# Product datasheet

Specifications

Green Premium™

## logic controller, Modicon M221, 24 IO, transistor, PNP, Ethernet

TM221CE24T

## Main

| | |
|---|---|
| Range of product | Modicon M221 |
| Product or component type | Logic controller |
| [Us] rated supply voltage | 24 V DC |
| Discrete input number | 14, discrete input 4 fast input conforming to IEC 61131-2 Type 1 |
| Analogue input number | 2 at 0...10 V |
| Discrete output type | Transistor |
| Discrete output number | 10 transistor 2 fast output |
| Discrete output voltage | 24 V DC |
| Discrete output current | 0.5 A |

## Complementary

| | |
|---|---|
| Discrete I/O number | 24 |
| Maximum number of I/O expansion module | 7 (local I/O-Architecture)<br>14 (remote I/O-Architecture) |
| Supply voltage limits | 20.4…28.8 V |
| Inrush current | 35 A |
| Maximum power consumption in W | 14 W at 24 V (with max number of I/O expansion module)<br>4.8 W at 24 V (without I/O expansion module) |
| Power supply output current | 0.52 A 5 V for expansion bus<br>0.2 A 24 V for expansion bus |
| Discrete input logic | Sink or source (positive/negative) |
| Discrete input voltage | 24 V |
| Discrete input voltage type | DC |
| Analogue input resolution | 10 bits |
| LSB value | 10 mV |
| Conversion time | 1 ms per channel + 1 controller cycle time for analogue input analog input |
| Permitted overload on inputs | +/- 30 V DC for 5 min (maximum) for analog input<br>+/- 13 V DC (permanent) for analog input |
| Voltage state 1 guaranteed | >= 15 V for input |
| Voltage state 0 guaranteed | <= 5 V for input |
| Discrete input current | 7 mA for discrete input<br>5 mA for fast input |
| Input impedance | 3.4 kOhm for discrete input<br>100 kOhm for analog input<br>4.9 kOhm for fast input |

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| | |
|---|---|
| **Response time** | 35 µs turn-off, I2...I5 terminal(s) for input |
| | 5 µs turn-on, I0, I1, I6, I7 terminal(s) for fast input |
| | 35 µs turn-on, other terminals terminal(s) for input |
| | 5 µs turn-off, I0, I1, I6, I7 terminal(s) for fast input |
| | 100 µs turn-off, other terminals terminal(s) for input |
| | 5 µs turn-on, turn-off, Q0...Q1 terminal(s) for output |
| | 50 µs turn-on, turn-off, Q2...Q3 terminal(s) for output |
| | 300 µs turn-on, turn-off, other terminals terminal(s) for output |
| **Configurable filtering time** | 0 ms for input |
| | 3 ms for input |
| | 12 ms for input |
| **Discrete output logic** | Positive logic (source) |
| **Maximum current per output common** | 5 A |
| **Output frequency** | 100 kHz for fast output (PWM/PLS mode) at Q0...Q1 |
| | 5 kHz for output at Q2...Q3 |
| | 0.1 kHz for output at Q4...Q9 |
| **Absolute accuracy error** | +/- 1 % of full scale for analog input |
| **Maximum leakage current** | 0.1 mA for transistor output |
| **Maximum voltage drop** | <1 V |
| **Mechanical durability** | 20000000 cycles for transistor output |
| **Maximum tungsten load** | <12 W for output and fast output |
| **Protection type** | Overload and short-circuit protection at 1 A |
| **Reset time** | 1 s automatic reset |
| **Memory capacity** | 256 kB for user application and data RAM with 10000 instructions |
| | 256 kB for internal variables RAM |
| **Data backed up** | 256 kB built-in flash memory for backup of application and data |
| **Data storage equipment** | 2 GB SD card (optional) |
| **Battery type** | BR2032 or CR2032X lithium non-rechargeable |
| **Backup time** | 1 year at 25 °C (by interruption of power supply) |
| **Execution time for 1 KInstruction** | 0.3 ms for event and periodic task |
| **Execution time per instruction** | 0.2 µs Boolean |
| **Exct time for event task** | 60 µs response time |
| **Maximum size of object areas** | 255 %C counters |
| | 512 %M memory bits |
| | 8000 %MW memory words |
| | 512 %KW constant words |
| | 255 %TM timers |
| **Realtime clock** | With |
| **Clock drift** | <= 30 s/month at 25 °C |
| **Regulation loop** | Adjustable PID regulator up to 14 simultaneous loops |
| **Positioning functions** | Position PTO 2 axe(s)pulse/direction mode (100 kHz) |
| | Position PTO 1 axe(s)CW/CCW mode (100 kHz) |
| **Function available** | Frequency generator |
| | PLS |
| | PWM |
| **Counting input number** | 4 fast input (HSC mode) at 100 kHz 32 bits |
| **counter function** | A/B |
| | Single phase |
| | Pulse/direction |
| **Integrated connection type** | USB port with mini B USB 2.0 connector |
| | Non isolated serial link serial 1 with RJ45 connector and RS232/RS485 interface |
| | Ethernet with RJ45 connector |

