# Product datasheet

Specifications

## logic controller, Modicon M221, 16 IO, 9 DI, 7 DO, relay, Ethernet

TM221CE16R

## Main

| | |
|---|---|
| **Range Of Product** | Modicon M221 |
| **Product Or Component Type** | Logic controller |
| **[Us] Rated Supply Voltage** | 100...240 V AC |
| **Discrete Input Number** | 9, discrete input conforming to IEC 61131-2 Type 1 |
| **Analogue Input Number** | 2 at 0...10 V |
| **Discrete Output Type** | Relay normally open |
| **Discrete Output Number** | 7 relay |
| **Discrete Output Voltage** | 5...125 V DC<br>5...250 V AC |
| **Discrete Output Current** | 2 A |

## Complementary

| | |
|---|---|
| **Discrete I/O Number** | 16 |
| **Maximum Number Of I/O Expansion Module** | 4 (local I/O-Architecture)<br>11 (remote I/O-Architecture) |
| **Supply Voltage Limits** | 85…264 V |
| **Network Frequency** | 50/60 Hz |
| **Inrush Current** | 40 A |
| **Maximum Power Consumption In Va** | 49 VA at 100...240 V with max number of I/O expansion module<br>33 VA at 100...240 V without I/O expansion module |
| **Power Supply Output Current** | 0.325 A 5 V for expansion bus<br>0.12 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 |
| **Response Time** | 35 µs turn-off, I2...I5 terminal(s) for input<br>10 ms turn-on for output<br>10 ms turn-off for output<br>5 µs turn-on, I0, I1, I6, I7 terminal(s) for fast input<br>35 µs turn-on, other terminals terminal(s) for input<br>5 µs turn-off, I0, I1, I6, I7 terminal(s) for fast input<br>100 µs turn-off, other terminals terminal(s) for input |
| **Configurable Filtering Time** | 0 ms for input<br>3 ms for input<br>12 ms for input |
| **Output Voltage Limits** | 125 V DC<br>277 V AC |
| **Maximum Current Per Output Common** | 6 A at COM 1<br>7 A at COM 0 |
| **Absolute Accuracy Error** | +/- 1 % of full scale for analog input |
| **Electrical Durability** | 100000 cycles AC-12, 120 V, 240 VA, resistive<br>100000 cycles AC-12, 240 V, 480 VA, resistive<br>300000 cycles AC-12, 120 V, 80 VA, resistive<br>300000 cycles AC-12, 240 V, 160 VA, resistive<br>100000 cycles AC-15, cos phi = 0.35, 120 V, 60 VA, inductive<br>100000 cycles AC-15, cos phi = 0.35, 240 V, 120 VA, inductive<br>300000 cycles AC-15, cos phi = 0.35, 120 V, 18 VA, inductive<br>300000 cycles AC-15, cos phi = 0.35, 240 V, 36 VA, inductive<br>100000 cycles AC-14, cos phi = 0.7, 120 V, 120 VA, inductive<br>100000 cycles AC-14, cos phi = 0.7, 240 V, 240 VA, inductive<br>300000 cycles AC-14, cos phi = 0.7, 120 V, 36 VA, inductive<br>300000 cycles AC-14, cos phi = 0.7, 240 V, 72 VA, inductive<br>100000 cycles DC-12, 24 V, 48 W, resistive<br>300000 cycles DC-12, 24 V, 16 W, resistive<br>100000 cycles DC-13, 24 V, 24 W, inductive (L/R = 7 ms)<br>300000 cycles DC-13, 24 V, 7.2 W, inductive (L/R = 7 ms) |
| **Switching Frequency** | 20 switching operations/minute with maximum load |
| **Mechanical Durability** | 20000000 cycles for relay output |
| **Minimum Load** | 1 mA at 5 V DC for relay output |
| **Protection Type** | Without protection at 5 A |
| **Reset Time** | 1 s |
| **Memory Capacity** | 256 kB for user application and data RAM with 10000 instructions<br>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<br>512 %KW constant words<br>255 %TM timers<br>512 %M memory bits<br>8000 %MW memory words |
| **Realtime Clock** | With |
| **Clock Drift** | <= 30 s/month at 25 °C |
| **Regulation Loop** | Adjustable PID regulator up to 14 simultaneous loops |

