MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

ALLEN-BRADLEY

2097-V34PR5

ETHERNET/IP INDEXING SERVO DRIVE

Used with the applicable Kinetix 300 configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: Kinetix 300 EtherNet/IP Indexing Servo Drive; applicable manufacturer document pages 1, 7, 13, 14, 15, 16, 17, 18, 20, 21, 30, 31, 32, 33, 34, 35, 36, 37, 40, 41, 42, 43, 46, 47, 48, 49, 53, 54, 173, 174, 175, 176, 177, 178



Kinetix 300 EtherNet/IP Indexing Servo Drives

Catalog Numbers 2097-V31PR0, 2097-V31PR2, 2097-V32PR0, 2097-V32PR2, 2097-V32PR4, 2097-V33PR1, 2097-V33PR3, 2097-V33PR5, 2097-V33PR6, 2097-V34PR3, 2097-V34PR5, 2097-V34PR6

Allen-Bradley
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Catalog Number Explanation

Kinetix 300 drive catalog numbers and descriptions are listed in these tables.

Table 2 - Kinetix 300 Drives (single-phase)

Cat. No.	Input Voltage	Continuous Output Current A (0-pk)	Features
2097-V31PR0	120/240V, 1 Ø	2.8	• 120V Doubler mode • Safe Torque Off
2097-V31PR2		5.7	
2097-V32PR0	240V, 1 Ø	2.8	• Integrated AC line filter • Safe Torque Off
2097-V32PR2		5.7	
2097-V32PR4		11.3	

Table 3 - Kinetix 300 Drives (single/three-phase)

Cat. No.	Input Voltage	Continuous Output Current A (0-pk)	Features
2097-V33PR1	120V, 1 Ø 240V, 1 Ø 240V, 3 Ø	2.8	Safe Torque Off
2097-V33PR3		5.7	
2097-V33PR5		11.3	
2097-V33PR6		17.0	

Table 4 - Kinetix 300 Drives (three-phase)

Cat. No.	Input Voltage	Continuous Output Current A (0-pk)	Features
2097-V34PR3	480V, 3 Ø	2.8	Safe Torque Off
2097-V34PR5		5.7	
2097-V34PR6		8.5	

Table 5 - Kinetix 300 Drive Accessories

Cat. No.	Drive Components
2097-F*x*	AC line filters
2097-TB1	Terminal block for I/O connector
2097-R*x*	Shunt resistors
2097-PGMR	Memory module programmer
2097-MEM	Memory modules 12 pack

Agency Compliance

If this product is installed within the European Union and has the CE marking, the following requirements apply.



ATTENTION: To meet CE requirements requires a grounded system, and the method to ground the AC line filter and drive must match. Failure to do to match systems ground makes the filter ineffective and can damage the filter. For ground examples, see Ground Your Kinetix 300 Drive System on page 62.

For more information on electrical noise reduction, see the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.

CE Requirements

To meet CE requirements, these requirements apply:

- Install an AC line filter (Kinetix 2090 or Bulletin 2097) as close to the drive as possible.
- Use Kinetix 2090 motor-power cables or use connector kits and connect the cable shields to the subpanel with the clamp provided.
- Use Kinetix 2090 motor-feedback cables or use connector kits and properly connect the feedback cable shield. Drive-to-motor power and feedback cables must not exceed 20 m (65.6 ft).
- Install the Kinetix 300 system inside an enclosure. Run input power wiring in conduit (grounded to the enclosure) outside of the enclosure. Separate signal and power cables.
- Isolate input power wiring and motor power cables from control wiring and motor feedback cables. Use shielded cable for power wiring and provide a grounded 360° clamp termination.

See Appendix A on page 173 for interconnect diagrams, including input power wiring and drive/motor interconnect diagrams.

Installing the Kinetix 300 Drive System

Topic	Page
System Design Guidelines	16
Electrical Noise Reduction	22
Mount Your Kinetix 300 Drive	30



ATTENTION: Plan the installation of your system so that you can cut, drill, tap, and weld with the system removed from the enclosure. Because the system is of the open type construction, be careful to keep any metal debris from falling into it. Metal debris or other foreign matter can become lodged in the circuitry, which can result in damage to components.

System Design Guidelines

Use the information in this section when you design your enclosure and plan to mount your system components on the panel.

For online product selection and system configuration tools, including AutoCAD (DXF) drawings of the product, see https://www.rockwellautomation.com/global/support/selection.page.

System Mounting Requirements

- To comply with UL and CE, the Kinetix® 300 system must be enclosed in a grounded conductive enclosure that offers protection as defined in standard EN 60529 (IEC 529) to IP4X. The enclosures must be not accessible to an operator or unskilled persons. A NEMA 4X enclosure exceeds these requirements providing protection to IP66.
- The panel that you install in the enclosure for mounting your system components must be on a flat, rigid, vertical surface that is not subjected to shock, vibration, moisture, oil mist, dust, or corrosive vapors.
- Size the drive enclosure so as not to exceed the maximum-ambient temperature rating. Consider heat dissipation specifications for all drive components.
- Isolate input power wire and motor power cables from control wires and motor feedback cables. Use shielded cable for power wires and provide a grounded 360° clamp termination.
- Use high-frequency (HF) techniques for bonding to connect the enclosure, machine frame, and motor housing, and to provide a low-impedance return path for high-frequency (HF) energy and reduce electrical noise.
- Use Kinetix 2090 motor-feedback cables or use connector kits and properly connect the feedback cable shield. Drive-to-motor power and feedback cables must not exceed 20 m (65.6 ft).

IMPORTANT System performance was tested at these cable length specifications. These limitations are also a CE requirement.

See the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001, for a better understanding the concept of electrical noise reduction.

Transformer Selection

The Kinetix 300 drive does not require an isolation transformer for three-phase input power. However, a transformer can be required to match the voltage requirements of the controller to the available service.

To size a transformer for the main AC power inputs, see Circuit Breaker/Fuse Selection on page 17 and the Kinetix 3, 300, 350, 2000, 6000, 6200, 6500, 7000 Servo Drives Specifications Technical Data, publication KNX-TD005.

IMPORTANT Use a form factor of 1.5 for single and three-phase power (where form factor is used to compensate for transformer, drive, and motor losses, and to account for utilization in the intermittent operating area of the torque speed curve).

For example, size a transformer to the voltage requirements of catalog number 2097-V34PR6 = 3 kW continuous x 1.5 = 4.5 KVA transformer.

Circuit Breaker/Fuse Selection

The Kinetix 300 drives use internal solid-state motor short-circuit protection and, when connected to a suitable branch circuit protection, are rated for use on a circuit that can deliver up to 100,000 A (fuses) or 65,000 A (circuit breakers).

IMPORTANT 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 drive's 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.

See the Kinetix 3, 300, 350, 2000, 6000, 6200, 6500, 7000 Servo Drives Specifications Technical Data, publication KNX-TD005, for input current and inrush current specifications for your Kinetix 300 drive.

See Fuse and Circuit Breaker (CB) Specifications on page 18 for recommended circuit breakers and fuses.

