

## Catalog Number Explanation

Kinetix 6200 and Kinetix 6500 (Bulletin 2094) modular drive catalog numbers and descriptions are listed in the tables below. All power modules are compatible with the Kinetix 6200 and Kinetix 6500 control modules.

**Table 3 - Kinetix 6200 and Kinetix 6500 Drive Catalog Numbers**

<b>Integrated Axis Modules (460V)</b>	<b>Cat. No.</b>
IAM power module, 400V-class, 6 kW converter, 4 A (0-pk) inverter	2094-BC01-MP5-M
IAM power module, 400V-class, 6 kW converter, 9 A (0-pk) inverter	2094-BC01-M01-M
IAM power module, 400V-class, 15 kW converter, 15 A (0-pk) inverter	2094-BC02-M02-M
IAM power module, 400V-class, 28 kW converter, 30 A (0-pk) inverter	2094-BC04-M03-M
IAM power module, 400V-class, 45 kW converter, 49 A (0-pk) inverter	2094-BC07-M05-M
<b>Axis Modules (460V)</b>	
AM power module, 400V-class, 4 A (0-pk)	2094-BMP5-M
AM power module, 400V-class, 9 A (0-pk)	2094-BM01-M
AM power module, 400V-class, 15 A (0-pk)	2094-BM02-M
AM power module, 400V-class, 30 A (0-pk)	2094-BM03-M
AM power module, 400V-class, 49 A (0-pk)	2094-BM05-M
<b>Kinetix 6200 Control Modules</b>	
Control module, Sercos interface, Safe Torque Off	2094-SE02F-M00-S0
Control module, Sercos interface, Safe Speed Monitor	2094-SE02F-M00-S1
<b>Kinetix 6500 Control Modules</b>	
Control module, EtherNet/IP network, Safe Torque Off	2094-EN02D-M01-S0
Control module, EtherNet/IP network, Safe Speed Monitor	2094-EN02D-M01-S1

**Table 4 - Kinetix 6000 Drive Component Catalog Numbers**

<b>Drive Components</b>	<b>Cat. No.</b>
Integrated power interface (IPIM) module, 400V-class, 15 kW, 24 A (rms)	2094-SEPM-B24-S
Kinetix 6000 shunt module, 200/400V-class, 200 W	2094-BSP2
Kinetix 6000 slot-filler module, 200/400V-class	2094-PRF

## Kinetix Drive Component Compatibility

The 2094-BCxx-Mxx-M and 2094-BMxx-M power modules contain the same power structure as the 2094-BCxx-Mxx-S and 2094-BMxx-S drive modules. Because of this, the 2094-BSP2 shunt module, 2094-PRF slot-filler module, and 2094-PRsx power rails are supported by both drive families.

In addition, 2094-BMxx-M AM power modules with Sercos interface are supported on power rails with a 2094-BCxx-Mxx-S IAM drive module. Conversely, 2094-BMxx-S AM drive modules are supported on power rails with a 2094-BCxx-Mxx-M IAM power module with Sercos interface.

**IMPORTANT** Kinetix 6500 EtherNet/IP control modules (catalog numbers 2094-EN02D-M01-Sx) are not compatible with IAM/AM modules on the same Bulletin 2094 power rail with Kinetix 6000 or Kinetix 6200 Sercos drives.

Table 5 - IAM and AM Module/Network Compatibility

IAM Module	Control Module	2094-BMxx-S Kinetix 6000 AM Module	2094-BMxx-M AM Power Modules	
			2094-SE02F-M00-Sx Kinetix 6200 Control Module	2094-EN02D-M01-Sx Kinetix 6500 Control Module
2094-BCxx-Mxx-S (series B, C, and D)	-	Fully compatible	Fully compatible	Not compatible
2094-BCxx-Mxx-M (IAM power module)	2094-SE02F-M00-Sx Sercos interface			
		2094-EN02D-M01-Sx EtherNet/IP network	Not compatible	Not compatible

For additional information on the 2094-BCxx-Mxx-S IAM and 2094-BMxx-S AM modules, refer to the Kinetix 6000 Multi-axis Servo Drives User Manual, publication [2094-UM001](#).

## Kinetix 6000M Integrated Drive-Motor System Compatibility

Bulletin 2094 power rails with Kinetix 6000 (series B, C, and D) or Kinetix 6200 drives are compatible with Kinetix 6000M integrated drive-motor (IDM) systems. The IDM power interface module (IPIM) mounts to the power rail and connects to as many as 16 IDM units.

