



### Main

|                           |  |
|---------------------------|--|
| Range of product          | Modicon M221                                       |
| Product or component type | Logic controller                                   |
| [Us] rated supply voltage | 100...240 V AC                                     |
| Discrete input number     | 14 discrete input conforming to IEC 61131-2 Type 1 |
| Analogue input number     | 2 at input range: 0...10 V                         |
| Discrete output type      | Relay normally open                                |
| Discrete output number    | 10 relay   |
| Discrete output voltage   | 5...125 V DC<br>5...250 V AC                       |
| Discrete output current   | 2 A  |

### Complementary

|                                |  |
|--------------------------------|--|
| Discrete I/O number            | 24   |
| Number of I/O expansion module | <= 7 for transistor output<br><= 7 for relay output  |
| Supply voltage limits          | 85...264 V   |
| Network frequency              | 50/60 Hz   |
| Inrush current                 | <= 40 A  |
| Power consumption in VA        | <= 58 VA at 100...240 V with max number of I/O expansion module<br><= 35 VA at 100...240 V without I/O expansion module  |
| Power supply output current    | 0.52 A at 5 V for expansion bus<br>0.16 A at 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 analog input  |
| Permitted overload on inputs   | +/- 30 V DC for analog input with 5 min maximum<br>+/- 13 V DC for analog input permanent  |
| Voltage state1 guaranteed      | >= 15 V for input  |
| Current state 1 guaranteed     | >= 2.6 mA for fast input<br>>= 4.2 mA for discrete input   |
| Voltage state 0 guaranteed     | <= 5 V for input   |
| Current state 0 guaranteed     | <= 1.3 mA for discrete input<br><= 0.6 mA for fast input   |
| Discrete input current         | 7 mA for discrete input<br>5 mA for fast input   |
| Input impedance                | 4.9 kOhm for fast input<br>3.4 kOhm for discrete input<br>100 kOhm for analog input  |
| Response time                  | 10 ms turn-on operation for output<br>35 µs turn-off operation for input; I2...I5 terminal<br>35 µs turn-off operation for input; I2...I5 terminal<br>10 ms turn-off operation for output<br>5 µs turn-on operation for fast input; I0, I1, I6, I7 terminal<br>35 µs turn-on operation for input; other terminals terminal<br>5 µs turn-off operation for fast input; I0, I1, I6, I7 terminal<br>100 µs turn-off operation for input; other terminals terminal |
| Configurable filtering time    | 0 ms for input<br>12 ms for input  |

|                                   |   |
|-----------------------------------|---|
|                                   | 3 ms for input  |
| Output voltage limits             | 125 V DC<br>277 V AC  |
| Current per output common         | 4 A at COM 2 terminal<br>4 A at COM 2 terminal<br>7 A at COM 0 terminal<br>7 A at COM 1 terminal  |
| Absolute accuracy error           | +/- 1 % of full scale for analog input  |
| Electrical durability             | Inductive AC-15, (cos phi = 0.35) 240 V / 120 VA : 100000 cycles<br>Resistive DC-12, 24 V / 48 W : 100000 cycles<br>Resistive AC-12, 120 V / 240 VA : 100000 cycles<br>Inductive AC-15, (cos phi = 0.35) 240 V / 36 VA : 300000 cycles<br>Resistive AC-12, 120 V / 80 VA : 300000 cycles<br>Inductive (L/R = 7 ms) DC-13, 24 V / 24 W : 100000 cycles<br>Resistive DC-12, 24 V / 16 W : 300000 cycles<br>Inductive (L/R = 7 ms) DC-13, 24 V / 7.2 W : 300000 cycles<br>Inductive AC-14, (cos phi = 0.7) 240 V / 240 VA : 100000 cycles<br>Inductive AC-15, (cos phi = 0.35) 120 V / 60 VA : 100000 cycles<br>Inductive AC-14, (cos phi = 0.7) 240 V / 72 VA : 300000 cycles<br>Inductive AC-15, (cos phi = 0.35) 120 V / 18 VA : 300000 cycles<br>Resistive AC-12, 240 V / 480 VA : 100000 cycles<br>Inductive AC-14, (cos phi = 0.7) 120 V / 120 VA : 100000 cycles<br>Resistive AC-12, 240 V / 160 VA : 300000 cycles<br>Inductive AC-14, (cos phi = 0.7) 120 V / 36 VA : 300000 cycles |
| 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 lithium non-rechargeable, battery life: 4 yr   |
| 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      | 512 %M memory bits<br>8000 %MW memory words<br>512 %KW constant words<br>255 %TM timers<br>255 %C counters  |
| 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) (counting frequency: 100 kHz), counting capacity: 32 bits   |
| Control signal type               | A/B<br>Pulse/direction<br>Single phase  |
| Integrated connection type        | USB port with connector mini B USB 2.0<br>Ethernet with connector RJ45<br>Non isolated serial link "serial 1" with connector RJ45 and interface RS232/RS485   |
| Supply                            | Serial serial link supply at 5 V 200 mA   |
| Transmission rate                 | 1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 15 m - communication protocol: RS485<br>1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 3 m - communication protocol: RS232<br>480 Mbit/s - communication protocol: USB   |
| Communication port protocol       | USB port : USB protocol - SoMachine-Network<br>Non isolated serial link : Modbus protocol master/slave - RTU/ASCII or SoMachine-Network<br>: Ethernet protocol  |
| 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   |

