+	RELAY+	–	–	–
44	Normally Open Relay Output-	RELAY-	–	–	–

(1) The I/O names and signals vary depending on the model of Ultra3000 you have installed, refer to the Ultra3000 Digital Servo Drives Installation Instructions, publication 2098-IN003 for information on your specific model.
(2) READY signal only available with firmware revision 1.29 (or above). Requires use of drive-mounted breakout board (2090-U3BB2-DM44).

Safe Torque Off Connector

The Kinetix 5300 drives have a Safe Torque Off (STO) connector, where as the Ultra3000 did not. Refer to Figure 20 for a the Kinetix 5300 connector, and see the Kinetix 5300 Single-axis EtherNet/IP Servo Drives User Manual, publication 2198-UM005 for information on STO with the Kinetix 5300 drive.

The Kinetix 5300 10-pin connector consists of two parallel 5-pin rows for cascading safety connections from drive-to-drive when drives are joined by the zero-stack feature.

Figure 20 - Kinetix 5300 STO Connector Assignment

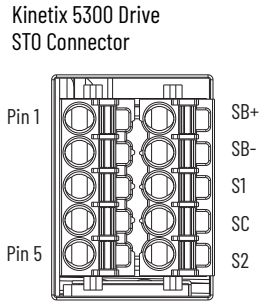


Table 40 - Kinetix 5300 STO Connector Assignment

STO Pins	Description	Signal
1 and 6	Safety bypass plus signal. Connect to both safety inputs to disable the STO function	SB+
2 and 7	Safety bypass minus signal. Connect to safety common to disable the STO function	SB-
3 and 8	STO input 1 (SS_IN_CH0)	S1
4 and 9	STO input common (SCOM)	SC
5 and 10	STO input 2 (SS_IN_CH1)	S2

The Safe Torque Off feature can be bypassed if necessary or applicable. Refer to Kinetix 5300 Single-axis EtherNet/IP Servo Drives User Manual, publication 2198-UM005 for information.

Notes:

About the Servo Drive System

About the Ultra3000 Servo Drive System

The Ultra™ 3000 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 41 - Ultra3000 Servo Drive System Overview

Ultra3000 Servo Drive System Component	Cat. No.	Description
Axis Module	2098-DSD-xxxx-xx (200V class) 2098-DSD-HVxxxx-xx (400V class)	Individual Axis Module
2090 Shunt Modules	2090-SRxxx-xx 2090-UCSR-P900 9101-1183 2090-UCSR-A300	Shunt Module: This module provides additional shunting capabilities in regenerative applications.
Resistive Brake Module (RBM)	2093-XBxxx-xx	Physically and electrically separate the drive power output from its corresponding motor.
24V Power Supply	1606-XLxxx	12...24V DC for control power and motor brakes.
Logix Controller Platform	1756-L60M03SE, 1756-MxxSE, and 1768-M04SE modules, and the 1784-PM16SE PCI card	Sercos interface module/PCI card serves as a link between the ControlLogix®/CompactLogix™/ 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.
Sercos Fiber-optic Cables	2090-SCxxx-x	Plastic or glass; in cabinet or on-machine duty.
RSLogix 5000 Software	9324-RLD300ENE	RSLogix 5000® software provides support for programming, commissioning, and maintaining the Logix family of controllers.
Servo Motors	Kinetix MP, Kinetix TL, LDC-series™, and LDL-Series™	Compatible servo motors.
Cables	Motor Power, Feedback, and Brake cables	See the specific drive and motor combination for the motor cables that are required for the system.
Drive-mounted Breakout Boards	2090-UXBB-DM15	Motor feedback (CN2) connections.
	2090-UXBB-DM09	Serial interface (CN3) connections.
	2090-U3BB-DM12	I/O (CN1) connections. These kits apply to all Ultra300 drives (and drive catalog numbers 2098-DSD-005, 2098-DSD-010, and 2098-DSD-020 in applications where 5V DC control power, if required, is user-supplied).
	2090-U3CBB-DM12	I/O (CN1) connections. These kits apply to only Ultra300 drive catalog numbers 2098-DSD-005, 2098-DSD-010, and 2098-DSD-020 in applications where a 24...5V DC converter for control power is required.
2090 AC Line Filters	2090-UXLF-xxx	AC line conditioning for EMC. Applies to 200V-class drives.
	2090-UXLF-HVxxx	AC line conditioning for EMC. Applies to 400V-class drives.

About the Kinetix 5300 Servo Drive System

The Kinetix 5300 servo drives are designed to provide a Kinetix Integrated Motion solution for your drive/motor application.

Table 42 - Kinetix 5300 Drive System Overview

Drive System Component	Cat. No.	Description
Kinetix 5300 Servo Drives	2198-C*xxxx*-ERS	200V-class (single-phase or three-phase) and 400V-class (three-phase) drives operate in standalone configurations. Modules can be zero-stacked from drive-to-drive and are compatible with the 24V DC shared-bus connection system to extend control power to multiple drives. Drives feature Safe Torque Off via the hardwired (STO) connector.
24V Shared-bus Connector Kits	2198-TCON-24VDCIN36	Control power input connector.
	2198-H040-*x*-*x*	Control power T-connector and bus-bar connectors, 55 mm, for frame 1 and 2 drives.
	2198-H070-*x*-*x*	Control power T-connector and bus-bar connectors, 85 mm, for frame 3 drives.
Feedback Connector Kit	2198-K53CK-D15M	Motor feedback connector kit with 15-pin connector plug for compatible motors and actuators. Kit features battery backup for Kinetix TLP, TL, and TLY multi-turn encoders.
Connector Sets	2198-CONKIT-PWR20	Connector set included with the frame 1 and 2 drives (except 2198-C2030 drives). Replacement sets are also available.
	2198-CONKIT-PWR30	Connector set included with 2198-C2030 drives. Replacement sets are also available.
	2198-CONKIT-PWR75	Connector set included with Frame 3 drives. Replacement sets are also available.
Logix 5000™ Controller Platform	Bulletin 1769 Bulletin 5069	Integrated Motion on the EtherNet/IP network in CompactLogix 5370, CompactLogix 5380, and CompactLogix 5480 controllers and Integrated Safety in Compact GuardLogix® 5370 controllers. Linear, device-level ring (DLR), and star topology is supported.
	1756-EN2T module 1756-EN2TR module 1756-EN3TR module	EtherNet/IP network communication modules for use with ControlLogix 5570, ControlLogix 5580, GuardLogix 5570, and GuardLogix 5580 controllers. Linear, device-level ring (DLR), and star topology is supported.
Studio 5000 Environment	—	Studio 5000 Logix Designer® application, version 33.00 or later, provides support for programming, commissioning, and maintaining the CompactLogix and ControlLogix controller families.
Rotary Servo Motors	Kinetix MP	Compatible rotary motors include 200V and 400V-class Kinetix MPL, MPM, MPF, and MPS servo motors.
	Kinetix TLP	Compatible rotary motors include 200V and 400V-class Kinetix TLP servo motors.
	Kinetix TL and TLY	Compatible rotary motors include 200V-class Kinetix TL and TLY servo motors.
Linear Actuators	Kinetix MP and LDAT-Series	Compatible linear actuators include 200V and 400V-class Kinetix MPAS and MPMA linear stages, Kinetix MPAR and MPAI linear actuators, and LDAT-Series linear thrusters.
Linear Motors	LDC-Series and LDL-Series	Compatible motors include LDC-Series™ iron-core and LDL-Series™ ironless linear motors.
Induction Motors	—	Induction motors with open-loop frequency control and closed-loop control are supported.
2090-Series Cables	2090-CTFB-MxD*x*-*xxxxx*	Motor feedback cables for Kinetix TLP motors.
	2090-CTP*x*-MxD*x*-*xxxxx*	Motor power/brake cables for Kinetix TLP motors.
	2090-CFBM6D*x*-CxAA*xx*	Motor feedback cables for Kinetix TLY servo motors.
	2090-CPxM6DF-16AA*xx*	Motor power/brake cables for Kinetix TLY servo motors.
	2090-DANFCT-S*xx*	Motor feedback cables for Kinetix TL servo motors.
	2090-DANPT-16S*xx*	Motor power cables for Kinetix TL servo motors.
	2090-DANBT-18S*xx*	Motor brake cables for Kinetix TL servo motors.
	2090-CFBM7DF-CEA*xxx*	Motor feedback cables for Kinetix® MP motors/actuators, LDAT-Series linear thrusters, and LDC/LDL-Series linear motors.
	2090-CPxM7DF-*xx*A*xxx*	Motor power/brake cables for Kinetix MP motors/actuators, LDAT-Series linear thrusters, and LDC/LDL-Series linear motors.
	2090-XXNFMF-S*xx* 2090-CFBM7DF-CDAF*xx*	Standard and continuous-flex feedback cables that include additional conductors for use with incremental encoders.
Ethernet Cables	1585J-M8CBJM-*x*, 1585J-M8UBJM-*x*	Ethernet cables are available in standard lengths. Shielded cable is required to meet EMC specifications.
AC Line Filters	2198-DB08-F 2198-DBR20-F 2198-DBR40-F	Bulletin 2198 three-phase AC line filters are required to meet CE and are available for use in all Kinetix 5300 drive systems.
24V DC Power Supply	1606-XL*xxx*	Bulletin 1606 24V DC power supply for control circuitry, digital inputs, and safety inputs.
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-R014, 2198-R031	

Specifications

Power Specifications

This section provides the power specifications for the Ultra™ 3000 and Kinetix® 5300 servo drives.

