MANUFACTURER DOCUMENT PACKAGE

# Manufacturer's Manual

Reference package for procurement and maintenance review

SIEMENS

## 6ES7214-1BD23-0XB0

**COMPACT AC RELAY CPU**

Used with the applicable SIMATIC S7-200 CPU224 configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: Siemens S7-200 System Manual; CPU224 AC/DC/Relay order code and applicable specifications / connection drawing

# CPU Specifications

Table A-2 CPU Order Numbers

| Order Number | CPU Model | Power Supply (Nominal) | Digital Inputs | Digital Outputs | Comm Ports | Analog Inputs | Analog Outputs | Removable Connector |
|---|---|---|---|---|---|---|---|---|
| 6ES7 211-0AA23-0XB0 | CPU 221 | 24 VDC | 6 x 24 VDC | 4 x 24 VDC | 1 | No | No | No |
| 6ES7 211-0BA23-0XB0 | CPU 221 | 120 to 240 VAC | 6 x 24 VDC | 4 x Relay | 1 | No | No | No |
| 6ES7 212-1AB23-0XB0 | CPU 222 | 24 VDC | 8 x 24 VDC | 6 x 24 VDC | 1 | No | No | No |
| 6ES7 212-1BB23-0XB0 | CPU 222 | 120 to 240 VAC | 8 x 24 VDC | 6 x Relay | 1 | No | No | No |
| 6ES7 214-1AD23-0XB0 | CPU 224 | 24 VDC | 14 x 24 VDC | 10 x 24 VDC | 1 | No | No | Yes |
| 6ES7 214-1BD23-0XB0 | CPU 224 | 120 to 240 VAC | 14 x 24 VDC | 10 x Relay | 1 | No | No | Yes |
| 6ES7 214-2AD23-0XB0 | CPU 224XP | 24 VDC | 14 x 24 VDC | 10 x 24 VDC | 2 | 2 | 1 | Yes |
| 6ES7 214-2AS23-0XB0 | CPU 224XPsi | 24 VDC | 14 x 24 VDC | 10 x 24 VDC | 2 | 2 | 1 | Yes |
| 6ES7 214-2BD23-0XB0 | CPU 224XP | 120 to 240 VAC | 14 x 24 VDC | 10 x Relay | 2 | 2 | 1 | Yes |
| 6ES7 216-2AD23-0XB0 | CPU 226 | 24 VDC | 24 x 24 VDC | 16 x 24 VDC | 2 | No | No | Yes |
| 6ES7 216-2BD23-0XB0 | CPU 226 | 120 to 240 VAC | 24 x 24 VDC | 16 x Relay | 2 | No | No | Yes |

Table A-3 CPU General Specifications

| Order Number | Module Name and Description | Dimensions (mm) (W x H x D) | Weight | Dissipation | VDC Available | |
|---|---|---|---|---|---|---|
| | | | | | +5 VDC | +24 VDC[1] |
| 6ES7 211-0AA23-0XB0 | CPU 221 DC/DC/DC 6 Inputs/ 4 Outputs | 90 x 80 x 62 | 270 g | 3 W | 0 mA | 180 mA |
| 6ES7 211-0BA23-0XB0 | CPU 221 AC/DC/Relay 6 Inputs/ 4 Relays | 90 x 80 x 62 | 310 g | 6 W | 0 mA | 180 mA |
| 6ES7 212-1AB23-0XB0 | CPU 222 DC/DC/DC 8 Inputs/ 6 Outputs | 90 x 80 x 62 | 270 g | 5 W | 340 mA | 180 mA |
| 6ES7 212-1BB23-0XB0 | CPU 222 AC/DC/Relay 8 Inputs/ 6 Relays | 90 x 80 x 62 | 310 g | 7 W | 340 mA | 180 mA |
| 6ES7 214-1AD23-0XB0 | CPU 224 DC/DC/DC 14 Inputs/ 10 Outputs | 120.5 x 80 x 62 | 360 g | 7 W | 660 mA | 280 mA |
| 6ES7 214-1BD23-0XB0 | CPU 224 AC/DC/Relay14 Inputs/ 10 Relays | 120.5 x 80 x 62 | 410 g | 10 W | 660 mA | 280 mA |
| 6ES7 214-2AD23-0XB0 | CPU 224XP DC/DC/DC 14 Inputs/10 Outputs | 140 x 80 x 62 | 390 g | 8 W | 660 mA | 280 mA |
| 6ES7 214-2AS23-0XB0 | CPU 224XPsi DC/DC/DC 14 Inputs/10 Outputs | 140 x 80 x 62 | 390 g | 8 W | 660 mA | 280 mA |
| 6ES7 214-2BD23-0XB0 | CPU 224XP AC/DC/Relay 14 Inputs/10 Relays | 140 x 80 x 62 | 440 g | 11 W | 660 mA | 280 mA |
| 6ES7 216-2AD23-0XB0 | CPU 226 DC/DC/DC 24 Inputs/16 Outputs | 196 x 80 x 62 | 550 g | 11 W | 1000 mA | 400 mA |
| 6ES7 216-2BD23-0XB0 | CPU 226 AC/DC/Relay 24 Inputs/16 Relays | 196 x 80 x 62 | 660 g | 17 W | 1000 mA | 400 mA |