Table 6 - Fuse and Circuit Breaker (CB) Specifications

Drive Cat. No.	Drive Voltage	Phase	UL Applications			IEC (non-UL) Applications		
			Fuses (Bussmann)	Miniature CB (1) Cat. No.	Motor Protection CB (1) (2) Cat. No.	DIN gG Fuses Amps, Max	Miniature CB (1) Cat. No.	Motor Protection CB (1) Cat. No.
2097-V31PR0	120V	Single-phase (voltage doubler)	KTK-R-20 (20 A)	1489-A1C200	140MT-D9E-C20	20	1492-SP1D200	140MT-D9E-C20
	120/240V	Single-phase	KTK-R-10 (10 A)	1489-A1C100	140MT-C3E-C10	10	1492-SP1D100	140MT-C3E-C10
2097-V31PR2	120V	Single-phase (voltage doubler)	KTK-R-30 (30 A)	1489-A1C300	140M-F8E-C32	32	1492-SP1D300	140M-F8E-C32
	120/240V	Single-phase	KTK-R-20 (20 A)	1489-A1C200	140MT-D9E-C20	20	1492-SP1D200	140MT-D9E-C20
2097-V32PR0	240V	Single-phase	KTK-R-15 (15 A)	1489-A1C150	140MT-D9E-C16	16	1492-SP1D150	140MT-D9E-C16
2097-V32PR2			KTK-R-20 (20 A)	1489-A1C200	140MT-D9E-C20	20	1492-SP1D200	140MT-D9E-C20
2097-V32PR4			KTK-R-30 (30 A)	1489-A1C300	140M-F8E-C32	32	1492-SP1D320	140M-F8E-C32
2097-V33PR1	120/240V	Single-phase	KTK-R-20 (20 A)	1489-A1C200	140MT-D9E-C20	20	1492-SP1D200	140MT-D9E-C20
	240V	Three-phase	KTK-R-15 (15 A)	1489-A3C150	140MT-D9E-C16	16	1492-SP3D150	140MT-D9E-C16
2097-V33PR3	120/240V	Single-phase	KTK-R-20 (20 A)	1489-A1C200	140MT-D9E-C20	20	1492-SP1D200	140MT-D9E-C20
	240V	Three-phase	KTK-R-15 (15 A)	1489-A3C150	140MT-D9E-C16	16	1492-SP3D150	140MT-D9E-C16
2097-V33PR5	120/240V	Single-phase	KTK-R-30 (30 A)	1489-A1C300	140M-F8E-C32	32	1492-SP1D300	140M-F8E-C32
	240V	Three-phase	KTK-R-20 (20 A)	1489-A3C200	140MT-D9E-C20	20	1492-SP3D200	140MT-D9E-C20
2097-V33PR6	120/240V	Single-phase	LPJ-40SP	N/A	140M-F8E-C32	40	N/A	140M-F8E-C32
	240V	Three-phase	KTK-R-30 (30 A)	1489-A3C300		32	1492-SP3D300	
2097-V34PR3	480V	Three-phase	KTK-R-10 (10 A)	1489-A3C100	140MT-C3E-C10	10	1492-SP3D100	140MT-C3E-C10
2097-V34PR5			KTK-R-10 (10 A)	1489-A3C100	140MT-C3E-C10	10	1492-SP3D100	140MT-C3E-C10
2097-V34PR6			KTK-R-20 (20 A)	1489-A3C200	140MT-D9E-C20	20	1492-SP3D200	140MT-D9E-C20

(1) Bulletin 1492 and 1489 circuit protection devices have lower short-circuit current ratings than Bulletin 140M and 140MT devices.
See https://ab.rockwellautomation.com/allenbradley/productdirectory.page for product literature with specific short-circuit ratings.
For 140M to 140MT device migration details, see Bulletin 140M to 140MT Motor Protection Circuit Breakers Migration Profile, publication MIGRAT-PP049.

(2) For UL applications, Bulletin 140M and 140MT devices are applied as self-protected combination motor controllers.

Power Dissipation Specifications

Use this table to size an enclosure and calculate required ventilation for your Kinetix 300 drive system.

Cat. No.	Power Dissipation, W
2097-V31PR0	28
2097-V31PR2	39
2097-V32PR0	28
2097-V32PR2	39
2097-V32PR4	67
2097-V33PR1	28
2097-V33PR3	39
2097-V33PR5	67
2097-V33PR6	117
2097-V34PR3	39
2097-V34PR5	58
2097-V34PR6	99

Minimum Clearance Requirements

This section provides information to assist you in making the choice of the size of your cabinet and position of your Kinetix 300 system components.

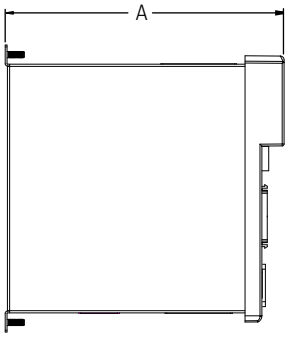
IMPORTANT Mount the module in an upright position as shown. Do not mount the drive module on its side.

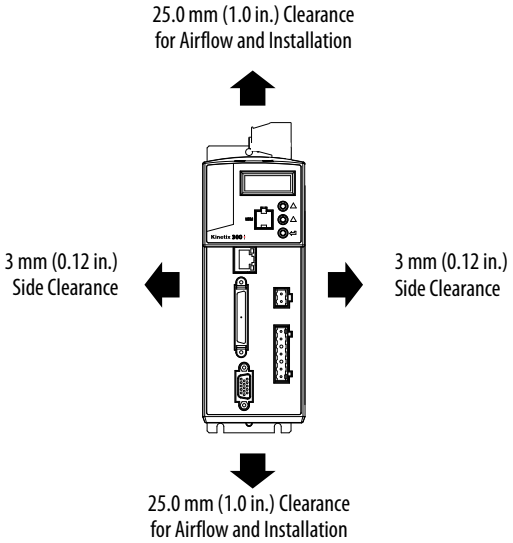
Figure 2 illustrates minimum clearance requirements for proper airflow and installation:

- Extra clearance is required depending on the accessory items installed.
- An extra 9.7 mm (0.38 in.) clearance is required left of the drive if the I/O expansion terminal block is used.
- An extra 26 mm (1.0 in.) clearance is required right of the drive when the heatsink is present.
- An extra 36 mm (1.42 in.) is required right of the drive when the side-mount line filter is present. An extra 50 mm (2.0 in.) is required behind the drive when the rear-mount line filter is present.
- An extra 5.0 mm (0.19 in.) clearance is required in front of the drive when the 2090-K2CK-D15M feedback connector kit is used.
- Extra clearance is required for the cables and wires that are connected to the top, front, and bottom of the drive.
- An extra 150 mm (6.0 in.) is required when the drive is mounted near noise sensitive equipment or clean wireways.

See the Kinetix 3, 300, 350, 2000, 6000, 6200, 6500, 7000 Servo Drives Specifications Technical Data, publication KNX-TD005 for Kinetix 300 drive dimensions.