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| Supply | (serial)serial link supply: 5 V, <200 mA |
|---|---|
| **Transmission rate** | 1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 15 m for RS485<br>1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 3 m for RS232<br>480 Mbit/s for USB |
| **Communication port protocol** | USB port: USB - SoMachine-Network<br>Non isolated serial link: Modbus master/slave - RTU/ASCII or SoMachine-Network<br>Ethernet |
| **Port Ethernet** | 10BASE-T/100BASE-TX 1 port with 100 m copper cable |
| **communication service** | Modbus TCP slave device<br>Modbus TCP server<br>Modbus TCP client<br>Ethernet/IP adapter<br>DHCP client |
| **Local signalling** | 1 LED (green) for PWR<br>1 LED (green) for RUN<br>1 LED (red) for module error (ERR)<br>1 LED (green) for SD card access (SD)<br>1 LED (red) for BAT<br>1 LED per channel (green) for I/O state<br>1 LED (green) for SL<br>Ethernet network activity (green) for ACT<br>Ethernet network link (yellow) for Link (Link Status) |
| **Electrical connection** | removable screw terminal block for inputs<br>removable screw terminal block for outputs<br>terminal block, 3 terminal(s) for connecting the 24 V DC power supply<br>connector, 4 terminal(s) for analogue inputs<br>Mini B USB 2.0 connector for a programming terminal |
| **Maximum cable distance between devices** | Shielded cable: <10 m for fast input<br>Unshielded cable: <30 m for output<br>Unshielded cable: <30 m for digital input<br>Unshielded cable: <1 m for analog input<br>Shielded cable: <3 m for fast output |
| **Insulation** | Between input and internal logic at 500 V AC<br>Between fast input and internal logic at 500 V AC<br>Non-insulated between inputs<br>Between output and internal logic at 500 V AC<br>Non-insulated between analogue input and internal logic<br>Non-insulated between analogue inputs |
| **marking** | CE |
| **Mounting support** | Top hat type TH35-15 rail conforming to IEC 60715<br>Top hat type TH35-7.5 rail conforming to IEC 60715<br>plate or panel with fixing kit |
| **Height** | 90 mm |
| **Depth** | 70 mm |
| **Width** | 110 mm |
| **Net weight** | 0.395 kg |

