

Start

Use this chapter to become familiar with the ArmorKinetix® system and obtain an overview of installation configurations.

About the ArmorKinetix System

On-machine drives include Distributed Servo Motor (DSM) and Distributed Servo Drive (DSD). Both are single axis inverters and can be powered by a Diode Front End (DFE) module. The connection between the in-cabinet system and the on-machine inverters is established by using the Power Interface Module (PIM) that distributes DC power and communication signals by using a single cable (hybrid cable). Each PIM module can support up to 24 axes. If more than 24 axes are needed, you can use multiple PIM modules.

Table 2 - ArmorKinetix System Overview

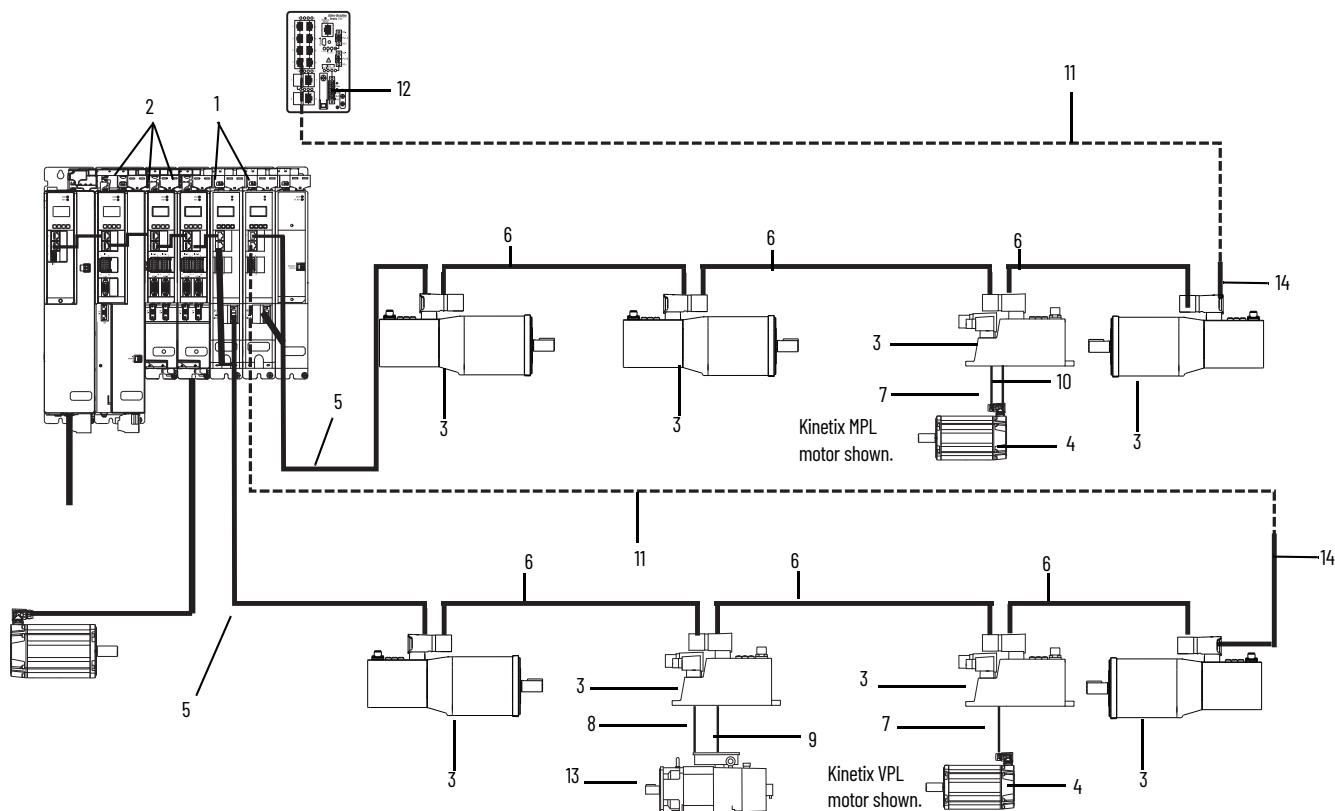
Drive System Component	Cat. No.	Description
DC-bus Power Supply	2198-Pxxx	Converter power supply with 200V and 400V-class (three-phase) AC input. Provides output current in a range of 10.5...69.2 A. Systems typically consist of one module, however, up to three modules in parallel is possible. Parallel modules increase available power for 2198 modules.
ArmorKinetix Power Interface Module (PIM)	2198-PIM070	The PIM module provides the connection between the in-cabinet system and the on-machine inverter. This module distributes DC power and communication signals to the DSD and DSM modules by using a single cable (hybrid cable). Each PIM module can support up to 24 axes.
ArmorKinetix System Single-axis Distributed Servo Drives (DSD)	2198-DSD0xx-ERS2 2198-DSD0xx-ERS5	Single-axis inverters with current ratings up to 8 A rms. Drives feature TÜV Rheinland-certified Safe Torque Off function with integrated safety connection options, PLe and SIL 3 safety ratings, and support for Hiperface DSL, and Hiperface encoder feedback. The DSD modules also support Timed and Monitored SS1 drive-based stopping functions, and support for controller based Safe Stop 1 and safe speed monitoring functions over the Ethernet network.
ArmorKinetix System Single-axis Distributed Servo Motors (DSM)	2198-DSM0xx-ERS2 2198-DSM0xx-ERS5	Single-axis motor/inverter with maximum continuous torque of 11.9 Nm and peak torque of 31.2 Nm with speeds up to 8000 rpm. The -ERS2 motor/inverters feature TÜV Rheinland-certified Safe Torque Off function with integrate safety connection, PLe, and SIL 3 for Hiperface DSL feedback only. The modules also support Timed SS1 drive-based stopping functions. The 2198-DSMxxx-ERS5 modules also support Timed and Monitored SS1 drive-based stopping functions, and support for controller-based Safe Stop 1 and Safely-limited Speed functions.
Kinetix® 5700 Capacitor Module	2198-CAPMOD-2240	Use for energy storage, external active-shunt connection, and to extend the DC-bus voltage to another inverter cluster. Modules are zero-stacked with servo drives and use the shared-bus connection system to extend the external DC-bus voltage in applications up to 104 A. Can parallel with itself or with another accessory module for up to 208 A with required 2198-KITCON-CAPMOD2240 kit that includes flexible bus-bars.
Kinetix 5700 Extension Module	2198-CAPMOD-DCBUS-IO	The extension module, paired with a capacitor module or DC-bus conditioner module, is used to extend the DC-bus voltage to another inverter cluster in systems with ≥104 A current and up to 208 A.
Kinetix 5700 DC-bus Conditioner Module	2198-DCBUSCOND-RP312	Decreases the voltage stress on insulation components in an inverter system and used to extend the DC-bus voltage to another inverter cluster. Modules are zero-stacked with servo drives and use the shared-bus connection system to extend the external DC-bus voltage in applications up to 104 A. Can parallel with itself or with another accessory module for up to 208 A with required 2198-KITCON-DCBUSCOND kit that includes flexible bus-bars.
Shared-bus Connector Kits	2198-TCON-24VDCIN36 2198-xxxx-P-T 2198-BARCON-xxDCAC100	24V input wiring connectors, T-connectors, and bus-bars for most Kinetix 5700 drive modules that use the 24V shared-bus connection system (optional).
	2198-BARCON-xxDC200 2198-KITCON-ENDCAP200	DC-bus links (55, 85, 100, and 220 mm) and end caps for the DC-bus shared-bus connection system (required and included with each respective drive module). DC-bus links (165, 275, and 440 mm) are optional and do not ship with any modules.
PIM Connector Kit	2198-KITCON-PIM070	Replacement connector kit.
Kinetix 5700 System Mounting Toolkit	2198-K5700-MOUNTKIT	Use to position the drive modules and identify drill-holes for mounting your Kinetix 5700 servo drive system.
Encoder Output Module	2198-ABQE	The Allen-Bradley® encoder output module is a DIN rail mounted EtherNet/IP™ network-based standalone module capable of outputting encoder pulses to a customer-supplied peripheral device (cameras, for example, used in line-scan vision systems).

