# Product data sheet

Specifications



## logic controller, Modicon M221, 40 IO, relay

TM221C40R

**Product availability: Stock - Normally stocked in distribution facility**

## Main

| | |
|---|---|
| **Range of Product** | Modicon M221 |
| **Product or Component Type** | Logic controller |
| **[Us] rated supply voltage** | 100...240 V AC |
| **Discrete input number** | 24, discrete input IEC 61131-2 Type 1 |
| **Analogue input number** | 2 0...10 V |
| **Discrete output type** | Relay normally open |
| **Discrete output number** | 16 relay |
| **Discrete output voltage** | 5...125 V DC<br>5...250 V AC |
| **Discrete output current** | 2 A |

## Complementary

| | |
|---|---|
| **Discrete I/O number** | 40 |
| **Maximum number of I/O expansion module** | 7 (local I/O-Architecture)<br>14 (remote I/O-Architecture) |
| **Supply voltage limits** | 85…264 V |
| **Network Frequency** | 50/60 Hz |
| **Inrush current** | 40 A |
| **Maximum power consumption in VA** | 67 VA 100...240 V with max number of I/O expansion module<br>37 VA 100...240 V without I/O expansion module |
| **Power supply output current** | 0.52 A 5 V expansion bus<br>0.24 A 24 V 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 analog input |
| **Permitted overload on inputs** | +/- 30 V DC 5 min maximum)analog input<br>+/- 13 V DC permanent)analog input |
| **Voltage state 1 guaranteed** | >= 15 V input |
| **Voltage state 0 guaranteed** | <= 5 V input |
| **Discrete input current** | 7 mA discrete input<br>5 mA fast input |

Price is “List Price” and may be subject to a trade discount – check with your local distributor or retailer for actual price.

Disclaimer: This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications

| | |
|---|---|
| **Input impedance** | 3.4 kOhm discrete input<br>100 kOhm analog input<br>4.9 kOhm fast input |
| **Response time** | 35 µs turn-off, I2...I5 input<br>10 ms turn-on output<br>10 ms turn-off output<br>5 µs turn-on, I0, I1, I6, I7 fast input<br>35 µs turn-on, other terminals input<br>5 µs turn-off, I0, I1, I6, I7 fast input<br>100 µs turn-off, other terminals input |
| **Configurable filtering time** | 0 ms input<br>3 ms input<br>12 ms input |
| **Output voltage limits** | 125 V DC<br>277 V AC |
| **Maximum current per output common** | 7 A |
| **Absolute accuracy error** | +/- 1 % of full scale 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 relay output |
| **Minimum load** | 1 mA 5 V DC relay output |
| **Protection type** | Without protection 5 A |
| **Reset time** | 1 s |
| **Memory capacity** | 256 kB user application and data RAM 10000 instructions<br>256 kB internal variables RAM |
| **Data backed up** | 256 kB built-in flash memory 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 77 °F (25 °C) by interruption of power supply) |
| **Execution time for 1 KInstruction** | 0.3 ms 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** | 512 %M memory bits<br>512 %KW constant words<br>8000 %MW memory words<br>255 %C counters<br>255 %TM timers |
| **Realtime clock** | With |
| **Clock drift** | <= 30 s/month 77 °F (25 °C) |
| **Regulation loop** | Adjustable PID regulator up to 14 simultaneous loops |
| **Counting input number** | 4 fast input (HSC mode) 100 kHz 32 bits |