|                       |   |
|-----------------------|---|
| Local signalling      | 1 LED red for module error (ERR)<br>1 LED green for PWR<br>1 LED green for RUN<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 | Mini B USB 2.0 connector for a programming terminal<br>Terminal block, 3 terminal(s) for connecting the 24 V DC power supply<br>Connector, 4 terminal(s) for analogue inputs<br>Removable screw terminal block for inputs<br>Removable screw terminal block for outputs   |
| Cable length          | <= 10 m shielded cable for fast input<br><= 10 m shielded cable for fast input<br><= 30 m unshielded cable for output<br><= 30 m unshielded cable for digital input<br><= 1 m unshielded cable for analog input   |
| Insulation            | 2300 V AC between output and internal logic<br>Non-insulated between analogue inputs<br>500 V AC between input and internal logic<br>Non-insulated between analogue input and internal logic<br>1500 V AC between supply and ground<br>500 V AC between sensor power supply and ground<br>500 V AC between input and ground<br>1500 V AC between output and ground<br>2300 V AC between supply and internal logic<br>500 V AC between sensor power supply and internal logic<br>500 V AC between Ethernet terminal and internal logic<br>2300 V AC between supply and sensor power supply |
| Marking               | CE  |
| Sensor power supply   | 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                 | 110 mm  |
| Product weight        | 0.395 kg  |

## Environment

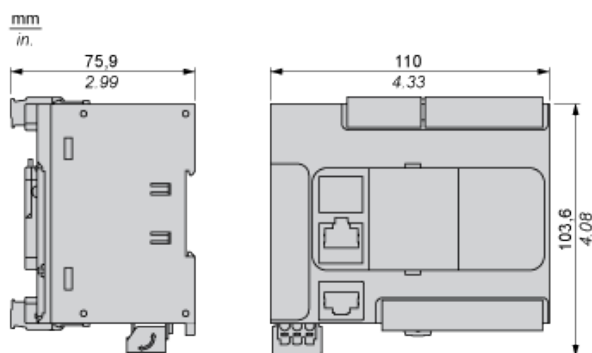
|                                       |  |
|---------------------------------------|--|
| standards                             | EN/IEC 60664-1<br>EN/IEC 61131-2<br>EN/IEC 61010-2-201   |
| product certifications                | ABS<br>CSA<br>CULus<br>LR<br>IACS E10<br>RCM<br>EAC<br>DNV-GL  |
| environmental characteristic          | Ordinary and hazardous location  |
| resistance to electrostatic discharge | 4 kV on contact conforming to EN/IEC 61000-4-2<br>8 kV in air conforming to EN/IEC 61000-4-2   |
| resistance to electromagnetic fields  | 10 V/m ( 80 MHz...1 GHz) conforming to EN/IEC 61000-4-3<br>3 V/m ( 1.4 GHz...2 GHz) conforming to EN/IEC 61000-4-3<br>1 V/m ( 2...2.7 GHz) conforming to EN/IEC 61000-4-3  |
| resistance to magnetic fields         | 30 A/m at 50...60 Hz conforming to EN/IEC 61000-4-8  |
| resistance to fast transients         | 2 kV for power lines conforming to EN/IEC 61000-4-4<br>2 kV for relay output conforming to EN/IEC 61000-4-4<br>1 kV for Ethernet line conforming to EN/IEC 61000-4-4<br>1 kV for serial link conforming to EN/IEC 61000-4-4<br>1 kV for I/O conforming to EN/IEC 61000-4-4 |
| surge withstand                       | 2 kV for power lines (AC) in common mode conforming to EN/IEC 61000-4-5<br>2 kV for power lines (AC) in common mode conforming to EN/IEC 61000-4-5<br>2 kV for relay output in common mode conforming to EN/IEC 61000-4-5  |