| | |
|---|---|
| **Counting Input Number** | 4 fast input (HSC mode) at 100 kHz 32 bits |
| **Counter Function** | Pulse/direction<br>A/B<br>Single phase |
| **Integrated Connection Type** | USB port with mini B USB 2.0 connector<br>Non isolated serial link serial 1 with RJ45 connector and RS232/RS485 interface<br>Ethernet with RJ45 connector |
| **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** | DHCP client<br>Ethernet/IP adapter<br>Modbus TCP server<br>Modbus TCP slave device<br>Modbus TCP 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 |
| **Insulation** | Between input and internal logic at 500 V AC<br>Non-insulated between analogue input and internal logic<br>Non-insulated between analogue inputs<br>Between supply and ground at 1500 V AC<br>Between sensor power supply and ground at 500 V AC<br>Between input and ground at 500 V AC<br>Between output and ground at 1500 V AC<br>Between supply and internal logic at 2300 V AC<br>Between sensor power supply and internal logic at 500 V AC<br>Between output and internal logic at 2300 V AC<br>Between Ethernet terminal and internal logic at 500 V AC<br>Between supply and sensor power supply at 2300 V AC |
| **Marking** | CE |
| **Sensor Power Supply** | 24 V DC at 250 mA supplied by the controller |
| **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** | 95 mm |
| **Net Weight** | 0.346 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** | cULus<br>LR<br>RCM<br>EAC<br>ABS<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** | 98 m/s² for 11 ms |

## Packing Units

| | |
|---|---|
| **Unit Type Of Package 1** | PCE |
| **Number Of Units In Package 1** | 1 |
| **Package 1 Height** | 10.829 cm |
| **Package 1 Width** | 14.04 cm |
| **Package 1 Length** | 14.181 cm |
| **Package 1 Weight** | 590.0 g |
| **Unit Type Of Package 2** | CAR |
| **Number Of Units In Package 2** | 20 |
| **Package 2 Height** | 28.9 cm |
| **Package 2 Width** | 39.5 cm |
| **Package 2 Length** | 57.4 cm |
| **Package 2 Weight** | 12.771 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** | 164 kg |

## Sustainability

**Green Premium$^{TM}$ 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

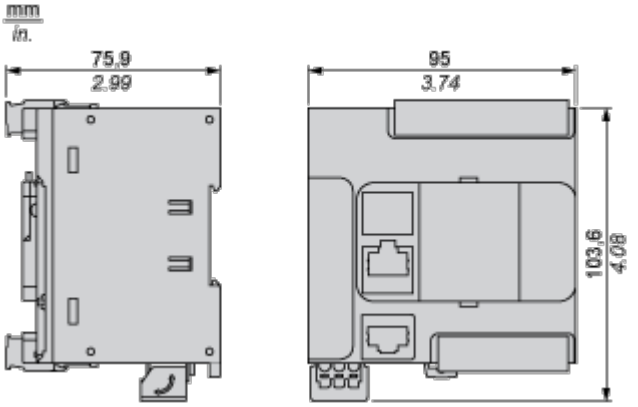
| | |
|---|---|
| Mercury Free | |
| Rohs Exemption Information | Yes |
| Pvc Free | |

## Certifications & Standards

| | |
|---|---|
| **Reach Regulation** | REACh Declaration |
| **Eu Rohs Directive** | Pro-active compliance (Product out of EU RoHS legal scope) |
| **China Rohs Regulation** | China RoHS declaration |
| **Environmental Disclosure** | Product Environmental Profile |
| **Weee** | The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins |
| **Circularity Profile** | End of Life Information |

