



### Main

|                           |                                                                          |
|---------------------------|--------------------------------------------------------------------------|
| Range of product          | Modicon M221                                                             |
| Product or component type | Logic controller                                                         |
| [Us] rated supply voltage | 24 V DC                                                                  |
| Discrete input number     | 9 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    | 7 transistor including 2 fast output                                     |
| Discrete output voltage   | 24 V DC                                                                  |
| Discrete output current   | 0.5 A                                                                    |

### Complementary

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Discrete I/O number            | 16                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Number of I/O expansion module | <= 4 for relay output<br><= 4 for transistor output                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Supply voltage limits          | 20.4...28.8 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Inrush current                 | <= 35 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Power consumption in W         | <= 3.9 W at 24 V without I/O expansion module<br><= 10 W at 24 V with max number of I/O expansion module                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Power supply output current    | 0.15 A at 24 V for expansion bus<br>0.325 A at 5 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   | +/- 13 V DC for analog input permanent<br>+/- 30 V DC for analog input with 5 min maximum                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Voltage state1 guaranteed      | >= 15 V for input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Current state 1 guaranteed     | >= 4.2 mA for discrete input<br>>= 2.6 mA for fast input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Voltage state 0 guaranteed     | <= 5 V for input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Current state 0 guaranteed     | <= 0.6 mA for fast input<br><= 1.3 mA for discrete input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Discrete input current         | 5 mA for fast input<br>7 mA for discrete input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Input impedance                | 4.9 kOhm for fast input<br>100 kOhm for analog input<br>3.4 kOhm for discrete input                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Response time                  | 300 µs turn-on, turn-off operation for output; other terminals terminal<br>50 µs turn-on, turn-off operation for output; Q2...Q3 terminal<br>5 µs turn-on, turn-off operation for output; Q0...Q1 terminal<br>100 µs turn-off operation for input; other terminals terminal<br>5 µs turn-off operation for fast input; I0, I1, I6, I7 terminal<br>35 µs turn-on operation for input; other terminals terminal<br>5 µs turn-on operation for fast input; I0, I1, I6, I7 terminal<br>35 µs turn-off operation for input; I2...I5 terminal |
| Configurable filtering time    | 12 ms for input<br>3 ms for input<br>0 ms for input                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

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.

|                                   |                                                                                                                                                                                                                                                                         |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Discrete output logic             | Positive logic (source)                                                                                                                                                                                                                                                 |
| Current per output common         | 3.5 A                                                                                                                                                                                                                                                                   |
| Output frequency                  | 0.1 kHz for output at Q4...Q6 terminal<br>5 kHz for output at Q2...Q3 terminal<br>100 kHz for fast output (PWM/PLS mode) at Q0...Q1 terminal                                                                                                                            |
| 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 0.2 A                                                                                                                                                                                                                          |
| Reset time                        | 1 s automatic reset                                                                                                                                                                                                                                                     |
| Memory capacity                   | 256 kB for internal variables RAM<br>256 kB for user application and data RAM with 10000 instructions                                                                                                                                                                   |
| 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                                                                                                                                                                                                                    |
| Positioning functions             | Position PTO 1 axe(s) CW/CCW mode (100 kHz)<br>Position PTO 2 axe(s) pulse/direction 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                                                                                                                                                                                       |
| Counter function                  | A/B<br>Pulse/Direction<br>Single phase                                                                                                                                                                                                                                  |
| Integrated connection type        | Non isolated serial link "serial 2" with connector RJ45 and interface RS232/RS485<br>Non isolated serial link "serial 1" with connector RJ45 and interface RS485<br>USB port with connector mini B USB 2.0                                                              |
| Supply                            | Serial serial link supply at 5 V 200 mA                                                                                                                                                                                                                                 |
| Transmission rate                 | 480 Mbit/s - communication protocol: USB<br>1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 3 m - communication protocol: RS232<br>1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 15 m - communication protocol: RS485                   |
| Communication port protocol       | Non isolated serial link : Modbus protocol master/slave - RTU/ASCII or SoMa-machine-Network<br>USB port : USB protocol - SoMachine-Network                                                                                                                              |
| Local signalling                  | 1 LED per channel green for I/O state<br>1 LED green for SL2<br>1 LED green for SL1<br>1 LED red for BAT<br>1 LED green for SD card access (SD)<br>1 LED red for module error (ERR)<br>1 LED green for RUN<br>1 LED green for PWR                                       |
| Electrical connection             | Mini B USB 2.0 connector for a programming terminal<br>Connector, 4 terminal(s) for analogue inputs<br>Terminal block, 3 terminal(s) for connecting the 24 V DC power supply<br>Removable screw terminal block for outputs<br>Removable screw terminal block for inputs |



