



### Main

|                           |                                                                  |
|---------------------------|------------------------------------------------------------------|
| Range of product          | Modicon M221                                                     |
| Product or component type | Logic controller                                                 |
| [Us] rated supply voltage | 24 V DC                                                          |
| Discrete input number     | 16, discrete input 4 fast input conforming to IEC 61131-2 Type 1 |
| Analogue input number     | 2 at 0...10 V                                                    |
| Discrete output type      | Transistor                                                       |
| Discrete output number    | 16 transistor 2 fast output                                      |
| Discrete output voltage   | 24 V DC                                                          |
| Discrete output current   | 0.1 A                                                            |

### Complementary

|                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Discrete I/O number                    | 32                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Maximum number of I/O expansion module | 7 for relay output                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Supply voltage limits                  | 20.4...28.8 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Inrush current                         | 35 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Maximum power consumption in W         | 23.2 W at 24 V (with max number of I/O expansion module)<br>4.2 W at 24 V (without I/O expansion module)                                                                                                                                                                                                                                                                                                                                                                        |
| Power supply output current            | 0.52 A 5 V for expansion bus<br>0.48 A 24 V for expansion bus                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Discrete input logic                   | Sink or source (positive/negative)                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Discrete input voltage                 | 24 V                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Discrete input voltage type            | DC                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Analogue input resolution              | 10 bits                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| LSB value                              | 10 mV                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Conversion time                        | 1 ms per channel + 1 controller cycle time for analogue input analog input                                                                                                                                                                                                                                                                                                                                                                                                      |
| Permitted overload on inputs           | +/- 30 V DC for 5 min (maximum) for analog input<br>+/- 13 V DC (permanent) for analog input                                                                                                                                                                                                                                                                                                                                                                                    |
| Voltage state 1 guaranteed             | >= 15 V for input                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Voltage state 0 guaranteed             | <= 5 V for input                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Discrete input current                 | 7 mA for discrete input<br>5 mA for fast input                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Input impedance                        | 100 kOhm for analog input<br>3.4 kOhm for input<br>4.9 kOhm for fast input                                                                                                                                                                                                                                                                                                                                                                                                      |
| Response time                          | 35 µs turn-off, I2...I5 terminal(s) for input<br>5 µs turn-on, I0, I1, I6, I7 terminal(s) for fast input<br>35 µs turn-on, other terminals terminal(s) for input<br>5 µs turn-off, I0, I1, I6, I7 terminal(s) for fast input<br>100 µs turn-off, other terminals terminal(s) for input<br>5 µs turn-on, turn-off, Q0...Q1 terminal(s) for output<br>50 µs turn-on, turn-off, Q2...Q3 terminal(s) for output<br>300 µs turn-on, turn-off, other terminals terminal(s) for output |
| Configurable filtering time            | 0 ms for input<br>3 ms for input<br>12 ms for input                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Discrete output logic                  | Positive logic (source)                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Maximum current per output common      | 1.6 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

|                                   |                                                                                                                                                                                     |
|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Output frequency                  | 100 KHz for fast output (PWM/PLS mode) at Q0...Q1<br>5 KHz for output at Q2...Q3<br>0.1 KHz for output at Q4...Q15                                                                  |
| Absolute accuracy error           | +/- 1 % of full scale for analog input                                                                                                                                              |
| Maximum leakage current           | 0.1 mA for transistor output                                                                                                                                                        |
| Maximum voltage drop              | <1 V                                                                                                                                                                                |
| Mechanical durability             | 20000000 cycles for transistor output                                                                                                                                               |
| Maximum tungsten load             | <2.4 W for output and fast output                                                                                                                                                   |
| Protection type                   | Short-circuit and overload protection with automatic reset<br>Short-circuit protection on output<br>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 year(s)                                                                                                                            |
| 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<br>0.7 ms for other instruction                                                                                                                  |
| Execution time per instruction    | 0.2 µs Boolean                                                                                                                                                                      |
| Exct time for event task          | 60 µs response time                                                                                                                                                                 |
| Application structure             | 1 cyclic auxiliary task<br>1 configurable freewheeling/cyclic master task<br>8 interrupt tasks                                                                                      |
| Maximum size of object areas      | 255 %C counters<br>512 %M memory bits<br>512 %KW constant words<br>8000 %MW memory words<br>255 %TM timers                                                                          |
| 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                | Frequency generator<br>PWM<br>PLS                                                                                                                                                   |
| Counting input number             | 4 fast input (HSC mode) at 100 kHz 32 bits                                                                                                                                          |
| Counter function                  | Single phase<br>A/B<br>Pulse/direction                                                                                                                                              |
| Integrated connection type        | USB port with mini B USB 2.0 connector<br>Non isolated serial link serial 1 with RJ45 connector and RS232/RS485 interface<br>Ethernet with RJ45 connector                           |
| Supply                            | (serial 1)serial link supply: 5 V, <200 mA                                                                                                                                          |
| Transmission rate                 | 1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 15 m for RS485<br>1.2...115.2 kbit/s (115.2 kbit/s by default) for bus length of 3 m for RS232<br>480 Mbit/s for USB |
| Communication port protocol       | USB port: USB - SoMachine-Network<br>Non isolated serial link: Modbus master/slave - RTU/ASCII or SoMachine-Network<br>Ethernet                                                     |
| Port Ethernet                     | 10BASE-T/100BASE-TX 1 port with 100 m copper cable                                                                                                                                  |
| Communication service             | Modbus TCP slave device<br>Modbus TCP server<br>Modbus TCP client<br>Ethernet/IP adapter<br>DHCP client                                                                             |