[1] This is the 24 VDC sensor power that is available after the internal relay coil power and 24 VDC comm port power requirements have been accounted for.

Table A-4 CPU Specifications

| | CPU 221 | CPU 222 | CPU 224 | CPU 224XP<br>CPU 224XPsi | CPU 226 |
|---|---|---|---|---|---|
| **Memory** | | | | | |
| User program size<br>with run mode edit<br>without run mode edit | 4096 bytes<br>4096 bytes | | 8192 bytes<br>12288 bytes | 12288 bytes<br>16384 bytes | 16384 bytes<br>24576 bytes |
| User data | 2048 bytes | | 8192 bytes | 10240 bytes | 10240 bytes |
| Backup (super cap)<br><br>(optional battery) | 50 hours typical (8 hours min. at 40°C)<br><br>200 days typical | | 100 hours typical (70 hours min. at 40°C)<br>200 days typical | 100 hours typical (70 hours min. at 40°C)<br><br>200 days typical | |
| **I/O** | | | | | |
| Digital I/O | 6 inputs/4outputs | 8 inputs/6 outputs | 14 inputs/10 outputs | 14 inputs/10 outputs | 24 inputs/16 outputs |
| Analog I/O | none | | | 2 inputs/1 output | none |
| Digital I/O image size | 256 (128 In/128 Out) | | | | |
| Analog I/O image size | None | 32 (16 In/16 Out) | 64 (32 In/32 Out) | | |
| Max. expansion modules allowed | None | 2 modules[1] | 7 modules[1] | | |
| Max. intelligent modules allowed | None | 2 modules[1] | 7 modules[1] | | |
| Pulse Catch inputs | 6 | 8 | 14 | | 24 |
| High-Speed Counters<br>Single phase<br><br>Two phase | 4 counters total<br>4 at 30 kHz<br><br>2 at 20 kHz | | 6 counters total<br>6 at 30 kHz<br><br>4 at 20 kHz | 6 counters total<br>4 at 30 kHz<br>2 at 200 kHz<br>3 at 20 kHz<br>1 at 100 kHz | 6 counters total<br>6 at 30 kHz<br><br>4 at 20 kHz |
| Pulse outputs | 2 at 20 kHz (DC outputs only) | | | 2 at 100 kHz<br>(DC outputs only) | 2 at 20 kHz<br>(DC outputs only) |
| **General** | | | | | |
| Timers | 256 total timers; 4 timers (1 ms); 16 timers (10 ms); 236 timers (100 ms) | | | | |
| Counters | 256 (backed by super capacitor or battery) | | | | |
| Internal memory bits<br>Stored on power down | 256 (backed by super capacitor or battery)<br>112 (stored to EEPROM) | | | | |
| Timed interrupts | 2 with 1 ms resolution | | | | |
| Edge interrupts | 4 up and/or 4 down | | | | |
| Analog adjustment | 1 with 8 bit resolution | | 2 with 8 bit resolution | | |
| Boolean execution speed | 0.22 μs per instruction | | | | |
| Real Time Clock | Optional cartridge | | Built-in | | |
| Cartridge options | Memory, Battery, and Real Time Clock | | Memory and battery | | |
| **Communications Built-in** | | | | | |
| Ports (Limited Power) | 1 RS-485 port | | | 2 RS-485 ports | |
| PPI, MPI (slave) baud rates | 9.6, 19.2, 187.5 kbaud | | | | |
| Freeport baud rates | 1.2 kbaud to 115.2 kbaud | | | | |
| Max. cable length per segment | With isolated repeater: 1000 m up to 187.5 kbaud, 1200 m up to 38.4 kbaud<br>Without isolated repeater: 50 m | | | | |
| Max. number of stations | 32 per segment, 126 per network | | | | |
| Max. number of masters | 32 | | | | |
| Peer to Peer (PPI Master Mode) | Yes (NETR/NETW) | | | | |
| MPI connections | 4 total, 2 reserved (1 for a PG and 1 for an OP) | | | | |