| | |
|---|---|
| **counter function** | Single phase<br>Pulse/direction<br>A/B |
| **Integrated connection type** | USB port mini B USB 2.0<br>Non isolated serial link serial 1 RJ45 RS485<br>Non isolated serial link serial 2 RJ45 RS232/RS485 |
| **Supply** | Serial)serial link supply 5 V, <200 mA |
| **Transmission rate** | 1.2...115.2 kbit/s (115.2 kbit/s by default) 49.2 ft (15 m) RS485<br>1.2...115.2 kbit/s (115.2 kbit/s by default) 9.8 ft (3 m) RS232<br>480 Mbit/s USB |
| **Communication port protocol** | USB port USB - SoMachine-Network<br>Non isolated serial link Modbus master/slave - RTU/ASCII or SoMachine-Network |
| **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 (green) for SL1<br>1 LED (green) for SL2<br>1 LED per channel (green) for I/O state |
| **Electrical connection** | removable screw terminal block for inputs<br>removable screw terminal block for outputs<br>terminal block, 3 for connecting the 24 V DC power supply<br>connector, 4 for analogue inputs<br>Mini B USB 2.0 connector for a programming terminal |
| **Maximum cable distance between devices** | Shielded cable <32.8 ft (10 m) fast input<br>Unshielded cable <98.4 ft (30 m) output<br>Unshielded cable <98.4 ft (30 m) digital input<br>Unshielded cable <3.3 ft (1 m) analog input |
| **Insulation** | Between input and internal logic 500 V AC<br>Non-insulated between analogue input and internal logic<br>Non-insulated between analogue inputs<br>Between supply and ground 1500 V AC<br>Between sensor power supply and ground 500 V AC<br>Between input and ground 500 V AC<br>Between output and ground 1500 V AC<br>Between supply and internal logic 2300 V AC<br>Between sensor power supply and internal logic 500 V AC<br>Between output and internal logic 2300 V AC<br>Between Ethernet terminal and internal logic 500 V AC<br>Between supply and sensor power supply 2300 V AC |
| **Marking** | CE |
| **Sensor power supply** | 24 V DC 250 mA supplied by the controller |
| **Mounting support** | Top hat type TH35-15 rail IEC 60715<br>Top hat type TH35-7.5 rail IEC 60715<br>plate or panel with fixing kit |
| **Height** | 3.5 in (90 mm) |
| **Depth** | 2.8 in (70 mm) |
| **Width** | 6.3 in (160 mm) |
| **Net Weight** | 1.005 lb(US) (0.456 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** | RCM<br>LR<br>cULus<br>DNV-GL<br>ABS<br>EAC<br>CE<br>UKCA<br>cULus HazLoc |
| **Environmental characteristic** | Ordinary and hazardous location |
| **Resistance to electrostatic discharge** | 8 kV in air IEC 61000-4-2<br>4 kV on contact IEC 61000-4-2 |
| **Resistance to electromagnetic fields** | 9.1 V/m (10 V/m) 80 MHz...1 GHz IEC 61000-4-3<br>2.7 V/m (3 V/m) 1.4 GHz...2 GHz IEC 61000-4-3<br>0.9 V/m (1 V/m) 2...2.7 GHz IEC 61000-4-3 |
| **Resistance to magnetic fields** | 98.4 A/m (30 A/m) 50/60 Hz IEC 61000-4-8 |
| **Resistance to fast transients** | 2 kV IEC 61000-4-4 power lines)<br>2 kV IEC 61000-4-4 relay output)<br>1 kV IEC 61000-4-4 I/O)<br>1 kV IEC 61000-4-4 Ethernet line)<br>1 kV IEC 61000-4-4 serial link) |
| **Surge withstand** | 2 kV power lines (AC) common mode IEC 61000-4-5<br>2 kV relay output common mode IEC 61000-4-5<br>1 kV I/O common mode IEC 61000-4-5<br>1 kV shielded cable common mode IEC 61000-4-5<br>0.5 kV power lines (DC) differential mode IEC 61000-4-5<br>1 kV power lines (AC) differential mode IEC 61000-4-5<br>1 kV relay output differential mode IEC 61000-4-5<br>0.5 kV power lines (DC) common mode IEC 61000-4-5 |
| **Resistance to conducted disturbances** | 10 V 0.15...80 MHz IEC 61000-4-6<br>3 V 0.1...80 MHz 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) Marine specification (LR, ABS, DNV, GL) |
| **Electromagnetic emission** | Conducted emissions 79 dBµV/m QP/66 dBµV/m AV power lines (AC))0.15…0.5 MHz IEC 55011<br>Conducted emissions 73 dBµV/m QP/60 dBµV/m AV power lines (AC))0.5…300 MHz IEC 55011<br>Conducted emissions 120...69 dBµV/m QP power lines)10…150 kHz IEC 55011<br>Conducted emissions 63 dBµV/m QP power lines)1.5…30 MHz IEC 55011<br>Radiated emissions 40 dBµV/m QP class A 10 m)30…230 MHz IEC 55011<br>Conducted emissions 79...63 dBµV/m QP power lines)150…1500 kHz IEC 55011<br>Radiated emissions 47 dBµV/m QP class A 10 m)200…1000 MHz IEC 55011 |
| **Immunity to microbreaks** | 10 ms |
| **Ambient air temperature for operation** | 14…131 °F (-10…55 °C) horizontal installation)<br>14…95 °F (-10…35 °C) vertical installation) |
| **Ambient Air Temperature for Storage** | -13…158 °F (-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...6561.68 ft (0...2000 m) |
| **Storage altitude** | 0…9842.5 ft (0…3000 m) |
| **Vibration resistance** | 3.5 mm 5…8.4 Hz symmetrical rail<br>3.5 mm 5…8.4 Hz panel mounting<br>1 gn 8.4…150 Hz symmetrical rail<br>1 gn 8.4…150 Hz panel mounting |
| **Shock resistance** | 98 m/s² 11 ms |