|                  |                                                                                                                                                                                                                                                                                                                                                        |
|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cable length     | ≤ 1 m unshielded cable for analog input<br>≤ 30 m unshielded cable for digital input<br>≤ 3 m shielded cable for fast output<br>≤ 30 m unshielded cable for output<br>≤ 10 m shielded cable for fast input                                                                                                                                             |
| Insulation       | 2300 V AC between supply and internal logic<br>500 V AC between input and ground<br>1500 V AC between supply and ground<br>Non-insulated between analogue inputs<br>Non-insulated between analogue input and internal logic<br>500 V AC between output and internal logic<br>Non-insulated between inputs<br>500 V AC between input and internal logic |
| Marking          | CE                                                                                                                                                                                                                                                                                                                                                     |
| Mounting support | Plate or panel with fixing kit<br>Top hat type TH35-7.5 rail conforming to IEC 60715<br>Top hat type TH35-15 rail conforming to IEC 60715                                                                                                                                                                                                              |
| Height           | 70 mm                                                                                                                                                                                                                                                                                                                                                  |
| Depth            | 70 mm                                                                                                                                                                                                                                                                                                                                                  |
| Width            | 95 mm                                                                                                                                                                                                                                                                                                                                                  |
| Product weight   | 0.346 kg                                                                                                                                                                                                                                                                                                                                               |

## Environment

|                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standards                                                               | EN/IEC 60664-1<br>EN/IEC 61131-2<br>EN/IEC 61010-2-201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Product certifications                                                  | 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                                    | 1 V/m ( 2...2.7 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>10 V/m ( 80 MHz...1 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                                           | 1 kV for serial link conforming to EN/IEC 61000-4-4<br>1 kV for Ethernet line conforming to EN/IEC 61000-4-4<br>1 kV for I/O conforming to EN/IEC 61000-4-4<br>2 kV for relay output conforming to EN/IEC 61000-4-4<br>2 kV for power lines conforming to EN/IEC 61000-4-4                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Surge withstand                                                         | 0.5 kV for power lines (DC) in common 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>1 kV for power lines (AC) in differential 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 shielded cable 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>2 kV for relay output 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                                                                                                 |
| Resistance to conducted disturbances, induced by radio frequency fields | 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)<br>3 Vrms (0.1...80 MHz) conforming to Marine specification (LR, ABS, DNV, GL)<br>10 Vrms (0.15...80 MHz) conforming to EN/IEC 61000-4-6                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Electromagnetic emission                                                | Radiated emissions conforming to EN/IEC 55011 class A 10 m, 200 MHz...1 GHz : 47 dBμV/m QP<br>Radiated emissions conforming to EN/IEC 55011 class A 10 m, 30...230 MHz : 40 dBμV/m QP<br>Conducted emissions conforming to EN/IEC 55011 power lines, 1.5...30 MHz : 63 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, 10...150 kHz : 120...69 dBμV/m QP<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 (AC), 0.15...0.5 MHz : 79 dBμV/m QP/66 dBμV/m AV |

|                                       |                                                                                                                                                                                                                                                          |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Immunity to microbreaks               | 10 ms                                                                                                                                                                                                                                                    |
| Ambient air temperature for operation | -10...35 °C for vertical installation<br>-10...55 °C for horizontal installation                                                                                                                                                                         |
| Ambient air temperature for storage   | -25...70 °C                                                                                                                                                                                                                                              |
| Relative humidity                     | 10...95 % without condensation in storage<br>10...95 % without condensation in operation                                                                                                                                                                 |
| 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                  | 1 gn (vibration frequency: 8.4...150 Hz) on panel mounting<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>3.5 mm (vibration frequency: 5...8.4 Hz) on symmetrical rail |
| Shock resistance                      | 147 m/s <sup>2</sup> (test wave duration:11 ms)                                                                                                                                                                                                          |