Ultra3000 (230V) Servo Drive Power Specifications

The table lists power specifications and requirements for the Ultra3000 230V drives (2098-DSD-005x-xx, -010x-xx, and -020x-xx).

Attribute	2098-DSD-005	2098-DSD-010	2098-DSD-020
AC input voltage (1)	100...240V rms, single-phase		
AC input frequency	47...63 Hz		
AC input current (2)(3) Nom (rms) 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
Continuous output current (rms)	1.8 A	3.5 A	7.1 A
Continuous output current (0-pk)	2.5 A	5.0 A	10 A
Peak output current (rms)	5.3 A	10.6 A	21.2 A
Peak output current (0-pk)	7.5 A	15 A	30 A
Bus capacitance	1410 µF	1880 µF	1880 µF
Internal shunt resistance	–	–	–
Shunt on	–	–	–
Shunt off	–	–	–
Bus overvoltage	400V DC	400V DC	400V DC
Energy absorption capability 115V AC input 230V AC input	 93 J 38 J	 125 J 51 J	
Continuous power output 115V AC input 230V AC input	 0.25 kW 0.5 kW	 0.5 kW 1.0 kW	 1.0 kW 2.0 kW

(1) Specification is for nominal voltage. The absolute limits are ±10%, or 88...265V rms.
(2) The 2098-DSD-005*x-xx*, 2098-DSD-010*x-xx*, and 2098-DSD-020*x-xx* (200V-class) drives are limited to:
Series A or B - one contactor cycle every 2 minutes.
Series C - one contactor cycle every 10 s for up to 2 minutes, not to exceed 12 cycles in 5 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.

The table lists power specifications and requirements for the Ultra3000 230V drives (2098-DSD-030, -075, and -150).

Attribute	2098-DSD-030	2098-DSD-075	2098-DSD-150
AC input voltage [1]	100...240V rms, single-phase	100...240V rms, three-phase	
AC input frequency	47...63 Hz		
Main AC input current [2][3] Nom (rms) 230V AC (0-pk) max inrush	 28 A 50 A	 30 A 50 A	 46 A 68 A
Auxiliary AC input current 115V AC (rms) nom 230V AC (rms) nom 115V AC (0-pk) max inrush [4] 230V AC (0-pk) max inrush [4]	 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)	10.6 A	24.7 A	45.9 A
Continuous output current (0-pk)	15 A	35 A	65 A
Peak output current (rms)	21.2 A	53 A	106 A
Peak output current (0-pk)	30 A	75 A	150 A
Bus capacitance	2820 µF	4290 µF	7520 µF
Internal shunt resistance	35 Ω	16.5 Ω	9.1 Ω
Shunt on	420V DC	420V DC	420V DC
Shunt off	402V DC	402V DC	402V DC
Bus overvoltage	452V DC	452V DC	452V DC
Internal shunt Continuous power Peak power	 50 W 4.5 kW	 50 W 10 kW	 180 W 18 kW
External shunt Resistance Continuous power Peak power	 30 Ω (-0/+5%) 2.4 kW 6 kW	 16.5 Ω (-0/+5%) 4 kW 10 kW	 9 Ω (-0/+5%) 8 kW 19 kW
Energy absorption capability 115V AC input 230V AC input	 251 J 139 J	 381 J 211 J	 669 J 370 J
Continuous power output 115V AC input 230V AC input	 1.5 kW 3 kW	 — 7.5 kW	 — 15 kW

(1) Specification is for nominal voltage. The absolute limits are ±10%, or 88...265V rms.
(2) The 2098-DSD-030*x-xx*, 2098-DSD-075*x-xx*, and 2098-DSD-150*x-xx* (200V-class) drives are limited to one contactor cycle per 2 minutes.
(3) Power initialization requires a short period of inrush current. Dual element time delay (slow blow) fuses are recommended.
(4) 400 µs half wave sine.

Ultra3000 (460V) Servo Drive Power Specifications

The table lists power specifications and requirements for the Ultra3000 460V drives (2098-DSD-HV030, -HV050, -HV100, -HV150, and -HV220).

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 460V AC (rms) max inrush	 4 A 6 A	 7 A 6 A	 14 A 6 A	 20 A 6 A	 28 A 6 A
Auxiliary AC input current 230V AC (rms) nom 360V AC (rms) nom 480V AC (rms) nom 230V AC (0-pk) max inrush [5] 480V AC (0-pk) max inrush [5]	 0.55 A 0.35 A 0.25 A 47 A 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 µF		705 µF	940 µF	1880 µF
Internal shunt resistance	120 Ω		40 Ω	25 Ω	20 Ω
Shunt on 230V AC input 480V AC input	 400V DC 800V DC				
Shunt off 230V AC input 480V AC input	 375V DC 750V DC				
Bus overvoltage 230V AC input 480V AC input	 410V DC 810V DC				
Internal shunt Continuous power Peak power	 100 W 5.3 kW		 200 W 16 kW	 200 W 25.6 kW	 400 W 32 kW
External shunt Resistance (-0/+5%) Continuous power Peak power	 120 Ω 3 kW 5.3 kW		 40 Ω 10 kW 16 kW	 25 Ω 15 kW 25.6 kW	 20 Ω 22 kW 32 kW
Energy absorption capability 230V AC input with 230V motor 230V AC input with 460V motor 480V AC input	 15 J 129 J 55 J		 22 J 194 J 82 J	 29 J 259 J 109 J	 59 J 517 J 219 J
Continuous power output 230V AC input 480V AC input	 1.5 kW 3.0 kW	 2.5 kW 5.0 kW	 5.0 kW 10 kW	 7.5 kW 15 kW	 11 kW 22 kW

(1) Specification is for nominal voltage. The absolute limits are ±10%, or 207...264V rms and 324...528V rms.
(2) The 2098-DSD-HV*xxx-xx* drives can be powered with 230V rms and used with motors that are designed for 230V operation. In such cases, the voltage levels that are used for shunting and DC bus overvoltage limits are adjusted to be compatible with the voltage limit of the motor.
The 2098-DSD-HV*xxx-xx* drives can be powered with 480V rms and used with motors that are designed for 480V operation. In such cases, the voltage levels that are used for shunting and DC bus overvoltage limits are adjusted to be compatible with the voltage limit of the motor.
(3) The 2098-DSD-HV*xxx -xx* (400V-class) drives are limited to three contactor cycles per minute.
(4) Power initialization requires a short period of inrush current (processor that is controlled via soft start circuitry). Dual element time delay (slow blow) fuses are recommended.
(5) 400 µs half wave sine.

Kinetix 5300 Servo Drive Input Power Specifications

The table lists input power specifications and requirements for the Kinetix 5300 servo drives.

Table 43 - Kinetix 5300 (110V and 230V, Single-phase and Three-phase) Power Specifications

Attribute	2198-C1004-ERS	2198-C1007-ERS	2198-C1015-ERS	2198-C1020-ERS
AC input voltage	85...132V rms, single-phase (110V nom) 170...253V rms, single-phase (230V nom) 170...253V rms, three-phase (230V nom)			
AC input frequency	47...63 Hz			
Main AC input current (rms) (1)	2.17 A	3.56 A	6.58 A	9.45 A
Max inrush current (0-pk) Nom 110V input (single-phase) Nom 230V input (single-phase) Nom 230V input (three-phase)	 6.0 A 11.5 A 7.4 A	 6.0 A 11.5 A 7.4 A	 6.0 A 11.5 A 7.4 A	 6.0 A 11.5 A 7.4 A
Peak AC input current (rms)	6.99 A	10.48 A	19.75 A	27.46 A
Control power input voltage (2)	21.6...26.4V DC 24V DC nom			
Control power input current (1) (3) (non-brake motors)	0.4 A_{DC}	0.4 A_{DC}	0.9 A_{DC}	0.9 A_{DC}
Continuous output current (rms) Nom 110V input (single-phase) Nom 230V input (single-phase) Nom 230V input (three-phase)	 2.8 A	 4.6 A	 8.5 A	 12.2 A
Continuous output current (0-pk) Nom 110V input (single-phase) Nom 230V input (single-phase) Nom 230V input (three-phase)	 4.0 A	 6.5 A	 12.0 A	 17.3 A
Peak output current (rms) (4) Nom 110V input (single-phase) Nom 230V input (single-phase) Nom 230V input (three-phase)	 6.6 A 9.5 A 9.5 A	 9.7 A 15.5 A 15.5 A	 12.2 A 20.5 A 29.2 A	 25.0 A 40.6 A 40.6 A
Peak output current (0-pk) Nom 110V input (single-phase) Nom 230V input (single-phase) Nom 230V input (three-phase)	 9.3 A 13.4 A 13.4 A	 13.7 A 21.9 A 21.9 A	 17.3 A 29.0 A 41.3 A	 35.4 A 57.4 A 57.4 A
Line loss ride through	20 ms			
Continuous output power @ 110V nom single-phase @ 230V nom single-phase @ 230V nom three-phase	 0.22 kW 0.46 kW 0.72 kW	 0.36 kW 0.76 kW 1.18 kW	 0.67 kW 1.41 kW 2.18 kW	 0.97 kW 2.02 kW 3.13 kW
Internal shunt on	387.5V			
Internal shunt off	377.5V			
Internal shunt resistor	100 Ω	100 Ω	60 Ω	60 Ω
Internal shunt power	30 W	30 W	50 W	50 W
Bus undervoltage limit	72V @110V AC input 144V @230V AC input			
Bus overvoltage limit	405V			
Bus capacitance	330 µF	560 µF	660 µF	1120 µF
Capacitive energy absorption @ 110V nom AC input @ 230V nom AC input	 21.31 J 5.94 J	 36.17 J 10.08 J	 42.63 J 11.88 J	 72.34 J 20.16 J
Efficiency @ 110V nom single-phase AC input @ 230V nom single-phase AC input @ 230V nom three-phase AC input	 91% 95% 97%			
Short-circuit current rating	200,000 A (rms) symmetrical			

(1) Drives are limited to one power cycle per minute.
(2) The cooling fan runs as part of the control power startup routine, when the inverter is enabled, and if the inverter temperature exceeds preset threshold.
(3) For current values when motors include a holding brake, refer to Kinetix 5300 Servo Drive Control Power Specifications.
(4) Peak RMS current allowed for up to 1.0 seconds.

