AMIKON TECHNICAL DOCUMENTATION

Installation Instructions

Siemens 6ES7214-1BD23-0XB8

CPU 224 AC/DC/relay

SUPPLY	INPUTS	OUTPUTS	PORTS
120-240 V AC	**14 digital**	**10 relay**	**1 RS485**

For qualified personnel only. Isolate the equipment and follow the complete manufacturer and site safety procedures. This reference does not replace the approved project design or the full installation manual.

01 PREPARATION AND WIRING CHECKS

- Use qualified personnel; disconnect all CPU and related field power before installation, removal or wiring.
- Install the open controller in a restricted-access enclosure, with at least 25 mm clearance above and below and 75 mm depth.
- Check expansion logic and sensor supply budgets; do not parallel an external 24 V supply with the CPU sensor supply.
- Provide appropriate grounding, a common power-disconnect arrangement and overcurrent protection according to the manual and applicable codes.
- Inspect removable connector engagement and observe the maximum 0.56 N m screw torque.
- Apply load-appropriate suppression and account for unintended short output pulses described by Siemens.
- Retain the Appendix H cross-reference and check actual CN unit approval markings separately.

02 ORIGINAL WIRING REFERENCE

Original source PDF pages 416, 1, 2, 3, 30, 31, 32, 33, 34, 35, 36, 410, 412, 413, 525, 526, 527. The following pages retain the original Siemens drawings and printed page numbers.

