About the Kinetix 2000 Drive System

The Kinetix 2000 multi-axis servo drive is designed to provide a Kinetix Integrated Motion solution for applications with output power requirements between 3...45 kW (4...49 A).

Kinetix 2000 Drive System Overview

Kinetix 2000 Component	Catalog Numbers	Description
Integrated Axis Module	2093-AC05-MP*x*	Integrated Axis Module (IAM) mounts on a Kinetix 2000 power rail, and is a 230V ac power converter and inverter. It is installed on a Kinetix 2000 power rail.
Axis Module	2093-AM*xx*	Axis Module (AM), is a shared 230V dc bus power inverter, that mounts on a Kinetix 2000 power rail. The AM must be used with an IAM.
	2093-AMP*x*	
Shunt Module	2093-ASP06	Shunt Module (SM), This module mounts on the Kinetix 2000power rail and provides additional shunting capability in regenerative applications.
Power Rail	2093-PRS*xx*	Power Rail (PR) consists of copper bus bars and a circuit board with connectors for each module. The power rail provides power and control signals from the converter section to adjacent inverters. The IAM, AM, SM, and SF modules mount to the power rail.
Power Rail Slot Filler	2093-PRF	Slot Filler (SF) is used when one or more slots on the Kinetix 2000 power rail are empty after all other power rail components are installed. One slot filler is required for each empty slot.
Logix Controller Platform	1756-L60M03SE, 1756-M*xx*SE, 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 Kinetix 2000 drive system. The communication link uses the IEC 61491 SErial Real-time COmmunication System (SERCOS) protocol over a fiber-optic cable.
RSLogix 5000 Software	9324-RLD300ENE	RSLogix 5000 software provides support for programming, commissioning, and maintaining the Logix family of controllers.
Servo Motors	MP-Series, TL-Series, and Y-Series	Compatible servo motors include the MP-Series (Low Inertia, Food Grade, and Stainless Steel) 230V motors; TL-Series motors; and Y-Series motors.
Integrated Linear Actuators	MP-Series	Compatible linear actuators include the MPAI-A*xxx* (Integrated Actuator) 230V actuators.
Cables	Motor Power, Feedback, and Brake cables	Motor power, feedback, and brake cables include integral molded, bayonet style, quick connect/quick-release connectors at the motor. Power and brake cables have flying leads on the drive end and straight connectors that connect to servo motors. Standard feedback cables have angled connectors (45°) on the drive end and straight connectors that connect to servo motors. Optional feedback cables have a straight connector on the motor end and flying leads that wire to a low-profile connector kit on the drive end.
	Fiber-optic cables	SERCOS fiber-optic cables are available in enclosure only, PVC, nylon, and glass with connectors at both ends.
Line Filters, ac	2090-XXLF-*xxxx*	Bulletin 2090-XXLF-*xxxx* single-phase and three-phase ac line filters are required to meet CE and available for use in 230V systems.
Line Interface Module	2094-AL09, 2094-AL15S, 2094-AL25S, 2094-AL50S, 2094-AL75S, 2094-AL75S-C2	Line Interface Module (LIM), contains the circuit breakers, ac line filter, power supplies, and contactor required for Kinetix 2000 operation. This module does not mount to the power rail. Alternatively, individual components may be purchased in place of a LIM.

Catalog Number Explanation

Kinetix 2000 drive catalog numbers and descriptions are listed in the table below.

Kinetix 2000 Drive Catalog Numbers

Integrated Axis Modules (230V)	Catalog Number
Kinetix 2000, IAM, 230V, 3 kW [1] Converter, 1 A Inverter	2093-AC05-MP1
Kinetix 2000, IAM, 230V, 3 kW [1] Converter, 2 A Inverter	2093-AC05-MP2
Kinetix 2000, IAM, 230V, 3 kW [1] Converter, 3 A Inverter	2093-AC05-MP5
Axis Modules (230V)	
Kinetix 2000, AM, 230V, 1 A Inverter	2093-AMP1
Kinetix 2000, AM, 230V, 2 A Inverter	2093-AMP2
Kinetix 2000, AM, 230V, 3 A Inverter	2093-AMP5
Kinetix 2000, AM, 230V, 6 A Inverter	2093-AM01
Kinetix 2000, AM, 230V, 9 A Inverter	2093-AM02
Power Rails	
Kinetix 2000, Single-Axis Power Rail	2093-PRS1
Kinetix 2000, Two-Axis Power Rail	2093-PRS2
Kinetix 2000, Three-Axis Power Rail	2093-PRS3
Kinetix 2000, Four-Axis Power Rail	2093-PRS4
Kinetix 2000, Five-Axis Power Rail	2093-PRS5
Kinetix 2000, Seven-Axis Power Rail	2093-PRS7
Kinetix 2000, Eight-Axis Power Rail with Shunt or Slot Filler	2093-PRS8S
Shunt Module	
Kinetix 2000, SM, 230V, 50 W	2093-ASP06
Slot Filler	
Kinetix 2000, SF, Power Rail Slot Filler	2093-PRF