Table 44 - Kinetix 5300 (230V, three-phase) Input Power Specifications

Attribute	2198-C2030-ERS	2198-C2055-ERS	2198-C2075-ERS
AC input voltage	170…253V rms, three-phase (230V nom)		
AC input frequency	47…63 Hz		
Main AC input current (rms) (1)	15.18 A	31.13 A	36.93 A
Max inrush current (0-pk)	7.4 A	14.8 A	14.8 A
Peak AC input current (rms)	41.26 A	73.06 A	86.25 A
Control power input voltage (2)	21.6…26.4V DC 24V DC nom		
Control power input current (1) (3) (non-brake motors)	0.9 A_{DC}	1.7 A_{DC}	1.7 A_{DC}
Continuous output current (rms)	19.6 A	40.2 A	47.7 A
Continuous output current (0-pk)	27.7 A	56.9 A	67.5 A
Peak output current (rms) (4)	61.0 A	108.0 A	127.5 A
Peak output current (0-pk)	86.3 A	152.7 A	180.3 A
Line loss ride through	20 ms		
Continuous output power	5.02 kW	10.30 kW	12.22 kW
Internal shunt on	387.5V		
Internal shunt off	377.5V		
Internal shunt resistor	60 Ω	40 Ω	
Internal shunt power	50 W	75 W	
Bus undervoltage limit	144V		
Bus overvoltage limit	405V		
Bus capacitance	1680 µF	2460 µF	3280 µF
Capacitive energy absorption	30.25 J	44.29 J	59.05 J
Efficiency	97%		
Short-circuit current rating	200,000 A (rms) symmetrical		

(1) Drives are limited to one power cycle per minute.
(2) The cooling fan runs as part of the control power startup routine, when the inverter is enabled, and if the inverter temperature exceeds preset threshold.
(3) For current values when motors include a holding brake, refer to Kinetix 5300 Servo Drive Control Power Specifications.
(4) Peak RMS current allowed for up to 1.0 seconds.

Table 45 - Kinetix 5300 (480V, three-phase) Input Power Specifications

Attribute	2198-C4004-ERS	2198-C4007-ERS	2198-C4015-ERS	2198-C4020-ERS
AC input voltage	342…528V rms, three-phase (480V nom)			
AC input frequency	47…63 Hz			
Main AC input current (rms) (1)	1.24 A	2.25 A	4.03 A	5.65 A
Max inrush current (0-pk)	15.5 A	15.5 A	15.5 A	15.5 A
Peak AC input current (rms)	3.59 A	6.29 A	12.18 A	16.10 A
Control power input voltage (2)	21.6…26.4V DC 24V DC nom			
Control power input current (1) (3) (non-brake motors)	0.4 A_{DC}	0.4 A_{DC}	0.9 A_{DC}	0.9 A_{DC}
Continuous output current (rms)	1.6 A	2.9 A	5.2 A	7.3 A
Continuous output current (0-pk)	2.3 A	4.1 A	7.4 A	10.3 A
Peak output current (rms) (4)	5.3 A	9.3 A	18.0 A	23.8 A
Peak output current (0-pk)	7.5 A	13.2 A	25.5 A	33.7 A
Line loss ride through	20 ms			
Continuous output power	0.86 kW	1.55 kW	2.78 kW	3.90 kW
Internal shunt on	775V			
Internal shunt off	765V			
Internal shunt resistor	100 Ω	100 Ω	60 Ω	60 Ω
Internal shunt power	30 W	30 W	50 W	50 W
Bus undervoltage limit	275V			
Bus overvoltage limit	810V			
Bus capacitance	165 µF	165 µF	280 µF	330 µF
Capacitive energy absorption	8.13 J		13.79 J	16.26 J
Efficiency	97%			
Short-circuit current rating	200,000 A (rms) symmetrical			

(1) Drives are limited to one power cycle per minute.
(2) The cooling fan runs as part of the control power startup routine, when the inverter is enabled, and if the inverter temperature exceeds preset threshold.
(3) For current values when motors include a holding brake, refer to Kinetix 5300 Servo Drive Control Power Specifications.
(4) Peak RMS current allowed for up to 1.0 seconds.

Table 46 - Kinetix 5300 (480V, three-phase) Input Power Specifications (continued)

Attribute	2198-C4030-ERS	2198-C4055-ERS	2198-C4075-ERS
AC input voltage	342…528V rms, three-phase (480V nom)		
AC input frequency	47…63 Hz		
Main AC input current (rms) (1)	9.06 A	17.50 A	21.29 A
Max inrush current (0-pk)	30.9 A	30.9 A	46.4 A
Peak AC input current (rms)	23.07 A	39.57 A	49.72 A
Control power input voltage (2)	21.6…26.4V DC 24V DC nom		
Control power input current (1) (3) (non-brake motors)	0.9 A $_{DC}$	1.7 A $_{DC}$	1.7 A $_{DC}$
Continuous output current (rms)	11.7 A	22.6 A	27.5 A
Continuous output current (0-pk)	16.5 A	32.0 A	38.9 A
Peak output current (rms) (4)	34.1 A	58.5 A	73.5 A
Peak output current (0-pk)	48.3 A	82.7 A	103.9 A
Line loss ride through	20 ms		
Continuous output power	6.25 kW	12.08 kW	14.70 kW
Internal shunt on	775V		
Internal shunt off	765V		
Internal shunt resistor	60 Ω	40 Ω	
Internal shunt power	50 W	75 W	
Bus undervoltage limit	275V		
Bus overvoltage limit	810V		
Bus capacitance	560 µF	820 µF	1230 µF
Capacitive energy absorption	27.59 J	40.40 J	60.60 J
Efficiency	97%		
Short-circuit current rating	200,000 A (rms) symmetrical		

(1) Drives are limited to one power cycle per minute.
(2) The cooling fan runs as part of the control power startup routine, when the inverter is enabled, and if the inverter temperature exceeds preset threshold.
(3) For current values when motors include a holding brake, refer to Kinetix 5300 Servo Drive Control Power Specifications.
(4) Peak RMS current allowed for up to 1.0 seconds.

Control and Auxiliary Power Specifications

This section provides the control and auxiliary power specifications for the Ultra3000 and Kinetix 5300 servo drives.

Ultra3000 Servo Drive Auxiliary Power Specifications

Table 47 - Ultra3000 Drives +24V Power Supply Requirements for Logic Power

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

IMPORTANT A 24V power supply can be used to power the digital I/O and supply 24V to the drive-mounted breakout boards (catalog numbers 2090-U3CBB-DMxx) provided the cumulative minimum current requirements are met.

Table 48 - Ultra3000 Drives 5V Supply Specifications

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

IMPORTANT Using the drive-mounted breakout board with 24V to 5V auxiliary power converter is preferred to using an external +5V DC power supply.

Table 49 - 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		
230V AC (rms) nom	0.5 A		
115V AC (0-pk) max inrush	47 A		
230V AC (0-pk) max inrush	95 A		

Table 50 - Ultra3000 Drive Auxiliary Power Specification (460V)

Attribute	2098-DSD-HV030	2098-DSD-HV050	2098-DSD-HV100	2098-DSD-HV150	2098-DSD-HV220
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	47 A				
480V AC (0-pk) max inrush	68 A				

Kinetix 5300 Servo Drive Control Power Specifications

Table 51 - Control Power Current Specifications

Kinetix 5300 Drive Cat. No.	24V Current per Module (non-brake motor) A_{DC}	24V Current (2 A brake motor) (1) A_{DC}	24V Inrush Current (2) A
2198-C1004-ERS	0.4	2.4	1.8
2198-C1007-ERS			
2198-C4004-ERS			
2198-C4007-ERS			
2198-C1015-ERS	0.9	2.9	2.4
2198-C1020-ERS			
2198-C2030-ERS			
2198-C4015-ERS			
2198-C4020-ERS			
2198-C4030-ERS			
2198-C2055-ERS	1.7	3.7	3.0
2198-C2075-ERS			
2198-C4055-ERS			
2198-C4075-ERS			

(1) See Kinetix Rotary Motion Specifications Technical Data, publication KNX-TD001, for brake current specifications of Kinetix MP, TLP, and TL/TLY rotary motors.
(2) Inrush current duration is less than 30 ms.

Power Dissipation Specifications

This section provides the power dissipation specifications for the Ultra3000 and Kinetix 5300 servo drives.

Ultra3000 Servo Drive Power Dissipation Specifications

Use the following table to size an enclosure and calculate required ventilation for an Ultra3000 servo drive system. Typical heat losses run approximately one-half maximum power losses. The maximum power losses are shown.