[1] You must calculate your power budget to determine how much power (or current) the S7-200 CPU can provide for your configuration. If the CPU power budget is exceeded, you may not be able to connect the maximum number of modules. See Appendix A for CPU and expansion module power requirements, and Appendix B to calculate your power budget.

Table A-5 CPU Power Specifications

| | DC | | AC | |
|---|---|---|---|---|
| **Input Power** | | | | |
| Input voltage | 20.4 to 28.8 VDC | | 85 to 264 VAC (47 to 63 Hz) | |
| Input current<br>CPU 221<br>CPU 222<br>CPU 224<br>CPU 224XP<br>CPU 224XPsi<br>CPU 226 | CPU only at 24 VDC<br>80 mA<br>85 mA<br>110 mA<br>120 mA<br>120 mA<br>150 mA | Max. load at 24 VDC<br>450 mA<br>500 mA<br>700 mA<br>900 mA<br>900 mA<br>1050 mA | CPU only<br>30/15 mA at 120/240 VAC<br>40/20 mA at 120/240 VAC<br>60/30 mA at 120/240 VAC<br>70/35 mA at 120/240 VAC<br>–<br>80/40 mA at 120/240 VAC | Max. load<br>120/60 mA at120/240 VAC<br>140/70 mA at 120/240 VAC<br>200/100 mA at 120/240VAC<br>220/100 mA at 120/240 VAC<br>–<br>320/160 mA at 120/240VAC |
| Inrush current | 12 A at 28.8 VDC | | 20 A at 264 VAC | |
| Isolation (field to logic) | Not isolated | | 1500 VAC | |
| Hold up time (loss of power) | 10 ms at 24 VDC | | 20/80 ms at 120/240 VAC | |
| Fuse (non-replaceable) | 3 A, 250 V Slow Blow | | 2 A, 250 V Slow Blow | |
| **24 VDC Sensor Power** | | | | |
| Sensor voltage (Limited Power) | L+ minus 5 V | | 20.4 to 28.8 VDC | |
| Current limit | 1.5 A peak, thermal limit non-destructive (See Table A-3 for rated load.) | | | |
| Ripple noise | Derived from input power | | Less than 1 V peak-to-peak | |
| Isolation (sensor to logic) | Not isolated | | | |