|                                        |                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Local signalling                       | 1 LED (green) for PWR<br>1 LED (green) for RUN<br>1 LED (red) for module error (ERR)<br>1 LED (green) for SD card access (SD)<br>1 LED (red) for BAT<br>1 LED per channel (green) for I/O state<br>1 LED (green) for SL<br>Ethernet network activity (green) for ACT<br>Ethernet network link (yellow) for Link (Link Status) |
| Electrical connection                  | Terminal block, 3 terminal(s) for connecting the 24 V DC power supply<br>Connector, 4 terminal(s) for analogue inputs<br>Mini B USB 2.0 connector for a programming terminal<br>HE-10 connector, 20 terminal(s) for inputs<br>HE-10 connector, 20 terminal(s) for outputs                                                     |
| Maximum cable distance between devices | Shielded cable: <10 m for fast input<br>Unshielded cable: <30 m for output<br>Unshielded cable: <30 m for digital input<br>Unshielded cable: <1 m for analog input<br>Shielded cable: <3 m for fast output                                                                                                                    |
| Insulation                             | Between input and internal logic at 500 V AC<br>Between fast input and internal logic at 500 V AC<br>Non-insulated between inputs<br>Between output and internal logic at 500 V AC<br>Non-insulated between analogue input and internal logic<br>Non-insulated between analogue inputs                                        |
| 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                                  | 70 mm                                                                                                                                                                                                                                                                                                                         |
| Net weight                             | 0.27 kg                                                                                                                                                                                                                                                                                                                       |

## Environment

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standards                             | EN/IEC 61010-2-201<br>EN/IEC 60664-1<br>EN/IEC 61131-2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Product certifications                | ABS<br>DNV-GL<br>LR<br>CULus<br>IACS E10<br>EAC<br>RCM<br>CSA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Environmental characteristic          | Ordinary and hazardous location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Resistance to electrostatic discharge | 8 kV in air conforming to EN/IEC 61000-4-2<br>4 kV on contact 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 (power lines) conforming to EN/IEC 61000-4-4<br>2 kV (relay output) conforming to EN/IEC 61000-4-4<br>1 kV (I/O) conforming to EN/IEC 61000-4-4<br>1 kV (Ethernet line) conforming to EN/IEC 61000-4-4<br>1 kV (serial link) conforming to EN/IEC 61000-4-4                                                                                                                                                                                                                                                                                            |
| Surge withstand                       | 2 kV power lines (AC) common mode conforming to EN/IEC 61000-4-5<br>2 kV relay output common mode conforming to EN/IEC 61000-4-5<br>1 kV I/O common mode conforming to EN/IEC 61000-4-5<br>1 kV shielded cable common mode conforming to EN/IEC 61000-4-5<br>0.5 kV power lines (DC) differential mode conforming to EN/IEC 61000-4-5<br>1 kV power lines (AC) differential mode conforming to EN/IEC 61000-4-5<br>1 kV relay output differential mode conforming to EN/IEC 61000-4-5<br>0.5 kV power lines (DC) common mode conforming to EN/IEC 61000-4-5 |
| Resistance to conducted disturbances  | 10 V 0.15...80 MHz conforming to EN/IEC 61000-4-6<br>3 V 0.1...80 MHz conforming to Marine specification (LR, ABS, DNV, GL)<br>10 V spot frequency (2, 3, 4, 6.2, 8.2, 12.6, 16.5, 18.8, 22, 25 MHz) conforming to Marine specification (LR, ABS, DNV, GL)                                                                                                                                                                                                                                                                                                  |