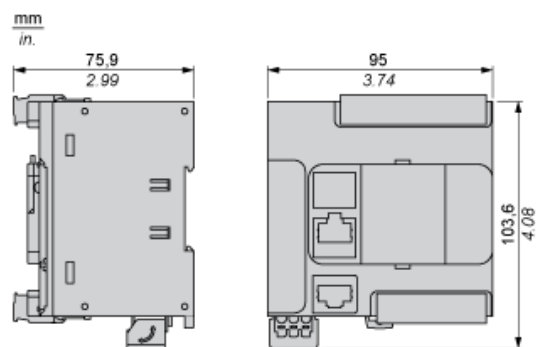
## Offer Sustainability

|                                  |                                                                                          |
|----------------------------------|------------------------------------------------------------------------------------------|
| Sustainable offer status         | Green Premium product                                                                    |
| RoHS (date code: YYWW)           | Compliant - since 1415 - <a href="#">Schneider Electric declaration of conformity</a>    |
| REACH                            | Reference contains SVHC above the threshold - <a href="#">go to CaP for more details</a> |
| Product environmental profile    | Available <a href="#">Download Product Environmental</a>                                 |
| Product end of life instructions | Available <a href="#">Download End Of Life Manual</a>                                    |

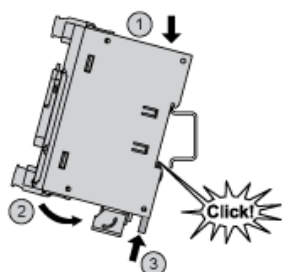
---

Dimensions

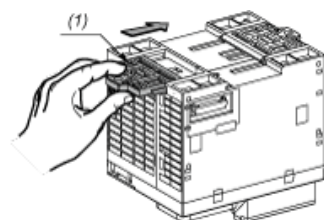
---