Table A-6 CPU Digital Input Specifications

| General | 24 VDC Input (CPU 221, CPU 222, CPU 224, CPU 226) | | 24 VDC Input (CPU 224XP, CPU 224XPsi) | |
|---|---|---|---|---|
| Type | Sink/Source (IEC Type 1 Sink) | | Sink/Source (IEC Type 1 Sink, except I0.3 to I0.5) | |
| Rated voltage | 24 VDC at 4 mA typical | | 24 VDC at 4 mA typical | |
| Max. continuous permissible voltage | 30 VDC | | | |
| Surge voltage | 35 VDC for 0.5 s | | | |
| Logic 1 (min.) | 15 VDC at 2.5 mA | | 15 VDC at 2.5 mA (I0.0 to I0.2 and I0.6 to I1.5)<br>4 VDC at 8 mA (I0.3 to I0.5) | |
| Logic 0 (max.) | 5 VDC at 1 mA | | 5 VDC at 1 mA (I0.0 to I0.2 and I0.6 to I1.5)<br>1 VDC at 1 mA (I0.3 to I0.5) | |
| Input delay | Selectable (0.2 to 12.8 ms) | | | |
| Connection of 2 wire proximity sensor (Bero)<br>Permissible leakage current (max.) | 1 mA | | | |
| Isolation (field to logic)<br>Optical (galvanic)<br>Isolation groups | Yes<br>500 VAC for 1 minute<br>See wiring diagram | | | |
| High Speed Counter (HSC) input rate<br>HSC Inputs<br>All HSC<br>All HSC<br>HC4, HC5 on CPU 224XP and CPU 224XPsi only | Logic 1 Level<br>15 to 30 VDC<br>15 to 26 VDC<br>> 4 VDC | Single phase<br>20 kHz<br>30 kHz<br>200 kHz | Two phase<br>10 kHz<br>20 kHz<br>100 kHz | |
| Inputs on simultaneously | All | | All<br>CPU 224XP AC/DC/RELAY only:<br>All at 55° C with DC inputs at 26 VDC max.<br>All at 50° C with DC inputs at 30 VDC max. | |
| Cable length (max.)<br>Shielded<br>Unshielded | 500 m normal inputs, 50 m HSC inputs[1]<br>300 m normal inputs | | | |

[1] Shielded twisted pair is recommended for HSC inputs.

Table A-7 CPU Digital Output Specifications

| General | 24 VDC Output (CPU 221, CPU 222, CPU 224, CPU 226) | 24 VDC Output (CPU 224XP) | 24 VDC Output (CPU 224XPsi) | Relay Output |
|---|---|---|---|---|
| Type | Solid State-MOSFET (Sourcing) | | Solid State-MOSFET (Sinking) | Dry contact |
| Rated voltage | 24 VDC | 24 VDC | 24 VDC | 24 VDC or 250 VAC |
| Voltage range | 20.4 to 28.8 VDC | 5 to 28.8 VDC (Q0.0 to Q0.4)<br>20.4 to 28.8 VDC (Q0.5 to Q1.1) | 5 to 28.8 VDC | 5 to 30 VDC or 5 to 250 VAC |
| Surge current (max.) | 8 A for 100 ms | | | 5 A for 4 s @ 10% duty cycle |
| Logic 1 (min.) | 20 VDC at maximum current | L+ minus 0.4 V at max. current | External Voltage Rail minus 0.4V with 10K pullup to External Voltage Rail | – |
| Logic 0 (max.) | 0.1 VDC with 10 K Ω Load | | 1M + 0.4V at max. load | – |
| Rated current per point (max.) | 0.75 A | | | 2.0 A |
| Rated current per common (max.) | 6 A | 3.75 A | 7.5 A | 10 A |
| Leakage current (max.) | 10 μ A | | | – |
| Lamp load (max.) | 5 W | | | 30 W DC; 200 W AC[2, 3] |
| Inductive clamp voltage | L+ minus 48 VDC, 1 W dissipation | | 1M +48 VDC, 1 W dissipation | – |
| On State resistance (contact) | 0.3 Ω typical (0.6 Ω max.) | | | 0.2 Ω (max. when new) |
| Isolation<br>Optical (galvanic, field to logic)<br>Logic to contact<br>Resistance (logic to contact)<br>Isolation groups | <br>500 VAC for 1 minute<br>–<br>–<br>See wiring diagram | | | <br>–<br>1500 VAC for 1 minute<br>100 M Ω<br>See wiring diagram |
| Delay (max.)<br>Off to on (μs)<br>On to off (μs)<br>Switching | <br>2μs (Q0.0, Q0.1), 15μs (all other)<br>10μs (Q0.0, Q0.1), 130μs (all other)<br>– | <br>0.5μs (Q0.0, Q0.1), 15μs (all other)<br>1.5μs (Q0.0, Q0.1), 130μs (all other)<br>– | | <br>–<br>–<br>10 ms |
| Pulse frequency (max.) | 20 kHz[1] (Q0.0 and Q0.1) | 100 kHz[1] (Q0.0 and Q0.1) | 100 kHz[1] (Q0.0 and Q0.1) | 1 Hz |
| Lifetime mechanical cycles | – | – | – | 10,000,000 (no load) |
| Lifetime contacts | – | – | – | 100,000 (rated load) |
| Outputs on simultaneously | All at 55° C (horizontal), All at 45° C (vertical) | | | |
| Connecting two outputs in parallel | Yes, only outputs in same group | | | No |
| Cable length (max.)<br>Shielded<br>Unshielded | <br>500 m<br>150 m | | | |