Siemens original installation documentation

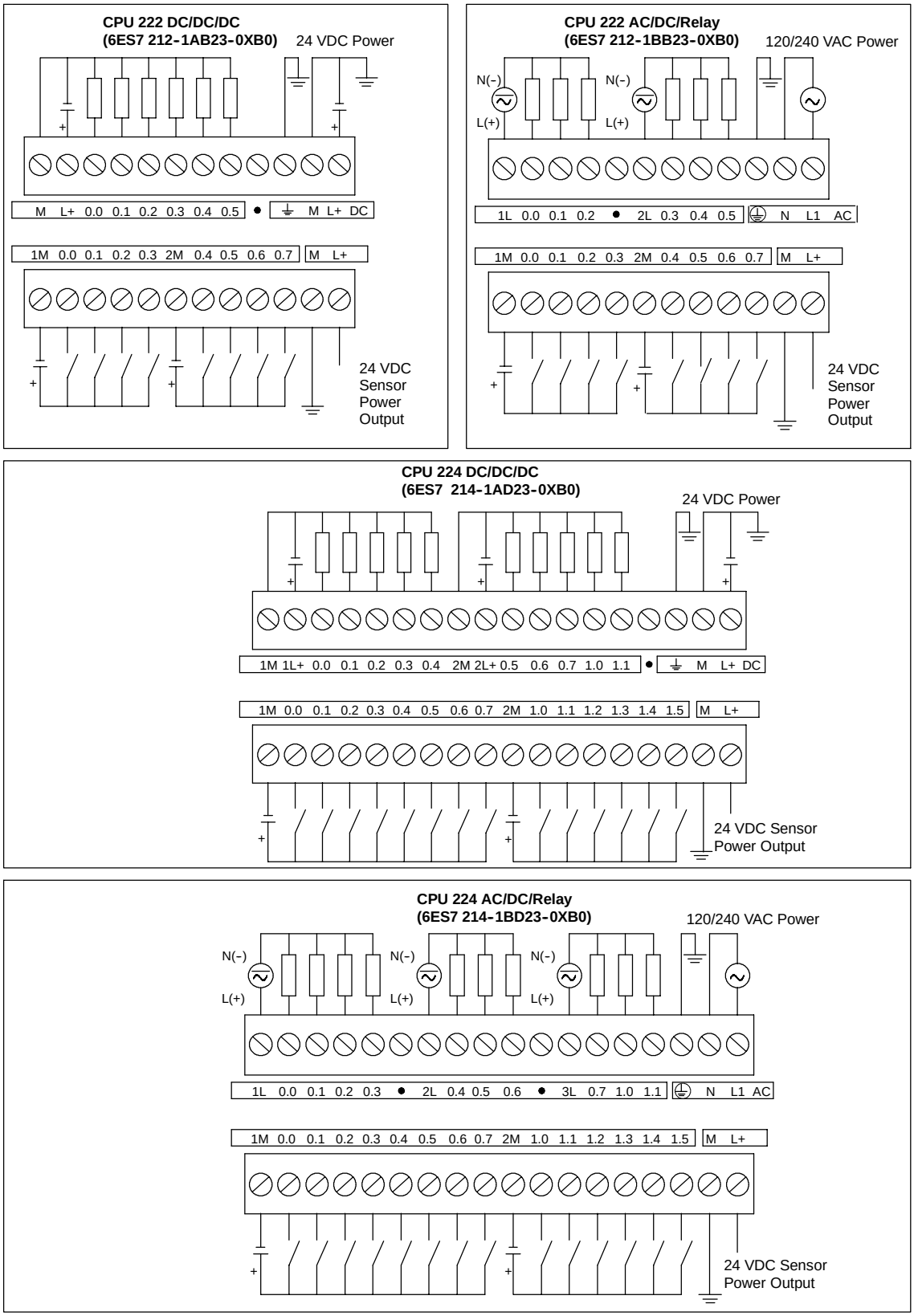


Figure A-4 CPU 222 and CPU 224 Wiring Diagrams

Guidelines for Installing S7-200 Devices

You can install an S7-200 either on a panel or on a standard rail, and you can orient the S7-200 either horizontally or vertically.

Warning

The SIMATIC S7-200 PLCs are Open Type Controllers. It is required that you install the S7-200 in a housing, cabinet, or electric control room. Entry to the housing, cabinet, or electric control room should be limited to authorized personnel.

Failure to follow these installation requirements could result in death or serious injury to personnel, and/or damage to equipment.

Always follow these requirements when installing S7-200 PLCs.

Separate the S7-200 Devices from Heat, High Voltage, and Electrical Noise

As a general rule for laying out the devices of your system, always separate the devices that generate high voltage and high electrical noise from the low-voltage, logic-type devices such as the S7-200.

When configuring the layout of the S7-200 inside your panel, consider the heat-generating devices and locate the electronic-type devices in the cooler areas of your cabinet. Operating any electronic device in a high-temperature environment will reduce the time to failure.

Consider also the routing of the wiring for the devices in the panel. Avoid placing low voltage signal wires and communications cables in the same tray with AC power wiring and high-energy, rapidly-switched DC wiring.

Provide Adequate Clearance for Cooling and Wiring

S7-200 devices are designed for natural convection cooling. For proper cooling, you must provide a clearance of at least 25 mm above and below the devices. Also, allow at least 75 mm of depth.

Caution

For vertical mounting, the maximum allowable ambient temperature is reduced by 10 degrees C. Mount the S7-200 CPU below any expansion modules.

When planning your layout for the S7-200 system, allow enough clearance for the wiring and communications cable connections. For additional flexibility in configuring the layout of the S7-200 system, use the I/O expansion cable.