Ultra3000 Servo Drive Cat. No.	Maximum Loss, watts
2098-DSD-005*x*-*xx*	48
2098-DSD-010*x*-*xx*	48
2098-DSD-020*x*-*xx*	50
2098-DSD-030*x*-*xx*	150 + dissipative shunt
2098-DSD-075*x*-*xx*	300 + dissipative shunt
2098-DSD-150*x*-*xx*	500 + dissipative shunt

Ultra3000 Servo Drive Cat. No.	Maximum Loss, watts
2098-DSD-HV030*x*-*xx*	175 + dissipative shunt
2098-DSD-HV050*x*-*xx*	175 + dissipative shunt
2098-DSD-HV100*x*-*xx*	350 + dissipative shunt
2098-DSD-HV150*x*-*xx*	350 + dissipative shunt
2098-DSD-HV220*x*-*xx*	600 + dissipative shunt

Kinetix 5300 Servo Drive Power Dissipation Specifications

Use this table to size an enclosure and calculate required ventilation for a Kinetix 5300 drive system.

Kinetix 5300 Drive Cat. No.	AC Input, nom	Usage as a % of Rated Power Output [1] (watts)				
		20%	40%	60%	80%	100%
2198-C1004-ERS	200...230V three-phase	12	16	20	25	29
2198-C1007-ERS		14	19	24	30	37
2198-C1015-ERS		26	36	47	59	71
2198-C1020-ERS		35	52	71	91	112
2198-C2030-ERS		53	87	124	164	206
2198-C2055-ERS		87	139	193	250	308
2198-C2075-ERS		97	159	225	293	364
2198-C4004-ERS	380...480V three-phase	16	21	26	31	36
2198-C4007-ERS		20	30	39	48	58
2198-C4015-ERS		33	48	62	78	93
2198-C4020-ERS		39	58	79	101	124
2198-C4030-ERS		57	89	123	157	193
2198-C4055-ERS		112	171	231	293	356
2198-C4075-ERS		134	204	273	344	417
2198-C1004-ERS	200...230V single-phase	12	16	20	25	30
2198-C1007-ERS		14	19	24	30	37
2198-C1015-ERS		25	36	47	59	72
2198-C1020-ERS		35	52	72	92	115
2198-C1004-ERS	110...120V single-phase	11	14	18	22	26
2198-C1007-ERS		12	17	21	27	32
2198-C1015-ERS		23	32	42	53	64
2198-C1020-ERS		30	44	59	77	96

(1) Internal shunt power is not included in the calculations and must be added based on utilization.

Cable Lengths

This section provides the feedback cable lengths for the Ultra3000 and Kinetix 5300 servo drives.

Table 52 - Ultra3000 and Kinetix 5300 Servo Drive Motor Cable Length Comparison (max)

Compatible Motor and Actuator Cat. No.	Feedback Type	Kinetix 5300		Ultra3000
		Cable Length, max m (ft)		Cable Length, max m (ft)
		≤400V AC Input	480V AC Input	
TLP-A/Bxxx-xxx-D	Nikon (24-bit) absolute high-resolution, multi-turn, and single-turn	50 (164)		–
TLY-Axxxx-B TL-Axxxx-B	Tamagawa (17-bit) absolute high-resolution, multi-turn	30 (98.4)		
TLY-Axxxx-H	Incremental encoder			30 (98.4)
MPL-A/Bxxxx-V/E	Hiperface, absolute high- resolution, multi-turn,and single-turn	50 (164)	20 (65.6)	90 (295.3)
MPL-A/Bxxxx-S/M		50 (164)		90 (295.3)
MPM-Axxxx-S/M				30 (98.4)
MPM-Bxxxx-S/M MPF-A/Bxxxx-S/M MPS-A/Bxxxx-S/M				90 (295.3)
MPAR-Axxxxx-M				30 (98.4)
MPAR-Bxxxxx-M				90 (295.3)
MPAR-Axxxxx-V MPAI-AxxxxM3	Absolute high-resolution, multi-turn	50 (164)	20 (65.6)	30 (98.4)
MPAS-A/Bxxxx-V MPAR-Bxxxxx-V MPAI-BxxxxM3				90 (295.3)
MPL-A/B15xx-H MPL-A/B2xxx-H	Incremental encoder	30 (98.4)	20 (65.6)	45 (147.6)
MPL-A/B3xx-H MPL-A/B4xxx-H		30 (98.4)		
MPAS-A/Bxxxx-ALM (direct drive)	Incremental, magnetic linear			30 (98.4)
LDAT-Sxxxxxx-xDx	Hiperface, absolute, magnetic scale	10 (33.1)		30 (98.4)
LDAT-Sxxxxxx-xBx	Incremental, magnetic scale			
LDC-Cxxxxxx-xH LDL-xxxxxxx-xH	Sin/Cos or TTL encoder			

Although the Ultra3000 servo drive motor feedback cables are available in standard lengths up to 90 m (295.3 ft), the drive/motor/feedback combination can limit the maximum cable length, as shown in Table 52.

Table 52 assumes that you are using cables that are recommended in the Ultra3000 Drives System Design Guide, publication KNX-RM008.

IMPORTANT Kinetix 5300 supports a maximum cable length of 50 m (164 ft). All 90 m (295 ft) cables that were used in an Ultra3000 installation must be replaced with 50 m (164 ft) cables.

The length of the power and feedback cables for the Kinetix 5300 drives cannot exceed 50 m (164 ft), although in some cases maximum cable length is less, refer to Table 52.

The maximum drive-to-motor cable length depends on the input power and feedback type. However, if flying lead cables were used on the Ultra3000 drive, the feedback connector kit needs to be replaced by 2198-K53CK-D15M feedback connector kit, as it is required for Kinetix 5300 drives when flying lead cables are used.

See the Kinetix Motion Accessories Technical Data, publication KNX-TD004, for cable specifications.

Environmental Specifications

This section provides the environmental specifications for the Ultra3000 and Kinetix 5300 servo drives.

Ultra3000 Servo Drive Environmental Specifications

Specification	Operational Range	Storage Range (non-operating)
Ambient Temperature	0 °C...55 °C (32 °F...131 °F)	-35 °C...70 °C (-40 °F...158 °F)
Relative Humidity	5...95% 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)	
Vibration	5...2000 Hz @ 2.5 g peak, 0.0006 mm (0.015 in.) maximum displacement	
Shock	15 g, 11 ms half-sine pulse	

Kinetix 5300 Servo Drive Environmental Specifications

Attribute	Operational Range	Storage Range (nonoperating)
Ambient temperature	0...50 °C (32...122 °F)	-40...+70 °C (-40...+158 °F)
Relative humidity	5...85% noncondensing	5...95% noncondensing
Protection class (IEC 60529)	IP20	
Degree of pollution (IEC 61800-5-1)	2	
Altitude	1000 m (3281 ft)	1000 m (3281 ft)
Vibration	5...55 Hz @ 0.35 mm (0.014 in.) double amplitude, continuous displacement; 55...500 Hz @ 2.0 g peak constant acceleration (ten sweeps in each of three mutually perpendicular directions)	
Shock	15 g, 11 ms half-sine pulse (three pulses in each direction of three mutually perpendicular directions)	

Certifications

This section lists the certifications for the Ultra3000 and Kinetix 5300 servo drives.

Ultra3000 Servo Drive Certifications

Agency Certification (1) (when product is marked)	Standards
cULus	UL Listed to U.S. and Canadian safety standards (UL 508 C File E145959).
CE	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.
Functional Safety	• EN 60204-1:1997 - Safety of Machinery - Electrical Equipment of Machines. • IEC 61508: Part 1-7:2000 - Functional Safety of Electrical/Electronic/ Programmable Electronic Safety-related Systems. • EN954-1:1996 - Safety of machinery. Safety-related parts of control systems. Part 1: General principles for design.

(1) See http://www.rockwellautomation.com/products/certification for Declarations of Conformity Certificates.

Kinetix 5300 Servo Drive Certifications

Agency Certification (1)	Standards
cULus (2)	UL Listed to U.S. and Canadian safety standards (UL61800-5-1 File E59272).
	Solid-state motor overload protection provides dynamic fold-back of motor current when 110% of the motor rating is reached with a peak current limit based on the peak rating of the motor as investigated by UL to comply with (UL61800-5-1 File E59272).
CE	European Union 2004/108/EC EMC Directive compliant with IEC 61800-3:2004 + A1:2012: Adjustable Speed Electrical Power Drive Systems - Part 3; EMC Product Standard including specific test methods.
	European Union 2006/95/EC Low Voltage Directive compliant with IEC 61800-5-1:2007 - Adjustable speed electrical power drive systems.
Functional Safety	TÜV certified for functional safety when used as described in the Kinetix 5300 Servo Drives User Manual, publication 2198-UM005. 2198-C*xxxx*-ERS (hardwired safety) drive ratings: up to Performance Level (PL) d, Category 3 according to ISO 13849; up to SIL CL 2 according to IEC 61508, IEC 61800-5-2, and IEC 62061.
C-Tick	Australian Radiocommunications Act, compliant with: • Radiocommunications Act: 1992 • Radiocommunications (Electromagnetic Compatibility) Standard: 1998 • Radiocommunications (Compliance Labeling - Incidental Emissions) Notice: 1998 • AS/NZS CISPR 11: 2002 (Group 1, Class A)
KC	Korean Registration of Broadcasting and Communications Equipment, compliant with: • Article 58-2 of Radio Waves Act, Clause 3 • Registration number: KCC-REM-RAA-2198
ODVA	EtherNet/IP conformance tested.
OSHA	Maximum audible noise from the servo drive system complies with OSHA standard 3074, Hearing Conservation (<85 dBA).