# Environment

| Standards | IEC 61131-2<br>UL 508<br>CAN/CSA C22.2 No. 213<br>IACS E10<br>ANSI/ISA 12-12-01 |
|---|---|
| **product certifications** | ABS<br>EAC<br>RCM<br>cULus<br>LR<br>DNV-GL<br>CE<br>UKCA<br>cULus HazLoc |

| | |
|---|---|
| **Environmental characteristic** | Ordinary and hazardous location |
| **Resistance to electrostatic discharge** | 8 kV in air conforming to IEC 61000-4-2<br>4 kV on contact conforming to IEC 61000-4-2 |
| **Resistance to electromagnetic fields** | 10 V/m 80 MHz...1 GHz conforming to IEC 61000-4-3<br>3 V/m 1.4 GHz...2 GHz conforming to IEC 61000-4-3<br>1 V/m 2...2.7 GHz conforming to IEC 61000-4-3 |
| **Resistance to magnetic fields** | 30 A/m 50/60 Hz conforming to IEC 61000-4-8 |
| **Resistance to fast transients** | 2 kV (power lines) conforming to IEC 61000-4-4<br>2 kV (relay output) conforming to IEC 61000-4-4<br>1 kV (I/O) conforming to IEC 61000-4-4<br>1 kV (Ethernet line) conforming to IEC 61000-4-4<br>1 kV (serial link) conforming to IEC 61000-4-4 |
| **Surge withstand** | 2 kV power lines (AC) common mode conforming to IEC 61000-4-5<br>2 kV relay output common mode conforming to IEC 61000-4-5<br>1 kV I/O common mode conforming to IEC 61000-4-5<br>1 kV shielded cable common mode conforming to IEC 61000-4-5<br>0.5 kV power lines (DC) differential mode conforming to IEC 61000-4-5<br>1 kV power lines (AC) differential mode conforming to IEC 61000-4-5<br>1 kV relay output differential mode conforming to IEC 61000-4-5<br>0.5 kV power lines (DC) common mode conforming to IEC 61000-4-5 |
| **Resistance to conducted disturbances** | 10 V 0.15...80 MHz conforming to IEC 61000-4-6<br>3 V 0.1...80 MHz conforming to Marine specification (LR, ABS, DNV, GL)<br>10 V spot frequency (2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz) conforming to Marine specification (LR, ABS, DNV, GL) |
| **Electromagnetic emission** | Conducted emissions - test level: 79 dBµV/m QP/66 dBµV/m AV ( power lines (AC)) at 0.15…0.5 MHz conforming to IEC 55011<br>Conducted emissions - test level: 73 dBµV/m QP/60 dBµV/m AV ( power lines (AC)) at 0.5…300 MHz conforming to IEC 55011<br>Conducted emissions - test level: 120...69 dBµV/m QP ( power lines) at 10…150 kHz conforming to IEC 55011<br>Conducted emissions - test level: 63 dBµV/m QP ( power lines) at 1.5…30 MHz conforming to IEC 55011<br>Radiated emissions - test level: 40 dBµV/m QP class A ( 10 m) at 30…230 MHz conforming to IEC 55011<br>Conducted emissions - test level: 79...63 dBµV/m QP ( power lines) at 150…1500 kHz conforming to IEC 55011<br>Radiated emissions - test level: 47 dBµV/m QP class A ( 10 m) at 200…1000 MHz conforming to IEC 55011 |
| **Immunity to microbreaks** | 10 ms |
| **Ambient air temperature for operation** | -10…55 °C (horizontal installation)<br>-10…35 °C (vertical installation) |
| **Ambient air temperature for storage** | -25…70 °C |
| **Relative humidity** | 10…95 %, without condensation (in operation)<br>10…95 %, without condensation (in storage) |
| **IP degree of protection** | IP20 with protective cover in place |
| **Pollution degree** | <= 2 |
| **Operating altitude** | 0...2000 m |
| **Storage altitude** | 0…3000 m |
| **Vibration resistance** | 3.5 mm at 5…8.4 Hz on symmetrical rail<br>3.5 mm at 5…8.4 Hz on panel mounting<br>1 gn at 8.4…150 Hz on symmetrical rail<br>1 gn at 8.4…150 Hz on panel mounting |
| **Shock resistance** | 147 m/s² for 11 ms |