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electromagnetic emission              | <p>Conducted emissions - test level: 79 dBµV/m QP/66 dBµV/m AV ( power lines (AC)) at 0.15...0.5 MHz conforming to EN/IEC 55011</p> <p>Conducted emissions - test level: 73 dBµV/m QP/60 dBµV/m AV ( power lines (AC)) at 0.5...300 MHz conforming to EN/IEC 55011</p> <p>Conducted emissions - test level: 120...69 dBµV/m QP ( power lines) at 10...150 kHz conforming to EN/IEC 55011</p> <p>Conducted emissions - test level: 63 dBµV/m QP ( power lines) at 1.5...30 MHz conforming to EN/IEC 55011</p> <p>Radiated emissions - test level: 40 dBµV/m QP class A ( 10 m) at 30...230 MHz conforming to EN/IEC 55011</p> <p>Conducted emissions - test level: 79...63 dBµV/m QP ( power lines) at 150...1500 kHz conforming to EN/IEC 55011</p> <p>Radiated emissions - test level: 47 dBµV/m QP class A ( 10 m) at 200...1000 MHz conforming to EN/IEC 55011</p> |
| Immunity to microbreaks               | 10 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Ambient air temperature for operation | <p>-10...55 °C (horizontal installation)</p> <p>-10...35 °C (vertical installation)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Ambient air temperature for storage   | -25...70 °C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Relative humidity                     | <p>10...95 %, without condensation (in operation)</p> <p>10...95 %, without condensation (in storage)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 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                  | <p>3.5 mm at 5...8.4 Hz on symmetrical rail</p> <p>3.5 mm at 5...8.4 Hz on panel mounting</p> <p>1 gn at 8.4...150 Hz on symmetrical rail</p> <p>1 gn at 8.4...150 Hz on panel mounting</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Shock resistance                      | 147 m/s² for 11 ms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

### Packing Units

|                  |            |
|------------------|------------|
| Package 1 Weight | 420.000 g  |
| Package 1 Height | 108.000 mm |
| Package 1 width  | 100.000 mm |
| Package 1 Length | 126.000 mm |

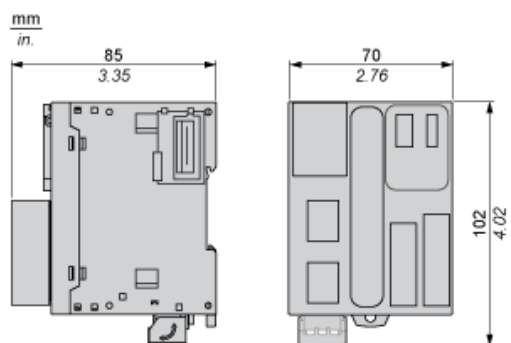
### Offer Sustainability

|                            |                                                                                                                                                                                      |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sustainable offer status   | Green Premium product                                                                                                                                                                |
| REACH Regulation           |  <a href="#">REACH Declaration</a>                                                                |
| EU RoHS Directive          | Pro-active compliance (Product out of EU RoHS legal scope)  <a href="#">EU RoHS Declaration</a> |
| Mercury free               | Yes                                                                                                                                                                                  |
| RoHS exemption information |  <a href="#">Yes</a>                                                                              |
| China RoHS Regulation      |  <a href="#">China RoHS Declaration</a>                                                           |
| Environmental Disclosure   |  <a href="#">Product Environmental Profile</a>                                                    |
| Circularity Profile        |  <a href="#">End Of Life Information</a>                                                          |
| WEEE                       | The product must be disposed on European Union markets following specific waste collection and never end up in rubbish bins                                                          |
| PVC free                   | Yes                                                                                                                                                                                  |

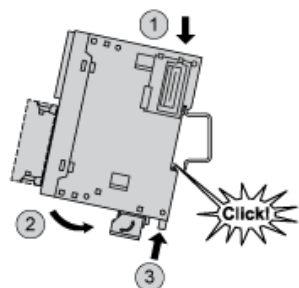
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Dimensions