(1) See rok.auto/certifications for declarations of conformity, certificates, and other certification details.
(2) UL has not evaluated the Safe Torque Off option in these products.

Interconnect Diagrams

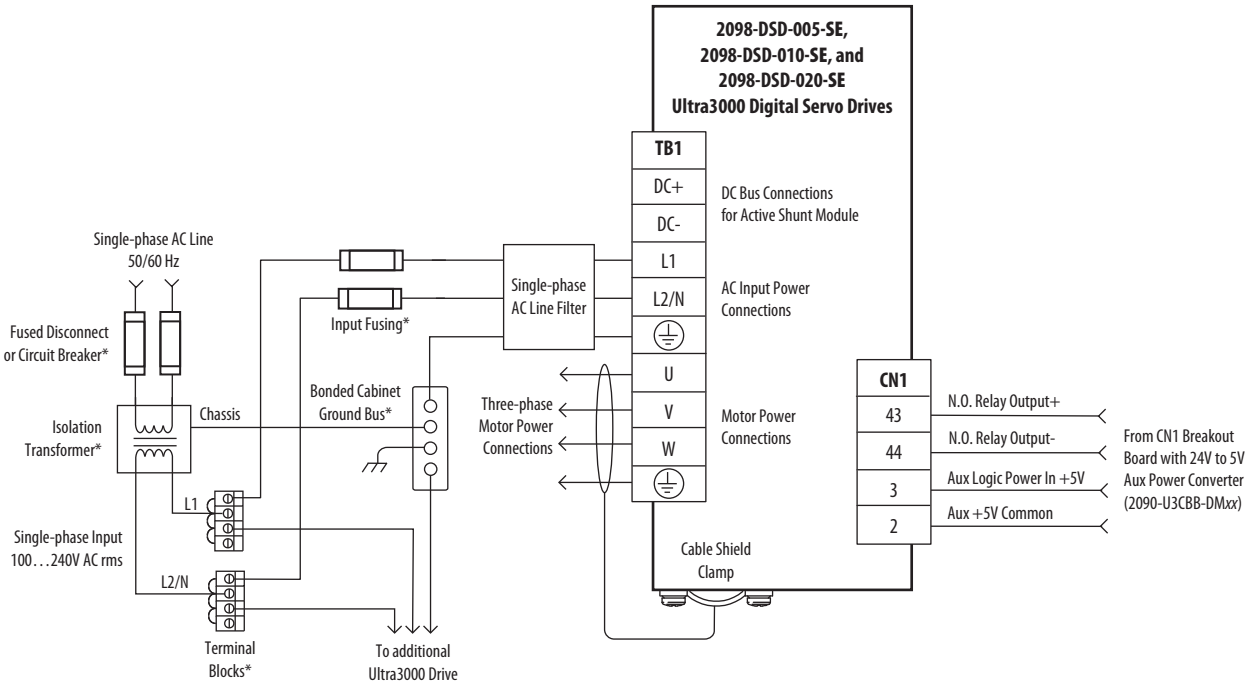
This appendix describes power wiring examples to help with the comparison of the power wiring for the Ultra™ 3000 servo drive and the Kinetix® 5300 drive systems.

Ultra3000 Servo Drive Power Wiring Examples

Figure 21 shows the power wiring diagram with 24V DC control string for 2098-DSD-005-SE, 2098-DSD-010-SE, and 2098-DSD-020-SE Ultra3000 Sercos drives. 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.

For Sercos drives, input line contactor is part of the PLC program and output control.

Figure 21 - Typical Power Wiring on Ultra3000 (230V) System

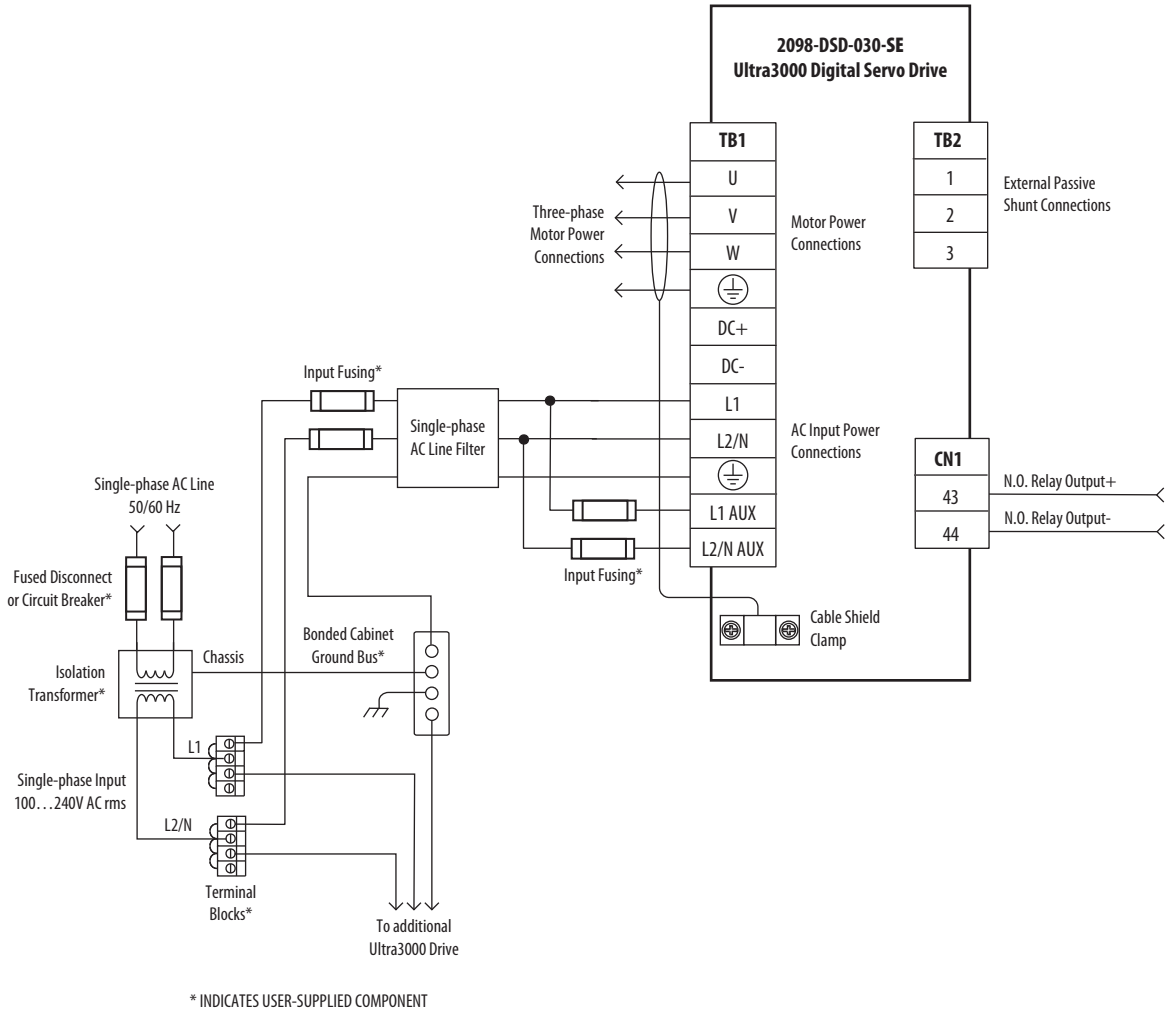


* INDICATES USER-SUPPLIED COMPONENT

Figure 22 shows the power wiring diagram with 24V DC control string for the 2098-DSD-030-SE Sercos drive.

For Sercos drives, input line contactor is part of the PLC program and output control.

Figure 22 - Typical Power Wiring on Ultra3000 (230V) System



* INDICATES USER-SUPPLIED COMPONENT

Figure 23 shows the power wiring diagram with 24V DC control string for 2098-DSD-075-SE and 2098-DSD-150-SE Ultra3000 Sercos drives.

For Sercos drives, input line contactor is part of the PLC program and output control.