Table 6 - IPIM Module Compatibility

IAM Module	Control Module	2094-SEPM-B24-S IDM Power Interface Module (IPIM)
2094-BCxx-Mxx-S (series B, C, and D)	-	Fully compatible
2094-BCxx-Mxx-M (IAM power module)	2094-SE02F-M00-Sx Sercos interface	
		2094-EN02D-M01-Sx EtherNet/IP network

For more information on Kinetix 6000M integrated drive-motor system installation, refer to the Kinetix 6000M Integrated Drive-Motor System User Manual, publication [2094-UM003](#).

## Agency Compliance

If this product is installed within the European Union and has the CE mark, or within the United Kingdom and has the UKCA mark, the following regulations apply.



**ATTENTION:** Meeting CE and UK requires a grounded system, and the method of grounding the AC line filter and drive must match. Failure to do this renders the filter ineffective and can cause damage to the filter. For grounding examples, refer to Grounded Power Configurations on [page 89](#).

For more information on electrical noise reduction, refer to the System Design for Control of Electrical Noise Reference Manual, publication [GMC-RM001](#).

### CE and UK Requirements (system without LIM module)

To meet CE and UK requirements when your Kinetix 6200 and Kinetix 6500 system does not include the LIM module, these requirements apply.

- Install 2090-XXLF-xxxx AC line filters for three-phase input power and single-phase control power (for example, Schaffner P/N FN 355-10-05 or Roxburgh P/N RES5FO8) as close to the IAM module as possible.
- Use Kinetix 2090 series motor power cables or use connector kits and terminate the cable shields to the chassis clamp provided.
- Combined motor power cable lengths for all Kinetix 6200 and Kinetix 6500 axes and hybrid cable lengths for all IDM units on the same DC bus must not exceed 240 m (787 ft) with 400V-class systems. Drive-to-motor power cables must not exceed 90 m (295.5 ft).
- Use Kinetix 2090 motor feedback cables or use connector kits and properly terminate the feedback cable shield. Drive-to-motor feedback cables must not exceed 90 m (295.5 ft).
- Install the Kinetix 6200 and Kinetix 6500 system inside an enclosure. Run input power wiring in conduit (grounded to the enclosure) outside of the enclosure. Separate signal and power cables.

Refer to Appendix A on [page 215](#) for interconnect diagrams, including input power wiring and drive/motor interconnect diagrams.

### CE and UK Requirements (system with LIM module)

To meet CE and UK requirements when your Kinetix 6200 and Kinetix 6500 system includes the LIM module, follow all the requirements as stated in [CE and UK Requirements \(system without LIM module\)](#) and these additional requirements as they apply to the AC line filter.

- Install the LIM module (catalog numbers 2094-BL02) as close to the IAM module as possible.
- Install the LIM module (catalog numbers 2094-BLxxS or 2094-XL75S-Cx) with line filter (catalog number 2090-XXLF-xxxx) as close to the IAM module as possible.

When the LIM module (catalog numbers 2094-BLxxS or 2094-XL75S-Cx) supports two IAM modules, each IAM module requires an AC line filter installed as close to the IAM module as possible.

**Notes:**

## Plan the Kinetix 6200 and Kinetix 6500 Drive System Installation

This chapter describes system installation guidelines used in preparation for mounting your Kinetix® 6200/6500 drive components.

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Electrical Noise Reduction	36



**ATTENTION:** Plan the installation of your system so that you can perform all cutting, drilling, tapping, and welding 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 designing your enclosure and planning to mount your system components on the panel.

For on-line product selection and system configuration tools, including AutoCAD (DXF) drawings of the product, refer to <http://www.rockwellautomation.com/en/e-tools>.

### System Mounting Requirements

- To comply with UL, CE, and UK requirements, the Kinetix 6200 and Kinetix 6500 drive systems must be enclosed in a grounded conductive enclosure offering protection as defined in standard EN/IEC 60529 to IP54 such that they are not accessible to an operator or unskilled person. A NEMA 4X enclosure exceeds these requirements providing protection to IP66.
- The panel you install inside the enclosure for mounting your system components must be on a flat, rigid, vertical surface that won't be 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.
- Combined motor power cable lengths for all axes and hybrid cable lengths for all IDM units on the same DC bus must not exceed 240 m (787

ft) with 400V-class systems. Drive-to-motor power cables must not exceed 90 m (295.5 ft).

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**IMPORTANT** System performance was tested at these cable length specifications. These limitations also apply when meeting CE and UK requirements.