Figure 2 - Minimum Clearance Requirements





Drive Cat. No.	A
2097-V31PR0	185 (7.29)
2097-V31PR2	185 (7.29)
2097-V32PR0	230 (9.04)
2097-V32PR2	230 (9.04)
2097-V32PR4	230 (9.04)
2097-V33PR1	185 (7.29)
2097-V33PR3	185 (7.29)
2097-V33PR5	185 (7.29)
2097-V33PR6	230 (9.04)
2097-V34PR3	185 (7.29)
2097-V34PR5	185 (7.29)
2097-V34PR6	230 (9.04)

Mount Your Kinetix 300 Drive

This procedure assumes that you have prepared your panel and understand how to bond your system. For installation instructions regarding other equipment and accessories, see the instructions that came with those products.



ATTENTION: This drive contains electrostatic discharge (ESD) sensitive parts and assemblies. You are required to follow static control precautions when you install, test, service, or repair this assembly. If you do not follow ESD control procedures, components can be damaged. If you are not familiar with static control procedures, see Allen-Bradley® publication 8000-4.5.2, Guarding Against Electrostatic Damage or any other applicable ESD Protection Handbook.

Follow these steps to mount your Kinetix 300 drive.

1. Lay out the position for the Kinetix 300 drive and accessories in the enclosure.

   See Establishing the Noise Zones on page 25 for panel layout recommendations. Mounting hole dimensions for the Kinetix 300 drive are shown in the Kinetix 3, 300, 350, 2000, 6000, 6200, 6500, 7000 Servo Drives Specifications Technical Data, publication KNX-TD005.

2. Attach the Kinetix 300 drive to the cabinet, first by using the upper mounting slots of the drive and then the lower.

   The recommended mounting hardware is M4 (#6-32) steel machine screws torqued to 1.1 N•m (9.8 lb•in). Observe bonding techniques as described in Bonding Drives on page 22.

   IMPORTANT To improve the bond between the Kinetix 300 drive and subpanel, construct your subpanel out of zinc plated (paint-free) steel.

3. Tighten all mounting fasteners.

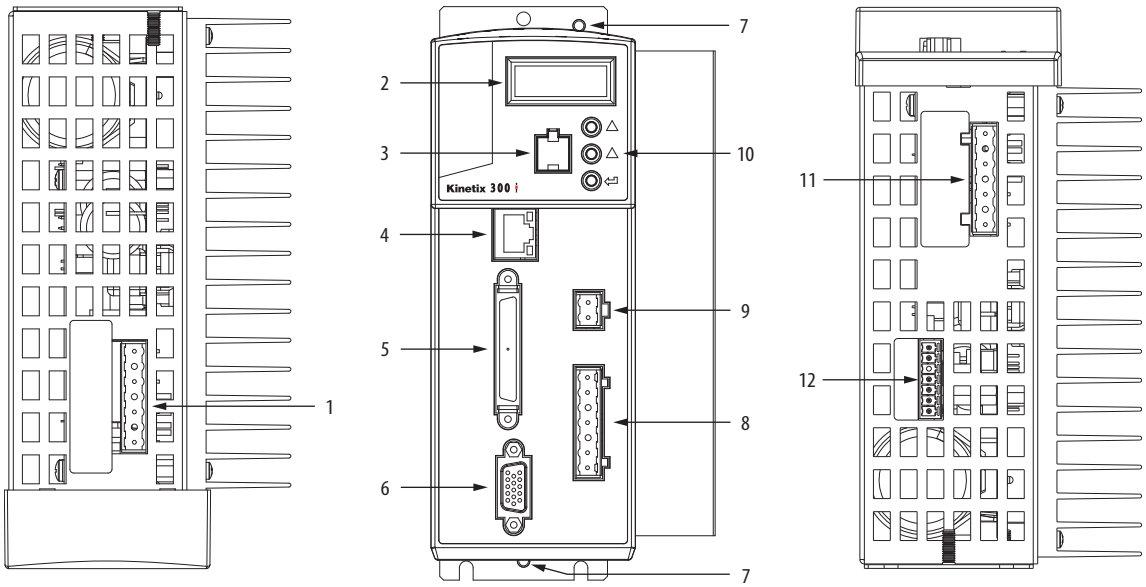
Kinetix 300 Drive Connector Data and Feature Descriptions

Topic	Page
Kinetix 300 Drive Connectors and Indicators	32
Control Signal Specifications	37
Motor Feedback Specifications	48

Kinetix 300 Drive Connectors and Indicators

Although the physical sizes of the Kinetix® 300 drives vary, the location of the connectors and indicators is identical.

Figure 9 - Kinetix 300 Drive Connector and Indicators



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

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

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

Item	Description
1	Mains (IPD) connector
2	Status and diagnostic display
3	Memory module socket
4	Ethernet communication port (Port 1)
5	I/O (IOD) connector
6	Motor feedback (MF) connector

Item	Description
7	Ground lug
8	Shunt resistor and DC bus (BC) connector
9	Back-up power (BP) connector
10	Display control push buttons (3)
11	Motor power (MP) connector
12	Safe Torque Off (STO) connector

Table 8 - Kinetix 300 Drive Connectors

Designator	Description	Connector
IPD	AC input power	3-position or 4-position plug/header
PORT1	Ethernet communication port	RJ45 Ethernet
IOD	I/O	SCSI 50-pin high-density connector
MF	Motor feedback	15-pin high-density D-shell (male)
CPD	Back-up power	2-pin quick-connect terminal block
BC	Shunt Resistor and DC Bus	7-pin quick-connect terminal block
MP	Motor power	6-pin quick-connect terminal block
STO	Safe Torque Off (STO) terminal	6-pin quick-connect terminal block

Safe Torque Off Connector Pinout

The Kinetix 300 drive ships with the (6-pin) wiring-plug header that connects your safety circuit to the Kinetix 300 drive Safe Torque Off feature, follow instructions in Safe Torque Off Feature Bypass that begin on page 168 to wire the drive with motion-allowed jumpers.