# Ordering and shipping details

| | |
|---|---|
| **Category** | US10MSX22533 |
| **Discount Schedule** | 0MSX |
| **GTIN** | 3606480648731 |
| **Returnability** | Yes |
| **Country of origin** | TW |

## Packing Units

| | |
|---|---|
| **Unit Type of Package 1** | PCE |
| **Nbr. of units in pkg.** | 1 |
| **Package 1 Height** | 4.331 in (11.000 cm) |
| **Package 1 Width** | 5.512 in (14.000 cm) |
| **Package 1 Length** | 8.268 in (21.000 cm) |
| **Package weight(Lbs)** | 28.924 oz (820.000 g) |
| **Unit Type of Package 2** | S04 |
| **Number of Units in Package 2** | 12 |
| **Package 2 Height** | 11.811 in (30.000 cm) |
| **Package 2 Width** | 15.748 in (40.000 cm) |
| **Package 2 Length** | 23.622 in (60.000 cm) |
| **Package 2 Weight** | 25.0004 lb(US) (11.340 kg) |
| **Unit Type of Package 3** | P12 |
| **Number of Units in Package 3** | 144 |
| **Package 3 Height** | 41.339 in (105.000 cm) |
| **Package 3 Width** | 31.496 in (80.000 cm) |
| **Package 3 Length** | 47.244 in (120.000 cm) |
| **Package 3 Weight** | 321.875 lb(US) (146.000 kg) |

## Contractual warranty

| | |
|---|---|
| **Warranty (in months)** | 18 |

## Environmental Data

Schneider Electric aims to achieve Net Zero status by 2050 through supply chain partnerships, lower impact materials, and circularity via our ongoing “Use Better, Use Longer, Use Again” campaign to extend product lifetimes and recyclability.

Environmental Data explained >

How we assess product sustainability >

### Environmental footprint

| | |
|---|---|
| Total lifecycle Carbon footprint | **115 kg CO2 eq.** |
| Carbon footprint of the manufacturing phase [A1 to A3] | **27 kg CO2 eq.** |
| Carbon footprint of the distribution phase [A4] | **2 kg CO2 eq.** |
| Carbon footprint of the installation phase [A5] | **0 kg CO2 eq.** |
| Carbon footprint of the use phase [B2, B3, B4, B6] | **84 kg CO2 eq.** |
| Carbon footprint of the end-of-life phase [C1 to C4] | **2 kg CO2 eq.** |
| Environmental Disclosure | **Product Environmental Profile** |

## Use Better

### Materials and Substances

| | |
|---|---|
| Packaging made with recycled cardboard | **Yes** |
| Packaging without single use plastic | **No** |
| EU RoHS Directive | **Compliant By Exemption** |
| REACh Regulation | **Reference contains Substances of Very High Concern above the threshold** |
| California proposition 65 | **WARNING: This product can expose you to chemicals including: Lead and lead compounds, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov** |
| PVC free | **Yes** |

