



### 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 conforming to IEC 61131-2 Type 1 including 4 fast input |
| Analogue input number     | 2 at input range: 0...10 V                                                |
| Discrete output type      | Transistor                                                                |
| Discrete output number    | 10 transistor including 2 fast output                                     |
| Discrete output voltage   | 24 V DC                                                                   |
| Discrete output current   | 0.5 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          | 20.4...28.8 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Inrush current                 | <= 35 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| 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 at 5 V for expansion bus<br>0.2 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 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                | 4.9 kOhm for fast input<br>3.4 kOhm for discrete input<br>100 kOhm for analog input                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Response time                  | 35 µs turn-off operation for input; I2...I5 terminal<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<br>5 µs turn-on, turn-off operation for output; Q0...Q1 terminal<br>50 µs turn-on, turn-off operation for output; Q2...Q3 terminal<br>300 µs turn-on, turn-off operation for output; other terminals terminal |
| Configurable filtering time    | 0 ms for input<br>12 ms for input<br>3 ms for input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Discrete output logic          | Positive logic (source)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Current per output common      | 5 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Output frequency               | 100 kHz for fast output (PWM/PLS mode) at Q0...Q1 terminal<br>5 kHz for output at Q2...Q3 terminal<br>0.1 kHz for output at Q4...Q9 terminal                                                                                                                                                                                                                                                                                                                                                                                            |

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. 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. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric Industries SAS nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein.

|                                   |                                                                                                                                                                                                                                                                                                             |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Absolute accuracy error           | +/- 1 % of full scale for analog input                                                                                                                                                                                                                                                                      |
| Leakage current                   | 0.1 mA for transistor output                                                                                                                                                                                                                                                                                |
| Voltage drop                      | <= 1 V                                                                                                                                                                                                                                                                                                      |
| Mechanical durability             | >= 20000000 cycles for transistor output                                                                                                                                                                                                                                                                    |
| 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<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                                                                                                                                                                                                                                                                                              |
| Ext 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                                                                                                                                                                                                                                                        |
| Positioning functions             | Position PTO 2 axe(s) pulse/direction mode (100 kHz)<br>Position PTO 1 axe(s) CW/CCW mode (100 kHz)                                                                                                                                                                                                         |
| Function available                | PWM<br>PLS<br>Frequency generator                                                                                                                                                                                                                                                                           |
| 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<br>Modbus TCP client<br>Modbus TCP slave device                                                                                                                                                                                                     |
| 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 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                     | 500 V AC between fast input and internal logic<br>Non-insulated between inputs<br>Non-insulated between analogue inputs<br>500 V AC between output and internal logic<br>500 V AC between input and internal logic<br>Non-insulated between analogue input and internal logic |
| 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                                                                                                                                                                                                                                                                        |
| Product weight                 | 0.395 kg                                                                                                                                                                                                                                                                      |

## Environment

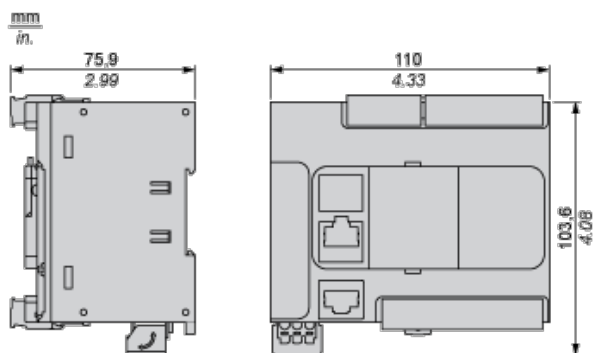
|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 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 relay output in common mode conforming to EN/IEC 61000-4-5<br>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  | 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 :<br>79 dB $\mu$ V/m QP/66 dB $\mu$ V/m AV<br>Conducted emissions conforming to EN/IEC 55011 power lines (AC), 0.5...300 MHz :<br>73 dB $\mu$ V/m QP/60 dB $\mu$ V/m AV<br>Conducted emissions conforming to EN/IEC 55011 power lines, 10...150 kHz :<br>120...69 dB $\mu$ V/m QP<br>Conducted emissions conforming to EN/IEC 55011 power lines, 1.5...30 MHz : 63 dB $\mu$ V/m QP<br>Radiated emissions conforming to EN/IEC 55011 class A 10 m, 30...230 MHz : 40 dB $\mu$ V/m QP<br>Conducted emissions conforming to EN/IEC 55011 power lines, 150...1500 kHz :<br>79...63 dB $\mu$ V/m QP<br>Radiated emissions conforming to EN/IEC 55011 class A 10 m, 200...1000 MHz : 47 dB $\mu$ V/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                      | 147 m/s <sup>2</sup> (test wave duration:11 ms)                                                                                                                                                                                                          |