|   |   |
|---|---|
|   | 1 kV for I/O in common mode conforming to EN/IEC 61000-4-5<br>1 kV for shielded cable in common mode conforming to EN/IEC 61000-4-5<br>0.5 kV for power lines (DC) in differential mode conforming to EN/IEC 61000-4-5<br>1 kV for power lines (AC) in differential mode conforming to EN/IEC 61000-4-5<br>1 kV for relay output in differential mode conforming to EN/IEC 61000-4-5<br>0.5 kV for power lines (DC) in common mode conforming to EN/IEC 61000-4-5   |
| resistance to conducted disturbances, induced by radio frequency fields | 10 Vrms (0.15...80 MHz) conforming to EN/IEC 61000-4-6<br>3 Vrms (0.1...80 MHz) conforming to Marine specification (LR, ABS, DNV, GL)<br>10 Vrms (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 conforming to EN/IEC 55011 power lines (AC), 0.15...0.5 MHz : 79 dBµV/m QP/66 dBµV/m AV<br>Conducted emissions conforming to EN/IEC 55011 power lines (AC), 0.5...300 MHz : 73 dBµV/m QP/60 dBµV/m AV<br>Conducted emissions conforming to EN/IEC 55011 power lines, 10...150 kHz : 120...69 dBµV/m QP<br>Conducted emissions conforming to EN/IEC 55011 power lines, 150 kHz...1.5 MHz : 79...63 dBµV/m QP<br>Conducted emissions conforming to EN/IEC 55011 power lines, 1.5...30 MHz : 63 dBµV/m QP<br>Radiated emissions conforming to EN/IEC 55011 class A 10 m, 30...230 MHz : 40 dBµV/m QP<br>Radiated emissions conforming to EN/IEC 55011 class A 10 m, 200 MHz...1 GHz : 47 dBµV/m QP |
| immunity to microbreaks   | 10 ms   |
| ambient air temperature for operation                                   | -10...55 °C for horizontal installation<br>-10...35 °C for 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 (vibration frequency: 5...8.4 Hz) on symmetrical rail<br>1 gn (vibration frequency: 8.4...150 Hz) on symmetrical rail<br>3.5 mm (vibration frequency: 5...8.4 Hz) on panel mounting<br>1 gn (vibration frequency: 8.4...150 Hz) on panel mounting  |
| shock resistance  | 98 m/s <sup>2</sup> (test wave duration: 11 ms)   |

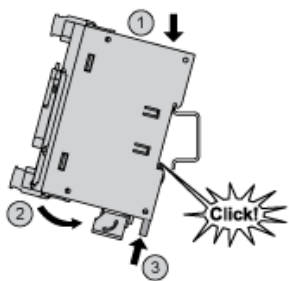
## Offer Sustainability

|                                  |   |
|----------------------------------|---|
| Sustainable offer status         | Green Premium product   |
| RoHS (date code: YYWW)           | Compliant - since 1415 - Schneider Electric declaration of conformity |
| REACH                            | Reference not containing SVHC above the threshold                     |
| Product environmental profile    | Available   |
| Product end of life instructions | Available   |