Table 2 - ArmorKinetix System Overview (Continued)

Drive System Component	Cat. No.	Description
Logix 5000® Controller Platform	1769 5069	Integrated Motion on the EtherNet/IP network in CompactLogix™ 5370, CompactLogix 5380, and CompactLogix 5480 controllers and Integrated Safety in Compact GuardLogix® 5370 and Compact GuardLogix 5380 controllers. Linea, and Device Level Ring (DLR) topology is supported.
	1756-L8xE module 1769-ERM module 5069-L3xxxERM module	EtherNet/IP network communication modules for use with ControlLogix® 5570, ControlLogix 5580, GuardLogix 5570, and GuardLogix 5580 controllers. Linear and Device Level Ring (DLR) topology is supported.
Studio 5000® Environment	N/A	Studio 5000 Logix Designer® application, version 35.00 or later, with an Add-on Profile (AOP), provides support for programming, commissioning, and maintaining the CompactLogix, ControlLogix, and GuardLogix controller families. Download AOP files from the Product Compatibility and Download Center at rok.auto/pdc .
Rotary Servo Motors	Kinetix VP motors	<ul style="list-style-type: none"> Compatible 400V-class motors include Kinetix VPL, VPF, VPH, and VPS servo motors. Compatible 200V-class motors include Kinetix VPL, VPF, and VPH servo motors.
	Kinetix MP motors	Compatible 200V and 400V-class motors include Kinetix MPL, MPM, MPF, and MPS servo motors.
Linear Actuators	Kinetix VPAR and MPAR, actuators Kinetix LDAT	Compatible actuators include 400V-class Kinetix VPAR and MPAR electric cylinders, and Kinetix LDAT linear thrusters.
Linear Motors	Kinetix LDC	Compatible motors include Kinetix LDC iron-core (200V and 400V-class) linear motors.
Induction Motors	N/A	Induction motors with open-loop frequency control and closed-loop control are supported.
Cables	2090-CDHIFS-12AFxxxx	This cable connects the Power Interface Module (PIM) to either the ArmorKinetix Distributed Servo Motor (DSM) or the Distributed Servo Drive (DSD).
	2090-CDHP1S-12AFxxxx, 2090-CDHP1S-12AFJ	This cable connects a DSx module to a DSx module (where DSx is either a DSM module or a DSD module).
	2090-CSBM1P7-14AFxx	This cable connects motor power to a Kinetix MPL motor and motor power/feedback to a Kinetix VPL motor.
	2090-CPWFLP7-14AFxx	This cable connects the DSD to induction motors.
	2090-CFBM7S7-CDAFxx	This cable connects the Kinetix motor feedback to the distributed servo drive.
	2090-CFBFLS7-CDAFxx	This cable connects a Kinetix or induction motor feedback for single or dual loop functionality to the DSD module.
	2090-CDET	The hybrid connector communication extension has only the communication/Ethernet pins populated on the M23 side, and passes through to an M12 X-coded Ethernet connection on the other side.
	1585J-M8CBJM-x	Ethernet cables are available in standard lengths. Shielded cable is required to meet EMC specifications.
Connector Terminator	2090-CDHT	DSx hybrid connector output terminator.
	2090-CDFT	DSD feedback connector terminator.
	2090-CDPT	DSD power connector terminator.
AC Line Filters	2198-DBR20-F, 2198-DBR40-F, 2198-DBR90-F, 2198-DBR200-F	2198 three-phase AC line filters are required to meet CE and UK and are available for use with DC-bus power supplies and regenerative bus supplies.
Line Reactors	1321-3Rxx-x	The 1321 line reactors help keep equipment running longer by absorbing many of the power line disturbances that can shut down your power supply.
AC Contactor	100-Cxxxxx 100-Dxxxxx 100-Exxxxx	The AC three-phase contactor control string must be wired in series with the contactor-enable relay at the CED connector to make sure that three-phase power is removed under various fault conditions to protect the power supply.
24V DC Power Supply	1606-XLxxx	1606 24V DC power supply for control circuitry, digital inputs, safety, and motor brake.
External Passive Shunt Resistors	2198-R014, 2198-R031, 2198-R127, 2198-R004	2198 external passive-shunt resistors for use when the DC-bus power supply internal shunt capability is exceeded. Not for use with regenerative bus supplies.
External Active Shunts	N/A	External active shunts from Rockwell Automation Encompass™ partner, Powerohm Resistors, Inc. or Bonitron, Inc. are available for connecting to 2198 DC-bus power supplies.