# Packing Units

| | |
|---|---|
| **Unit Type of Package 1** | PCE |
| **Number of Units in Package 1** | 1 |
| **Package 1 Height** | 11.133 cm |

| | |
|---|---|
| **Package 1 Width** | 14.136 cm |
| **Package 1 Length** | 15.607 cm |
| **Package 1 Weight** | 621.0 g |
| **Unit Type of Package 2** | CAR |
| **Number of Units in Package 2** | 20 |
| **Package 2 Height** | 29.7 cm |
| **Package 2 Width** | 39.8 cm |
| **Package 2 Length** | 57.0 cm |
| **Package 2 Weight** | 13.211 kg |
| **Unit Type of Package 3** | P12 |
| **Number of Units in Package 3** | 240 |
| **Package 3 Height** | 105.0 cm |
| **Package 3 Width** | 120.0 cm |
| **Package 3 Length** | 80.0 cm |
| **Package 3 Weight** | 94 kg |

# Sustainability

**Green Premium<sup>TM</sup> label** is Schneider Electric's commitment to delivering products with best-in-class environmental performance. Green Premium promises compliance with the latest regulations, transparency on environmental impacts, as well as circular and low-$CO_2$ products.

**Guide to assessing product sustainability** is a white paper that clarifies global eco-label standards and how to interpret environmental declarations.

Learn more about Green Premium >

Guide to assess a product's sustainability >

Transparency   RoHS/REACh

## Well-being performance

✓ Mercury Free

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✓ Rohs Exemption Information        Yes

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✓ Pvc Free

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## Certifications & Standards

**Reach Regulation**                     REACh Declaration

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**Eu Rohs Directive**                    Pro-active compliance (Product out of EU RoHS legal scope)

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**China Rohs Regulation**                China RoHS declaration

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**Environmental Disclosure**             Product Environmental Profile

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**Weee**                                 The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins

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**Circularity Profile**                  End of Life Information

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Dimensions Drawings

**Dimensions**

mm
in.

75,9
2.99

110
4.33

103,6
4.08
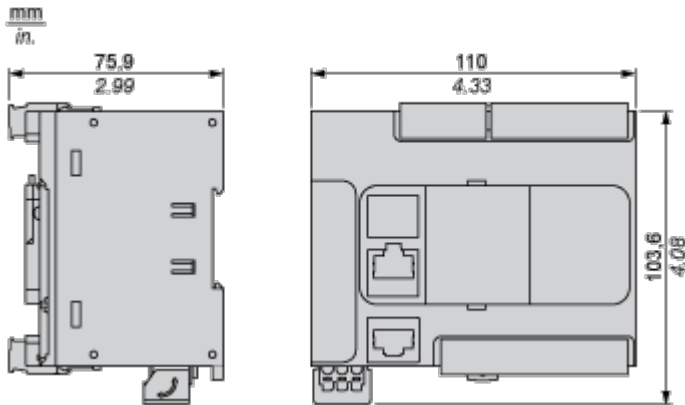
Mounting and Clearance

**Mounting on a Rail**

17-Sept-2024
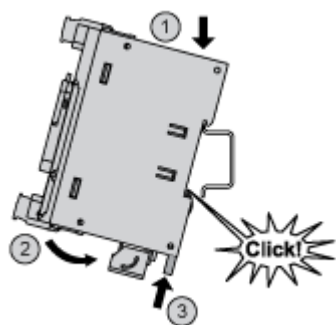
## Direct Mounting on a Panel Surface
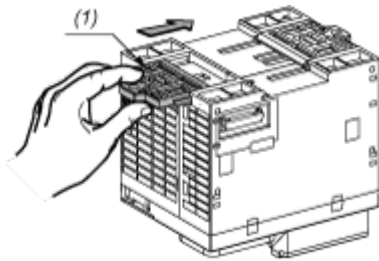