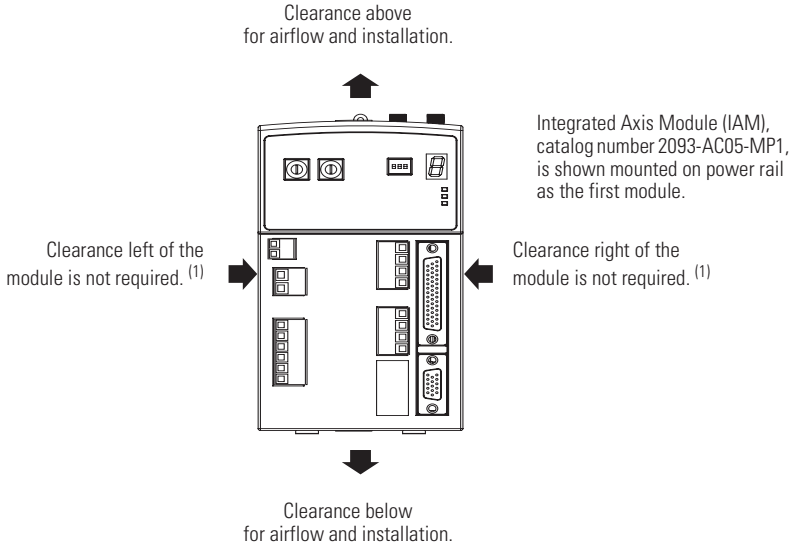
[1] Derated to 2 kW for single-phase operation.

Minimum Clearance Requirements

This section provides information to assist you in sizing your cabinet and positioning your Kinetix 2000 system components.

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

Minimum Clearance Requirements



(1) The power rail, catalog number 2093-PRS*xx*, does not extend left of the first module or right of the last module.

Minimum Clearance Dimensions

Cat. No.	Clearance Above, Min	Clearance Below, Min	Cabinet Depth Clearance, Min (1)	
2093-AC05-MP1, 2093-AC05-MP2, 2093-AC05-MP5. 2093-AMP1, 2093-AMP2, 2093-AMP5, 2093-AM01, 2093-AM02	50.8 mm (2.0 in.)	50.8 mm (2.0 in.)	200 mm (7.9 in.)	If 15-pin connector kit, catalog number 2090-K2CK-D15M, is attached.
			235 mm (9.25 in.)	44-pin connector kit options include: • 2090-U3BK-D44xx connector kit (containing a 2090-U3BK-D44 terminal block and 2090-U3BK-D44xx cable) • 2090-U3BK-D44 terminal block and custom-built cable. • 2090-U3BK-D44 terminal block and flying lead cable.
2093-ASP06	305 mm (12.0 in.)	50.8 mm (2.0 in.)	200 mm (7.9 in.)	
2093-PRF	None	None	None	

(1) Additional clearance required to accommodate cable bend restrictions.

Refer to the Kinetix 2000 Power Rail Installation Instructions, publication 2093-IN004, when installing your power rail.