Typical Hardware Configurations

Each ArmorKinetix PIM module supports up to 24 ArmorKinetix DSD and/or DSM modules. Total cable length for the ArmorKinetix system [PIM, DSD (including motor connections), and DSM modules] is 140 m (459 ft) maximum.



Item	Description	Item	Description
1	ArmorKinetix PIM Modules	8	ArmorKinetix DSD to Induction Motor Power Cable (2090-CPWFLP7-14AFxx) 1...4 m (3.28...13.12 ft)
2	Kinetix 5700 Servo Drives	9	ArmorKinetix DSD to Induction Motor Feedback or Stand-alone Feedback Cable (2090-CFBFLS7-CDAFxx) 1...4 m (3.28...13.12 ft)
3	ArmorKinetix DSD or DSM Module	10	ArmorKinetix DSD to Kinetix Motor Feedback Cable (2090-CFBM7S7-CDAFxx) 1...4 m (3.28...13.12 ft)
4	Kinetix VPL or Kinetix MPL Motor	11	Ethernet patchcord, 1 Gigabit with hybrid connector to connect to communication extension 85 m (278 ft) max. (1585D-M8UGDM, 1585D-M8TGDE, or 1585D-E8TGDE)
5	ArmorKinetix PIM to DSx Hybrid Cable (2090-CDHIFS-12AFxxxx) 3...50 m (9.8...164 ft)	12	Managed Ethernet Switch
6	ArmorKinetix DSx to DSx Hybrid Cable (2090-CDHP1S-12AFxxxx) 0.5...30 m (1.64...98.4 ft)	13	Induction Motor
7	ArmorKinetix DSD to Kinetix Motor Power/Feedback Cable (2090-CSBM1P7-14AFxx) 1...4 m (3.28...13.12 ft)	14	Communication Extension Jumper Cable (2090-CDET)

Communication Configurations

The Armorkinetix System supports linear and ring Ethernet topology by using ControlLogix, GuardLogix, or CompactLogix controllers.

These examples feature the ControlLogix 5580 programmable automation controllers with support for integrated motion and integrated safety over the EtherNet/IP network. Other Allen-Bradley controllers are also compatible with the ArmorKinetics modules.

Refer to ControlLogix Communication Module Specifications Technical Data, publication [1756-TD003](#), for more information on ControlLogix 1756-EN2T, 1756-EN2TR, 1756-EN3TR, and 1756-EN4TR communication modules.