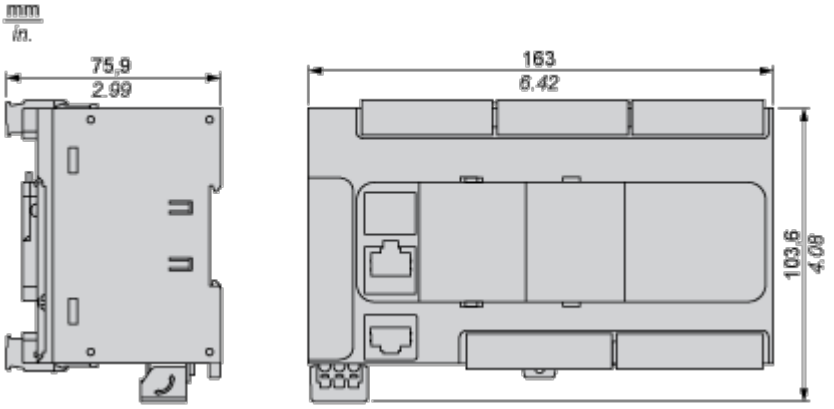
## Use Again

### Repack and remanufacture

| | |
|---|---|
| Recyclability potential, in % | **0** |
| Circularity Profile | **End of Life Information** |
| Take-back | **No** |
| WEEE Label | **The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins.** |