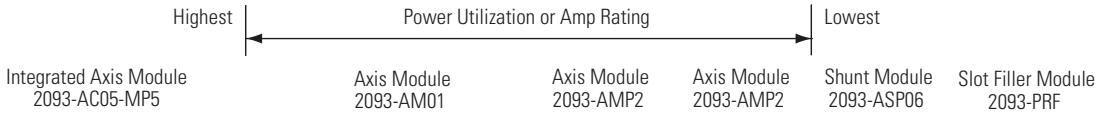
ATTENTION

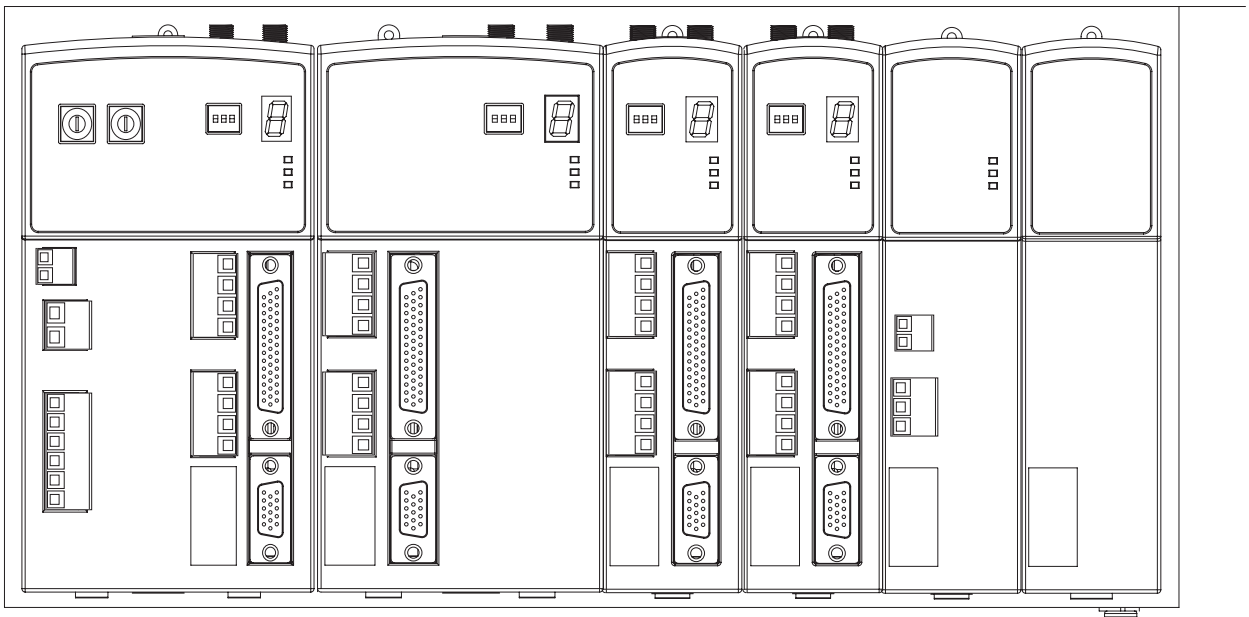
To avoid damage to the power rail during installation, do not remove the protective boots until the module for each slot is ready for mounting.

Determining Mounting Order

Mount IAM, AM, and SM modules in the order (left to right) shown in the figure. A slot filler (SF) must occupy any unoccupied slots. Mount axis modules according to power utilization (highest to lowest) from left to right starting with the highest power utilization. If power utilization is unknown, position axis modules (highest to lowest) from left to right based on Amp rating.

Module Mounting Order





Seven-axis Power Rail Module 2093-PRS7

IMPORTANT

Position the integrated axis module (IAM) in the leftmost slot of the power rail. Position your axis modules (AM), shunt module (SM), and slot fillers (SF) to the right of the IAM.

Install axis modules according to power utilization (highest to lowest) from left to right. The AM requiring the highest power utilization should be on the left.

Install the shunt module to the right of the last AM. Only slot fillers may be installed to the right of the shunt module.

Do not mount a shunt module on the power rail of a follower IAM. Common-bus follower IAMs will disable any rail mounted or external shunt modules.

SHOCK HAZARD

To avoid personal injury due to electrical shock, place a slot filler module in all empty slots on the power rail.

A unoccupied power rail connector will disable the Kinetix 2000 system, however control power will still be present.

2093-PRS8S Module Configuration

The 2093-PRS8S power rail is unique in that it has nine slots, but can accommodate only eight axis modules (IAM and AMs). The last slot must be occupied by a shunt module (SM) or a slot filler (SF), or a double-wide axis module (AM) occupying both slots 7 and 8.

The table shows valid 2093-PRS8S power rail configurations with the maximum number of axis modules. Configurations with fewer axis modules are valid when the slots to the right of the axis modules (IAM and AM) are occupied by a single shunt module (SM), or slot filler (SF) modules as described in Determining Mounting Order on page 38.