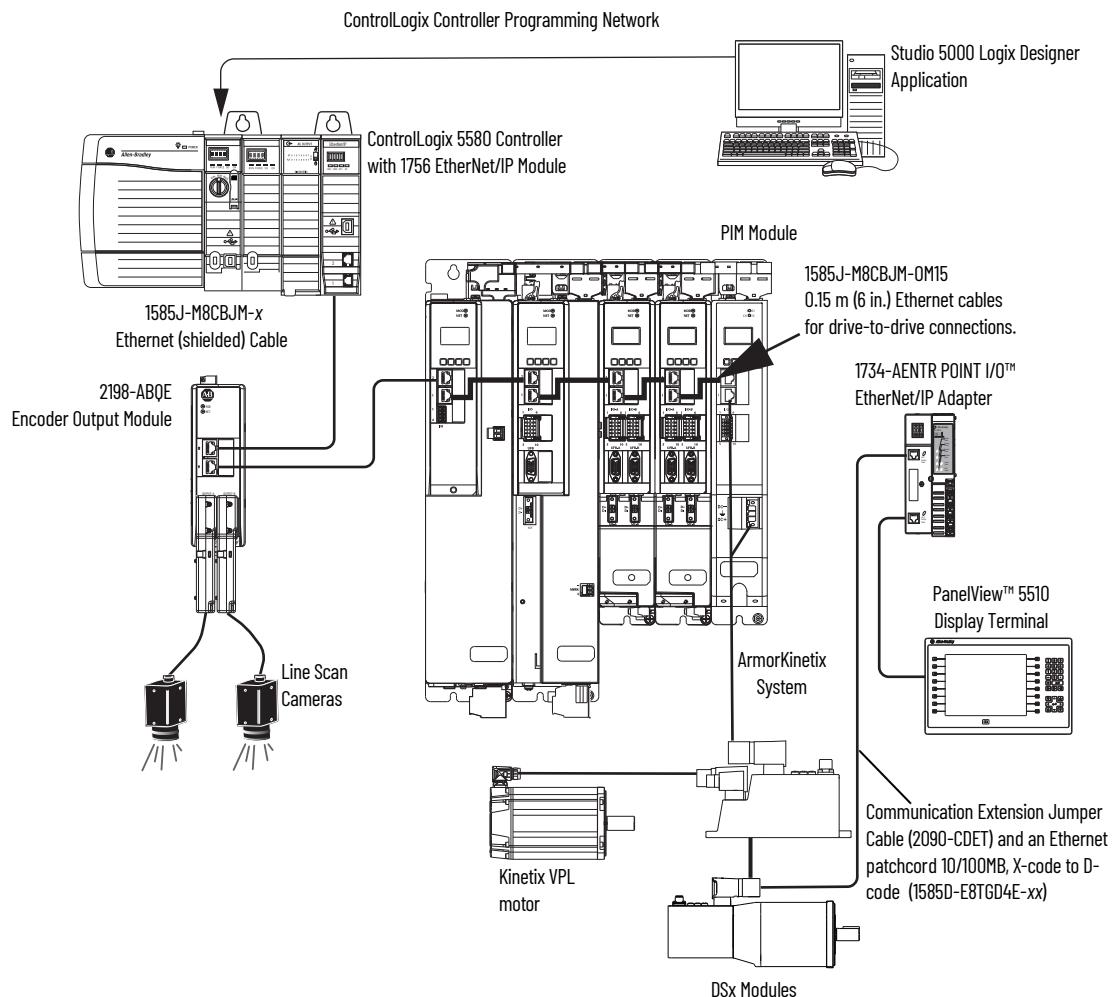


These example configurations use the 2198-Pxxx DC-bus power supply.

Linear Topology

In this example, all devices are connected by using linear topology. The ArmorKinetix System modules 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 1 - ArmorKinetix System Linear Communication Installation