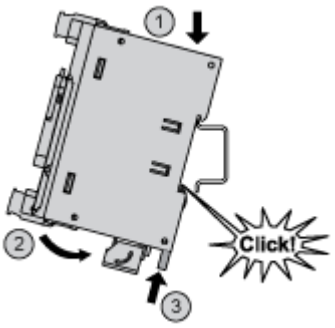
Dimensions Drawings

## Dimensions

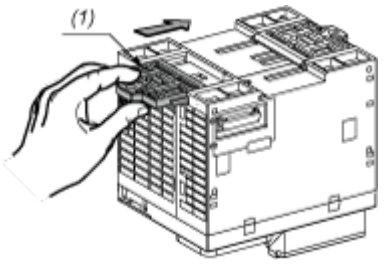


Mounting and Clearance

## Mounting on a Rail

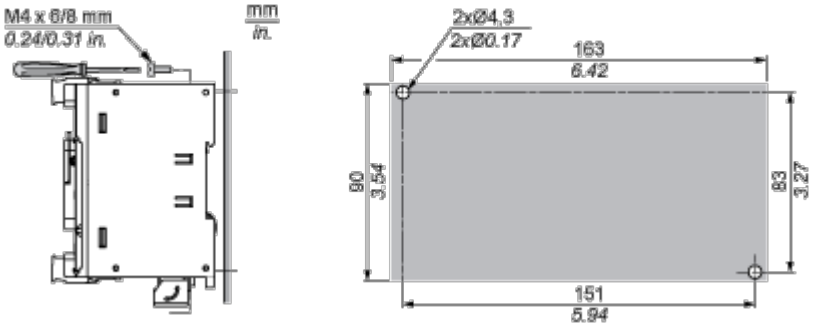


## Direct Mounting on a Panel Surface



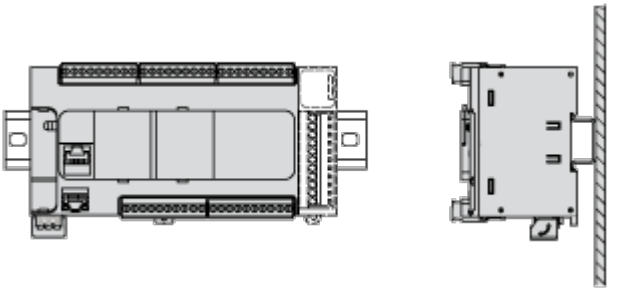

(1) Install a mounting strip

## Mounting Hole Layout

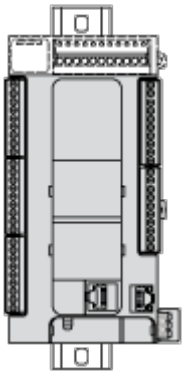


## Mounting

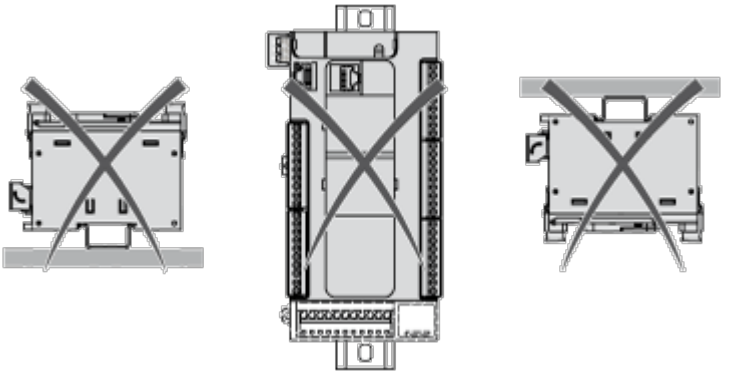
### Correct Mounting Position



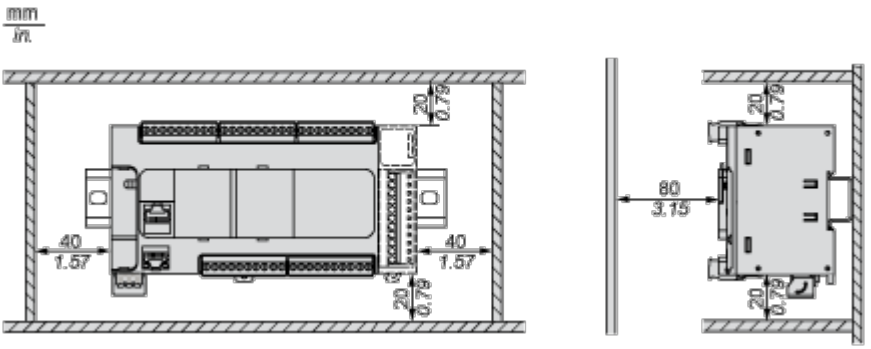
### Acceptable Mounting Position



### Incorrect Mounting Position



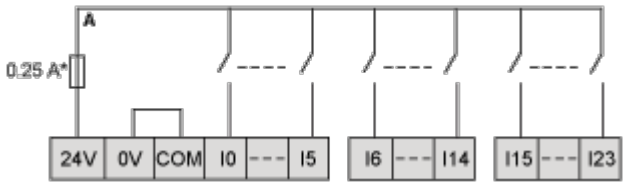
## Clearance



Connections and Schema

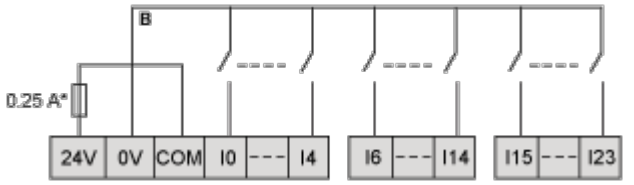
## Digital Inputs

### Wiring Diagram (Positive Logic)



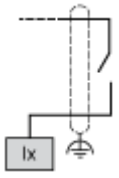