Valid 2093-PRS8S Module Positions

Slot Number								
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
IAM	AM [1]		AM		AM		AM [2]	
IAM	AM		AM		AM		AM	SM or SF [2]
IAM	AM		AM		AM	AM	AM	SM or SF [2]
IAM	AM		AM	AM	AM	AM	AM	SM or SF [2]
IAM	AM	AM	AM	AM	AM	AM	AM	SM or SF [2]

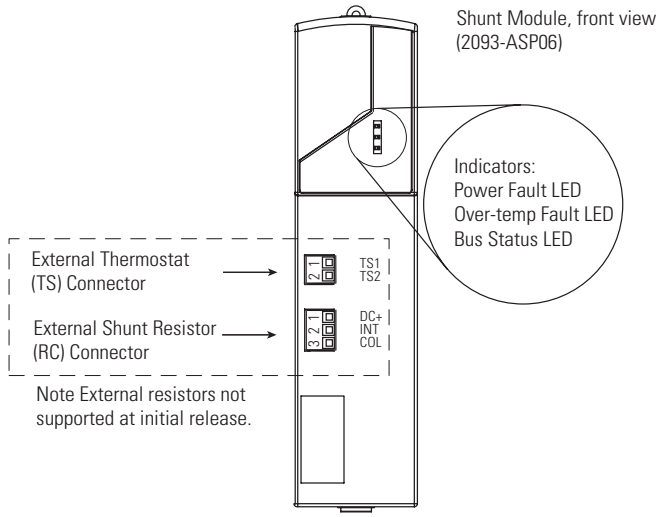
[1] Axis modules (AM) are available in double-width (2093-AM01 and 2093-AM02) and single-width (2093-AMP1, 2093-AMP2, and 2093-AMP5).

[2] Only the following modules may occupy slot 8 in the 2093-PRS8S power rail: a shunt module (2093-ASP06), a slot filler (2093-PRF), or a double-width axis module (2093-AM01 or 2093-AM02) occupying both slots 7 and 8. Refer to the Node Addressing Example 4 on page 108 for information on slot assignment and logical addressing of an axis module in slot 8.

Locating Shunt Module Connectors and Indicators

The Kinetix 2000 shunt module (2093-ASP06) is suitable for both 230V applications.

Locating Shunt Module Connectors and Indicators



Shunt Module Connectors

Designator	Description	Connector
TS	Thermal switch connector	Two-position connector housing
RC	External shunt resistor connector	Three-position connector housing

External Thermal Switch Two-pin (TS) Connector Pinout

TS Pin	Description	Signal
1	External passive shunt module thermal switch connections (1), (2)	TS1
2		TS2

(1) Factory default bypasses the external thermal switch by placing a jumper between TS-1 and TS-2.

(2) External shunt resistor is not supported in the initial release of Kinetix 2000.

External Shunt Resistor Three-pin (RC) Connector Pinout

RC Pin	Description	Signal
1	External resistor connection (1), (2)	DC+
2	Internal shunt connection	INT
3	Collector connection	COL

(1) Factory default bypasses the external shunt resistor by placing a jumper between RC-2 and RC-3.

(2) External shunt resistor is not supported in the initial release of Kinetix 2000.

Refer to Wiring 15-pin Panel-mounted Breakout Kit on page 97 when wiring the RC and TS connectors.

IAM/AM Power Wiring Requirements

Module	Catalog Number	Description	Connects to Terminals		Recommended Wire Size mm² (AWG)	Strip Length mm (in.)	Torque Value Nm (lb-in.)
			Pin	Signal			
IAM or AM	2093-AC05-MP*x*, 2093-AMP*x*, or 2093-AM0*x*	Motor power	MP-1 MP-2 MP-3 MP-4	U V W ⏚	Solid H05(07) V-U: 2.5(14) Stranded H07 V-R: 2.5(14) Flexible H05(07) V-K: 2.5(14) Flexible with ferrule: 2.5(14) (1) 6 (12) max	7 (0.28)	0.5 (4.4)
		Brake control and power	BC-1 BC-2 BC-3 BC-4	PWR MBRK+ MBRK- COM	Solid H05(07) V-U: 0.75(18) Stranded H07 V-R: 0.75(18) Flexible H05(07) V-K: 0.75(18) Flexible with ferrule: 0.75(18)		

1) The gauge of the motor power wiring is dependent on the drive and motor combination. Consult your machine builder, the NEC, and applicable local codes.

Shunt Module Power Wiring Requirements

Module	Catalog Number	Description	Connects to Terminals		Recommended Wire Size mm² (AWG)	Strip Length mm (in.)	Torque Value Nm (lb-in.)
			Pin	Signal			
SM	2093-ASP06	DC bus to external passive shunt module, catalog number 1336-MOD-KA005 (1)	RC-1	DC+	10 (8) (2)	7 (0.28)	0.5 (4.4)
			RC-2	INT			
			RC-3	COL			
		Thermal switch (1)	TS-1	TS1	0.75 (18)		
			TS-2	TS2			

1) External shunt resistor is not supported in the initial release of Kinetix 2000 drive.