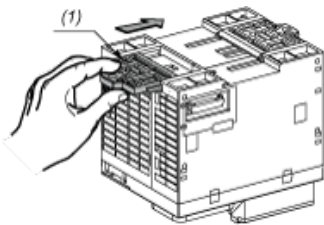
## Dimensions



## Mounting on a Rail

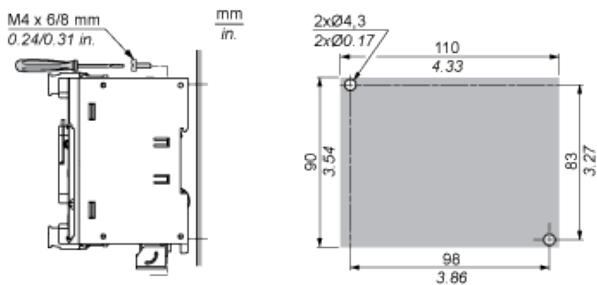


### Direct Mounting on a Panel Surface



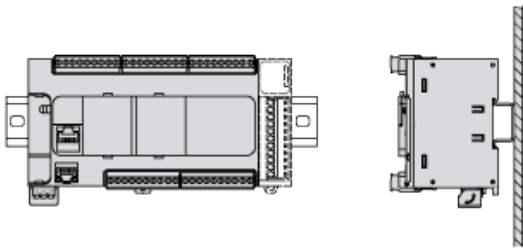
(1) Install a mounting strip

### Mounting Hole Layout

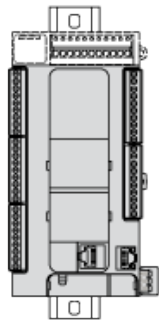


### Mounting

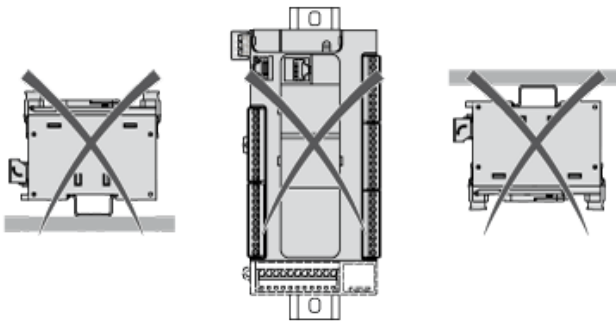
#### Correct Mounting Position



#### Acceptable Mounting Position

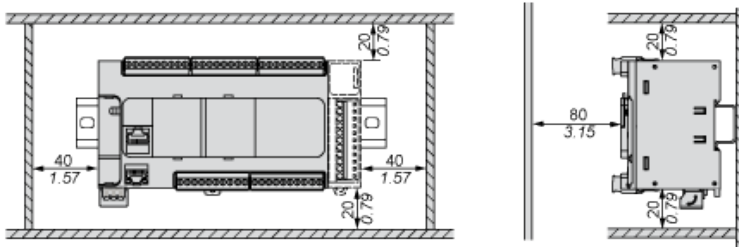


#### Incorrect Mounting Position



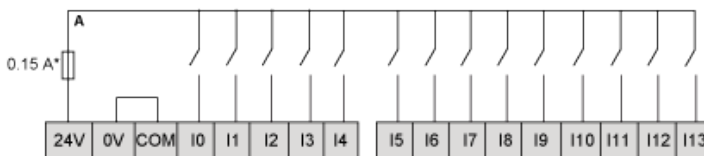
## Clearance

mm  
in.