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- Combined length of Ethernet cables on Kinetix 6500 systems connecting drive-to-drive, drive-to-controller, or drive-to-switch must not exceed 100 m (328 ft).
- Segregate 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.
- Use high-frequency (HF) bonding techniques to connect the modules, enclosure, machine frame, and motor housing, and to provide a low-impedance return path for high-frequency (HF) energy and reduce electrical noise.

Refer to the System Design for Control of Electrical Noise Reference Manual, publication [GMC-RM001](#), to better understand the concept of electrical noise reduction.

## Transformer Selection

The IAM power module 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, refer to the Kinetix 6200/6500 power specifications in the Kinetix Servo Drives Technical Data, publication [KNX-TD003](#).

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**IMPORTANT** If using an autotransformer, make sure that the phase to neutral/ground voltages do not exceed the input voltage ratings of the drive.

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

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For example, to size a transformer to the voltage requirements of a 2094-BC01-M01-M integrated axis module:  
 $2094\text{-BC01-M01-M} = 6 \text{ kW continuous} \times 1.5 = 9.0 \text{ KVA transformer}$

## AC Line Filter Selection

These AC line filters are available for your servo drive input power.

**Table 7 - Kinetix 6200/6500 (three-phase) AC Line Filter Selection**

Drive Cat. No.	Voltage	Current A @ 50 °C (122 °F)	Weight, approx kg (lb)	AC Line Filter Cat. No.
2094-BC01-MP5-M	500V AC 50/60 Hz	30	2.7 (5.9)	2090-XXLF-X330B
2094-BC01-M01-M				
2094-BC02-M02-M				
2094-BC04-M03-M		75	5.2 (11.4)	2090-XXLF-375B
2094-BC07-M05-M		100	9.5 (20.9)	2090-XXLF-3100

Refer to the Kinetix Motion Accessories Specifications Technical Data, publication [KNX-TD004](#), for additional AC line filter specifications.

## Circuit Breaker/Fuse Options

The 2094-BCxx-Mxx-M and 2094-BMxx-M drive modules, and the Kinetix 6000M integrated drive-motor system (2094-SEPM-B24-S IPIM module and MDF-SBxxxxxx IDM units) 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) and 65,000 A (circuit breakers).

**Table 8 - Control and DC-bus Circuit Protection Specifications**

IAM Module Cat. No.	Control Input Power		DC-bus Power		
	Bussmann Fuse <sup>(1)</sup>	Allen-Bradley® Circuit Breaker <sup>(2)</sup> (non-UL)	Bussmann Fuse	Mersen Fuse <sup>(3)</sup>	
2094-BC01-MP5-M	FNQ-R-10 (10 A) or FNQ-R-7.5 (7.5 A)	1492-SPM2D060 or 1492-SPM1D150	FWJ-20A14F	DCT20-2	HSJ20
2094-BC01-M01-M			FWJ-40A	A70QS40-4	HSJ40
2094-BC02-M02-M			FWJ-70A	A70QS70-4	HSJ70
2094-BC04-M03-M			FWJ-125A	A70QS125-4	HSJ125
2094-BC07-M05-M					

(1) Use FNQ-R-7.5 circuit breaker for higher single -cycle inrush current capability. This is recommended when the continuous control-power current exceeds 3.0 A.

(2) Use 1492-SPM1D150 circuit breaker for higher single -cycle inrush current capability. This is recommended when the continuous control-power current exceeds 3.0 A.

(3) Mersen fuses were formerly known as Ferraz-Shawmut.

### Input Power Circuit Protection (LIM)

The 2094-BL02 line interface module (LIM) contains supplementary protection devices and, when protected by suitable branch circuit protection, is rated for use on a circuit capable of delivering up to 5000 A. When this module is used, protection on the line side of the LIM module is required. Fuses must be class J or CC only.

The 2094-BLxxS and 2094-XL75S-Cx LIM modules contain branch circuit rated devices suitable for use on a circuit capable of delivering up to 65,000 A (400V-class).

Refer to the Line Interface Module Installation Instructions, publication [2094-IN005](#), for power specifications and more information on using the LIM module.

Refer to Input Power Circuit Protection (without LIM) on [page 31](#) when your drive system does not include the LIM module.

### Input Power Circuit Protection (without LIM)

The fuses and Allen-Bradley circuit breakers shown in [Table 9](#) and [Table 10](#) are recommended for use with 2094-BCxx-Mxx-M IAM power modules when the line interface module (LIM) is not used.