Figure 23 - Typical Power Wiring on Ultra3000 (230V) System

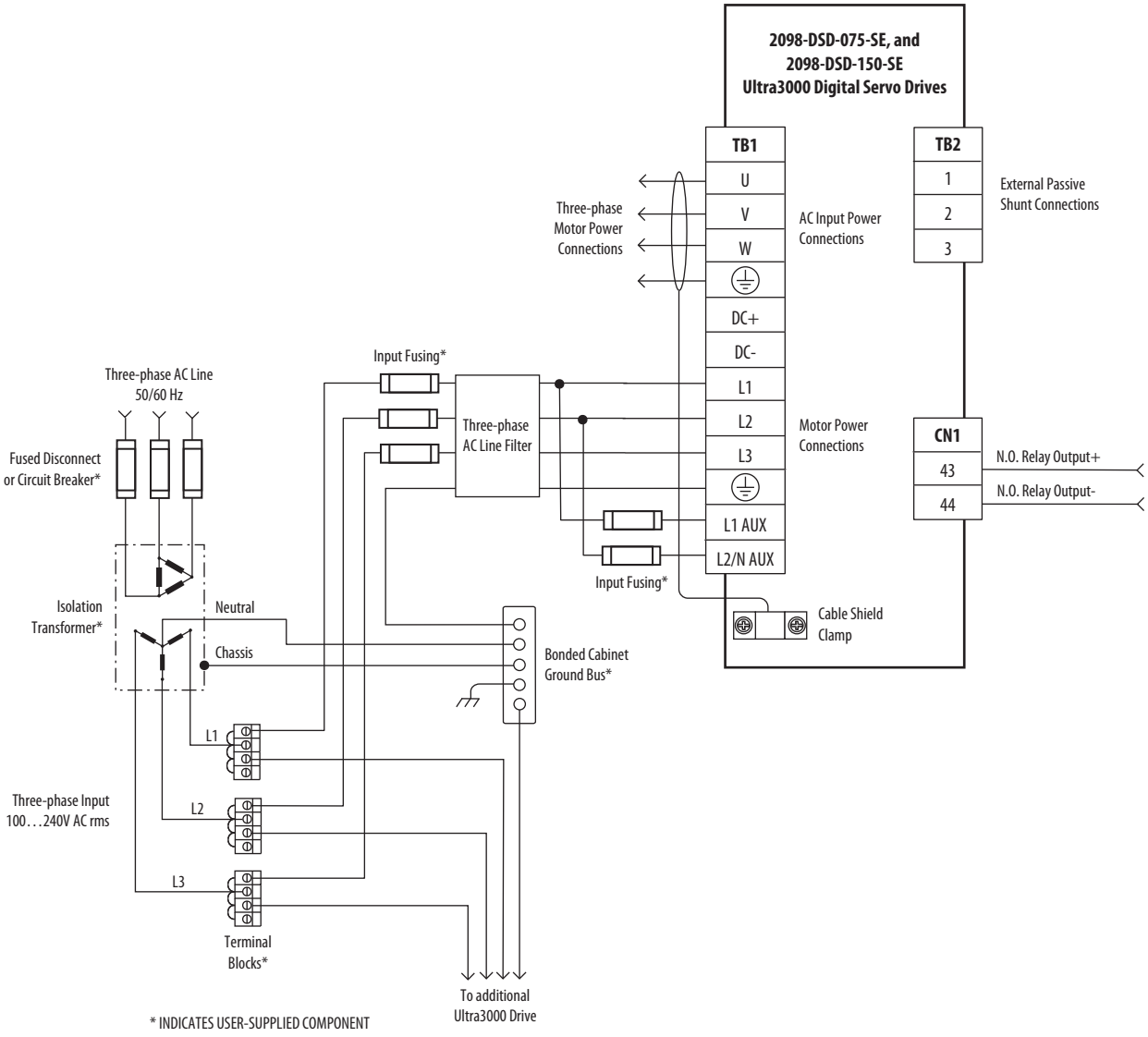
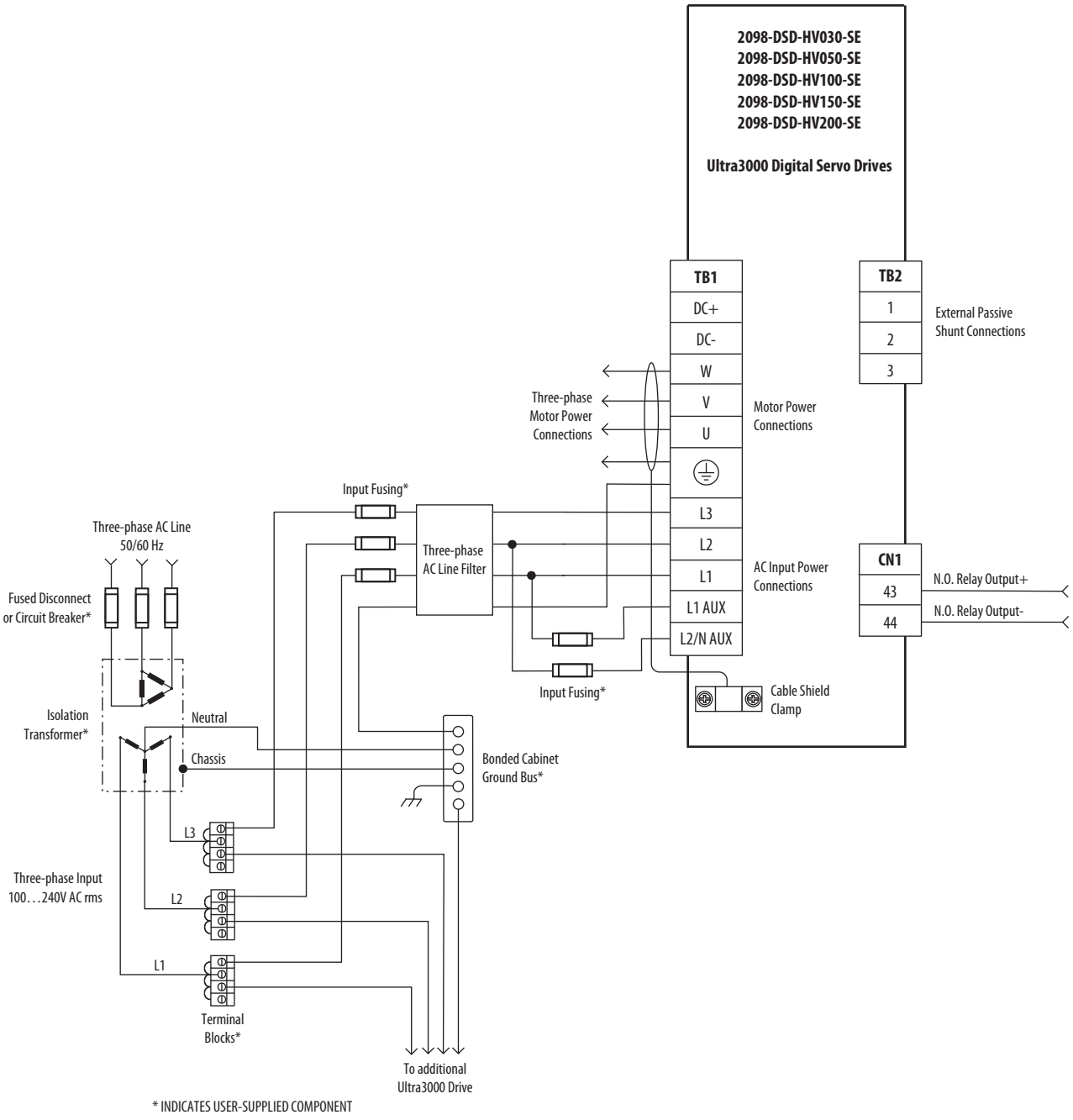


Figure 24 shows the power wiring diagram with 24V DC control string for 2098-DSD-HV030-SE, 2098-DSD-HV050-SE, 2098-DSD-HV100-SE, 2098-DSD-HV150-SE, and 2098-DSD-HV220-SE Ultra3000 Sercos drives.

Figure 24 - Typical Power Wiring on Ultra3000 (460V) System



Kinetix 5300 Servo Drive Power Wiring Examples

This section provides examples to assist you in wiring the Kinetix 5300 servo drive system.

You must supply input power components. The line filters are wired downstream of the circuit protection.

Table 53 - Interconnect Diagram Notes

Note	Information
1	For power wiring specifications, see Wiring Requirements on page 71.
2	For input fuse and circuit breaker sizes, see Circuit Breaker/Fuse Selection on page 25.
3	AC (EMC) line filter is required for EMC compliance. Place line filter as close to the drive as possible and do not route very dirty wires in wireway. If routing in wireway is unavoidable, use shielded cable with shields that are grounded to the drive chassis and filter case. For AC line filter specifications, see Kinetix Servo Drives Specifications Technical Data, publication KNX-TD003. Drives are limited to one power cycle per minute.
4	Terminal block is required to make connections.
5	Cable shield clamp must be used to meet CE requirements.
6	PE ground connection bonded to the panel must be used to meet CE requirements.
7	Internal shunt wired to the shunt connector is the default configuration. Unplug the internal shunt connector and connect the external shunt wires to the spare shunt connector plug. Damage can occur to the drive if it is operated without either an internal or external shunt connected.
8	For motor cable specifications, see Kinetix Motion Accessories Specifications Technical Data, publication KNX-TD004.
9	MPL-A/B15*xx*-H...MPL-A/B45*xx*-H, MPL-A15*xx*-V/E...MPL-A2*xx*-V/E, MPL-A3*xx*-S/M...MPL-A45*xx*-S/M, MPM-A115*xx*...MPM-A130*xx*, MPF-A3*xx*...MPF-A45*xx*, MPS-A*xxx*, MPAR-A*xxx*, MPAS-A*xxx*, MPAS-B*xxx* (direct drive), and encoders use the +5V DC supply.
10	MPL-B15*xx*-V/E...MPL-B2*xx*-V/E, MPL-B3*xx*-S/M...MPL-B9*xx*-S/M, MPL-A5*xx*, MPM-B*xx*, MPM-A165*xx*...MPM-A215*xx*, MPF-B*xx*, MPF-A5*xx*, MPS-B*xxx*, MPAR-B*xxx*, and MPAS-B*xxx* (ballscrew) encoders use the +9V DC supply.
11	LDAT-Series linear thrusters, Kinetix MPAS (direct drive) linear stages, and LDC/LDL-Series™ linear motors exclude a brake option, so only the 2090-CPWM7DF-*xx*AA*xx* or 2090-CPWM7DF-*xx*AF*xx* motor power cables are specified.

IMPORTANT For three-phase operation, Kinetix 5300 drives must use center-grounded wye secondary input power configurations.