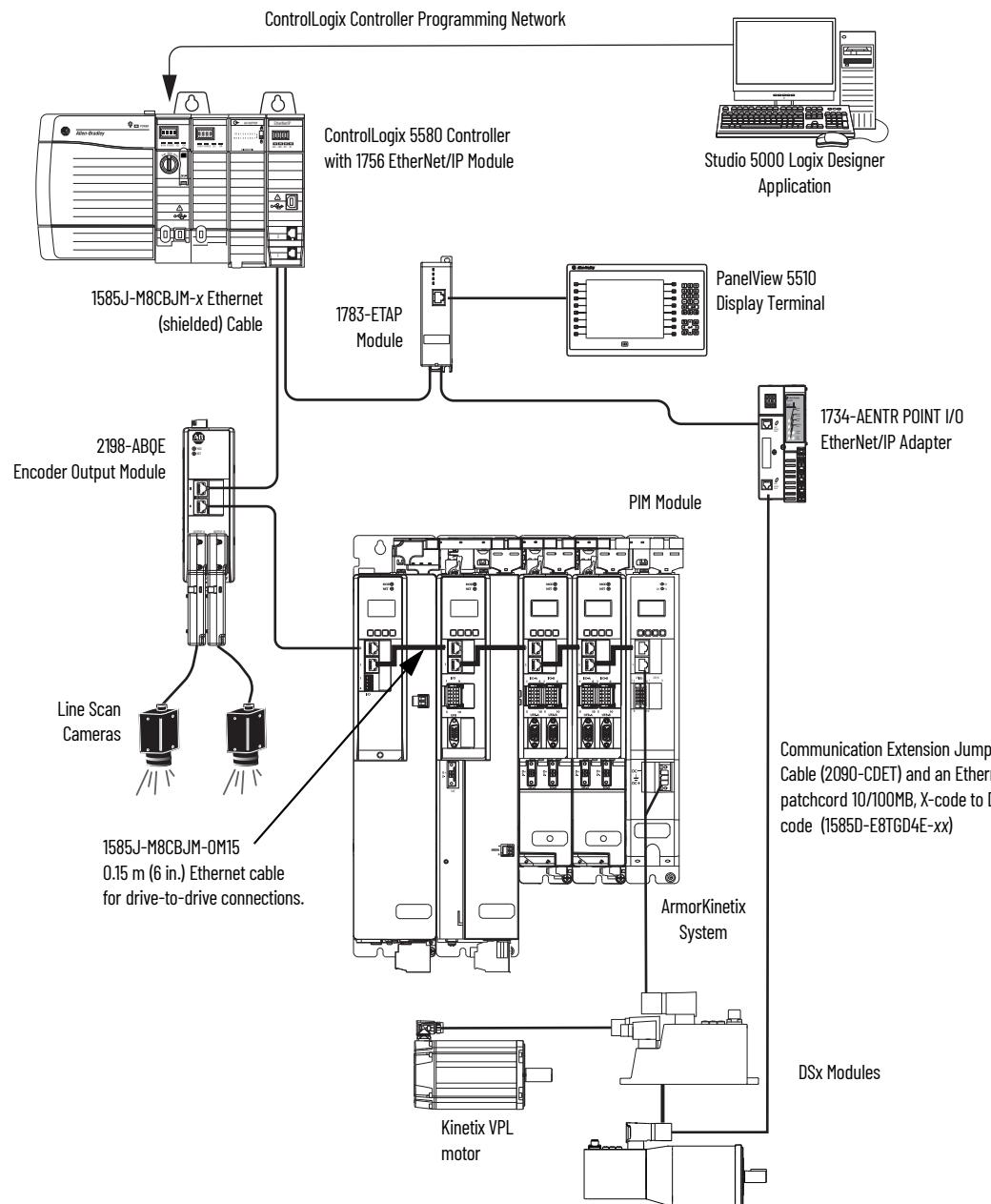


Device Level Ring Topology

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 1783-ETAP device). DLR is an ODVA standard. For more information, refer to the EtherNet/IP Device Level Ring Application Technique, publication [ENET-ATO07](#).

Devices without dual ports, for example the display terminal, require a 1783-ETAP module to complete the network ring.

Figure 2 - ArmorKinetix System Ring Communication Installation



DC-bus Power Supply Input Power Configurations

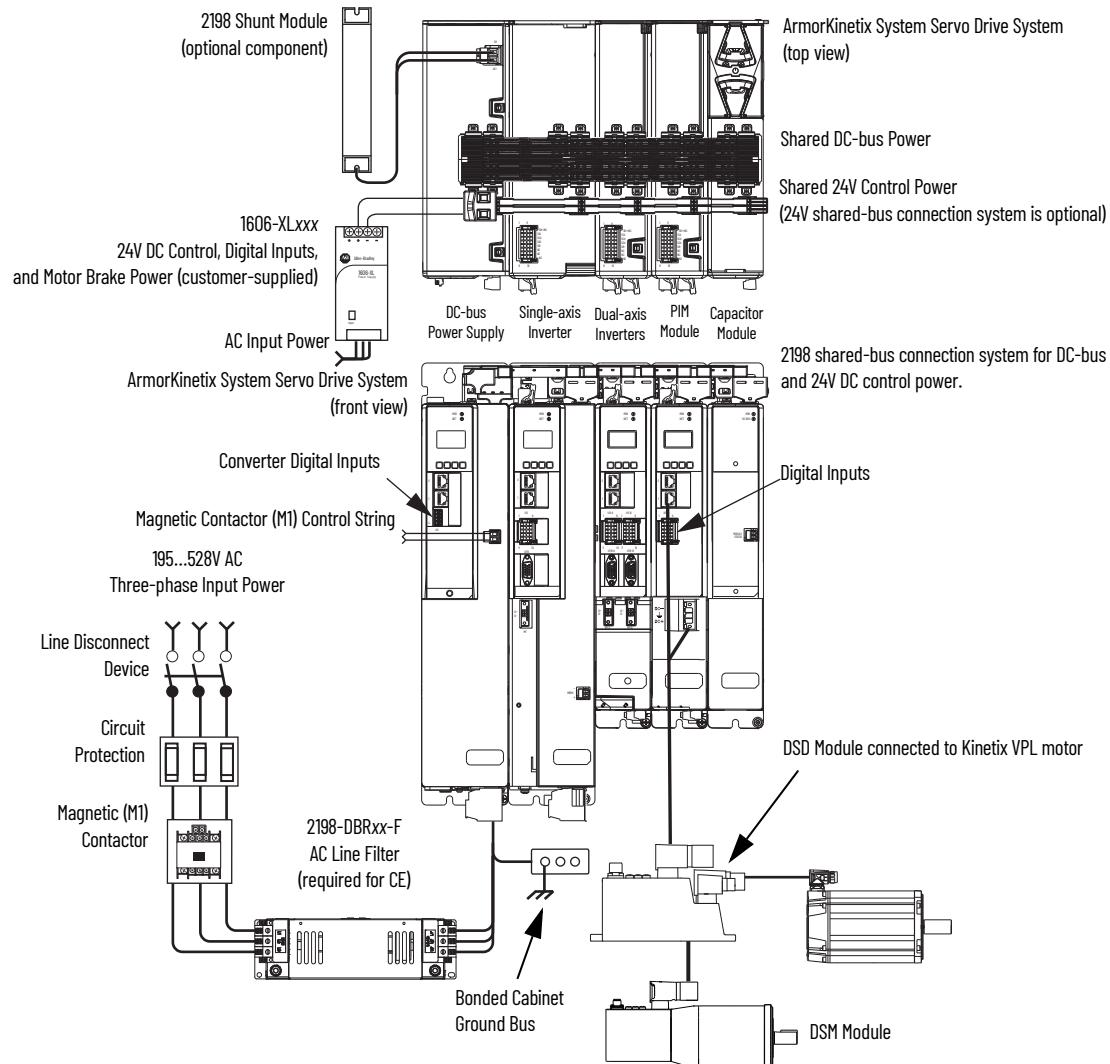
A single 2198-Pxxx DC-bus (converter) power supply can supply the ArmorKinetix System drive system with 276...747V shared DC-bus power. For additional output power (kW) you can install two or three 2198-P208 DC-bus power supplies. You can also extend the DC-bus to additional inverter clusters via accessory modules.