(*) Type T fuse

### Wiring Diagram (Negative Logic)




(*) Type T fuse

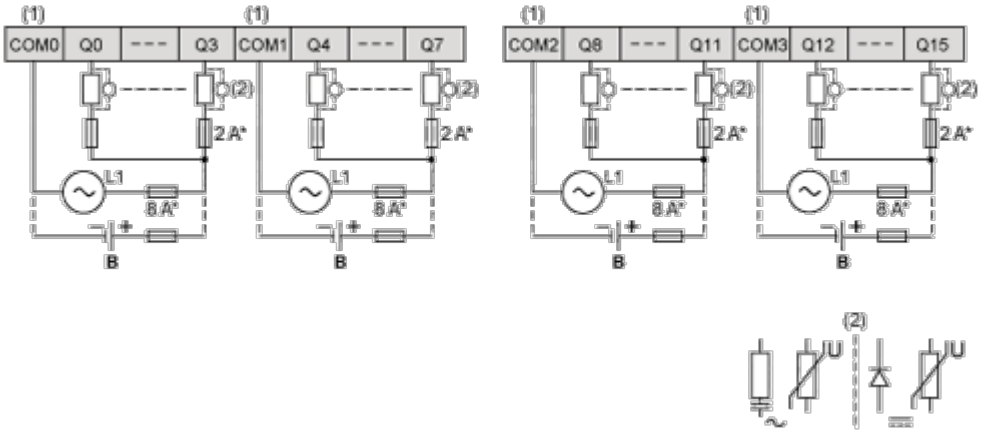
### Connection of the Fast Inputs




I0, I1, I6, I7

## Relay Outputs

### Negative Logic (Sink)



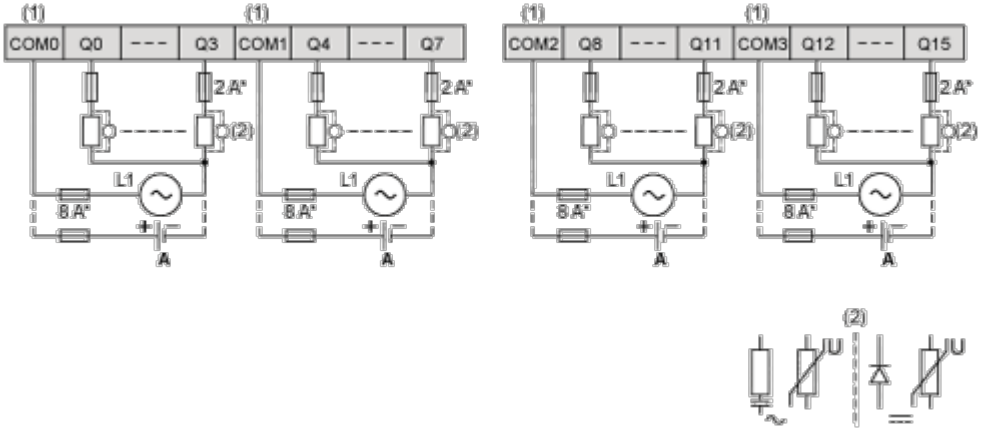

(*) Type T fuse

(1) The COM0, COM1, COM2 and COM3 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)



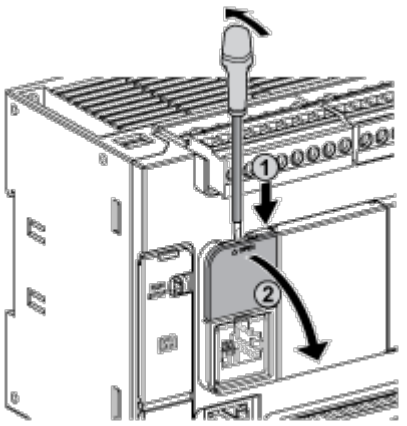

(*) Type T fuse

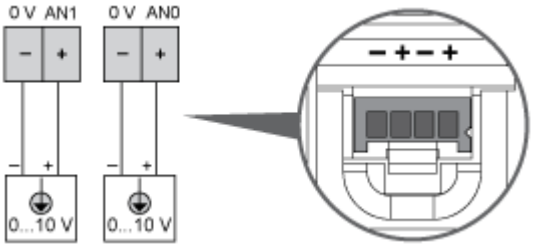
(1) The COM0, COM1, COM2 and COM3 terminals are not connected internally.

(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

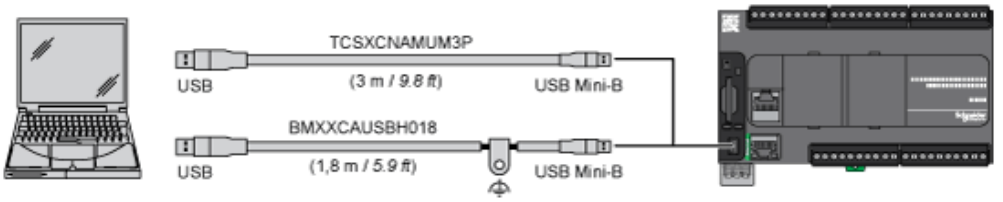


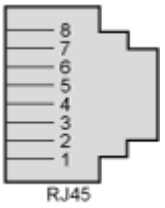

The (-) poles are connected internally.