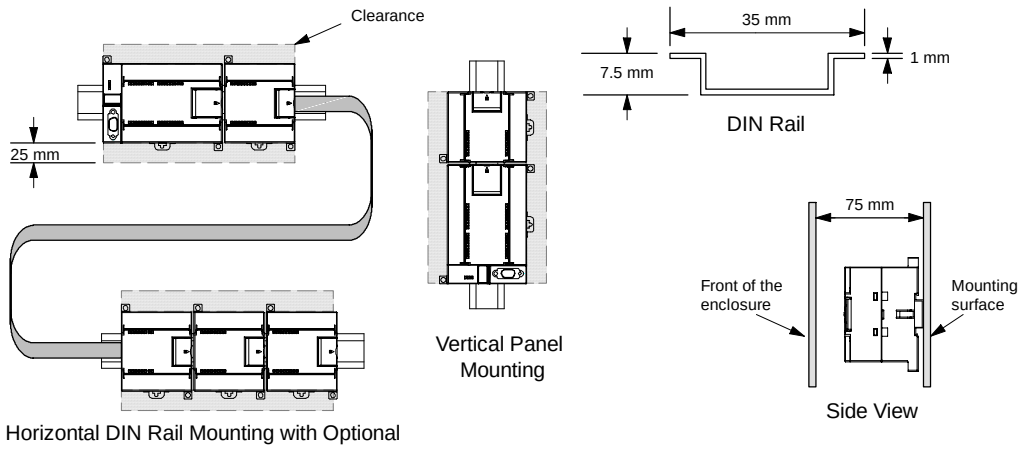
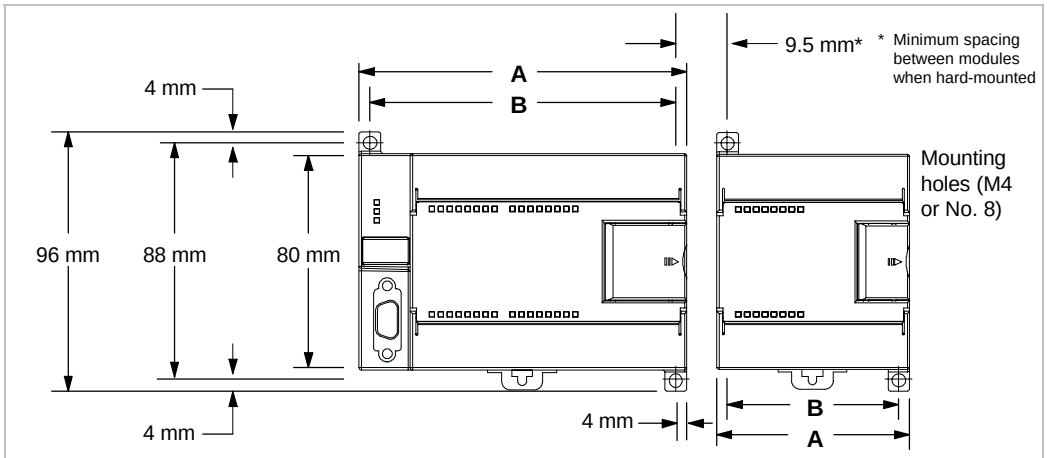


Figure 3-1 Mounting Methods, Orientation, and Clearance

Mounting Dimensions

The S7-200 CPUs and expansion modules include mounting holes to facilitate installation on panels. Refer to Table 3-1 for the mounting dimensions.

Table 3-1 Mounting Dimensions



S7-200 Module		Width A	Width B
CPU 221 and CPU 222		90 mm	82 mm
CPU 224		120.5 mm	112.5 mm
CPU 224XP, CPU 224XPsi		140 mm	132 mm
CPU 226		196 mm	188 mm
Expansion modules:	4- and 8-point DC and Relay I/O (8I, 4Q, 8Q, 4I/4Q) and Analog Out (2 AQ)	46 mm	38 mm
Expansion modules: Modem	16-point digital I/O (16I, 8I/8Q), Analog I/O (4AI, 8AI, 4AQ, 4AI/1AQ), RTD, Thermocouple, PROFIBUS, Ethernet, Internet, AS-Interface, 8-point AC (8I and 8Q), Position, and	71.2 mm	63.2 mm
Expansion modules:	32-point digital I/O (16I/16Q)	137.3 mm	129.3 mm
Expansion modules:	64-point digital I/O (32I/32Q)	196 mm	188 mm

Installing a CPU or Expansion Module

Installing the S7-200 is easy! Just follow these steps.

Panel Mounting

1. Locate, drill, and tap the mounting holes (M4 or American Standard number 8), using the dimensions in Table 3-1.
2. Secure the module(s) to the panel, using the appropriate screws.
3. If you are using an expansion module, connect the expansion module ribbon cable into the expansion port connector under the access door.

DIN Rail Mounting

1. Secure the rail to the mounting panel every 75 mm.
2. Snap open the DIN clip (located on the bottom of the module) and hook the back of the module onto the DIN rail.
3. If you are using an expansion module, connect the expansion module ribbon cable into the expansion port connector under the access door.
4. Rotate the module down to the DIN rail and snap the clip closed. Carefully check that the clip has fastened the module securely onto the rail. To avoid damage to the module, press on the tab of the mounting hole instead of pressing directly on the front of the module.

Tip

Using DIN rail stops could be helpful if your S7-200 is in an environment with high vibration potential or if the S7-200 has been installed vertically.