(1)    Install a mounting strip

## Mounting Hole Layout

**TM221CE24T**
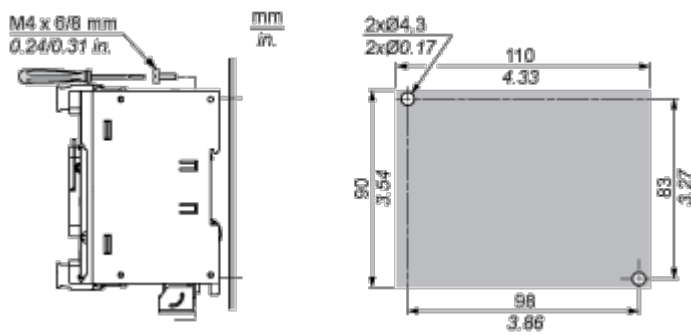
## Mounting

### Correct Mounting Position
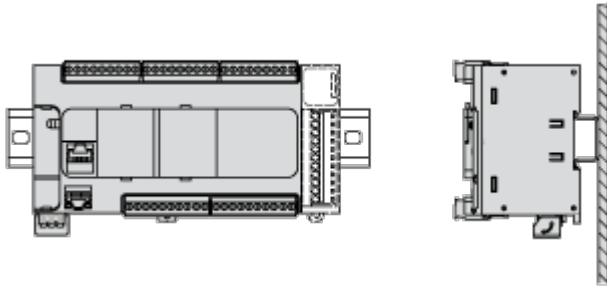
### Acceptable Mounting Position
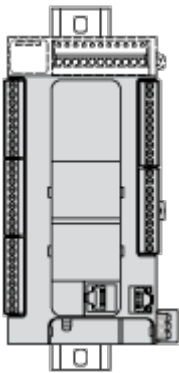
### Incorrect Mounting Position
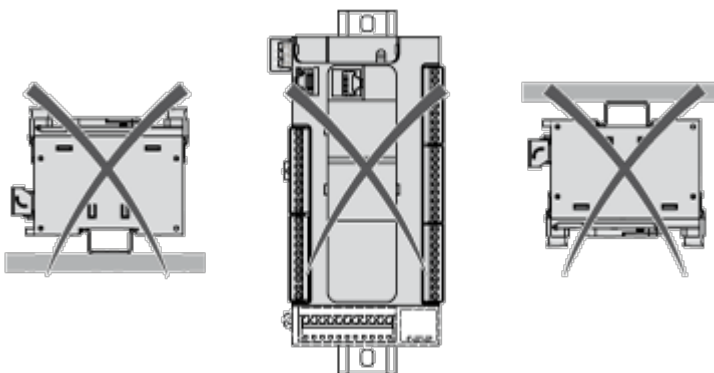
**Clearance**
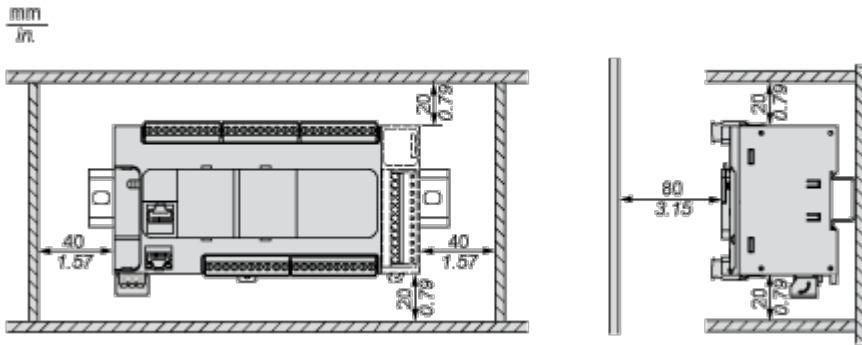
Connections and Schema

**Digital Inputs**
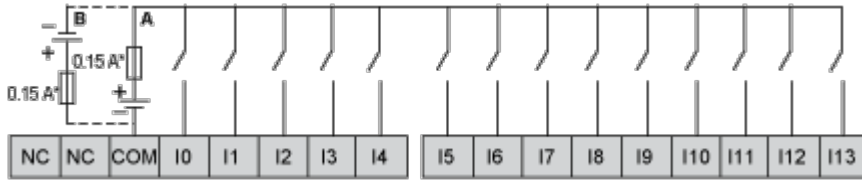


(*)  Type T fuse

(A)  Sink wiring (positive logic).