## Mounting on a Rail

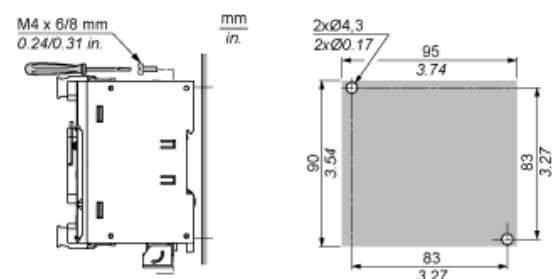


## Direct Mounting on a Panel Surface



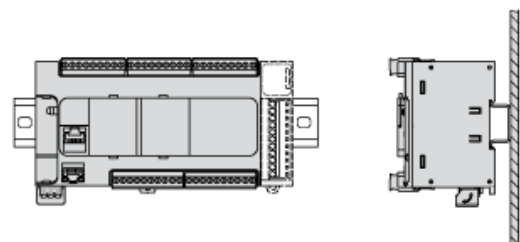
(1) Install a mounting strip

## Mounting Hole Layout

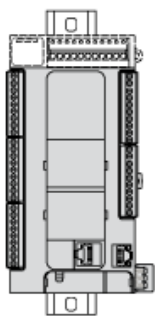


## Mounting

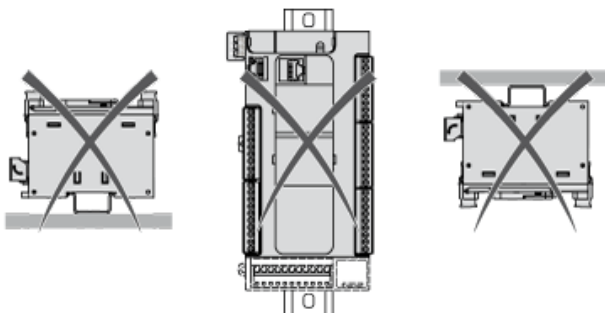
### Correct Mounting Position



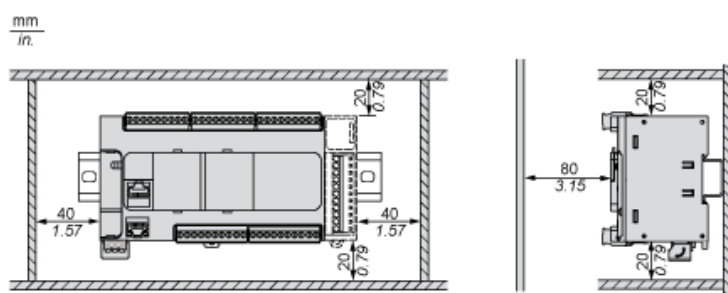
## Acceptable Mounting Position



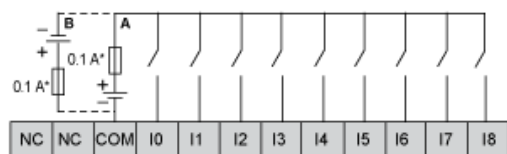
## Incorrect Mounting Position



## Clearance

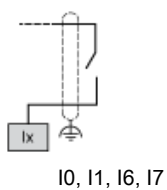


## Digital Inputs

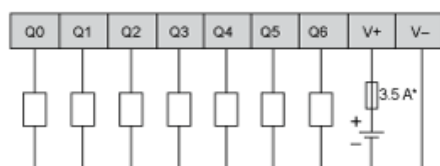


- (\*) Type T fuse  
(A) Sink wiring (positive logic).  
(B) Source wiring (negative logic).

## Connection of the Fast Inputs

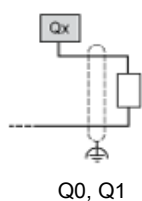


## Transistor Outputs

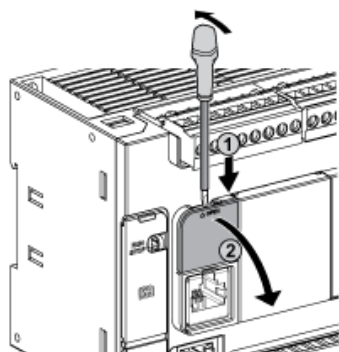


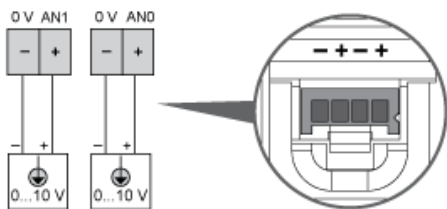
- (\*) Type T fuse

## Connection of the Fast Outputs



## Analog Inputs

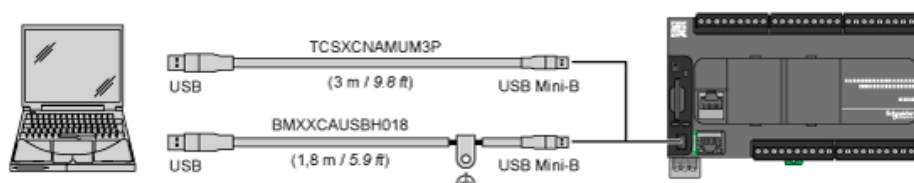




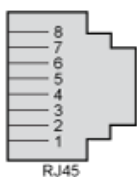
The (-) poles are connected internally.