Figure 10 - Safe Torque Off Connector

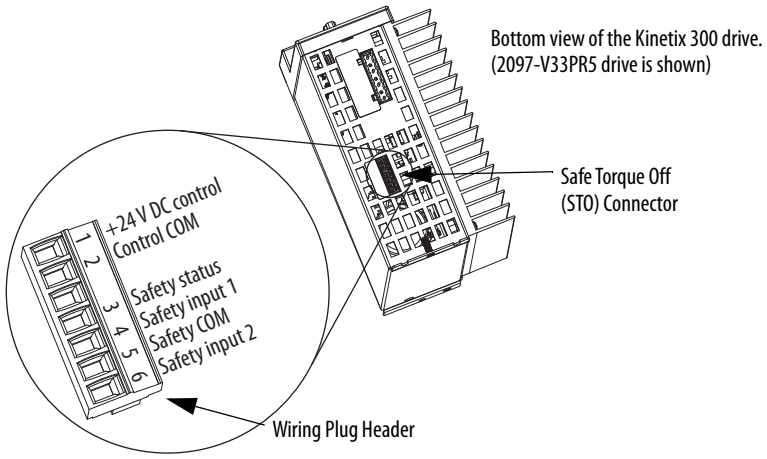


Table 9 - Kinetix 300 Drive Safe Torque Off Connector Pinout

STO Pin	Description	Signal
1	+24V DC output from the drive	+24V DC control
2	+24V DC output common	Control COM
3	Safety status	Safety Status
4	Safety input 1 (+24V DC to enable)	Safety Input 1
5	Safety common	Safety COM
6	Safety input 2 (+24V DC to enable)	Safety Input 2

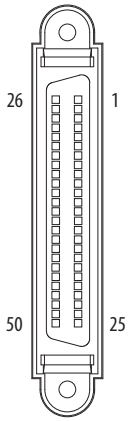
IMPORTANT Use Pins STO-1 (+24V DC Control) and STO-2 (Control COM) only for the motion-allowed jumpers to defeat the Safe Torque Off function. When the Safe Torque Off function is in operation, the 24V supply must come from an external source.

I/O Connector Pinout

IOD Pin	Description	Signal
1	Master encoder A+/Step+ input	MA+
2	Master encoder A-/Step- input	MA-
3	Master encoder B+/Direction+ input	MB+
4	Master encoder B-/Direction- input	MB-
5	Reserved	—
6	Reserved	—
7	Buffered encoder output: channel A+	BA+
8	Buffered encoder output: channel A-	BA-
9	Buffered encoder output: channel B+	BB+
10	Buffered encoder output: channel B-	BB-
11	Buffered encoder output: channel Z+	BZ+
12	Buffered encoder output: channel Z-	BZ-
13…21	Reserved	—
22	Analog common	ACOM
23	Analog output (max 10 mA)	AO
24	Positive (+) of analog signal input	AIN1+
25	Negative (-) of analog signal input	AIN1-
26	Digital input group ACOM terminal	IN_A_COM
27	Negative travel limit switch	IN_A1
28	Positive travel limit switch	IN_A2
29	Inhibit/enable input	IN_A3

IOD Pin	Description	Signal
30	Digital input A4	IN_A4
31	Digital input group BCOM terminal	IN_B_COM
32	Digital input B1	IN_B1
33	Digital input B2	IN_B2
34	Digital input B3	IN_B3
35	Digital input B4	IN_B4
36	Digital input Group CCOM Terminal	IN_C_COM
37	Digital input C1	IN_C1
38	Digital input C2	IN_C2
39	Registration input sensor	IN_C3
40	Digital input C4	IN_C4
41	Ready output collector	RDY+
42	Ready output emitter	RDY-
43	Programmable output #1 collector	OUT1-C
44	Programmable output #1 emitter	OUT1-E
45	Programmable output #2 collector	OUT2-C
46	Programmable output #2 emitter	OUT2-E
47	Programmable output #3 collector	OUT3-C
48	Programmable output #3 emitter	OUT3-E
49	Programmable output #4 collector	OUT4-C
50	Programmable output #4 emitter	OUT4-E

Figure 11 - Pin Orientation for 50-pin SCSI I/O (IOD) Connector



Motor Feedback (MF) Connector Pinout

MF Pin	Description	Signal
1	Sine differential input+ AM+ differential input+	SIN+ AM+
2	Sine differential input- AM- differential input-	SIN- AM-
3	Cosine differential input+ BM+ differential input+	COS+ BM+
4	Cosine differential input- BM- differential input-	COS- BM-
5	Data differential input + Index pulse+	DATA+ IM+
6	Common	ECOM
7	Encoder power (+9V)	EPWR_9V (2)
8	Single-ended 5V Hall effect commutation	S3

MF Pin	Description	Signal
9	Reserved	—
10	Data differential input - Index pulse-	DATA- IM-
11	Motor thermal switch (normally closed) (1)	TS
12	Single-ended 5V Hall effect commutation	S1
13	Single-ended 5V Hall effect commutation	S2
14	Encoder power (+5V)	EPWR_5V (2)
15	Reserved	—

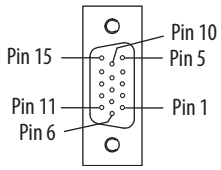
(1) Not applicable unless motor has integrated thermal protection.

(2) Determine which power supply your encoder requires and connect to only the specified supply. Do not make connections to both.

ATTENTION: To avoid damage to components, determine which power supply your encoder requires and connect the encoder power to either the 5V or 9V supply, but not both.

IMPORTANT Drive-to-motor power and feedback cable length must not exceed 20 m (65.6 ft). System performance was tested at these specifications and also applies when meeting CE requirements.

Figure 12 - Pin Orientation for 15-pin Motor Feedback (MF) Connector

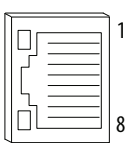


Ethernet Communication Connector Pinout

Port 1 Pin	Description	Signal
1	Transmit Port (+) Data Terminal	+ TX
2	Transmit Port (-) Data Terminal	- TX
3	Receive Port (+) Data Terminal	+ RX
4	—	—

Port 1 Pin	Description	Signal
5	—	—
6	Receive Port (-) Data Terminal	- RX
7	—	—
8	—	—

Figure 13 - Pin Orientation for 8-pin Ethernet Communication Port



AC Input Power Connector Pinout

IPD Designator	Description (2097-V31PR*x* drives)	Signal
L2/N	AC Power In (non-doubler operation)	L2/N
L1	AC Power In	L1
N	AC Power Neutral (120V doubler only)	N
PE	Protective Earth (ground)	PE

IPD Designator	Description (2097-V32PR*x* drives)	Signal
L2	AC Power In	L2
L1	AC Power In	L1
PE	Protective Earth (ground)	PE

IPD Designator	Description (2097-V33PR*x*, and 2097-V34PR*x* drives)	Signal
L3	AC Power In (three-phase models)	L3
L2	AC Power In	L2
L1	AC Power In	L1
PE	Protective Earth (ground)	PE

Back-up Power Connector Pinout

BP Designator	Description	Signal
+24V	Positive 24V DC	+24V DC
-24V	24V DC power supply return	Return

Shunt Resistor and DC Bus Connector Pinout

BC Designator	Description	Signal
+	Positive DC bus/Shunt resistor	+
+		+
SH	Shunt Resistor	SH
-	Negative DC bus	-
-		-

Motor-Power Connector Pinout

MP Designator	Description	Signal
PE	Protective Earth (ground)	PE
W	Motor power out	W
V	Motor power out	V
U	Motor power out	U

Control Signal Specifications

This section provides a description of the Kinetix 300 drive I/O (IOD), communication, shunt resistor, and DC bus (BC), and back-up power (BP) connectors.

Digital Inputs

The Kinetix 300 drive has 12 digital inputs. They can be used for travel limit switches, proximity sensors, push buttons, and hand shake with other devices. Each input can be assigned an individual de-bounce time via MotionView software or Explicit Messaging.