**IMPORTANT** LIM Module (catalog number 2094-BLxxS) provides branch circuit protection to the IAM power module. Follow all applicable NEC and local codes.

**Table 9 - UL/CSA Circuit Protection Specifications**

IAM Module Cat. No.	Drive Voltage (three-phase) nom	Fuses (Bussmann) Cat. No.	Miniature CB Cat. No.	Motor Protection CB, Self-protected CMC Cat. No.	Molded Case CB Cat. No.
2094-BC01-MP5-M	360...480V	KTK-R-20 (20 A) Class CC	1489-M3D300	140M-F8E-C32	-
2094-BC01-M01-M	360...480V	KTK-R-20 (20 A) Class CC		140M-F8E-C32	
2094-BC02-M02-M	360...480V	KTK-R-30 (30 A) Class CC	-	140M-F8E-C45	
2094-BC04-M03-M	360...480V	LPJ-45SP (45 A) Class J		-	140G-G6C3-C50
2094-BC07-M05-M	360...480V	LPJ-80SP (80 A) Class J		-	140G-G6C3-C90

**Table 10 - EN/IEC (non-UL/CSA) Circuit Protection Specifications**

IAM Module Cat. No.	Drive Voltage (three-phase) nom	Miniature CB Cat. No.		Motor Protection CB Cat. No.	Molded Case CB Cat. No.
2094-BC01-MP5-M	360...480V	1492-SPM3D300	1489-M3D300	140M-F8E-C32	-
2094-BC01-M01-M	360...480V			140M-F8E-C32	
2094-BC02-M02-M	360...480V	1492-SPM3D400	-	140M-F8E-C45	
2094-BC04-M03-M	360...480V	-		-	140G-G6C3-C50
2094-BC07-M05-M	360...480V	-		-	140G-G6C3-C90

Refer to the Kinetix Servo Drives Technical Data, publication [KNX-TD003](#), for additional power specifications for your IAM power module.

## Enclosure Selection

This example is provided to assist you in sizing an enclosure for your Bulletin 2094 drive system. The example system consists of these components:

- 6-axis Bulletin 2094 servo drive system
- Line Interface Module (LIM)
- ControlLogix® chassis and modules (controller)

Size the Bulletin 2094 servo drive and LIM module and use the results to predict the amount of heat dissipated into the enclosure. You also need heat dissipation data from other equipment inside the enclosure (such as the ControlLogix controller). Once the total amount of heat dissipation (in watts) is known, you can calculate the minimum enclosure size.

**Table 11 - Bulletin 2094 System Heat Dissipation Example**

Enclosure Component	Description	Loading <sup>(1)</sup>	Heat Dissipation <sup>(1)</sup> watts
2094-BC02-M02-M	Integrated axis module (IAM), 400/460V	15 kW (converter section)	44
		15 A (inverter section)	72
2094-BM02-M	Axis module (AM), 400/460V, 15 A	60%	93
2094-BM02-M	Axis module (AM), 400/460V, 15 A	60%	93
2094-BM01-M	Axis module (AM), 400/460V, 9 A	40%	73
2094-BM01-M	Axis module (AM), 400/460V, 9 A	40%	73
2094-BM01-M	Axis module (AM), 400/460V, 9 A	20%	57
2094-BL25S	Line interface module (LIM), 400/460V, 25 A; 24V DC 20 A	100%	43
2094-PRS6	Power rail, 460V, 6 axis	-	0
2090-XB33-32	Resistive brake module (RBM), 33 A, 32 Ω	-	30
Total Kinetix 6200 and Kinetix 6500 system wattage			578

(1) To determine heat dissipation specifications for your drive system components, refer to [Power Dissipation Specifications](#) on [page 34](#).

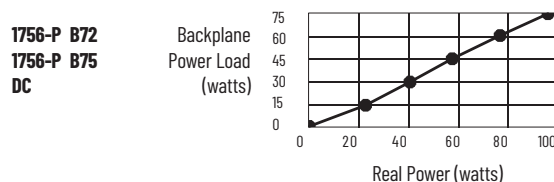
**Table 12 - ControlLogix System Heat Dissipation Example**

Enclosure Component	Description	Backplane Power Load <sup>(1)</sup> watts	Heat Dissipation <sup>(1)</sup> watts
1756-M08SE	8-axis Sercos interface module	3.2	0
1756-L5563	L63 ControlLogix processor	4.5	0
1756-IB16D	16 -point input module	0.84	5.8
1756-OB16D	16 -point output module	4.64	3.3
1756-ENxTx	EtherNet/IP communication module	4.0	0
Backplane total		17.18 <sup>(2)</sup>	-
1756-PB72	24V DC ControlLogix power supply	-	25 <sup>(2)</sup>
1756-A7	7-slot mounting chassis	-	-
Total ControlLogix system wattage			34.1

(1) For ControlLogix module specifications, refer to the ControlLogix Selection Guide, publication [1756-SG001](#).