(B)  Source wiring (negative logic).

**Connection of the Fast Inputs**
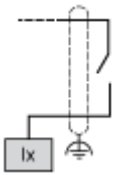


I0, I1, I6, I7

## Transistor Outputs
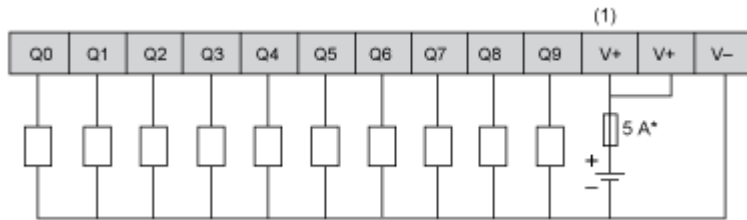


(*)   Type T fuse

(1)   The V+ terminals are connected internally.

## Connection of the Fast Outputs
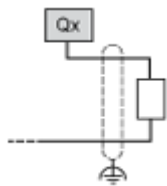


Q0, Q1

**Analog Inputs**
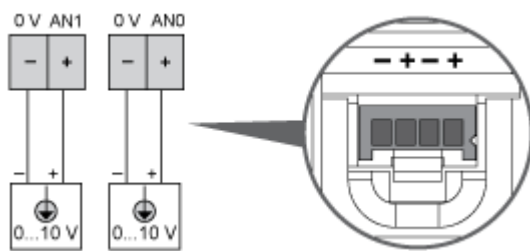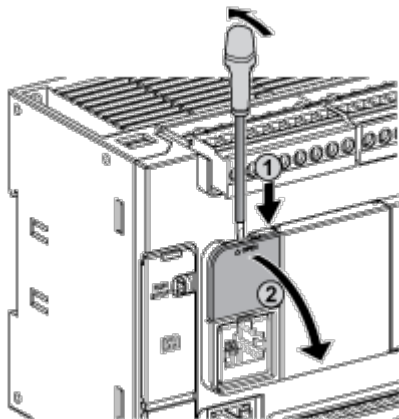


The (-) poles are connected internally.

| Pin | Wire Color |
|-----|-----------|
| 0 V | Black |
| AN1 | Red |
| 0 V | Black |
| AN0 | Red |

**Ethernet Connection**
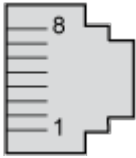


| Pin N° | Signal |
|--------|--------|
| 1 | TD+ |
| 2 | TD- |
| 3 | RD+ |
| 4 | - |
| 5 | - |
| 6 | RD- |
| 7 | - |
| 8 | - |