2) Requires copper wire rated for 105 °C (221 °F), 600V.

Refer to Power Specifications on page 154 for additional information, and to the Power Wiring Examples on page 169 for interconnect diagrams.

ATTENTION

This drive contains ESD (Electrostatic Discharge) 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, refer to Allen-Bradley publication 8000-4.5.2, Guarding Against Electrostatic Damage or any other applicable ESD Protection Handbook.

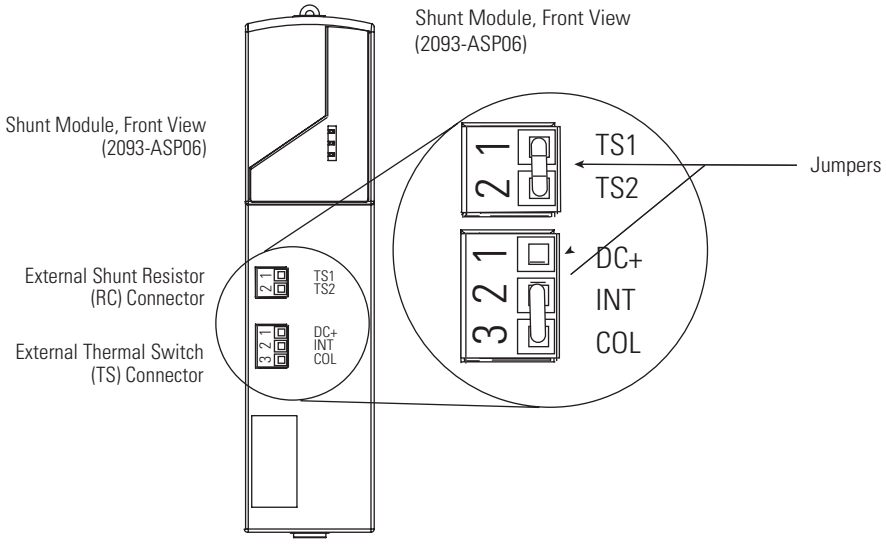
Shunt Module Connections

Follow these guidelines when wiring your shunt.

Shunt Module Wiring

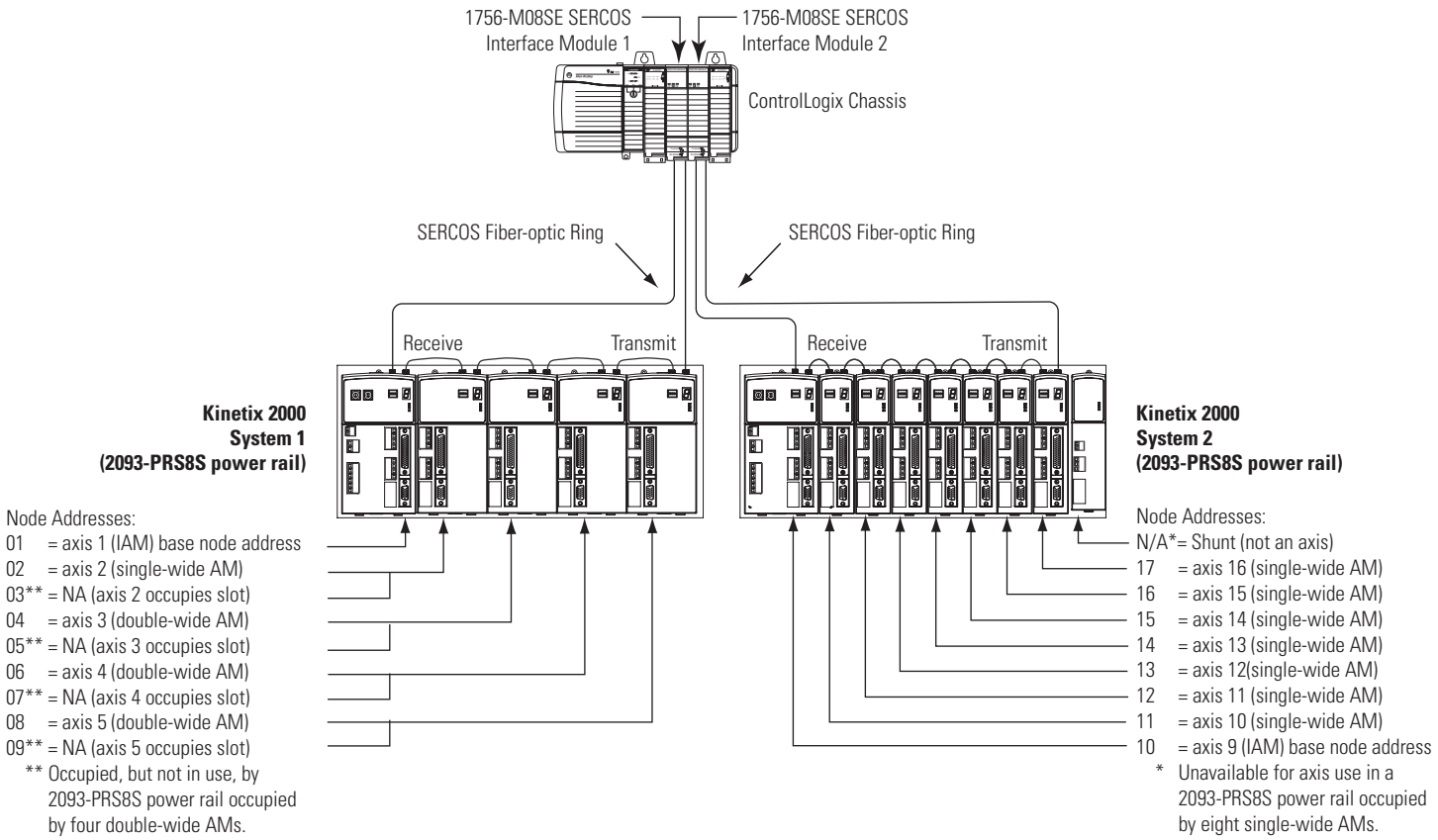
With this shunt module	Cat. No.	Do this
Power rail mounted shunt module.	2093-ASP06	• Verify the internal shunt jumper is in place between RC-2 and RC-3, as shown in the figure below. • Verify the thermal switch jumper is in place between TS-1 and TS-2, as shown in the figure below.