The inputs are separated into three groups: A, B, and C. Each group has four inputs and share one common: ACOM, BCOM, and CCOM respectively.

Travel limit switches, the inhibit/enable input, and registration input have dedicated inputs as shown in Table 10. For more information on the overtravel inputs, see Appendix E on page 219.

Table 10 - Digital Input Assignments

Digital Input	Function
IN_A1	Negative travel-limit switch
IN_A2	Positive travel-limit switch
IN_A3	Inhibit/enable input
IN_A4	N/A
IN_B1	N/A
IN_B2	N/A
IN_B3	N/A
IN_B4	N/A
IN_C1	N/A
IN_C2	N/A
IN_C3	Registration input sensor
IN_C4	N/A

You can configure the inputs that are listed as N/A for any of these functions.

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

Table 14 - Indexing Truth Table

Drive Input	Value					
Start Index Input	—	—	Move to On	—	—	—
Start Motion bit in Output Assembly	—	—	—	Move to On	—	—
Abort Index Input	On	—	Off	Off	Move to On	—
Abort Index bit in Output Assembly	—	On	Off	Off	—	Move to On
Previous Drive State	Enabled	Enabled	Enabled	Enabled	Indexing	Indexing
Resulting Drive State	Will not index	Will not index	Starts indexing	Starts indexing	Aborts indexing	Aborts Indexing

The digital inputs are optically isolated and sink up to 24V DC. Electrical details are shown in Table 15 on page 41. You can configure the inputs for PNP sourcing or NPN sinking.

Figure 18 - Sourcing of Digital Inputs

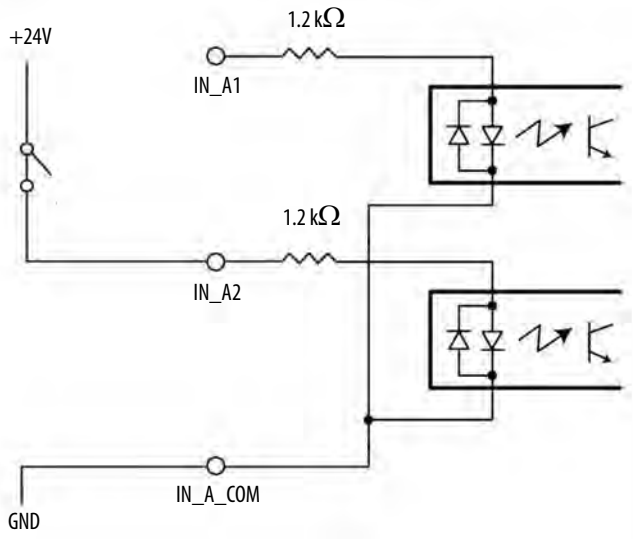


Figure 19 - Sinking of Digital Inputs

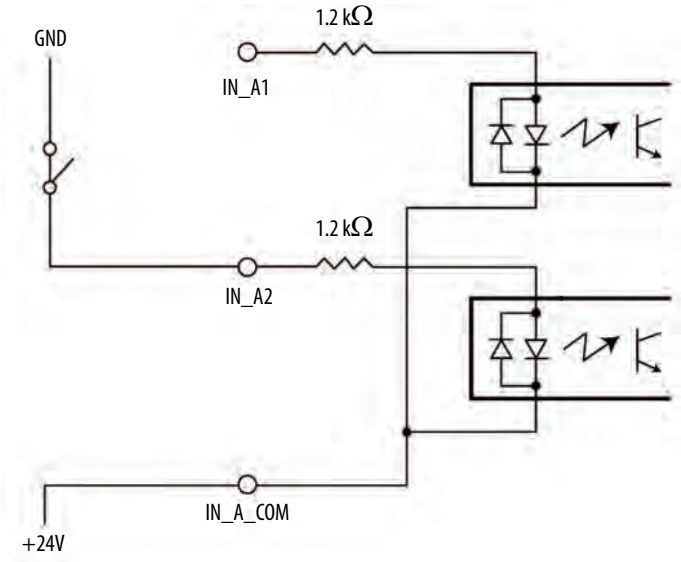


Table 15 - Digital Input Signal Specifications

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

Digital Outputs

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

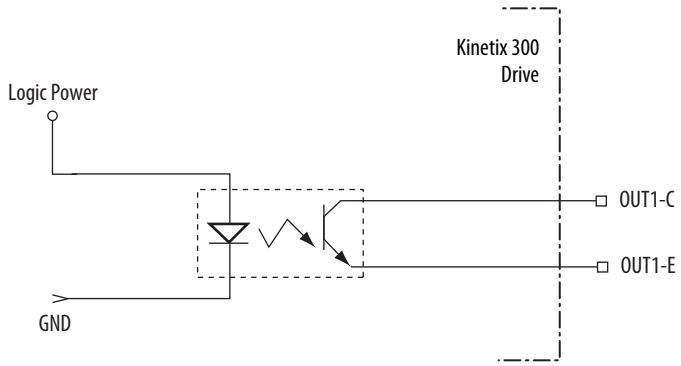
- Not assigned
- Zero speed
- In-speed window
- Current limit
- Runtime fault
- Ready
- Brake (motor brake release)

The Ready Output has a fixed function that becomes active when the drive is enabled and the output power transistors become energized.

Table 16 - Digital Output Signal Specifications

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

Figure 20 - Digital Output Circuit



Analog Reference Input

The analog reference input AIN1+ and AIN1- (IOD-24 and IOD-25) accepts up to a ±10V DC analog signal as shown in Table 17. The analog signal is converted to a digital value with 12-bit resolution (11 bit plus sign). The total reference voltage as seen by the drive is the voltage difference between AIN1+ and AIN1-. If used in Single-ended mode, one of the inputs must be connected to a voltage source while the other one must be connected to Analog Common (ACOM). If used in Differential mode, the voltage source is connected across AIN1+ and AIN1- and the driving circuit common, if available, is connected to the drive Analog Common (ACOM) terminal.

Table 17 - Analog Signal Input Specifications

Parameter	Value
Scan time	0.0625 ms
Current, max	Depend on load
Input impedance	47 kΩ, typical
Voltage range	-10…10V DC

Differential signal inputs are preferred when using master gearing/step and direction. When using differential signal inputs, sinking or sourcing outputs can be used. Single-ended inputs can be used but are not recommended. Sinking type outputs cannot be used if single-ended inputs are used. The function of the master gearing/step and direction inputs is software selectable. Use the MotionView software, General category, to choose the desirable function.

An external pulse-train signal (step) supplied by an external device, such as a PLC or stepper indexer, can control the speed and position of the servo motor. The frequency of the step signal controls the speed of the motor. The number of pulses that are supplied to the Kinetix 300 drive determines the position of the servo motor. Direction input controls direction of the motion.

Buffered Encoder Outputs

There are many applications where it is desired to close the feedback loop to an external device. This feature is accessible through the buffered encoder output connections (IOD-7...IOD-12) for TTL differential line encoder types. A master drive that powers a motor with a SICK-Stegmann high-resolution encoder generates buffered-encoder outputs for master gearing to a slave drive. However, a Tamagawa high-resolution encoder does not.