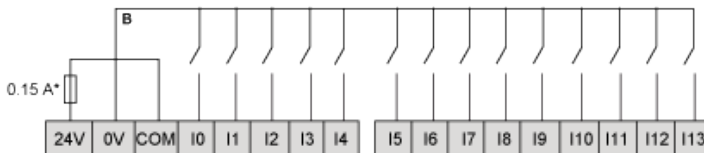
## Digital Inputs

### Wiring Diagram (Positive Logic)



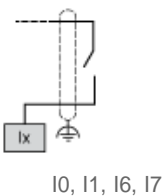
(\*) Type T fuse

### Wiring Diagram (Negative Logic)



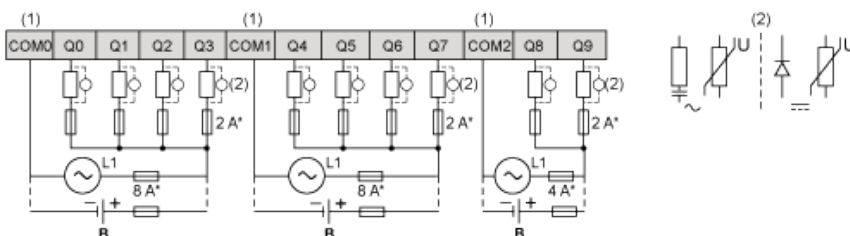
(\*) Type T fuse

### Connection of the Fast Inputs



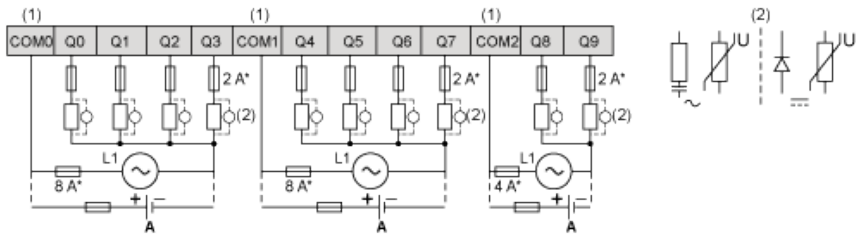
## Relay Outputs

### Negative Logic (Sink)



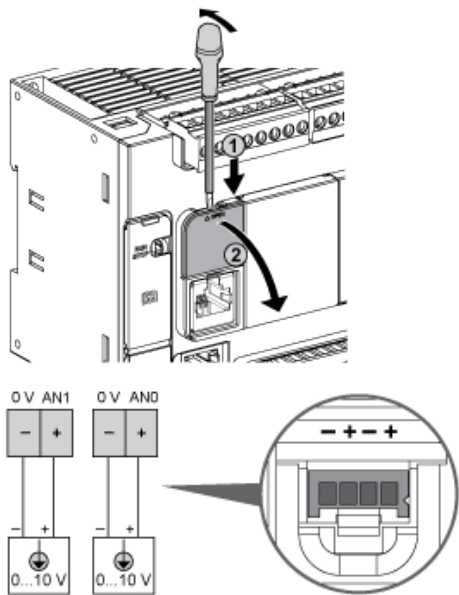
- (\*) Type T fuse
  - (1) The COM0, COM1 and COM2 terminals are not connected internally.
  - (2) To improve the life time of the contacts, and to protect from potential inductive load damage, you must connect a free wheeling diode in parallel to each inductive DC load or an RC snubber in parallel of each inductive AC load
- B Sink wiring (negative logic)**

**Positive Logic (Source)**



- (\*) Type T fuse
  - (1) The COM0, 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)**

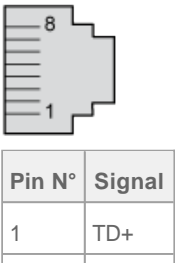
**Analog Inputs**



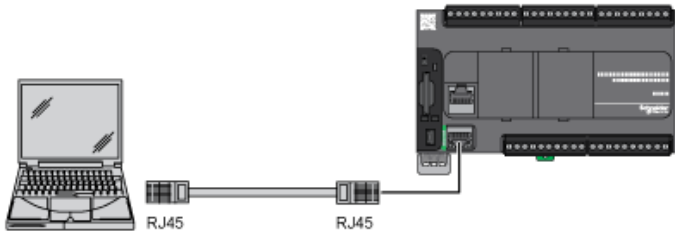
The (-) poles are connected internally.