RJ45　　　　RJ45
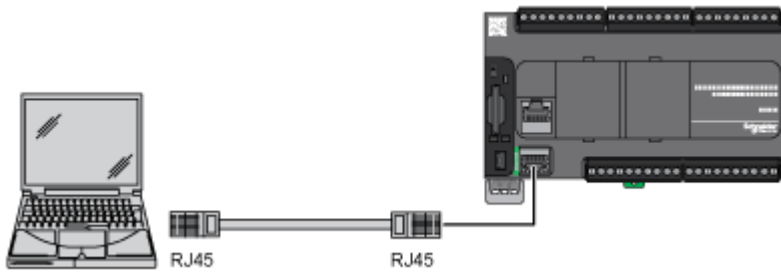
**USB Mini-B Connection**

**SL1 Connection**



RJ45
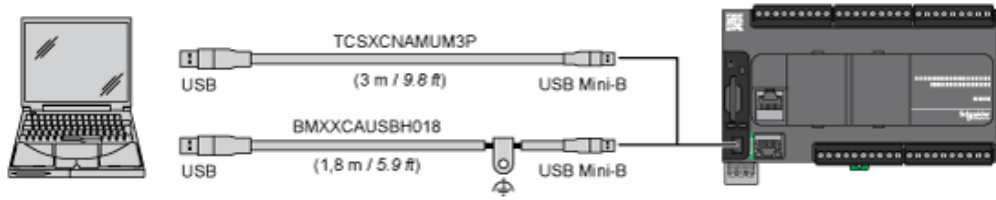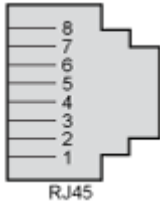
SL1

| N ° | RS 232 | RS 485 |
|-----|--------|--------|
| 1 | RxD | N.C. |
| 2 | TxD | N.C. |
| 3 | RTS | N.C. |
| 4 | N.C. | D1 |
| 5 | N.C. | D0 |
| 6 | CTS | N.C. |
| 7 | N.C*. | 5 Vdc |
| 8 | Common | Common |

N.C.: not connected
* : 5 Vdc delivered by the controller. Do not connect.
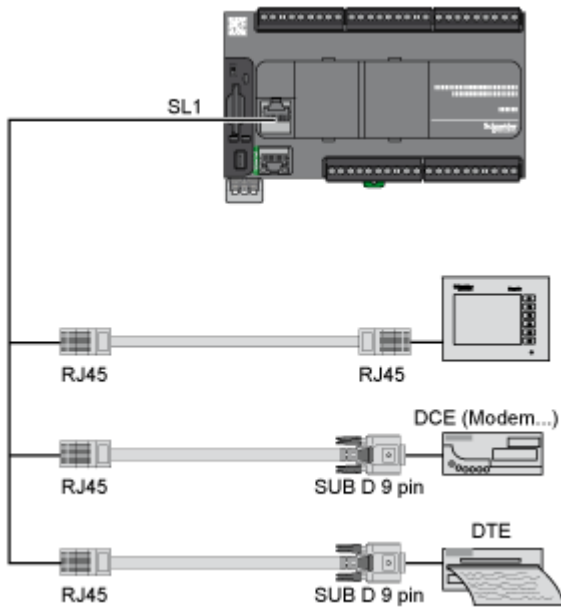
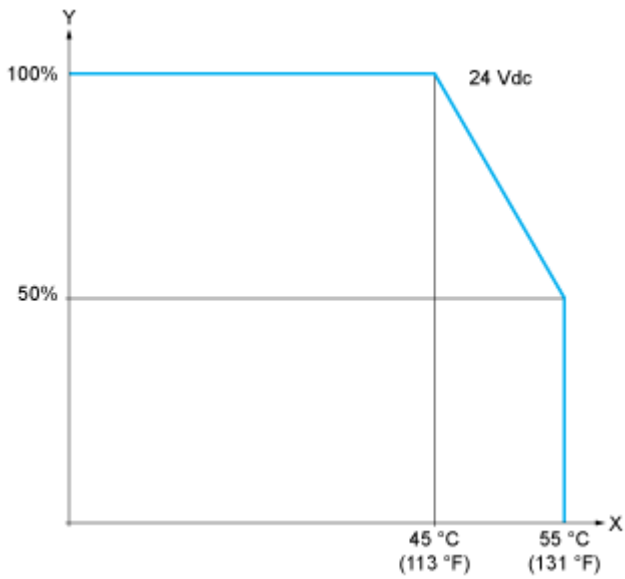## Performance Curves