Typical DC-bus Power Supply Configuration Example

In this multi-axis example, AC input power is fed to the DC-bus (converter) power supply. One single-axis (inverter) module, one dual-axis (inverter), and one PIM module support five axes of motion. The PIM module connects to one DSD module, which connects to a Kinetix VPL motor, and a DSM module. The DC-bus power supply is mounted on the far left and the inverters are positioned on the right, but the reverse mounting order (right to left) is also possible.

Digital inputs are wired to sensors and the control circuitry at the IOD connectors. The contactor-enable relay protects the DC-bus power supply in the event of shutdown fault conditions.

Figure 3 - Typical DC-bus Power Supply Installation

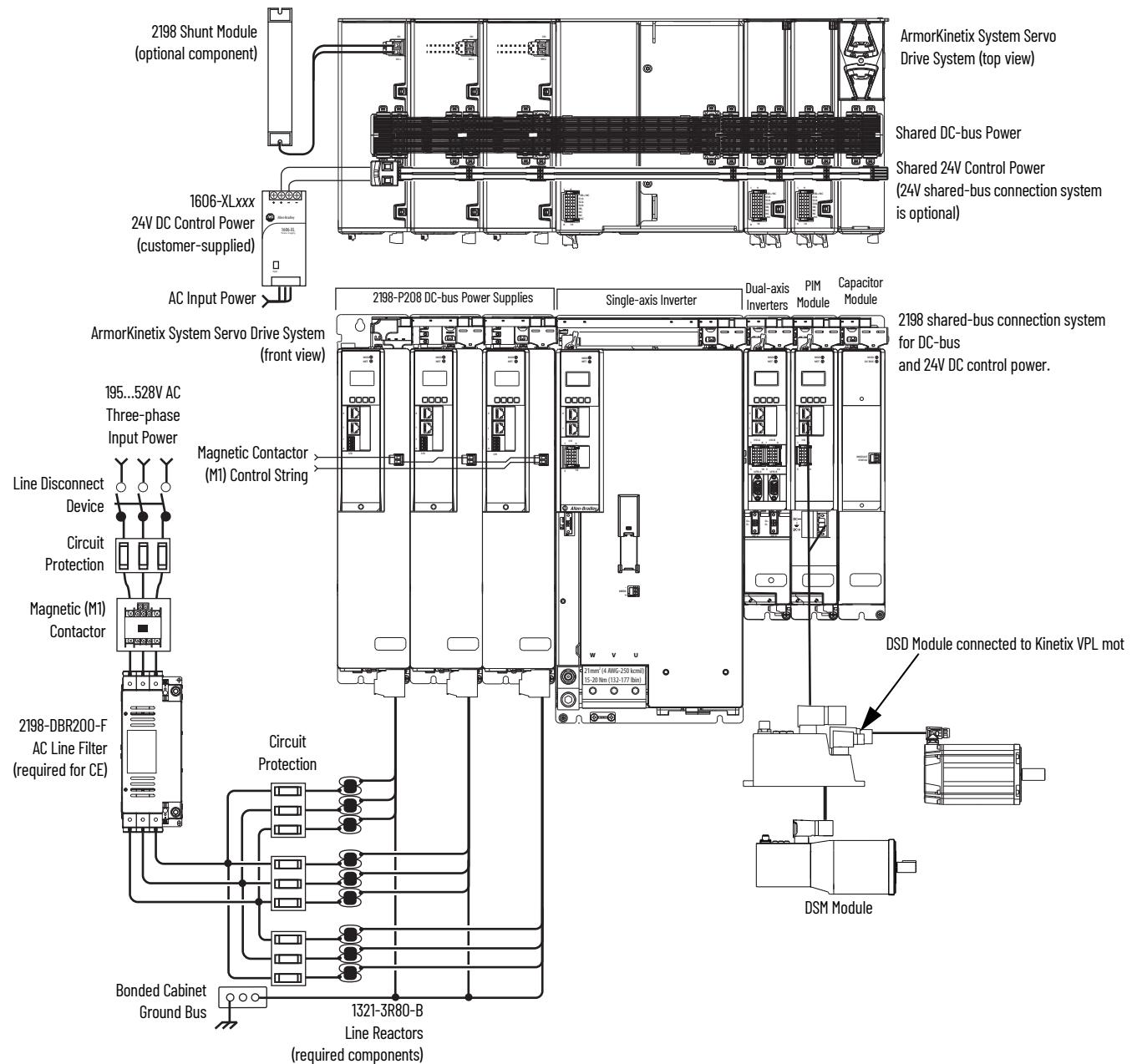


Multiple DC-Bus Power Supply Configuration Example

In this example, three DC-bus (converter) power supplies all receive AC input power and feed the inverter modules for increased output power.

Contactor enable relays from each of the DC-bus power supplies are wired in series to protect the DC-bus power supply in the event of shutdown fault conditions.