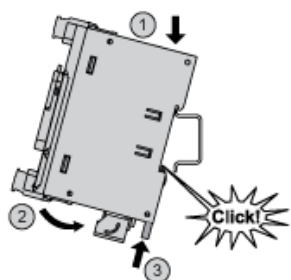
## Offer Sustainability

|                                  |                                                                       |
|----------------------------------|-----------------------------------------------------------------------|
| 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                                                             |

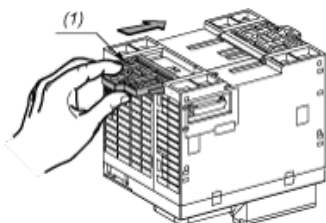
## Dimensions



## Mounting on a Rail

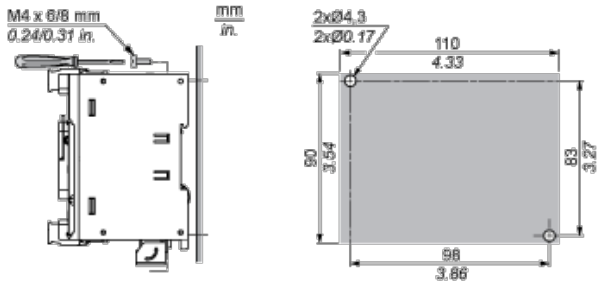


## Direct Mounting on a Panel Surface



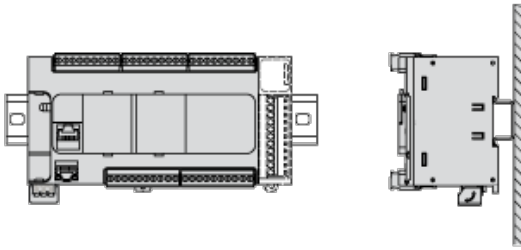
(1) Install a mounting strip

### Mounting Hole Layout

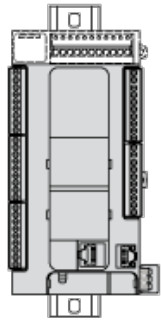


### Mounting

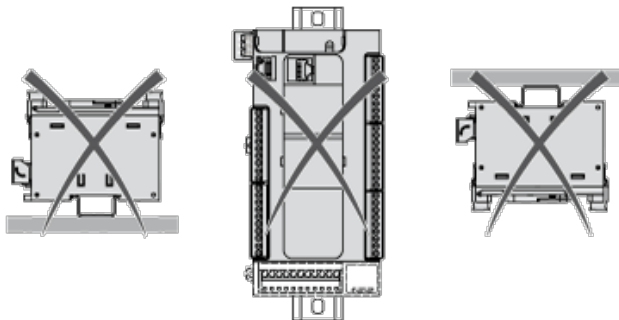
#### Correct Mounting Position



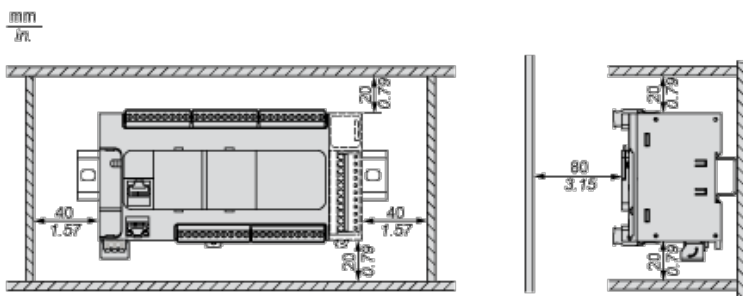
#### Acceptable Mounting Position



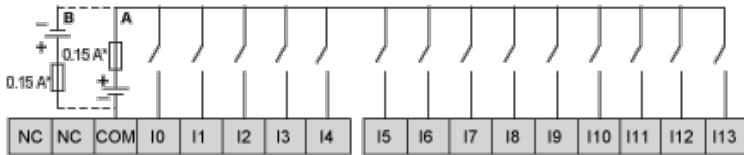
#### Incorrect Mounting Position



### Clearance

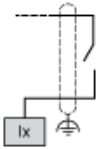