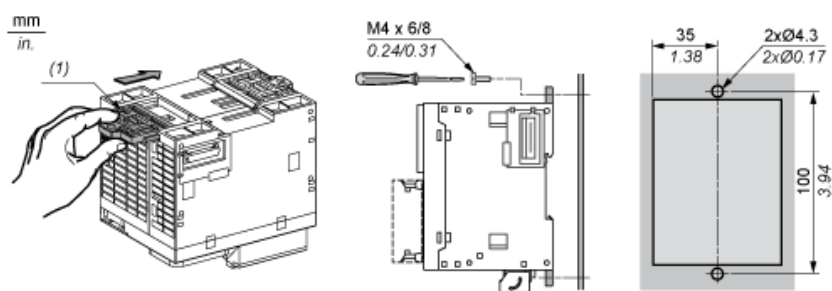
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## Mounting on a Rail



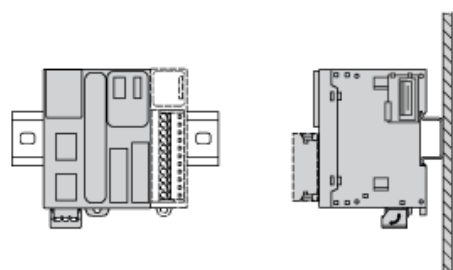
## Direct Mounting on a Panel Surface



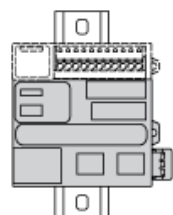
(1) Install a mounting strip

## Mounting

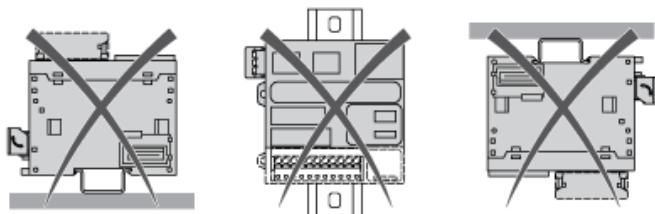
### Correct Mounting Position



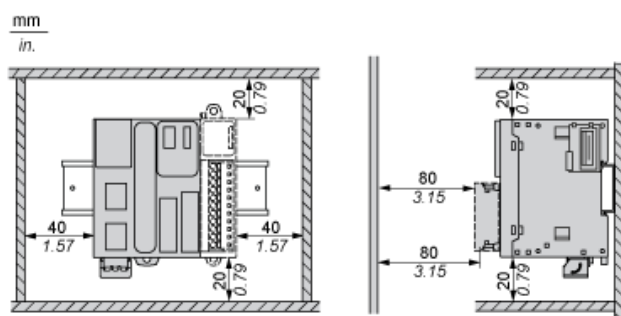
### Acceptable Mounting Position



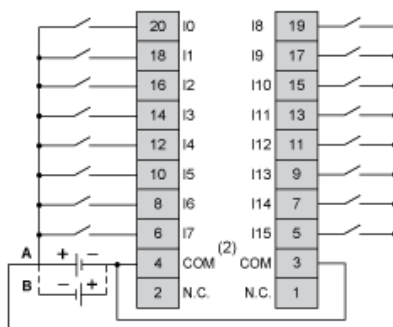
## Incorrect Mounting Position



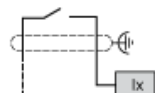
## Clearance



## Digital Inputs

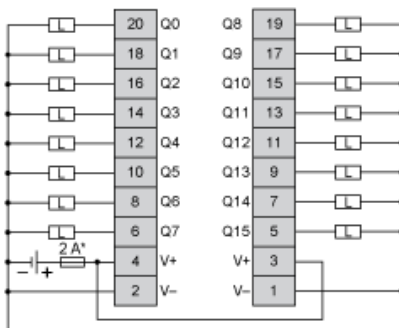


- (1) The COM terminals are not connected internally.  
A : Sink wiring (positive logic).  
B : Source wiring (negative logic).

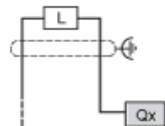


Ix I0, I1, I6, I7

## Digital Outputs

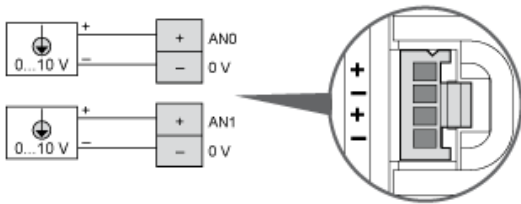
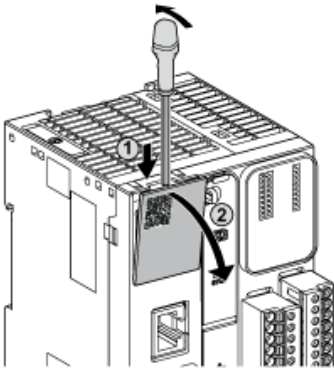


- (\*) Type T fuse  
(1) The V+ terminals are connected internally.