1 Depending on your pulse receiver and cable, an additional external load resistor (at least 10% of rated current) may improve pulse signal quality and noise immunity.

2 Relay lifetime with a lamp load will be reduced by 75% unless steps are taken to reduce the turn-on surge below the surge current rating of the output.

3 Lamp load wattage rating is for rated voltage. Reduce the wattage rating proportionally for voltage being switched (for example 120 VAC – 100 W).



**Warning**

When a mechanical contact turns on output power to the S7-200 CPU, or any digital expansion module, it sends a “1” signal to the digital outputs for approximately 50 microseconds.

This could cause unexpected machine or process operation which could result in death or serious injury to personnel, and/or damage to equipment.

You must plan for this, especially if you are using devices which respond to short duration pulses.

Table A-8 CPU 224XP and CPU 224XPsi Analog Input Specifications

| General | Analog Input (CPU 224XP, CPU 224XPsi) |
|---|---|
| Number of inputs | 2 points |
| Analog input type | Single-ended |
| Voltage range | ±10 V |
| Data word format, full scale range | –32,000 to +32,000 |
| DC Input impedance | > 100 KΩ |
| Maximum input voltage | 30 VDC |
| Resolution | 11 bits plus 1 sign bit |
| LSB value | 4.88 mV |
| Isolation | None |
| Accuracy[1] | |
| Worst case 0° to 55° C | ±2.5% of full scale |
| Typical 25° C | ±1.0% of full scale |
| Repeatability | ±0.05% of full scale |
| Analog to digital conversion time | 125 msec |
| Conversion type | Sigma Delta |
| Step response | 250 ms max. |
| Noise rejection | –20 dB @ 50 Hz typical |

1 Analog input accuracy may deviate up to +/–10% of full scale when subjected to severe RF interferences such as specified in the product standard EN 61131–2:2007.

Table A-9 CPU 224XP and CPU 224XPsi Analog Output Specifications

| General | Analog Output (CPU 224XP, CPU 224XPsi) |
|---|---|
| Number of outputs | 1 point |
| Signal range | |
| Voltage | 0 to 10 V (Limited Power) |
| Current | 0 to 20 mA (Limited Power) |
| Data word format, full range | 0 to +32767 |
| Date word format, full scale | 0 to +32000 |
| Resolution, full range | 12 bits |
| LSB value | |
| Voltage | 2.44 mV |
| Current | 4.88 μA |
| Isolation | none |
| Accuracy | |
| Worst case, 0° to 55° C | |
| Voltage output | ± 2% of full-scale |
| Current output | ± 3% of full-scale |
| Typical 25° C | |
| Voltage output | ± 1% of full-scale |
| Current output | ± 1% of full-scale |
| Settling time | |
| Voltage output | < 50 μS |
| Current output | < 100 μS |
| Maximum output drive | |
| Voltage output | ≥ 5000 Ω minimum |
| Current output | ≤ 500 Ω maximum |