Figure 4 - Multiple DC-bus Power Supply Installation

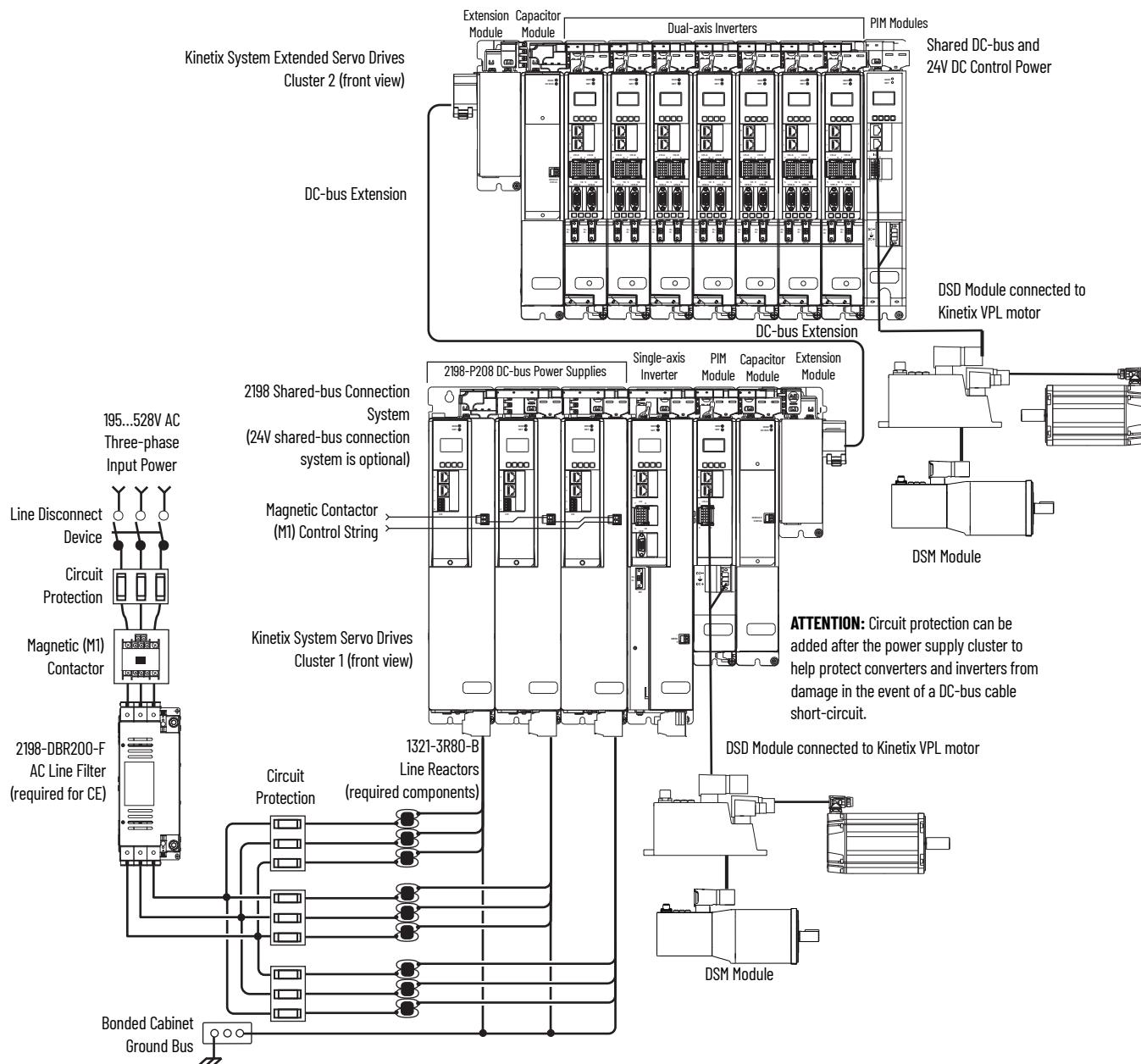


IMPORTANT When two or three DC-bus power supplies are wired together in the same drive cluster, they must all be catalog number 2198-P208.

Extended DC-bus Configuration Example

In this example, two drive clusters in the same cabinet are connected by the same 276...747V DC bus voltage. Kinetix 5700 accessory modules provide connection points for the DC-bus at the end of cluster 1 and the beginning of cluster 2. The Kinetix 5700 servo drive system is capable of up to 208 A DC-bus current. Two accessory modules are needed when the DC-bus system current exceeds 104 A. See [Accessory Module Selection](#) on [page 32](#) for more information on when accessory modules are required.