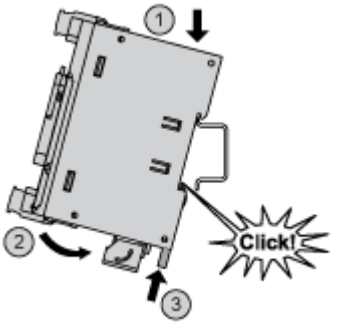
Dimensions Drawings

## Dimensions

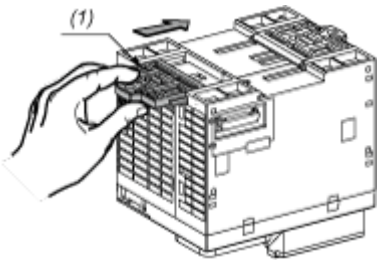


Mounting and Clearance

## Mounting on a Rail

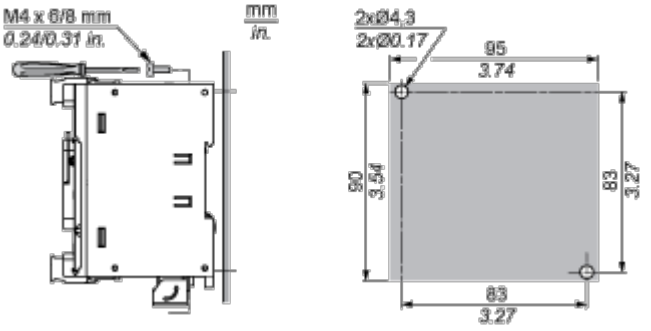


## Direct Mounting on a Panel Surface



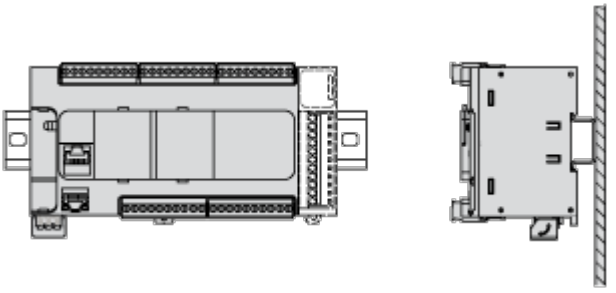

(1) Install a mounting strip

## Mounting Hole Layout

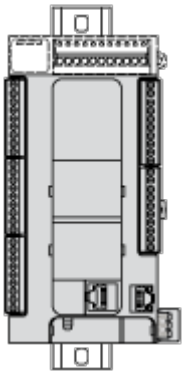


## Mounting

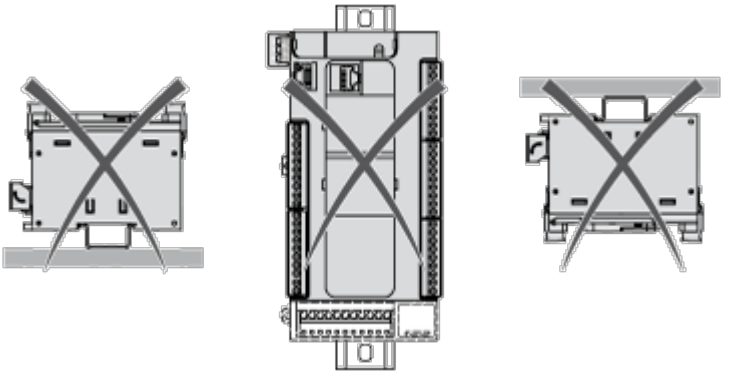
### Correct Mounting Position



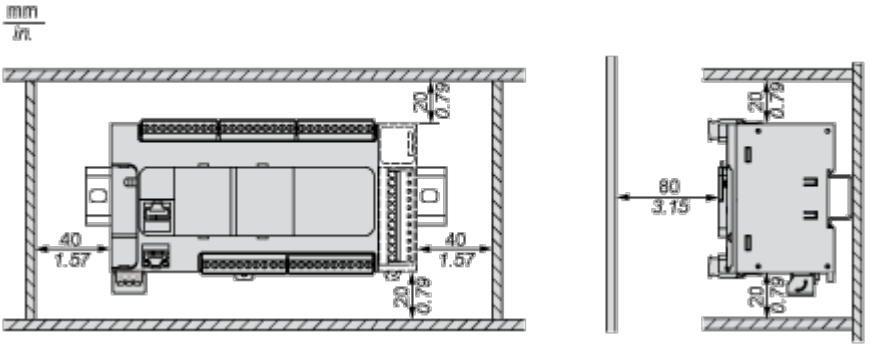
### Acceptable Mounting Position



### Incorrect Mounting Position



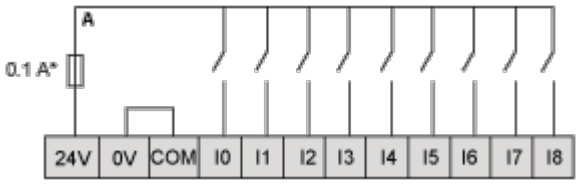
## Clearance



Connections and Schema

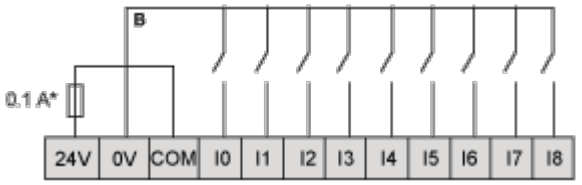
## Digital Inputs

### Wiring Diagram (Positive Logic)



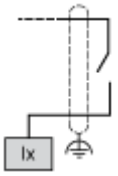

(*) Type T fuse

### Wiring Diagram (Negative Logic)




(*) Type T fuse

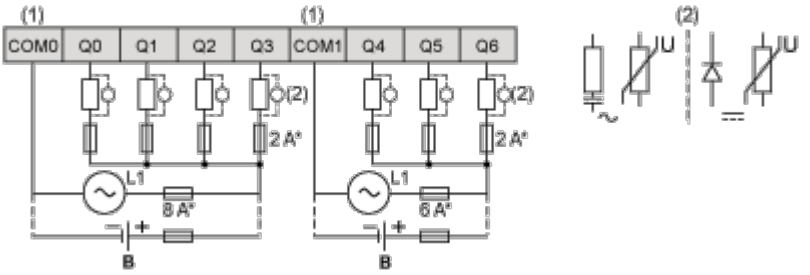
### Connection of the Fast Inputs




I0, I1, I6, I7