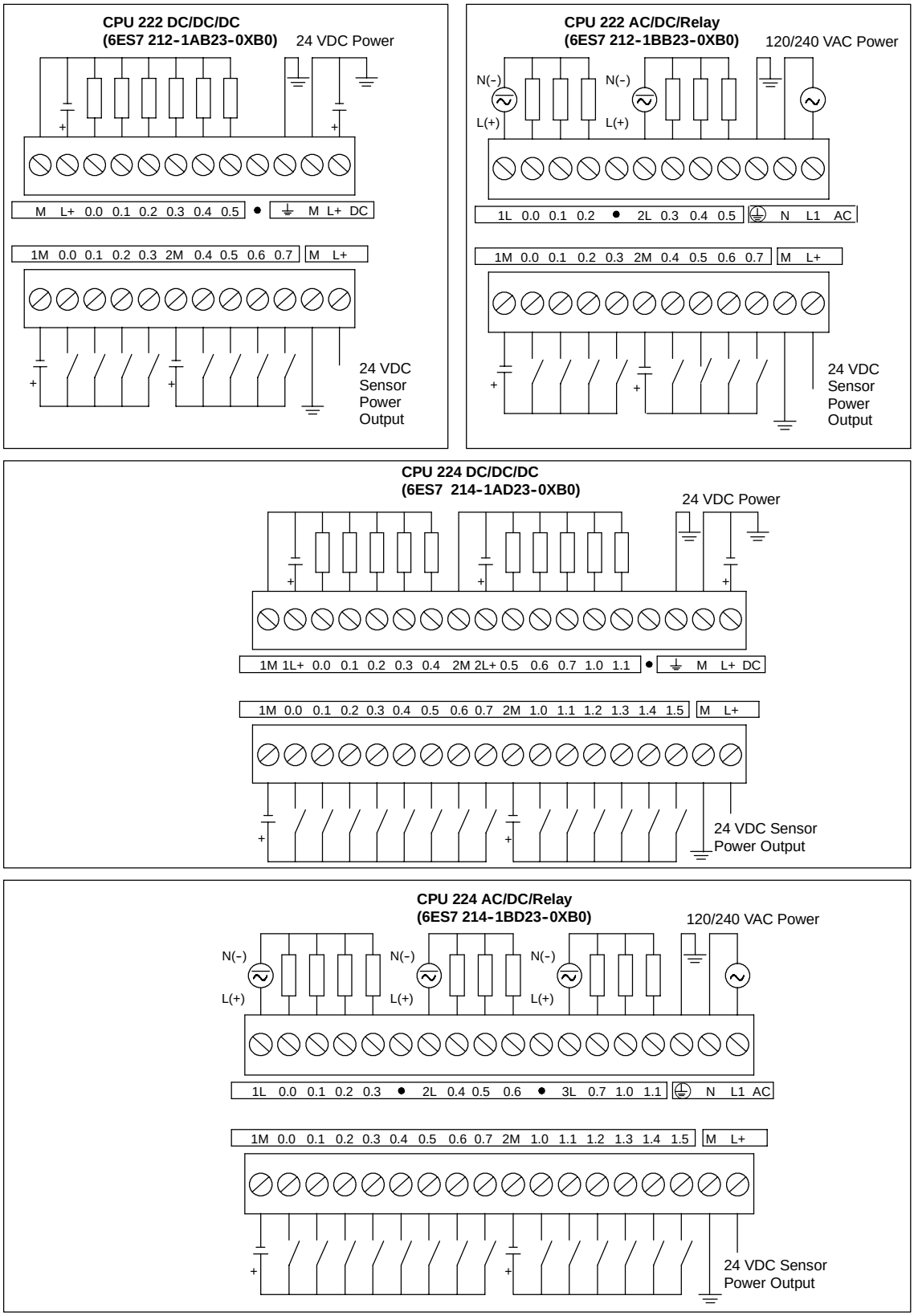



Figure A-4 CPU 222 and CPU 224 Wiring Diagrams