Figure 25 - Kinetix 5300 Drives Power Wiring (three-phase operation)

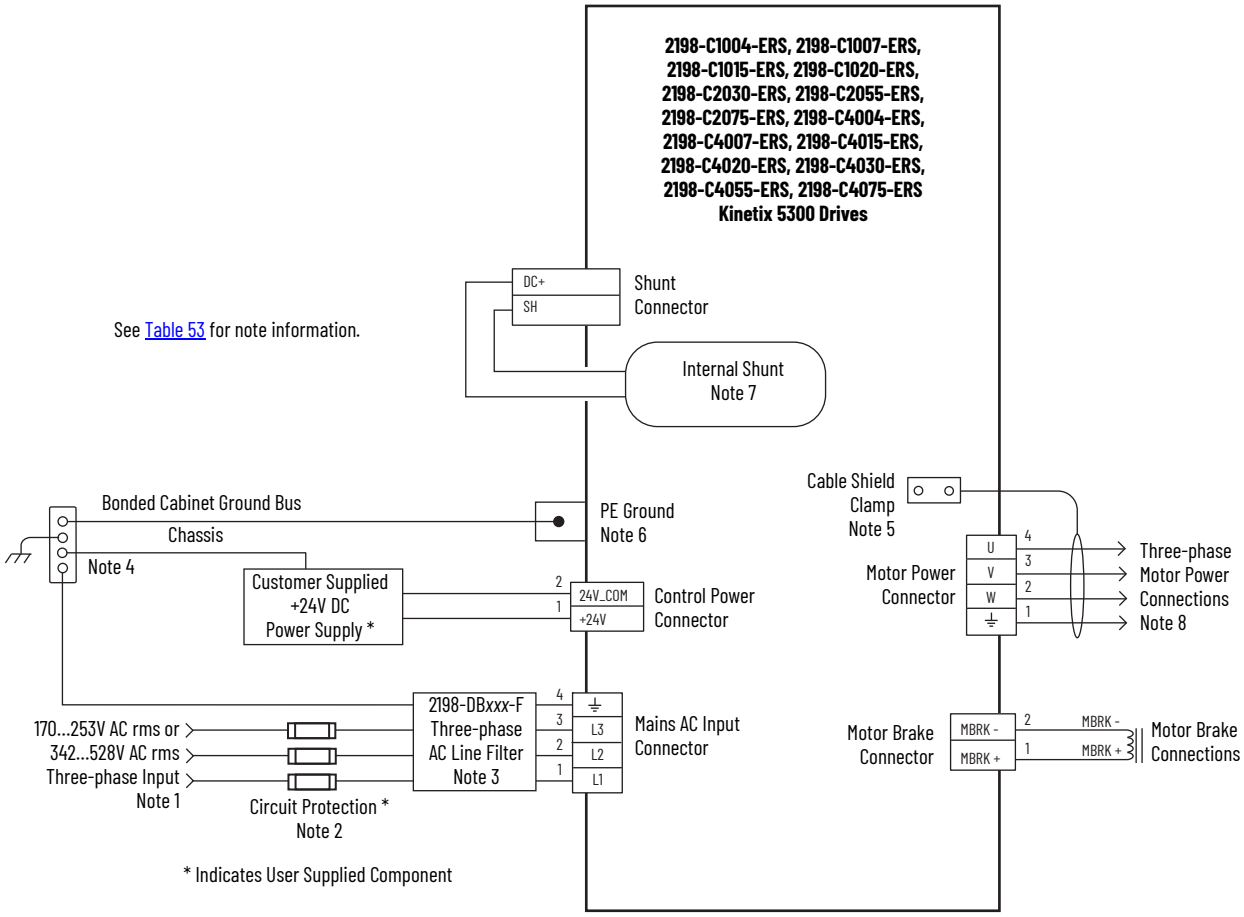
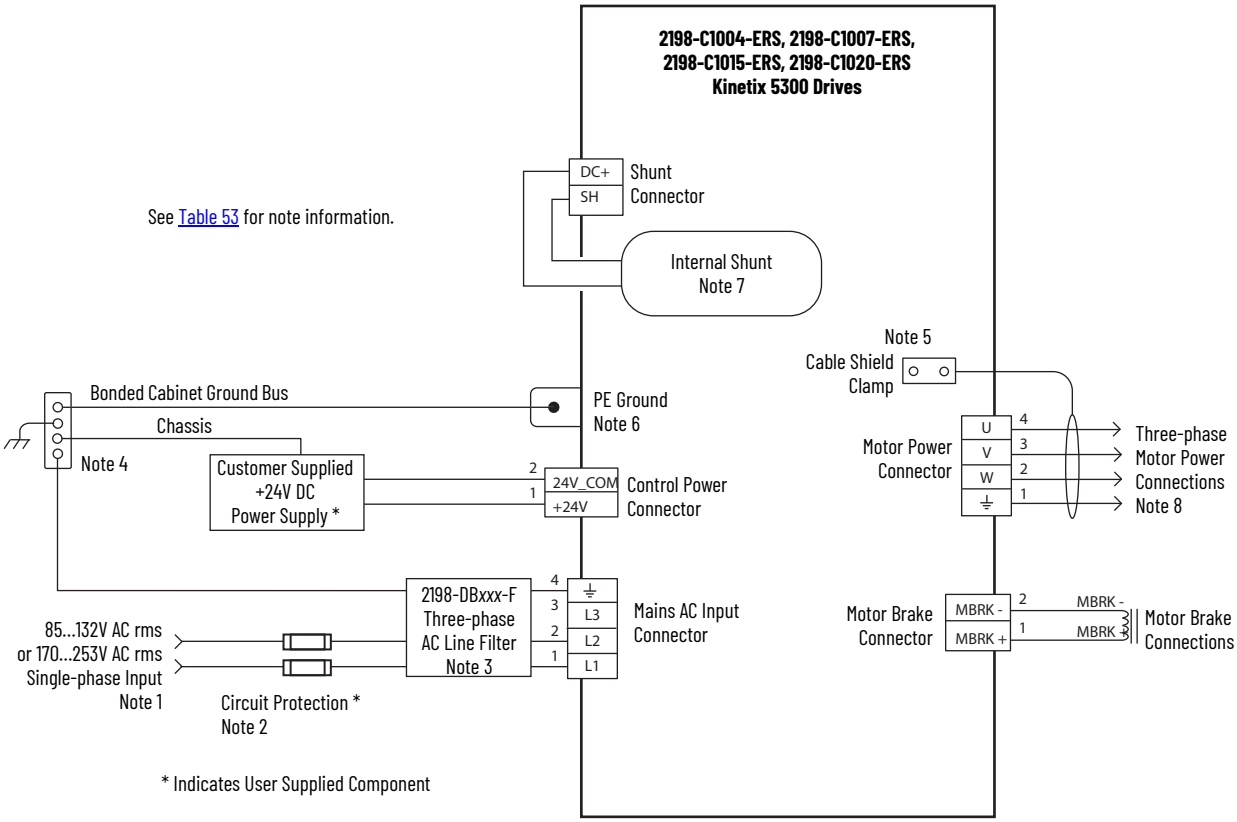


Figure 26 - Kinetix 5300 Drives Power Wiring (Single-phase operation)



Notes:

Communication Configurations

The Kinetix® 5300 servo drives support any Ethernet topology including linear, ring, and star by using ControlLogix® or CompactLogix™ controllers.

These examples feature the CompactLogix 5380 programmable automation controllers (Bulletin 5069) that are part of the Logix 5000™ family of controllers (version 33.00 or later).

See CompactLogix 5380, Compact GuardLogix® 5380, and CompactLogix 5480 Controller Specifications Technical Data, publication 5069-TD002, for more information on CompactLogix 5380 controllers.

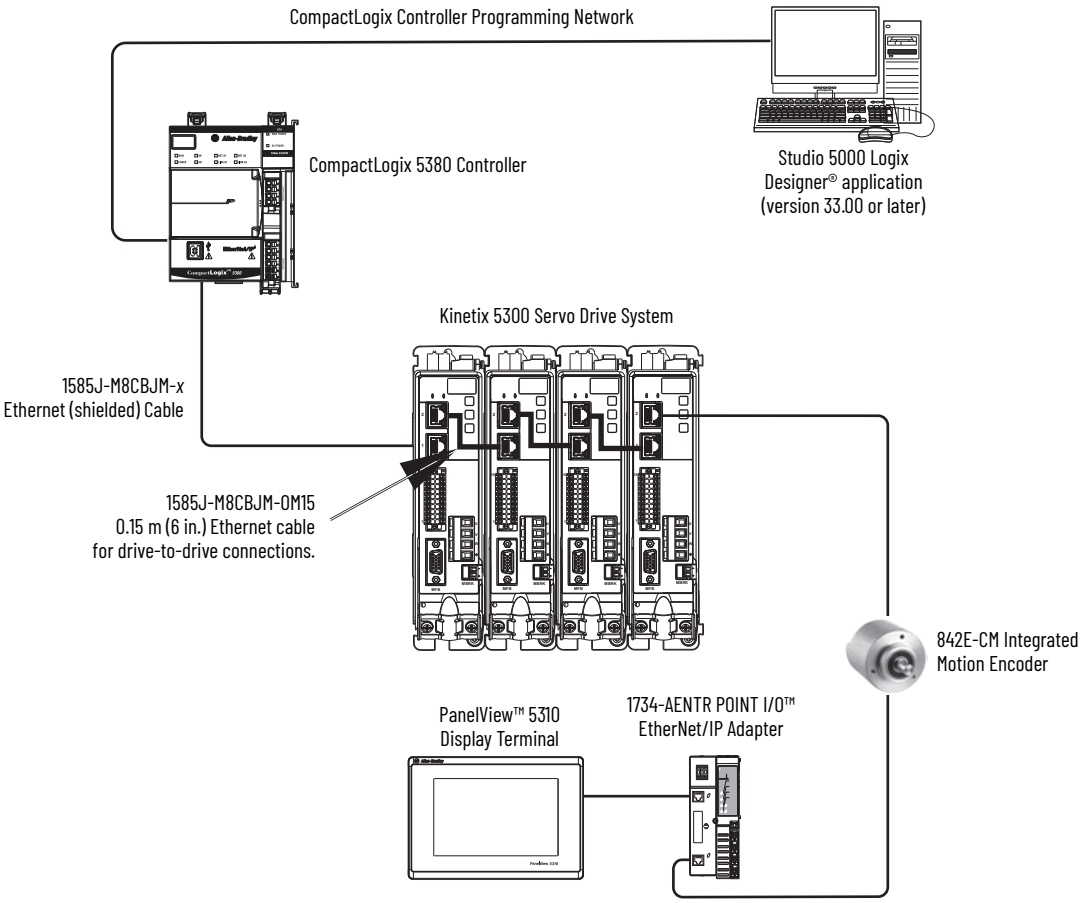
These examples feature the CompactLogix 5380 programmable automation controllers (catalog number 5069-L340ERM) with support for Integrated Motion over the EtherNet/IP network.