(2) Real power heat dissipation is determined by applying the backplane power load (17.18W) to the graph below.

**Figure 9 - ControlLogix Real Power**



For backplane power loading requirements of other ControlLogix power supplies, refer to the ControlLogix Selection Guide, publication [1756-SG001](#).

In this example, the amount of power dissipated inside the cabinet is the sum of the Bulletin 2094 system value (578 W) and the ControlLogix system value (34 W) for a total of 612 W.

With no active method of heat dissipation (such as fans or air conditioning) either of these approximate equations can be used.

Metric	Standard English
$A = \frac{0.38Q}{1.8T - 1.1}$	$A = \frac{4.08Q}{T - 1.1}$
Where T is temperature difference between inside air and outside ambient (°C), Q is heat generated in enclosure (Watts), and A is enclosure surface area (m <sup>2</sup> ). The exterior surface of all six sides of an enclosure is calculated as:	Where T is temperature difference between inside air and outside ambient (°F), Q is heat generated in enclosure (Watts), and A is enclosure surface area (ft <sup>2</sup> ). The exterior surface of all six sides of an enclosure is calculated as:
$A = 2dw + 2dh + 2wh$	$A = (2dw + 2dh + 2wh) / 144$
Where d (depth), w (width), and h (height) are in meters.	Where d (depth), w (width), and h (height) are in inches.

Total system watts dissipated (Q) was calculated at 612 W. The maximum ambient rating of the Bulletin 2094 system is 50 °C (122 °F) and if the maximum environmental temperature is 30 °C (86 °F), then T=20 in the equation below.

$$A = \frac{0.38 (612)}{1.8 (20) - 1.1} = 6.66 \text{ m}^2$$

In this example, the enclosure must have an exterior surface of 6.66 m<sup>2</sup>. If any portion of the enclosure is not able to transfer heat, do not include that portion in the calculation.

Because the minimum cabinet depth to house the 460V drive (selected for this example) is 302 mm (11.9 in.), then the cabinet needs to be approximately 2500 mm (high) x 950 mm (wide) x 302 mm (deep).

$$2 \times (0.3 \times 0.95) + 2 \times (0.3 \times 2.5) + 2 \times (0.95 \times 2.5) = 6.82 \text{ m}^2$$

Because this cabinet size is considerably larger than what is necessary to house the system components, consider some means of cooling in a smaller cabinet to be more efficient. Contact your cabinet manufacturer for options available to cool your cabinet.

**Table 13 - Power Dissipation Specifications**

Bulletin 2094 Drive Modules <sup>(1)</sup>	Usage as % of Rated Power Output (watts)				
	20%	40%	60%	80%	100%
IAM (converter) power module <sup>(2)</sup>					
2094-BC01-MP5-M	18	21	25	29	34
2094-BC01-M01-M					33
2094-BC02-M02-M	36	44	54	64	75
2094-BC04-M03-M	50	67	87	110	135
2094-BC07-M05-M	71	101	137	179	226
IAM (inverter) module or AM power module <sup>(2)</sup>					
2094-BC01-MP5-S or 2094-BMP5-M	46	54	61	69	77
2094-BC01-M01-S or 2094-BM01-M	57	73	90	108	126
2094-BC02-M02-S or 2094-BM02-M	53	72	93	116	142
2094-BC04-M03-S or 2094-BM03-M	94	130	169	211	255
2094-BC07-M05-S or 2094-BM05-M	121	183	252	326	407
Shunt module - 2094-BSP2	68	121	174	227	280
IPIM module - 2094-SEPM-B24-S	To calculate power dissipation for IPIM modules on your 2094 power rail, refer to the Kinetix 6000M Integrated Drive-Motor User Manual, publication <a href="#">2094-UM003</a> .				

(1) Power dissipation for the Bulletin 2094 control modules, catalog numbers 2094-SE02F-M00-Sx and 2094-EN02D-M01-Sx, is included in the IAM and AM power module specifications.  
 (2) Internal shunt power is not included in the calculations and must be added based on utilization.