Shunt Module Jumper Settings



(1) These jumpers are factory installed.

Node Addressing Example 4



In Example 4, xxxxx system 1 with an eight-axis power rail contains one IAM, and four double-wide AMs. xxxxx system 2 with an eight-axis power rail contains one IAM, eight single-wide AMs, and a shunt module.

SERCOS interface module 1 controls axes 1...5, and module 2 controls axes 9...16.

The shunt module (or a slot filler) in xxxxx system 2 occupies a slot, but is not assigned a node address, since future expansion of this system is impossible.

IMPORTANT Only the following modules may occupy slot eight in the 2093-PRS8S power rail: a shunt module (2093-ASP06), a slot filler (2093-PRF), or a double-width axis module (2093-AM01 or 2093-AM02) occupying both slots seven and eight.

IMPORTANT The node address for each axis module is determined by the base node-address switch setting on the IAM.

Do not position axis modules to the right of a shunt or slot filler modules. The added distance between non-adjacent axes can increase electrical noise and impedance, and requires longer fiber-optic cable lengths.

Auxiliary Control Power Specifications

This section lists auxiliary control power requirements for a Kinetix 2000 system comprised of an IAM, up to seven AMs, a Shunt Module, or a Slot Filler.

Auxiliary Control Power Specifications

Number of AMs (2093-AMPx or 2093-AMx)	**Current Requirements** (115V ac)	**Current Requirements** (230V ac)	**Max Inrush**	**Input VA**
0	0.3 A	0.15 A	93 A	50 VA
1	0.6 A	0.30 A		99 VA
2	0.9 A	0.45 A		148 VA
3	1.2 A	0.60 A		197 VA
4	1.5 A	0.75 A		247 VA
5	1.8 A	0.90 A		296 VA
6	2.1 A	1.05 A		345 VA
7	2.4 A	1.20 A		395 VA
Shunt Module (2093-ASP06)	2.5 A	1.25 A		410 VA
Slot Filler (2093-PRF)	—	—	—	—

Shunt Module Power Specifications

The table below lists the power specifications for the 2093-ASP06 Shunt Module (SM).

SM Power Specifications

Kinetix 2000 Drives	Shunt Module Catalog Number	Specifications						Fuse Replacement
		Drive Voltage V ac	Resistance Ω	Peak Power kW	Peak Current A	Continuous Power W	Capacitance µF	
2093-AC05-MP1	2093-ASP06 (1)	230	15.0	10.9	27.0	50	164	N/A (no internal fuse)
2093-AC05-MP2								
2093-AC05-MP5								

(1) 1Contact your Allen-Bradley sales representative for availability of external shunt modules.