IMPORTANT The buffered encoder outputs are not supported with Tamagawa high-resolution motor feedback.

If a motor with encoder feedback is being used, the A+, A-, B+, B-, Z+, and Z- signals are passed directly through drive pins IOD-7...IOD-12 with no filtering, up to a speed of 2 MHz. The encoder pass through delay is approximately 100 ns.

Ethernet Connections

An RJ45 Ethernet connector (port 1) is provided on the Kinetix 300 drive.

Table 20 - Ethernet Communication Specifications

Attribute	Value
Communication	100BASE-TX, full-duplex
Cyclic update period	2 ms, min
Auto MDI/MDIX crossover detection/correction	Yes
Cable	CAT5E or CAT6, unshielded, or shielded, 100 m (328 ft)

24V DC Back-up Power

The Kinetix 300 drive can use an external power supply to power the logic and communication circuits. If an independent 24V (@ 1 A) power supply is connected to the BP connector, the logic and communication circuits remain active during a mains input-power loss.

Table 21 - 24V DC Back-up Power Specifications

Attribute	Value
Input voltage	20…26V DC
Current	500 mA
Inrush, max	30 A

Motor Feedback Specifications

The Kinetix 300 drive accepts motor feedback signals from the following types of encoders with these general specifications.

Table 22 - Motor Feedback General Specifications

Attribute	Motor Feedback
Feedback device support	• SICK-Stegmann Hiperface • Generic TTL Incremental • Tamagawa 17 bit Serial
Power supply voltage (EPWR5V)	5.13…5.67V
Power supply current (EPWR5V)	400 mA, max (1) (2)
Power supply voltage (EPWR9V)	8.3…9.9V
Power supply current (EPWR9V)	275 mA, max (2)(3)
Thermostat	Single-ended, under 500 Ω = no fault, over 10 kΩ = fault

(1) 400 mA on the 5V supply with no load on the 9V supply.
(2) 300 mA on the 5V supply with 150 mA on the 9V supply.
(3) 275 mA on the 9V supply with no load on the 5V supply.

TIP Auto configuration is possible by using the Kinetix 300 drive MotionView OnBoard software for Allen-Bradley® motors.

Motor Feedback Specifications

The Kinetix 300 drives support multiple types of feedback devices by using the 15-pin (MF) motor feedback connector and by sharing connector pins in many cases.

Table 23 - Motor Feedback Signals by Device Type

MF Pin	SICK-Stegmann Hiperface	Generic TTL Incremental	Tamagawa 17 bit Serial
1	SIN+	AM+	—
2	SIN-	AM-	—
3	COS+	BM+	—
4	COS-	BM-	—
5	DATA+	IM+	DATA+
6	ECOM	ECOM	ECOM
7	EPWR9V	—	—
8	—	S3	—
9	—	—	—
10	DATA-	IM-	DATA-
11	TS	TS	—
12	—	S1	—
13	—	S2	—
14	—	EPWR5V	EPWR5V
15	—	—	—

Figure 25 is the motor-thermostat interface schematic. Although the thermostat signal is shown for all feedback types, some motors do not support this feature because it is not part of the feedback device.

Figure 25 - Motor Thermostat Interface

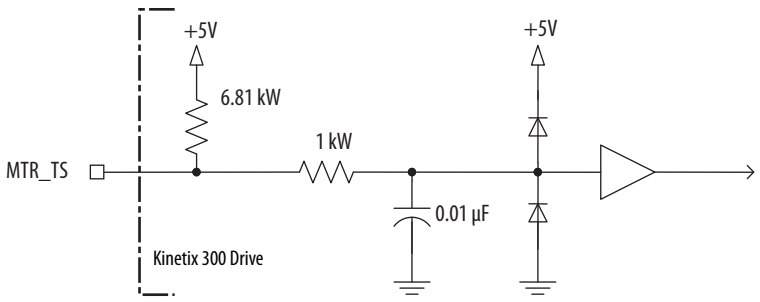


Table 24 - Motor Thermostat State Specifications

State	Resistance at TS
No Fault	500 Ω
Fault	10 kΩ

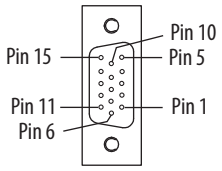
Feedback Power Supply

The Kinetix 300 drive generates +5V and +9V DC for motor feedback power. Short circuit protection and separate common mode filtering for each channel is included.

Table 28 - Motor Feedback Power Specifications

Supply	Reference	Voltage			Current mA	
		Min	Nominal	Max	Min	Max
+5V DC	EPWR_5V	5.13	5.4	5.67	0	400
+9V DC	EPWR_9V	8.3	9.1	9.9	0	275

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



Notes:

Interconnect Diagrams

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Interconnect Diagram Notes

This appendix provides wiring examples to assist you in wiring the Kinetix® 300 system. The notes in this table apply to the wiring examples on the pages that follow.