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

## USB Mini-B Connection



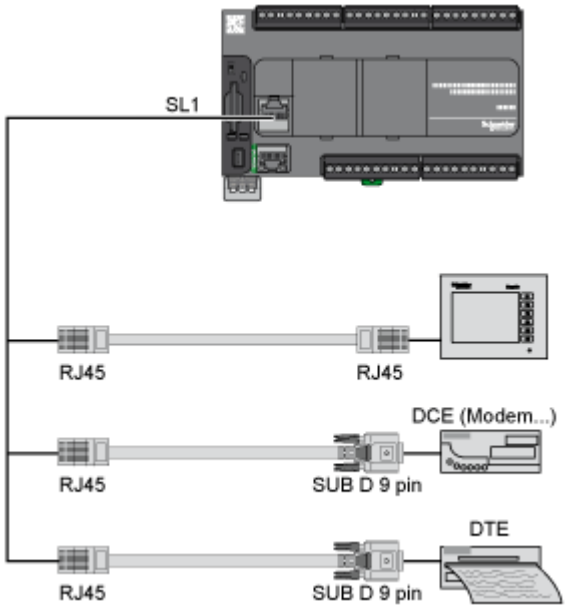
## SL1 Connection



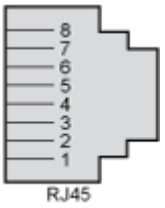

SL1

| 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.



## SL2 Connection



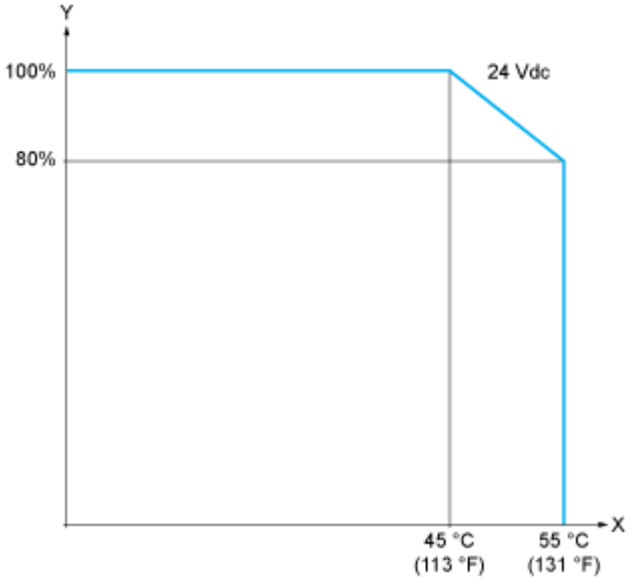

| N ° | RS 485 |
|---|---|
| 1 | N.C. |
| 2 | N.C. |
| 3 | N.C. |
| 4 | D1 |
| 5 | D0 |
| 6 | N.C. |
| 7 | N.C. |
| 8 | Common |

N.C.: not connected

Performance Curves

## Derating Curves

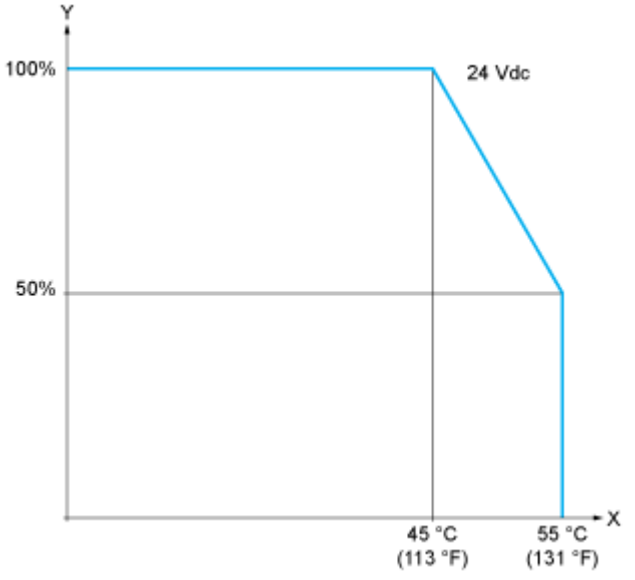
### Embedded Digital Inputs (No Cartridge)




X : Ambient temperature

Y : Input simultaneous ON ratio

### Embedded Digital Inputs (with Cartridge)




X : Ambient temperature

Y : Input simultaneous ON ratio