If your system is in a high-vibration environment, then panel-mounting the S7-200 will provide a greater level of vibration protection.

Removing a CPU or Expansion Module

To remove an S7-200 CPU or expansion module, follow these steps:

1. Remove power from the S7-200.
2. Disconnect all the wiring and cabling that is attached to the module. Most S7-200 CPU and expansion modules have removable connectors to make this job easier.
3. If you have expansion modules connected to the unit that you are removing, open the access cover door and disconnect the expansion module ribbon cable from the adjacent modules.
4. Unscrew the mounting screws or snap open the DIN clip.
5. Remove the module.

Removing and Reinstalling the Terminal Block Connector

Most S7-200 modules have removable connectors to make installing and replacing the module easy. Refer to Appendix A to determine whether your S7-200 module has removable connectors. You can order an optional fan-out connector for modules that do not have removable connectors. See Appendix E for order numbers.

To Remove the Connector

1. Open the connector door to gain access to the connector.
2. Insert a small screwdriver in the notch in the middle of the connector.
3. Remove the terminal connector by prying the screwdriver away from the S7-200 housing. See Figure 3-2.

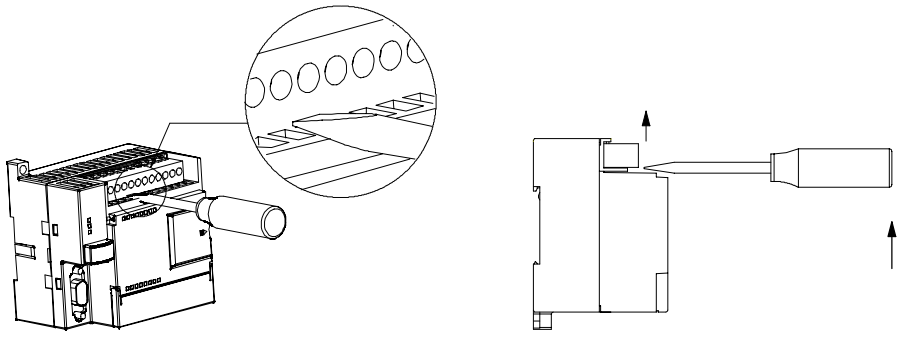


Figure 3-2 Removing the Connector

To Reinstall the Connector

1. Open the connector door.
2. Align the connector with the pins on the unit and align the wiring edge of the connector inside the rim of the connector base.
3. Press down firmly to rotate the connector until it snaps into place. Check carefully to ensure that the connector is properly aligned and fully engaged.



Warning

Use of non-isolated or single insulation supplies to supply low voltage circuits from an AC line can result in hazardous voltages appearing on circuits that are expected to be touch safe, such as communications circuits and low voltage sensor wiring.

Such unexpected high voltages could result in death or serious injury to personnel, and/or damage to equipment.

Only use high voltage to low voltage power converters that are approved as sources of touch safe, limited voltage circuits.

Guidelines for Grounding the S7-200

The best way to ground your application is to ensure that all the common and ground connections of your S7-200 and related equipment are grounded to a single point. This single point should be connected directly to the earth ground for your system.

For improved electrical noise protection, it is recommended that all DC common returns be connected to the same single-point earth ground. Connect the 24 VDC sensor supply common (M) to earth ground.

All ground wires should be as short as possible and should use a large wire size, such as 2 mm^2 (14 AWG).

When locating grounds, remember to consider safety grounding requirements and the proper operation of protective interrupting devices.

Guidelines for Wiring the S7-200

When designing the wiring for your S7-200, provide a single disconnect switch that simultaneously removes power from the S7-200 CPU power supply, from all input circuits, and from all output circuits. Provide overcurrent protection, such as a fuse or circuit breaker, to limit fault currents on supply wiring. You might want to provide additional protection by placing a fuse or other current limit in each output circuit.

Install appropriate surge suppression devices for any wiring that could be subject to lightning surges.

Avoid placing low-voltage signal wires and communications cables in the same wire tray with AC wires and high-energy, rapidly switched DC wires. Always route wires in pairs, with the neutral or common wire paired with the hot or signal-carrying wire.