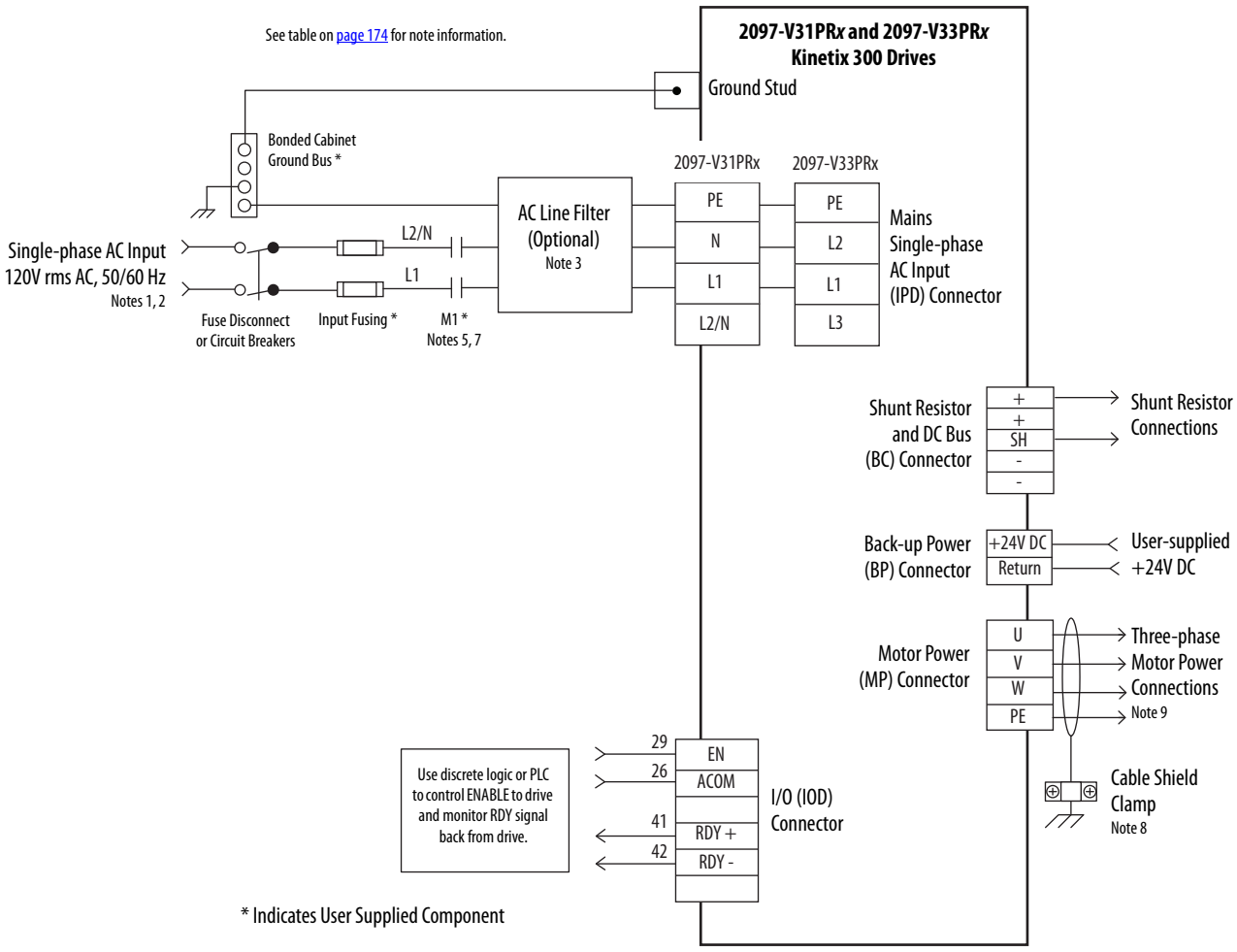
Note	Information
1	For power wiring specifications, see Power Wiring Requirements on page 63.
2	For input fuse and circuit breaker sizes, see Circuit Breaker/Fuse Selection on page 17.
3	Place the AC (EMC) line filters as close to the drive as possible and do not route very dirty wires in the wireway. If routing in a wireway is unavoidable, use shielded cable with shields that are grounded to the drive chassis and filter case. For AC line filter specifications, see the Kinetix 3, 300, 350, 2000, 6000, 6200, 6500, 7000 Servo Drives Specifications Technical Data, publication KNX-TD005. This filter does not apply to 2097-V32PRx drives because they have integrated AC line filters.
4	Terminal block is required to make connections. Configure one pair from the Digital OUT-1… OUT-4, pins 43…50, as Brake in MotionView software. For Digital Output specifications, see Digital Outputs on page 42.
5	Contactor coil (M1) needs integrated surge suppressors for AC coil operation. See the Kinetix 3, 300, 350, 2000, 6000, 6200, 6500, 7000 Servo Drives Specifications Technical Data, publication KNX-TD005.
6	See the Motor Brake Currents table on page 188 to size the interposing relay for your application.
7	Drive Enable input must be opened when main power is removed, or a drive fault occurs. A delay of at least 1.0 second must be observed before attempting to enable the drive after main power is restored.
8	Cable shield clamp must be used to meet CE requirements. No external connection to ground is required.
9	For motor cable specifications, see the Kinetix Motion Control Selection Guide, publication KNX-SG001.
10	Motor power cables (2090-XXNPMF-*xx*S*xx* and 2090-CPBM6DF-16AA*xx*) have a drain wire that must be folded back under the cable shield clamp.
11	MPL-A*xxx* and MPL-B15*xxx*-H…MPL-B45*xxx*-H, MPM-A*xxx*, MPF-A*xxx*, MPS-A*xxx*, LDAT-S*xxxxxx*-*x*B*x*, MPAR-A*xxx*, MPAI-A*xxx*, MPAS-A*xxx*, and MPAS-B*xxx* (direct drive) encoders use the +5V DC supply.
12	MPL-B15*xxx*-S/M…MPL-B45*xxx*-S/M, MPM-B*xxx*, MPF-B*xxx*, MPS-B*xxx*, LDAT-S*xxxxxx*-*x*D*x*, MPAR-B*xxx*, MPAI-Bxxx, and MPAS-B*xxx* (ballscrew) encoders use the +9V DC supply.
13	Brake connector pins are labeled plus (+) and minus (-) or F and G respectively. Power connector pins are labeled U, V, W, and GND or A, B, C, and D respectively.
14	Kinetix LDAT linear thrusters do not have a brake option, so only the 2090-CPWM7DF-*xx*AA*xx* or 2090-CPWM7DF-*xx*AF*xx* motor power cables apply.

Power Wiring Examples

You must supply input power components. The single-phase and three-phase line filters are wired downstream of fusing and the M1 contactor.

In this example, the 2097-V31PR*x* drives are wired to use the voltage doubling circuit. The 120V input voltage provides 240V output to motors. The 2097-V33PR*x* drives are wired for single-phase 120V operation.

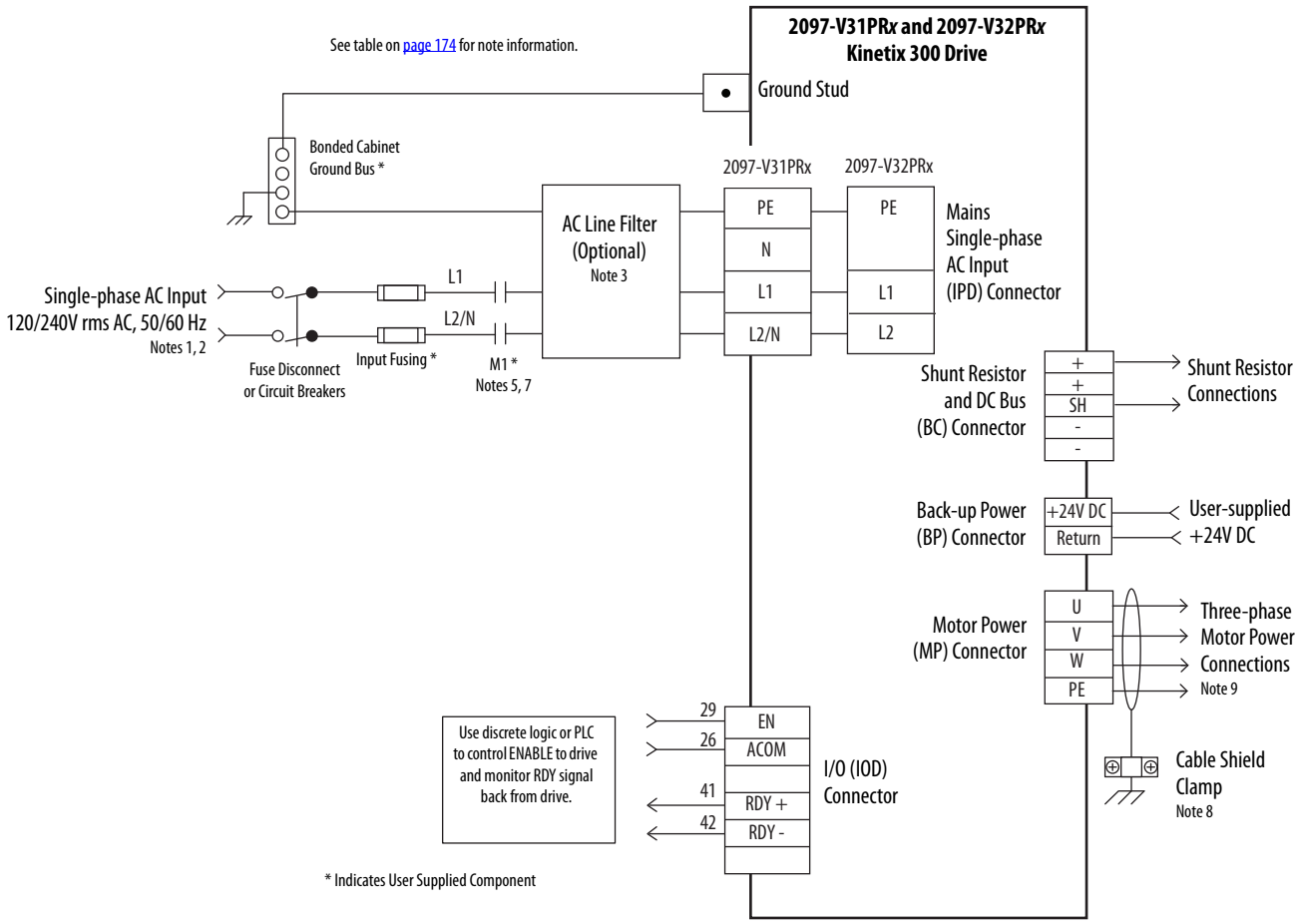
Figure 86 - Kinetix 300 Drive (120V Single-phase Input Power)