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

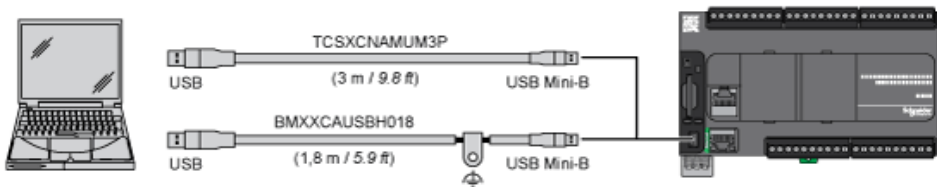
**Ethernet Connection**



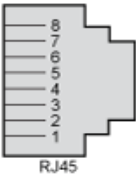
|   |     |
|---|-----|
| 2 | TD- |
| 3 | RD+ |
| 4 | -   |
| 5 | -   |
| 6 | RD- |
| 7 | -   |
| 8 | -   |



USB Mini-B Connection



SL1 Connection

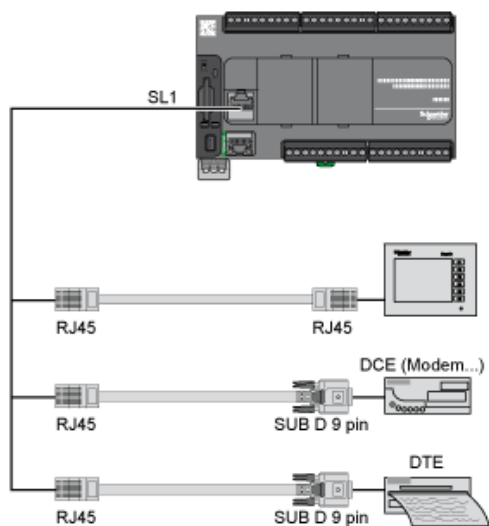


SL1

| 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 |

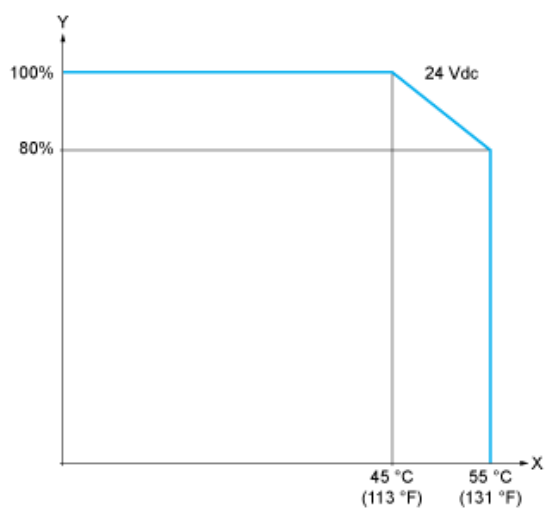
N.C.: not connected  
\* : 5 Vdc delivered by the controller. Do not connect.





## Derating Curves

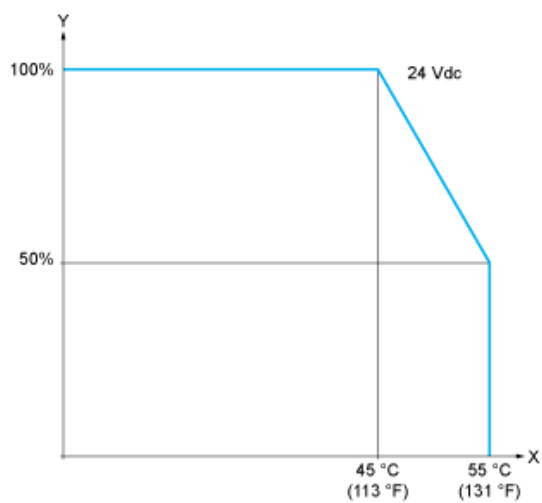
### Embedded Digital Inputs (No Cartridge)



X : Ambient temperature

Y : Input simultaneous ON ratio

### Embedded Digital Inputs (with Cartridge)



X : Ambient temperature

Y : Input simultaneous ON ratio