## Digital Inputs



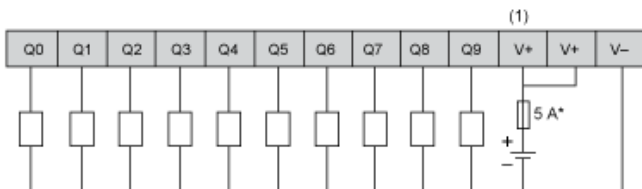
- (\*) Type T fuse
- (A) Sink wiring (positive logic).
- (B) Source wiring (negative logic).

### Connection of the Fast Inputs



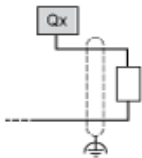
I0, I1, I6, I7

## Transistor Outputs



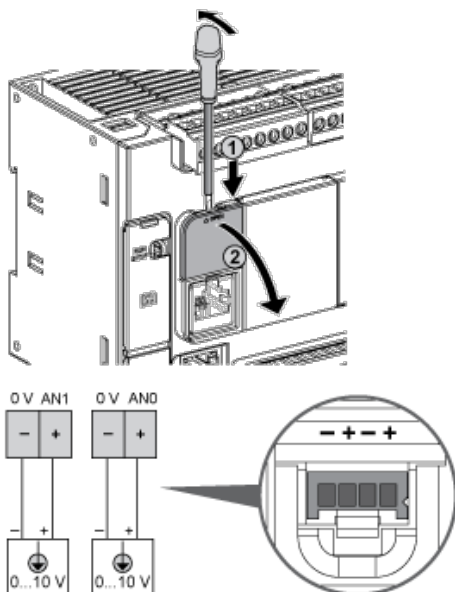
- (\*) Type T fuse
- (1) The V+ terminals are connected internally.

### Connection of the Fast Outputs



Q0, Q1

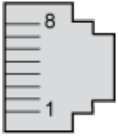
## Analog Inputs



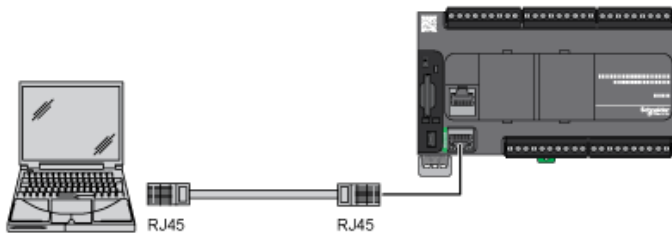
The (-) poles are connected internally.

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

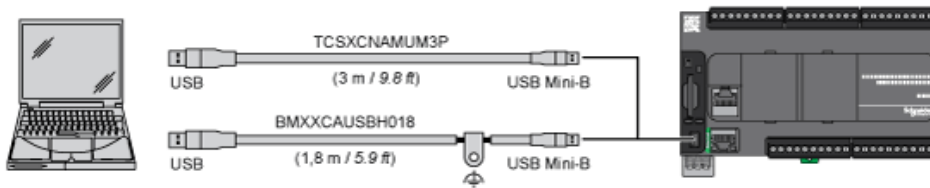
## Ethernet Connection



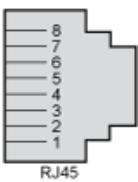
| Pin N° | Signal |
|--------|--------|
| 1      | TD+    |
| 2      | TD-    |
| 3      | RD+    |
| 4      | -      |
| 5      | -      |
| 6      | RD-    |
| 7      | -      |
| 8      | -      |