Figure 5 - Extended DC-bus Installation

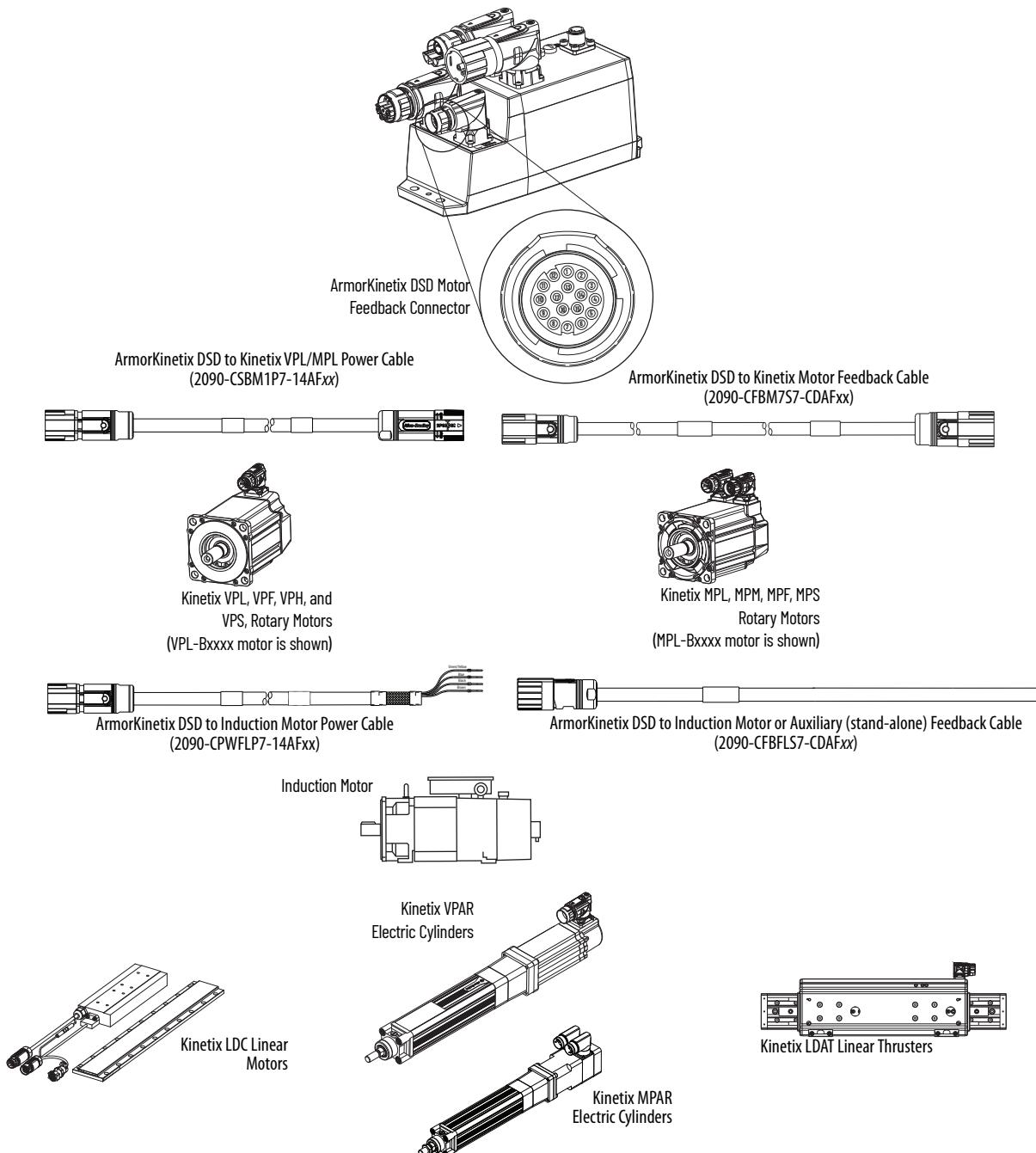


IMPORTANT When two or three DC-bus power supplies are wired together in the same drive cluster, they must all be catalog number 2198-P208.

Motor Feedback Configurations for ArmorKinetix DSD

Feedback connections are made at the motor feedback (MF) connector on the DSD. These examples illustrate how you can make these connections. To see motor power and brake connections, refer to [Chapter 5 on page 71](#).

Figure 6 - Feedback Configuration Example



Integrated Safety Configurations

The GuardLogix or Compact GuardLogix safety controller issues the safe torque-off (STO) or safe stop (SS1) command over the EtherNet/IP network and the ArmorKinetix DSx module executes the command.

Table 3 - Integrated Functional Safety Support

Integrated Safety Over the EtherNet/IP TM Network	Safety Function	ArmorKinetix DSD Cat. No.	ArmorKinetix DSM Cat. No.	Minimum Controller ⁽¹⁾ Required
Drive-based stopping functions	Timed Safe Stop 1 (SS1)	2198-DSDxxx-ERS2 2198-DSDxxx-ERS5	2198-DSMxxx-ERS2 2198-DSMxxx-ERS5	<ul style="list-style-type: none"> • GuardLogix 5580 • CompactGuardLogix 5380
	Monitored Safe Stop 1 (SS1)			
Controller-based stopping functions	<ul style="list-style-type: none"> • Monitored Safe Stop 1 (SS1) • Safe Stop 2 (SS2) 			
Controller-based monitoring functions	<ul style="list-style-type: none"> • Safe Operational Stop (SOS) • Safely Limited Speed (SLS) • Safety Limited Position (SLP) • Safe Direction (SDI) 	2198-DSDxxx-ERS5	2198-DSMxxx-ERS5	
Safety feedback function	Safety Feedback Interface (SFX)			
Integrated STO mode	Safe Torque-off (STO)	2198-DSDxxx-ERS5	2198-DSMxxx-ERS5	<ul style="list-style-type: none"> • GuardLogix 5570 • CompactGuardLogix 5370
		2198-DSDxxx-ERS2	2198-DSMxxx-ERS2	

(1) Where a ControlLogix or CompactLogix (non-safety) controller is specified, a GuardLogix or Compact GuardLogix controller is backwards compatible. Also, GuardLogix 5580 and Compact GuardLogix 5380 controllers are backwards compatible with GuardLogix 5570 and Compact GuardLogix 5370 controllers.