Use the shortest wire possible and ensure that the wire is sized properly to carry the required current. The connector accepts wire sizes from 2 mm^2 to 0.3 mm^2 (14 AWG to 22 AWG). Use shielded wires for optimum protection against electrical noise. Typically, grounding the shield at the S7-200 gives the best results.

When wiring input circuits that are powered by an external power supply, include an overcurrent protection device in that circuit. External protection is not necessary for circuits that are powered by the 24 VDC sensor supply from the S7-200 because the sensor supply is already current-limited.

Most S7-200 modules have removable connectors for user wiring. (Refer to Appendix A to determine if your module has removable connectors.) To prevent loose connections, ensure that the connector is seated securely and that the wire is installed securely into the connector. To avoid damaging the connector, be careful that you do not over-tighten the screws. The maximum torque for the connector screw is 0.56 N-m (5 inch-pounds).

To help prevent unwanted current flows in your installation, the S7-200 provides isolation boundaries at certain points. When you plan the wiring for your system, you should consider these isolation boundaries. Refer to Appendix A for the amount of isolation provided and the location of the isolation boundaries. Isolation boundaries rated less than 1500 VAC must not be depended on as safety boundaries.



Tip

For a communications network, the maximum length of the communications cable is 50 m without using a repeater. The communications port on the S7-200 is non-isolated. Refer to Chapter 7 for more information.

Guidelines for Inductive Loads

You should equip inductive loads with suppression circuits to limit voltage rise when the control output turns off. Suppression circuits protect your outputs from premature failure due to high inductive switching currents. In addition, suppression circuits limit the electrical noise generated when switching inductive loads.

Tip

The effectiveness of a given suppression circuit depends on the application, and you must verify it for your particular use. Always ensure that all components used in your suppression circuit are rated for use in the application.

DC Outputs and Relays That Control DC Loads

The DC outputs have internal protection that is adequate for most applications. Since the relays can be used for either a DC or an AC load, internal protection is not provided.

Figure 3-3 shows a sample suppression circuit for a DC load. In most applications, the addition of a diode (A) across the inductive load is suitable, but if your application requires faster turn-off times, then the addition of a Zener diode (B) is recommended. Be sure to size your Zener diode properly for the amount of current in your output circuit.

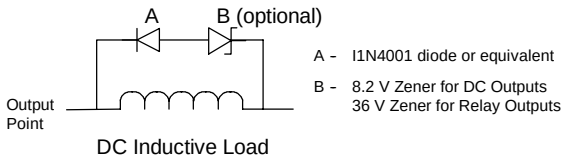


Figure 3-3 Suppression Circuit for a DC Load

AC Outputs and Relays That Control AC Loads

The AC outputs have internal protection that is adequate for most applications. Since the relays can be used for either a DC or an AC load, internal protection is not provided.

Figure 3-4 shows a sample suppression circuit for an AC load. When you use a relay or AC output to switch 115 V/230 VAC loads, place resistor/capacitor networks across the AC load as shown in this figure. You can also use a metal oxide varistor (MOV) to limit peak voltage. Ensure that the working voltage of the MOV is at least 20% greater than the nominal line voltage.

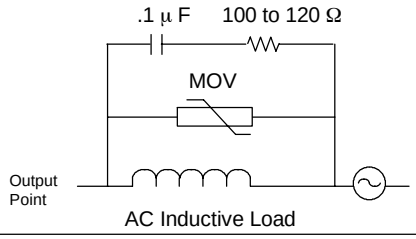


Figure 3-4 Suppression Circuit for an AC Load

Warning

When relay expansion modules are used to switch AC inductive loads, the external resistor/capacitor noise suppression circuit must be placed across the AC load to prevent unexpected machine or process operation. See Figure 3-4.

Guidelines for Lamp Loads

Lamp loads are damaging to relay contacts because of the high turn-on surge current. This surge current will nominally be 10 to 15 times the steady state current for a Tungsten lamp. A replaceable interposing relay or surge limiter is recommended for lamp loads that will be switched a large number of times during the lifetime of the application.

S7-200CN Products

A cross-reference of SIMATIC S7-200 products to S7-200CN products is shown in the following table. For wiring and performance specifications, refer to the cross-referenced SIMATIC S7-200 product in Appendix A. Check the markings on the actual S7-200CN product for the specific Agency approvals and Certifications.