Qx Q0, Q1

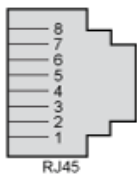
## Analog Inputs



The (-) poles are connected internally.

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

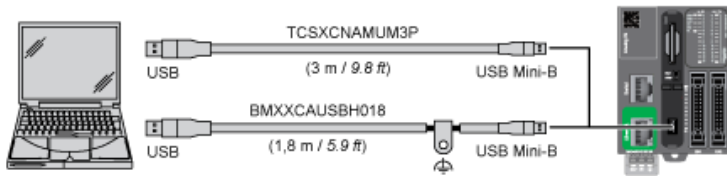
## Ethernet Connection



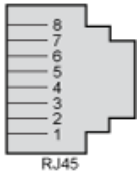
| Pin N ° | Signal |
|---------|--------|
| 1       | TD+    |
| 2       | TD-    |
| 3       | RD+    |
| 4       | -      |
| 5       | -      |
| 6       | RD-    |
| 7       | -      |
| 8       | -      |



## USB Mini-B Connection



## SL1 Connection

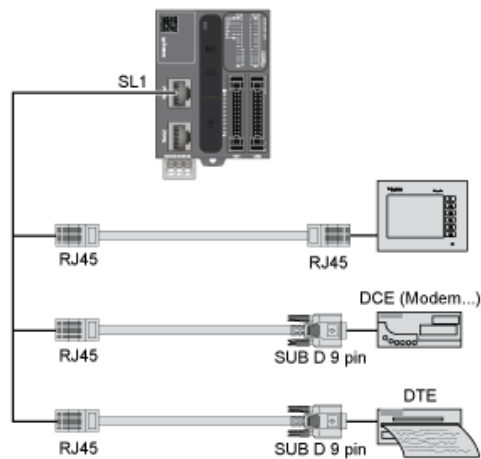


SL1

| 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 |

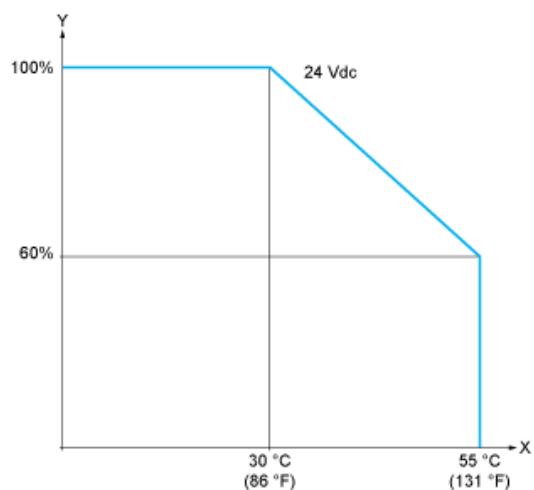
N.C.: not connected

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



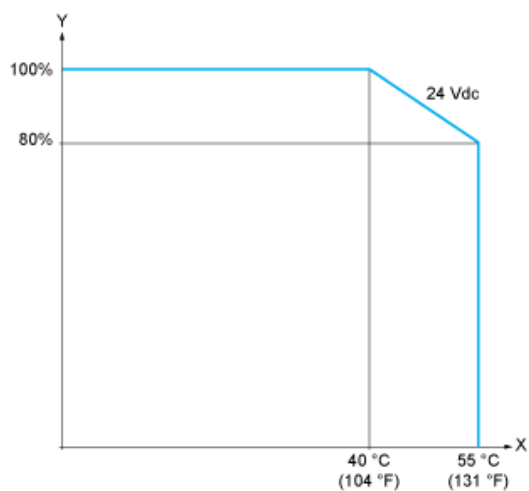
## Derating Curves

### Embedded Digital Inputs



X : Ambient temperature  
Y : Input simultaneous ON ratio

### Embedded Digital Outputs



X : Ambient temperature  
Y : Output simultaneous ON ratio