## Relay Outputs

### Negative Logic (Sink)



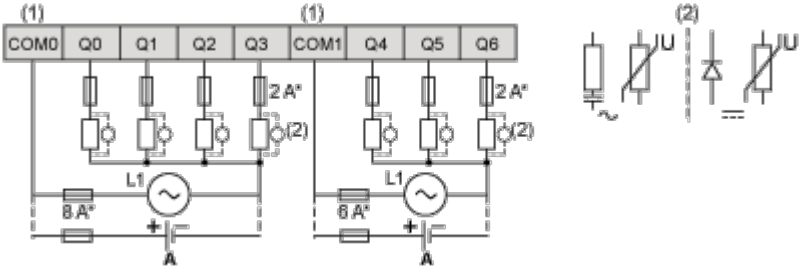

(*) Type T fuse

(1) The COM1 and COM2 terminals are not connected internally.

(2) To improve the life time of the contacts, and to protect from potential inductive load damage, you must connect a free wheeling diode in parallel to each inductive DC load or an RC snubber in parallel of each inductive AC load

B Sink wiring (negative logic)

### Positive Logic (Source)



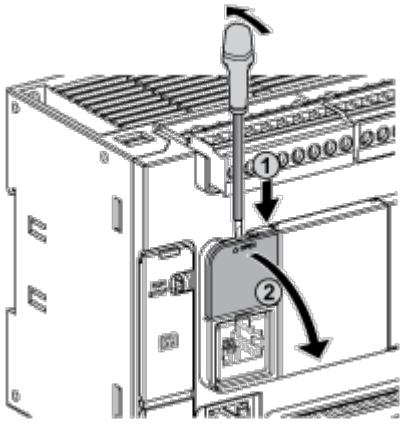

(*) Type T fuse

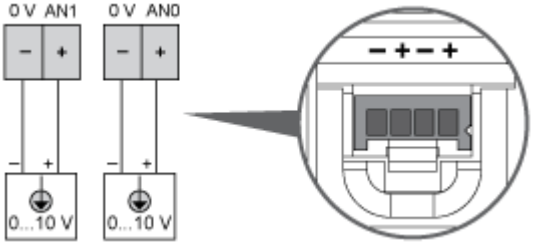
(1) The COM1 and COM2 terminals are not connected internally.

(2) To improve the life time of the contacts, and to protect from potential inductive load damage, you must connect a free wheeling diode in parallel to each inductive DC load or an RC snubber in parallel of each inductive AC load

A Source wiring (positive logic)

## Analog Inputs

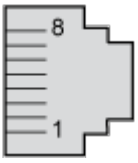


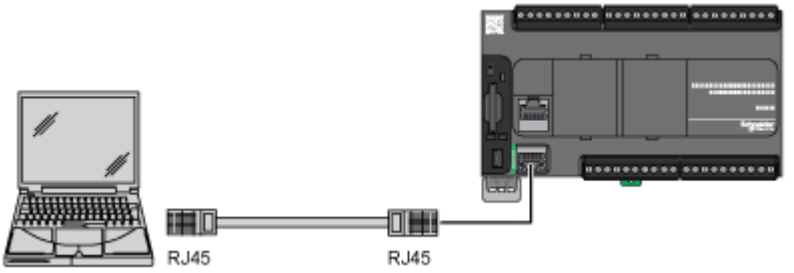

The (-) poles are connected internally.