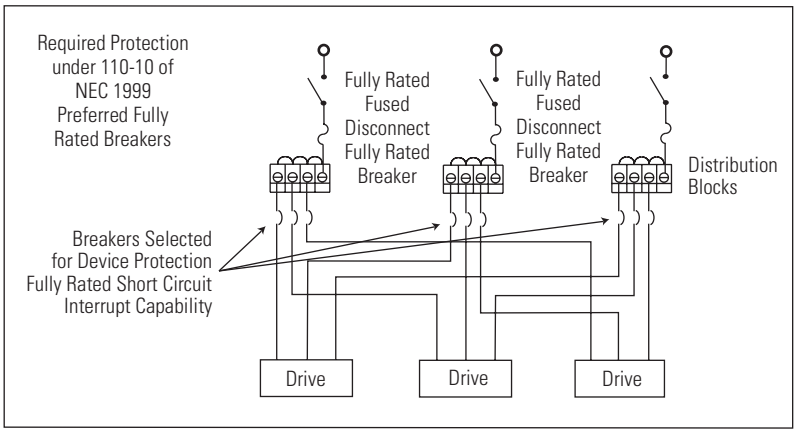
Circuit Breaker/Fuse Specifications

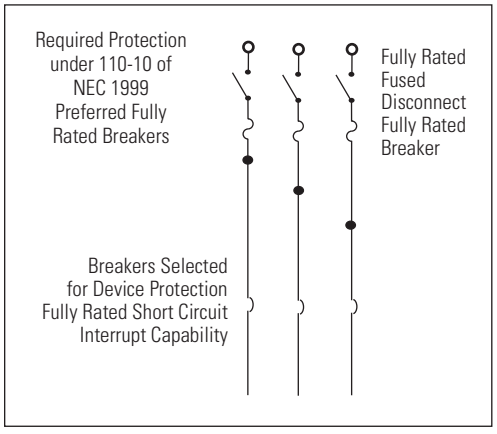
While circuit breakers offer some convenience, there are limitations for their use. Circuit breakers do not handle high current inrush as well as fuses. A Kinetix 2000 system needs to be protected by a device having a short circuit interrupt current rating of the service capacity provided or a maximum of 100,000 A.

If an upstream circuit protection device is rated for the overload current and short circuit rating, a supplementary circuit protection device (such as the 1492 product) can be used as the only Kinetix 2000 branch-circuit protection device. The upstream fully rated device let-through must be less than or equal to the 10 kA interrupt rating of the 1492 circuit protection device.

The wiring interconnection in the figures below provide examples of the needed protection and follows UL and NEC codes. Full compliance is dependent on final wiring design and installation.

Circuit Protection under NEC 1999 110-10 (preferred fully rated devices)





Power Dissipation Specifications

Use the following table to size an enclosure and calculate required ventilation for your Kinetix 2000 system.

Kinetix 2000 Modules		Usage as a Percentage of Rated Power Output (Watts)				
		20%	40%	60%	80%	100%
Converter (IAM) [1]						
2093-AC05-MP1	Three-phase	7.0	10.5	14.0	17.4	20.9
2093-AC05-MP2						
2093-AC09-MP5						
2093-AC05-MP1	Single-phase	5.8	8.0	10.3	12.6	14.8
2093-AC05-MP2						
2093-AC09-MP5						
Inverter (IAM and AM) [1]						
2093-AC05-MP1 and 2093-AMP1		31.6	33.6	35.6	37.6	39.6
2093-AC05-MP2 and 2093-AMP2		33.0	36.4	39.8	43.3	46.8
2093-AC05-MP5 and 2093-AMP5		36.2	42.9	49.8	56.8	63.9
2093-AM01		38. 3	46.7	55. 3	64. 1	73. 1
2093-AM02		44. 3	55.6	67. 3	79.2	91.4
Shunt module (SM)						
2093-ASP06		35.8	45.8	55.8	65.8	75.8
Power Rail						
2093-PRS*xx*		0	0	0	0	0
Connector Kit						
2093-K2CK-D15M		0	0	0	0	0

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

Environmental Specifications

Attribute	Operational Range	Storage Range (non-operating)
Ambient Temperature	0...50 °C (32...122 °F)	-40...85 °C (-40...185 °F)
Relative Humidity	5...95% noncondensing	5...95% noncondensing
Altitude	1000 m (3281 ft) 3000 m (9843 ft) with derating (1)	3000 m (9843 ft) during transport
Environmental Rating	IP2X (EN60529) For use only in a Pollution Degree 2 Environment (UL508c, section 2.7) Open Device (UL508c, section 2.5)	
Vibration	5...55 Hz @ 0.35 mm (0.014 in.) double amplitude, continuous displacement; 55...500 Hz @ 2.0 g peak constant acceleration	
Shock	15 g, 11 ms half-sine pulse (3 pulses in each direction of 3 mutually perpendicular directions)	
Conformal Coating	IB31: DSP and SERCOS pins, anti-dust and anti-humidity 1B73LSE: Power Rail connector pins, Converter, Inverter, Shunt, Power Rail, and Slot Filler PCB assemblies, clear UL creepage and clearance issue.	