### Derating Curves

**Embedded Digital Inputs (No Cartridge)**
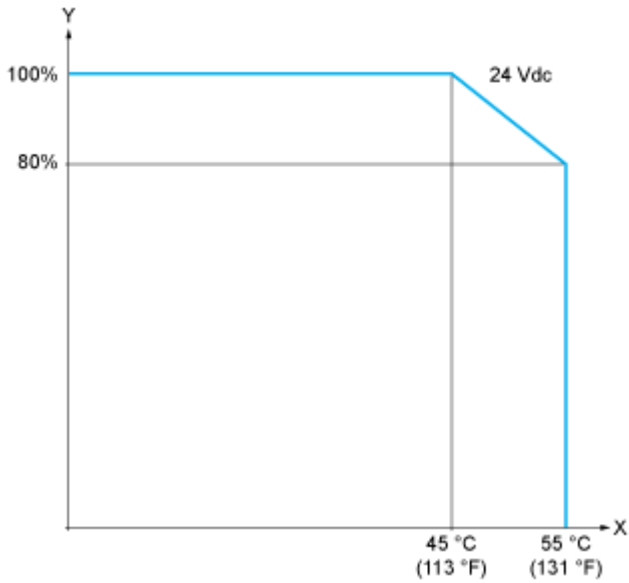


X : Ambient temperature

Y : Input simultaneous ON ratio

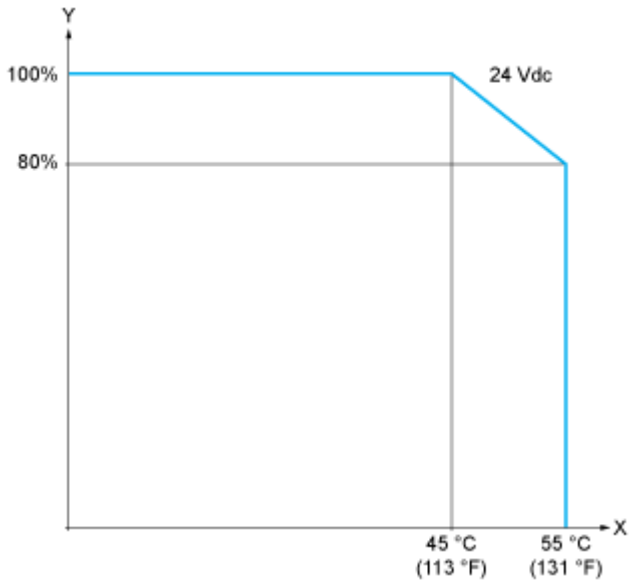**Embedded Digital Inputs (with Cartridge)**



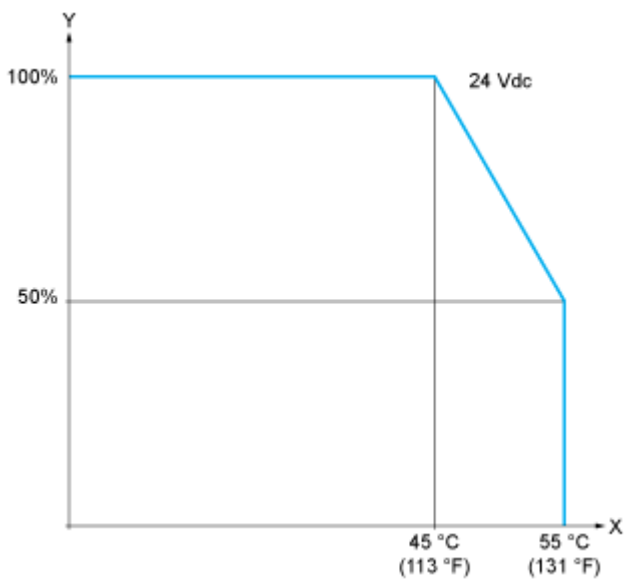X : Ambient temperature

Y : Input simultaneous ON ratio

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**Derating Curves**

**Embedded Digital Outputs (No Cartridge)**



X : Ambient temperature

Y : Output simultaneous ON ratio

**Embedded Digital Outputs (with Cartridge)**



X : Ambient temperature

Y : Output simultaneous ON ratio