## USB Mini-B Connection



## SL1 Connection



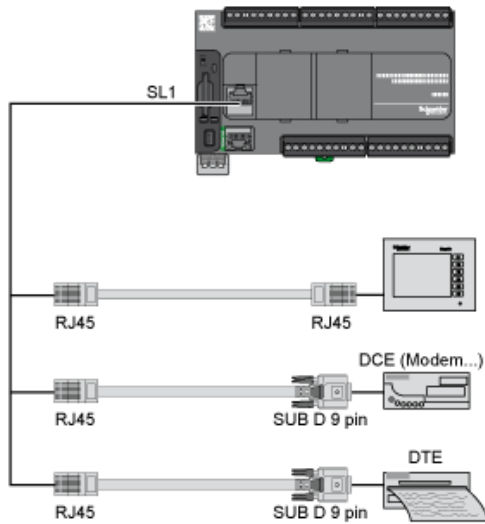
SL1

| 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 |

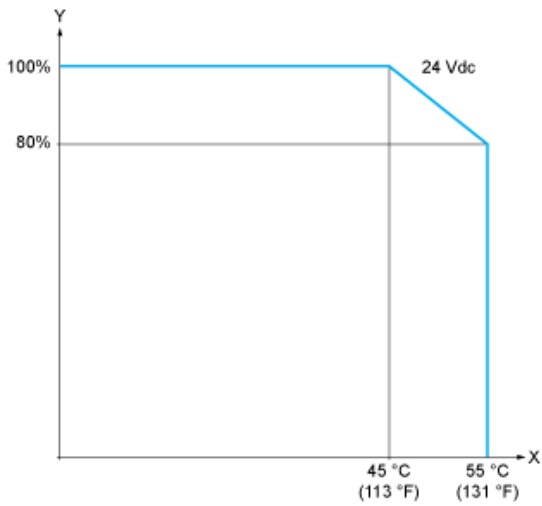
N.C.: not connected

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



## Derating Curves

### Embedded Digital Inputs (No Cartridge)

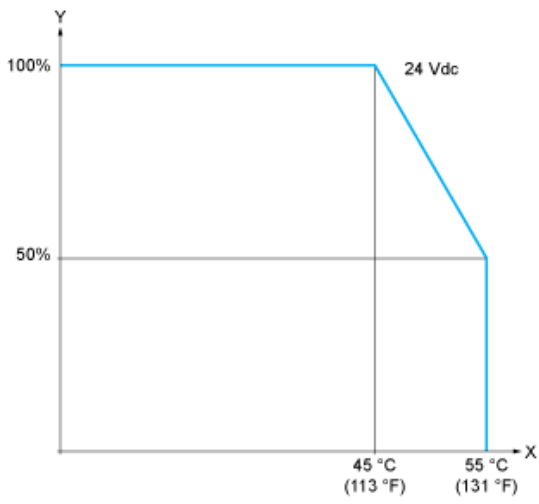


X : Ambient temperature

Y : Input simultaneous ON ratio

### Embedded Digital Inputs (with Cartridge)

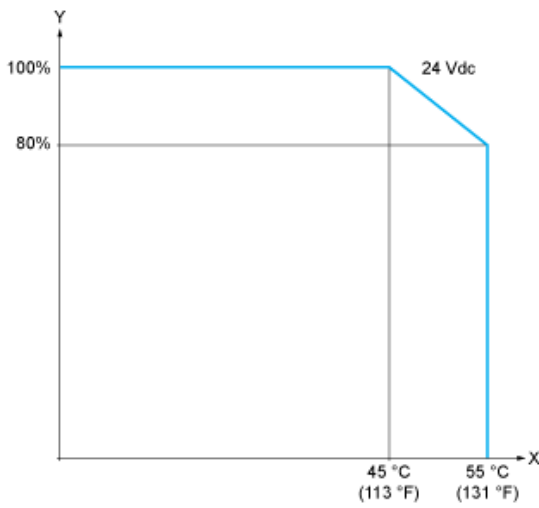




X : Ambient temperature  
 Y : Input simultaneous ON ratio

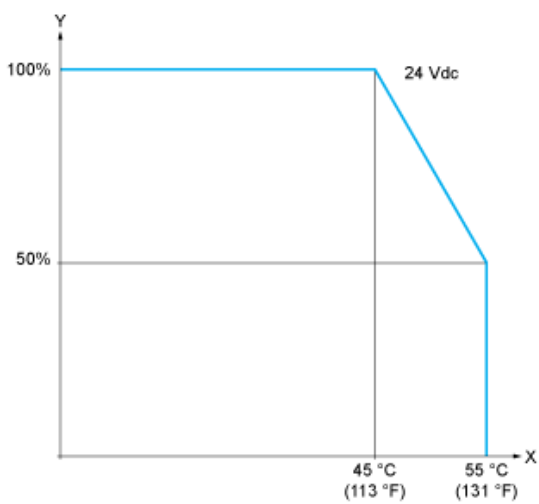
## Derating Curves

### 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