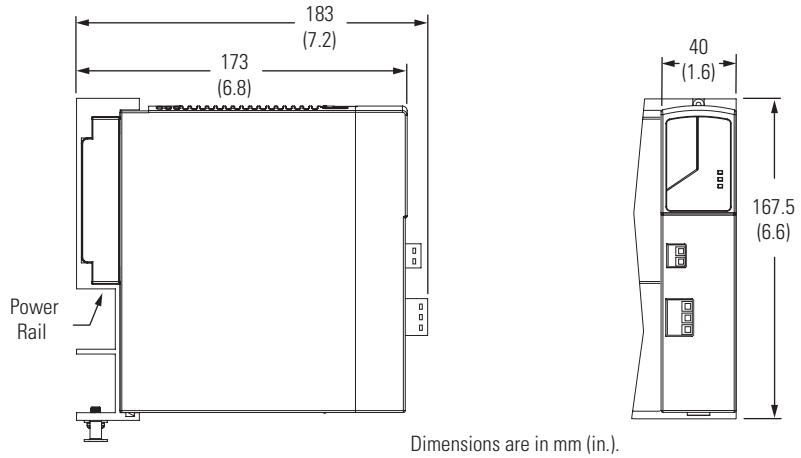
(1) Peak current output is derated by 15% for each 1000 m over 1000 m (3281 ft).

Weight Specifications

Kinetix 2000 Module	Catalog Number	Description, Approx. kg (lb)
IAM	2093-AC05-MP1	1.32 (2.9)
	2093-AC05-MP2	
	2093-AC05-MP5	
AM	2093-AMP1	0.67 (1.5)
	2093-AMP2	
	2093-AMP5	
	2093-AM01	0.95 (2.1)
	2093-AM02	
SM	2093-ASP06	0.59 (1.3)

Kinetix 2000 Module	Catalog Number	Description, Approx. kg (lb)
Power Rails (Slim)	2093-PRS1	0.27 (0.6)
	2093-PRS2	0.38 (0.8)
	2093-PRS3	0.51 (1.1)
	2093-PRS4	0.64 (1.4)
	2093-PRS5	0.77 (1.7)
	2093-PRS7	1.03 (2.3)
	2093-PRS8S	1.28 (2.8)
Slot Filler Module	2093-PRF	0.15 (0.3)

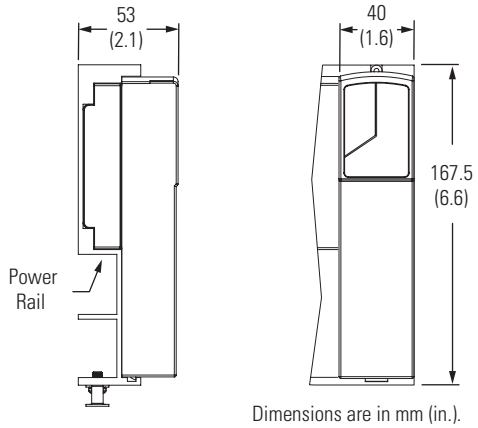
Shunt Module Dimensions
2093-ASP06



Dimensions are in mm (in.).

Modules are shown mounted to the power rail and the dimensions reflect that in the depth of the module.

Slot Filler Dimensions
2093-PRF



Dimensions are in mm (in.).

Modules are shown mounted to the power rail and the dimensions reflect that in the depth of the module.

Kinetix 2000 Capacitance Values

Use the tables below when calculating total bus capacitance and additional bus capacitance for your Kinetix 2000 common bus application.

IAM and AM (230V) Modules

IAM Converter (230V)	Capacitance µF
2093-AC05-MP1	540
2093-AC05-MP2	
2093-AC05-MP5	

IAM or AM Inverter (230V)	Capacitance µF
2093-AC05-MP1 or 2093-AMP1	200
2093-AC05-MP2 or 2093-AMP2	
2093-AC05-MP5 or 2093-AMP5	
2093-AM01	540
2093-AM02	

SM (230V) Module

SM (230V)	Capacitance µF
2093-ASP06	164