IMPORTANT When using an external Ethernet switch for routing traffic between the controller and the drive, switches with IEEE-1588 time synchronization capabilities (boundary or transparent clock) must be used to make sure switch delays are compensated.

Kinetix 5300 Servo Drive Linear Topology

In this example, all devices are connected in linear topology. The Kinetix 5300 drives include dual-port connectivity, however, if any device becomes disconnected, all devices downstream of that device lose communication. Devices without dual ports must include the 1783-ETAP module or be connected at the end of the line.

Figure 27 - Kinetix 5300 Linear Communication Installation

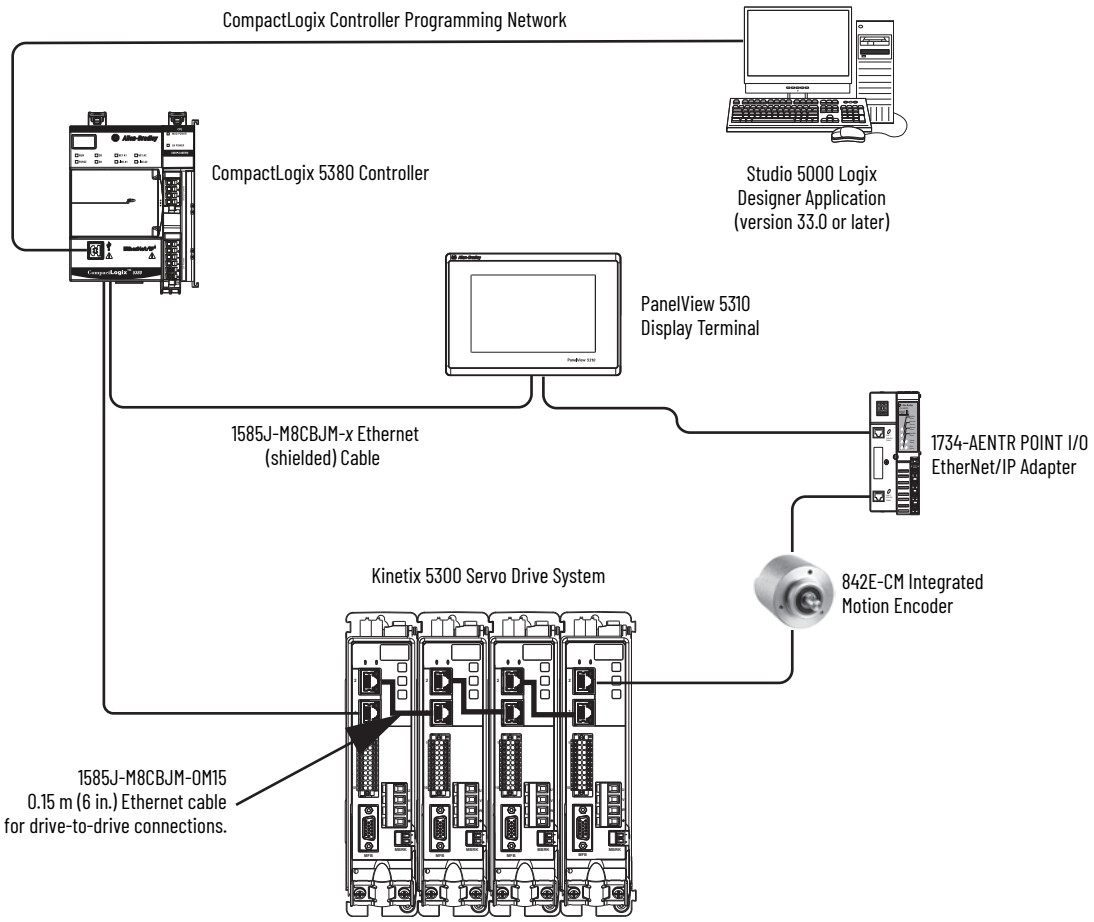


Ring Topology

In this example, the devices are connected by using ring topology. If only one device in the ring is disconnected, the rest of the devices continue to communicate. For ring topology to work correctly, a Device Level Ring (DLR) supervisor is required (for example, the CompactLogix controller). DLR is an ODVA standard. For more information, See the EtherNet/IP Embedded Switch Technology Application Guide, publication ENET-AP005.

Devices without dual ports require a 1783-ETAP module to complete the network ring.

Figure 28 - Kinetix 5300 Ring Communication Installation

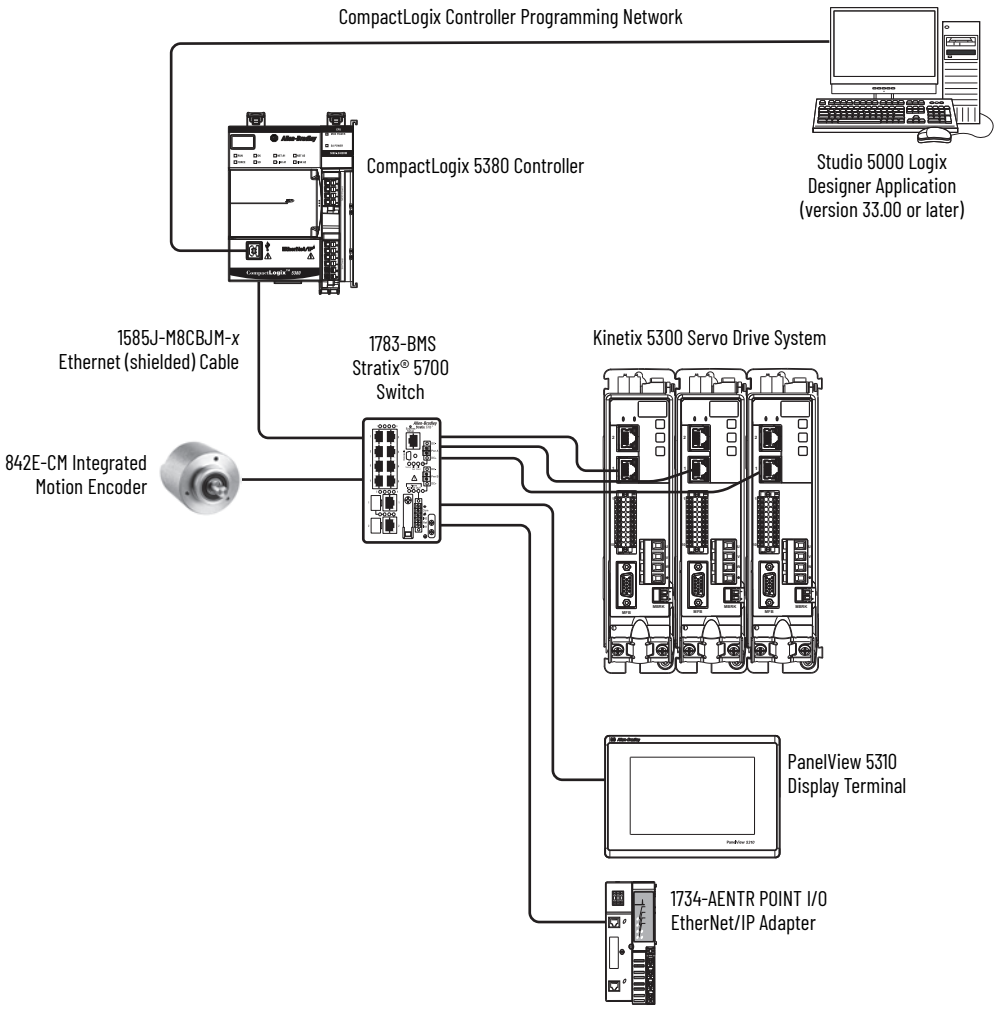


Star Topology

In this example, the devices are connected by using star topology. Each device is connected directly to the switch.

Kinetix 5300 drives have dual ports, but in star topology all drives are connected to the switch. Kinetix 5300 and other devices operate independently. The loss of one device does not impact the operation of other devices.

Figure 29 - Kinetix 5300 Star Communication Installation



You can use the 842E-CM integrated motion encoder for applications requiring an external encoder for gearing or camming to the Kinetix 5300 drive. By providing auxiliary feedback directly through the EtherNet/IP network, the 842E-CM encoder helps eliminate the need for point-to-point wiring while letting customers use the encoder in a variety of network topologies. For more information, see the 842E-CM Integrated Motion on EtherNet/IP Product Profile, publication 842ECM-PP001.

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
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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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Waste Electrical and Electronic Equipment (WEEE)

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

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

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