In this example, single-phase 240V AC is applied to 2097-V31PR*x* and 2097-V32PR*x* drives.

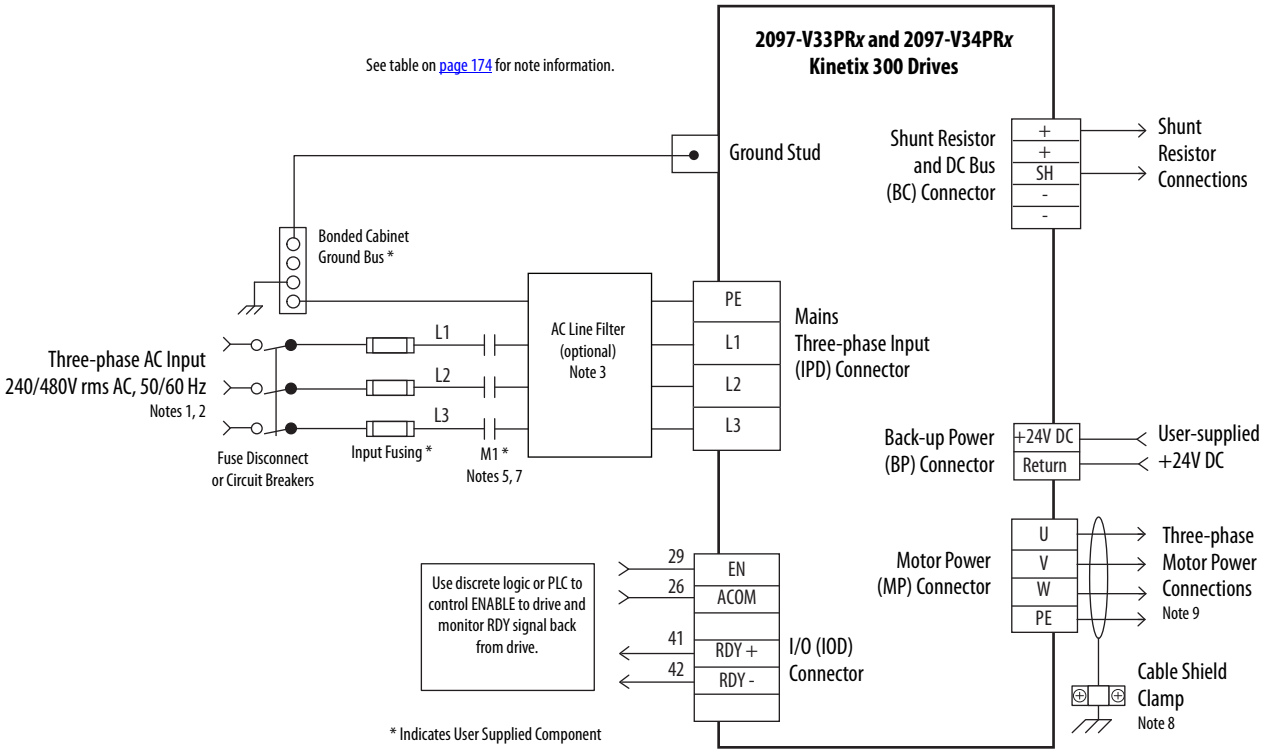
IMPORTANT The 2097-V32PRx models have integrated AC line filters and do not require the AC line filter that is shown in this diagram.

Figure 87 - Kinetix 300 Drives (240V Single-phase Input Power)



In this example, three-phase 240V AC is applied to 2097-V33PR*x* drives and 480V AC is applied to 2097-V34PR*x* drives.

Figure 88 - Kinetix 300 Drive (240/480V Three-phase Input Power)

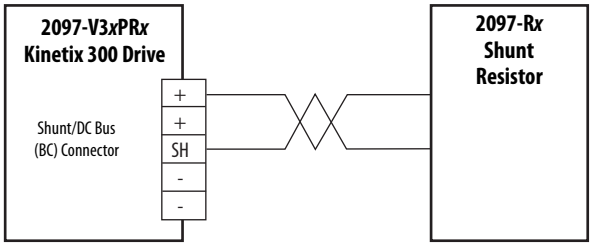


IMPORTANT For the 480V Kinetix 300 drives to meet EN ISO 13849-1 (PLd) spacing requirements, each phase voltage to ground must be less than or equal to 300V AC rms. To meet the requirement, the power system must use center grounded wye secondary configuration for 400/480V AC mains.

Shunt-Resistor Wiring Example

See the the Kinetix 3, 300, 350, 2000, 6000, 6200, 6500, 7000 Servo Drives Specifications Technical Data, publication KNX-TD005, for the Bulletin 2097-Rx shunt resistors available for the Kinetix 300 drives. See the Kinetix 300 Shunt Resistor Installation Instructions, publication 2097-IN002, for more installation information.

Figure 89 - Shunt-Resistor Wiring Example



Kinetix 300 Drive/Rotary Motor Wiring Examples

These wiring diagrams apply to Kinetix 300 drives with compatible rotary motors.

IMPORTANT The Kinetix MP motor wiring examples on this page apply to motors equipped with circular DIN (threaded) connectors.

Figure 90 - Kinetix MP (MPL-A/B and MPS-A/B) Motors