Table H-1 Cross Reference for SIMATIC S7-200 Products to S7-200CN Products

Model Name and Description	S7-200 SIMATIC Product	S7-200CN Product
CPU 222 DC/DC/DC, 8 Inputs/6 Outputs	6ES7 212-1AB23-0XB0	6ES7 212-1AB23-0XB8
CPU 222 AC/DC/Relay 8 Inputs/ 6 Relays	6ES7 212-1BB23-0XB0	6ES7 212-1BB23-0XB8
CPU 224 DC/DC/DC 14 Inputs/ 10 Outputs	6ES7 214-1AD23-0XB0	6ES7 214-1AD23-0XB8
CPU 224 AC/DC/Relay14 Inputs/ 10 Relays	6ES7 214-1BD23-0XB0	6ES7 214-1BD23-0XB8
CPU 224XP DC/DC/DC 14 Inputs/10 Outputs	6ES7 214-2AD23-0XB0	6ES7 214-2AD23-0XB8
CPU 224XPsi DC/DC/DC 14 Inputs/10 Outputs	6ES7 214-2AS23-0XB0	6ES7 214-2AS23-0XB8
CPU 224XP AC/DC/Relay 14 Inputs/10 Relays	6ES7 214-2BD23-0XB0	6ES7 214-2BD23-0XB8
CPU 226 DC/DC/DC 24 Inputs/16 Outputs	6ES7 216-2AD23-0XB0	6ES7 216-2AD23-0XB8
CPU 226 AC/DC/Relay 24 Inputs/16 Relays	6ES7 216-2BD23-0XB0	6ES7 216-2BD23-0XB8
EM 221 Digital Input 8 x 24 VDC	6ES7 221-1BF22-0XA0	6ES7 221-1BF22-0XA8
EM 221 Digital Input 16 x 24 VDC	6ES7 221-1BH22-0XA0	6ES7 221-1BH22-0XA8
EM 222 Digital Output 8 x 24 VDC	6ES7 222-1BF22-0XA0	6ES7 222-1BF22-0XA8
EM 222 Digital Output 8 x Relays	6ES7 222-1HF22-0XA0	6ES7 222-1HF22-0XA8
EM 223 24 VDC Digital Comb 4 Inputs/4 Outputs	6ES7 223-1BF22-0XA0	6ES7 223-1BF22-0XA8
EM 223 24 VDC Digital Comb 4 Inputs/4 Relay Outputs	6ES7 223-1HF22-0XA0	6ES7 223-1HF22-0XA8
EM 223 24 VDC Digital Comb 8 Inputs/8 Outputs	6ES7 223-1BH22-0XA0	6ES7 223-1BH22-0XA8
EM 223 24 VDC Digital Comb 8 Inputs/8 Relay Outputs	6ES7 223-1PH22-0XA0	6ES7 223-1PH22-0XA8
EM 223 24 VDC Digital Comb 16 Inputs/16 Outputs	6ES7 223-1BL22-0XA0	6ES7 223-1BL22-0XA8
EM 223 24 VDC Digital Comb 16 Inputs/16 Relay Outputs	6ES7 223-1PL22-0XA0	6ES7 223-1PL22-0XA8
EM 223 24 VDC Digital Comb 32 Inputs/32 Outputs	6ES7 223-1BM22-0XA0	6ES7 223-1BM22-0XA8
EM 223 24 VDC Digital Comb 32 Inputs/32 Relay Outputs	6ES7 223-1PM22-0XA0	6ES7 223-1PM22-0XA8
EM 231 Analog Input, 4 Inputs	6ES7 231-0HC22-0XA0	6ES7 231-0HC22-0XA8
EM 235 Analog Combination 4 Inputs/1 Output	6ES7 235-0KD22-0XA0	6ES7 235-0KD22-0XA8
EM 232 Analog Output, 2 Outputs	6ES7 232-0HB22-0XA0	6ES7 232-0HB22-0XA8
EM 231 Analog Input RTD, 2 Inputs	6ES7 231-7PB22-0XA0	6ES7 231-7PB22-0XA8
EM 231 Analog Input Thermocouple, 4 Inputs	6ES7 231-7PD22-0XA0	6ES7 231-7PD22-0XA8