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

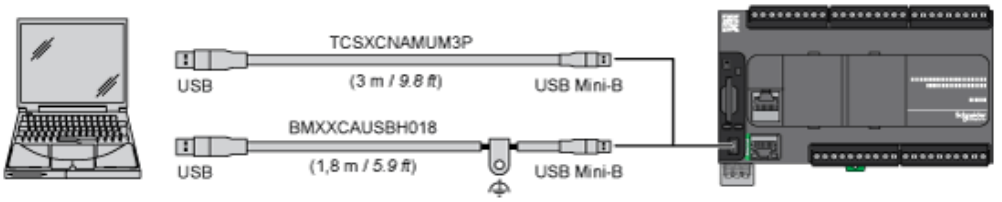
## Ethernet Connection



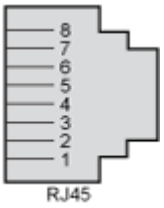

| Pin N° | Signal |
|---|---|
| 1 | TD+ |
| 2 | TD- |
| 3 | RD+ |
| 4 | - |
| 5 | - |
| 6 | RD- |
| 7 | - |
| 8 | - |



## USB Mini-B Connection



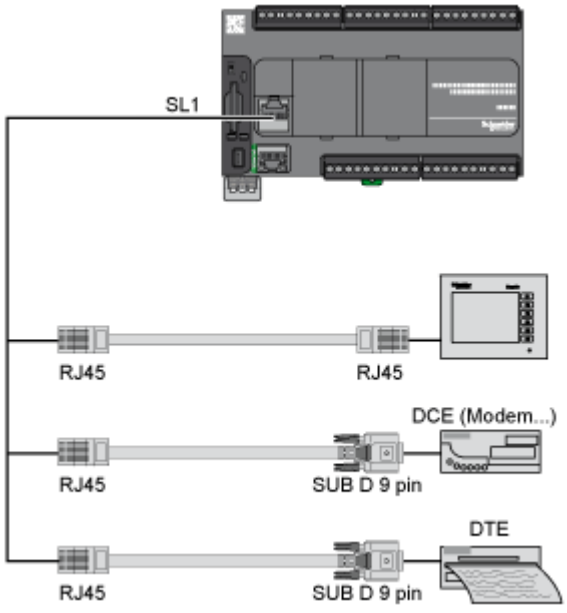
## SL1 Connection




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 |

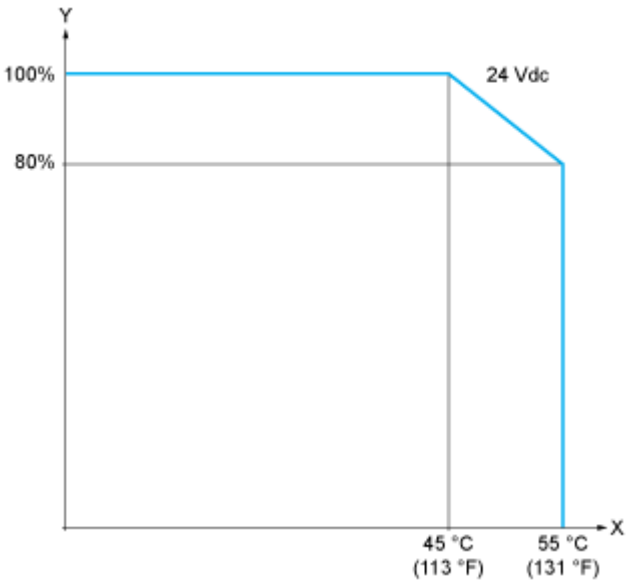
N.C.: not connected
* : 5 Vdc delivered by the controller. Do not connect.



Performance Curves

## Derating Curves

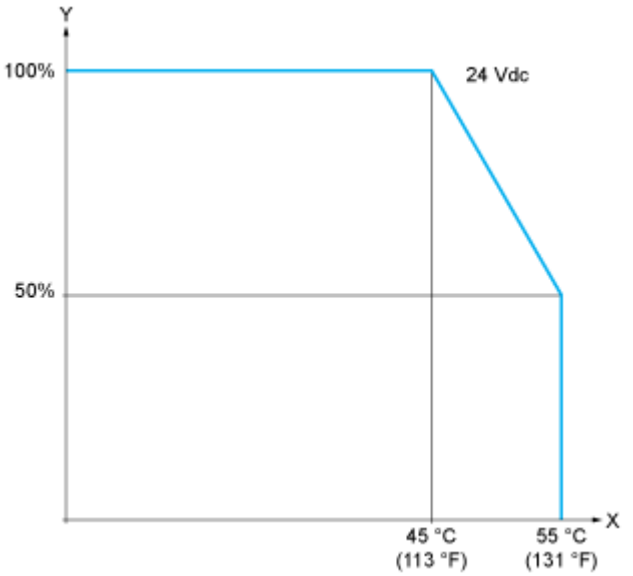
### Embedded Digital Inputs (No Cartridge)




X : Ambient temperature

Y : Input simultaneous ON ratio

### Embedded Digital Inputs (with Cartridge)




X : Ambient temperature

Y : Input simultaneous ON ratio