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

## USB Mini-B Connection



## SL1 Connection



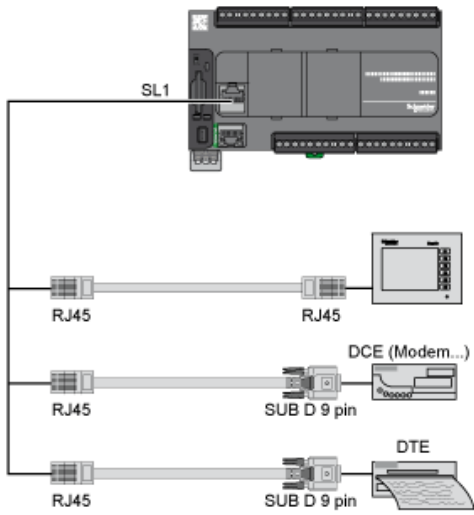
SL1

| 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 |

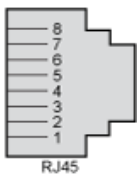
N.C.: not connected

\* : 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 |

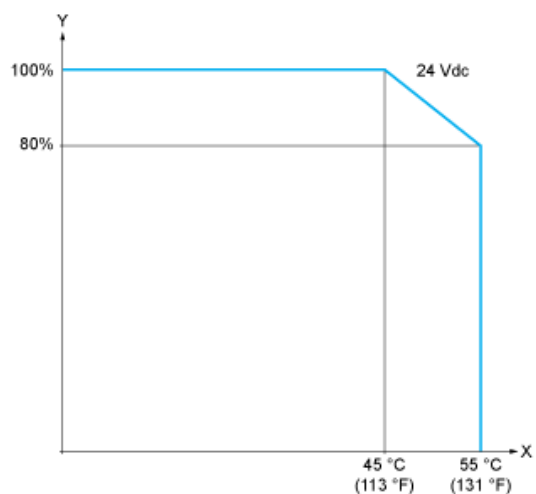
N.C.: not connected

---

## Derating Curves

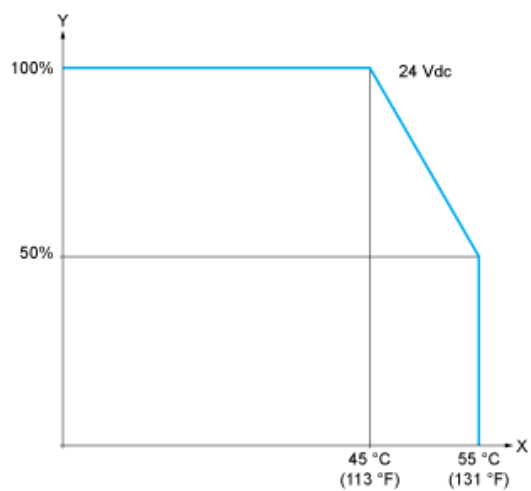
---

### Embedded Digital Inputs (No Cartridge)



X : Ambient temperature  
Y : Input simultaneous ON ratio

### Embedded Digital Inputs (with Cartridge)



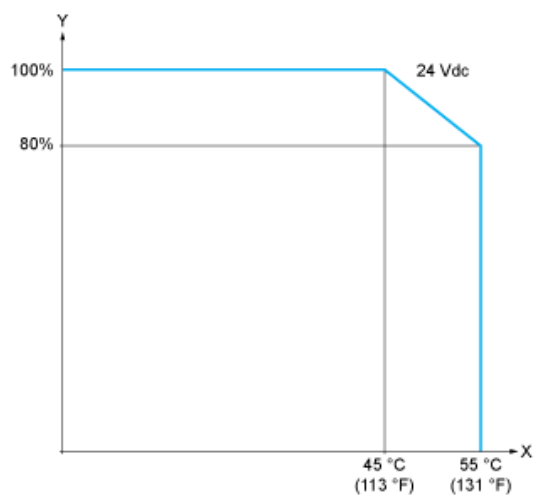
X : Ambient temperature  
Y : Input simultaneous ON ratio

---

## Derating Curves

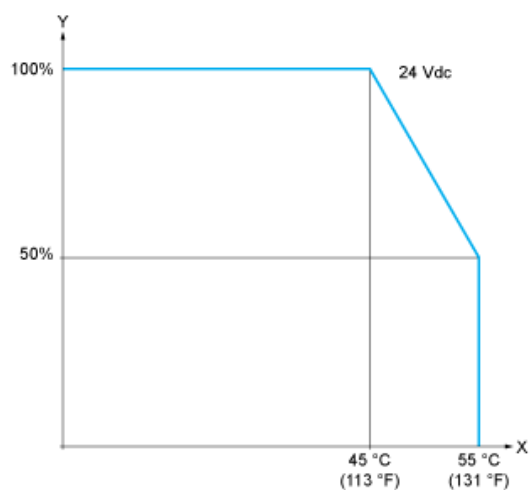
---

### 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